Rural vulnerability, climate change and adaptation in Angola

Oliver Sykes, June 2013

CONTENTS

Abbreviations

ACM	Associação Cristã da Mocidade
ACT	Action by Churches Together
ADB	African Development Bank
CA	Christian Aid
CBA	Community-Based Adaptation
CBNRM	Community-Based Natural Resource Management
CC	Climate Change
CCA	Climate Change Adaptation
CSDRM	Climate Smart Disaster Risk Management
DJF	December January February
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EbA	Ecosystems-base Adaptation
EC	European Community
ENSO	El Niño Southern Oscillation
FAO	Food and Agriculture Organisation
FEWS	Famine Early Warning System
GCM	Global Circulation Model
GEF	Global Environment Facility
GNI	Gross National Income
GoA	Government of Angola
HDI	Human Development Index
IIED	International Institute for Environment and Development
INAMET	Instituto Nacional de Geofisica e Meteorologia
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-Tropical Convergence Zone
JJA	June July August
LDC	Least Developed Country
MAM	March April May
MPLA	Movimento Para a Liberação de Angola
NAPA	National Adaptation Programme of Action
NGO	Non-Governmental Organisation
PVCA	Participatory Vulnerability and Capacity Assessment
RCM	Regional Circulation Model
SCF	Save the Children Fund
SON	September October November
SSA	Sub-Saharan Africa
UN	United Nations
UNDP	UN Development Programme
UNFCCC	UN Framework Convention on Climate Change
UNITA	União Nacional para a Independência Total de Angola
USAID	US Administration for International Development
WRSI	Water Requirement Satisfaction Index

1. Introduction and background

1.1 Introduction

Eleven years after the end of the war and in a country with an economic growth rate consistently amongst the top three countries globally (1), rural Angolans should no longer be suffering the effects of chronic food insecurity and vulnerability to external shocks. Already in 2007, Angola's per capita income approached that of middle-income countries (10) and the UN Human Development Index in 2009 ranked Angola a 'medium human development' country above Ghana, Kenya, Bangladesh (2). While such ranking is largely down to oil revenue boosting GNI, Angola also has other factors in its favour including extensive unexploited arable land, low population density and a climate that is generally favourable for agriculture in comparison with many neighbours.

Yet in terms of key social indicators concerning poverty, child and maternal mortality, life expectancy, access to health education and water /sanitation, Angola continues to perform extremely poorly (3). The huge wealth of the country is not benefitting the majority of Angolans.

The agricultural year 2011-12 saw reduced rainfall in parts of the country and harvests were well below average. The effect of this on rural smallholders in ten provinces was dramatic, with indices of malnutrition amongst poor and marginalised communities quickly returning to the emergency levels seen during the war and triggering national and international humanitarian responses in ten out of 16 provinces (4). This exposed, in a stark manner, the chronic vulnerability of millions of rural Angolans to external shocks. Rains in the 12-13 agricultural season are once again looking weak. But there is a greater problem here than erratic rainfall and the question that needs to be answered is: what are the key factors causing this chronic vulnerability and what role does climate change play alongside other pressures?

This report was commissioned to try to tease apart the complex question of multiple vulnerabilities amongst rural smallholder communities in Angola. There is a particular focus on three areas of the country where Christian Aid has had significant programme interest for a long period of time. Conclusions may have implications for CA's programme approach and will hopefully benefit partners and communities supported by CA's work.

1.2 Christian Aid programme background

Christian Aid's programme in Angola has evolved through changing political and funding contexts from its conception in the 1980s, when the Angola programme was run from then Zaire. The last years of the war from 1997 to 2002 saw a large programme focussed on humanitarian assistance and food security, always working

in partnership with existing local NGOs and churches. Since the end of the war and with an increasingly prevalent donor perspective that Angola's own wealth should be used for poverty reduction, development funding especially to NGOs has declined, to be replaced by multilateral match funding and lending in partnership with the government. Christian Aid's analysis is that while extreme poverty and vulnerability continue in Angola there is much to be gained from an approach that works with local partners to challenge the structures and relationships that keep people marginalised and vulnerable (5). To this end the vision of the Angola programme for the period 2013-16 is: "Justice in the use of power, at all levels, for an Angola better for all".

Two programme objectives have been defined for the next period namely:

- Inclusive peace, shared citizenship - To strengthen the foundations for inclusive peace and shared citizenship, including the promotion of civil and political rights, gender equity and non-violent models and practices.
- Shared resources towards dignity for all - To increase the access of poor Angolan women, men and children to their social and economic rights and to resources, in particular land and housing rights.

Under the second objective above, the strategy includes an explicit undertaking to work in the area of resilience and sustainability, as an element of access to resources, through a programme focussed on climate change adaptation (CCA). Christian Aid's work in the area of CCA is supported by a series of technical guides and toolkits developed with partners from experience in a range of countries (6, 7, 8, 9).

1.3 Report scope

Christian Aid's strategic approach for 2012-16 states:

"There is a relationship between the land rights of poor rural communities, land grabbing and "development investments", and Climate Change. This equation is not yet clear and more work needs to be done by the programme to understand these long term issues." (5)

Emerging from this, the core research question set is:

"What are the key factors affecting the viability of rural smallholder livelihoods in Huila, Kwanza Sul and Kuando Kubango, what mitigation is available and what are the implications for the way Christian Aid works with these communities and respective partner organisations?". Full terms of reference can be found in Appendix A.

Clarification of the relationship between land rights, climate change and livelihoods is part of the purpose of this report. However there are numerous additional pressures that contribute to maintaining poverty and vulnerability amongst rural smallholders. Amongst these, this work aims to provide a better understanding of those factors, such as gender inequality, that Christian Aid and partners can directly address. It also tries to understand the significance of different pressures, in order to inform appropriate responses.

1.4 Methodology and report structure

Work presented here follows field research and a report undertaken in 2011, and some of that work is referred to here. Extensive analysis of satellite interpretation imagery has been carried out in order to develop a picture of rainfall trends over the recent past in comparison with historical averages. Additional material has been gathered through desk-based research of the academic and practitioner literature.

Following this introductory chapter, Chapter 2 provides a brief description of the socio-economic background in Angola. Chapter 3 then discusses climate change trends and projections for the region, the country and the three study areas, leading to Chapter 4 which presents key aspects of vulnerability and the role of climatic effects in exacerbating vulnerability. Chapter 5 discusses current development narratives and frameworks in response to climatic effects and their relevance to Angola and our study areas. Chapter 6 concludes the report and provides recommendations and suggested next steps.

2 Angola: socio-economic background

Since the end of the war, the Angolan economy has, on paper, been one of the most successful in the world with a consistent and high rate of economic growth. However, growth is largely dependent on oil production which creates little local employment (10). Oil production peaked at 2m barrels a day in 2008 and has declined since but there may be further increases in production as new fields come on-stream (12). It is claimed that production will continue at between 1.75 and 2m barrels a day until 2025 (11) and with the likelihood of continuing increased in energy prices, GoA will continue to benefit and to use oil revenue for urbanisation and infrastructure. Allegations of high level corruption continue, with many billions missing from state accounts (for example 13).

It follows that Angola is a very unequal country. It has the fourth highest Gini index in Africa and maintains its position amongst the poorest performing countries in terms of human development, illustrated by child mortality and overall undernourishment statistics that are amongst the worst in Africa (Fig. 1 below) (3). Some indicators have improved and in the period between 2001 and 2012, life expectancy at birth rose 11 years from 40 to 51. The fertility rate has declined from 7.2 during the war years (then the highest in the world) to 5.1 children per woman which is still above the SSA average (3). Life for rural Angolans, where 95% of the population lives in poverty, remains fragile and the situation is worse for rural women. A legacy of the war and, more recently, of male migration in search of work, is that more than 30% of households are female-headed (14) and these families are particularly vulnerable. Reasons for this are explored further below and include food price increases that are amongst the highest in Africa (3) and this disproportionately affects the family provider.

There has been no national census since the 1970s so these figures are estimates: the population of about 20.2 million (3) increasingly lives in urban areas or in the more fertile central highlands. Up to a third of the population is estimated to live in or near the capital Luanda and ‘rampant urbanisation’ (15) continues, with the best estimate of rural population now at 40% (18).

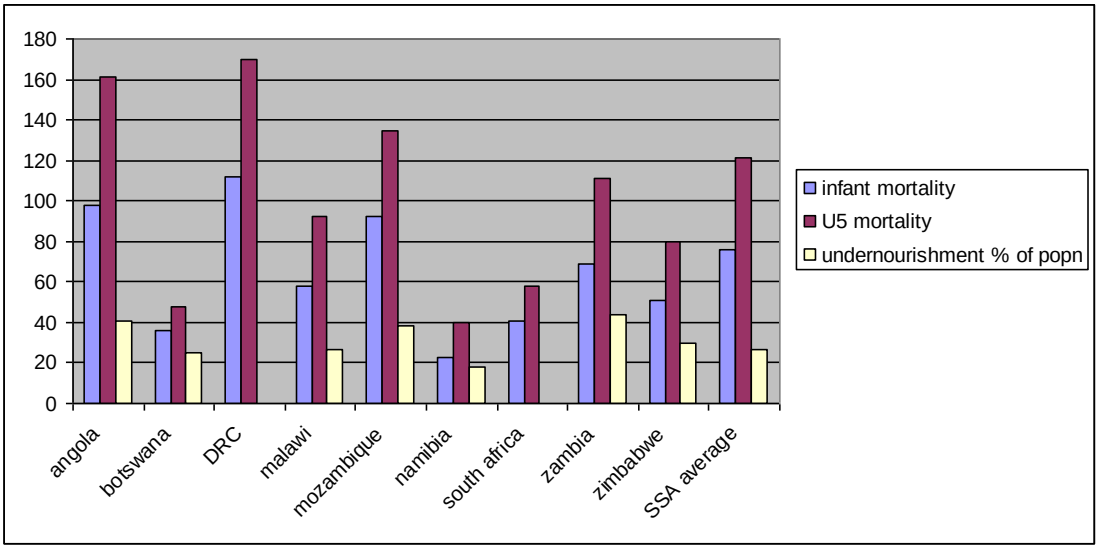

Figure 1 – regional child mortality and nutrition statistics 2010 (3)

There have been two rounds of legislative elections since the end of the war in 2002. The large majority gained by the MPLA in the 2008 elections allowed a change in the constitution such that presidential elections are no longer required, with the president being selected from the winning party. Thus Jose Eduardo dos Santos continues as president and, with the MPLA winning again comfortably in 2012, shows no sign of moving on. The overall result has been a

"full consolidation of the hegemony of President dos Santos and the MPLA over the Angolan political system" (16).

The impact of this on the country's economy and on ordinary Angolans is profound and effectively cements the thread of strong authoritarianism that has prevailed since the colonial era and was clearly exacerbated by the long war. This manifests itself in a combination of a sharply-defined power hierarchy, a weak culture of participation, fear of challenging power alongside a continuing expectation that only those in power can resolve people's everyday problems. Economic development has been largely based in the oil and construction sectors, focussed on urban development and major infrastructure.

There are signs of economic diversification, however and the contribution of agriculture to the economy is increasing having almost trebled between 2007 and 2011 and now at around 10% of GNI (17). Angola's food production index has seen one of the highest increases in Africa in the period 1999 to 2009, second only to Sierra Leone. This is from a very low base however and agricultural yield and per capita production are still well below the SSA average (3). Historically Angola was a food exporter and had significant food transformation industry; this was destroyed in the war and Angola currently imports a significant proportion of its food needs (18). As will be further explored in Chapter 3, the bulk of agricultural production in Angola is from smallholder subsistence farmers who nevertheless experience high levels of absolute poverty.

A major factor in the persistence of rural poverty in particular is the paucity of basic infrastructure and services in health, education and water /sanitation. The government's own web pages on development needs in the provinces show huge shortfalls in education and health provision (e.g. 19), in terms of both infrastructure and staffing. Recent rises in public sector salaries (17) will help to fill gaps in staffing but, for example, with more than 80% of the school age population outside the system in some areas, there is a long way to go (19).

2.1 Three focus areas – snapshots

Cela municipality, Kwanza Sul province. Kwanza Sul province straddles the coastal strip and the central highlands. The province was heavily affected by the war with large areas occupied by UNITA for periods and historical political affiliation still influences allocation of development funding by central government. The population of 2.3m (19) is largely agricultural: land in Kwanza Sul is in demand due to location and quality and this has implications for security of land tenure by subsistence farmers with customary rights to their land. Cela municipality (which is where Christian Aid partner ACM has a long history of project work) with its principal town Waku kungo has been the focus of much development attention in recent years from commercial farmers, wealthy ranchers and government resettlement projects: at the same time (according to a government website) only 25,000 out of a school-age population of 200,000 children are able to attend school in Cela (19).

Chibia municipality, Huila province. Our study area is in and to the west of the Bicuar National park in southern Huila, a province in southern Angola with a population of about 2.9m (20) and provincial capital Lubango. With a drier climate toward the south of the province much of Huila is more suited to livestock than arable farming and there is pressure from large private ranch owners and commercial estates on subsistence farmers, pastoralists and semi-nomadic communities. Although Lubango was never occupied by UNITA, much of Huila saw fighting and there was widespread destruction of infrastructure including schools, roads and health posts. Namibia is accessible by road and cross-border movement influences trade and provincial government priorities.

Mavinga municipality, Kuando Kubango province. Kuando Kubango is the second largest province after Moxico and is sparsely populated with large areas of relatively pristine natural habitat especially towards the east. UNITA's principal military base during the war was in this province and fear of continuing UNITA sympathies may be behind certain Government of Angola development and security policies in the province. Mavinga town was isolated by road due to landmines until recently and much of the province remains heavily mined. Kuando Kubango's population has increased significantly since the end of the war due to returning refugees from Zambia and the majority of the population are subsistence farmers depending on rainfed agriculture (21).

3 Climate change in Angola

3.1 Developing a local climate change analysis

The information set out in this section forms part of the analysis needed to inform a rounded response to climate change effects. Christian Aid has developed a comprehensive toolkit on assembling a climate change analysis for a particular area and this is based on a combination of knowledge derived from climate science and monitoring, such as is presented here, and local knowledge and perceptions about weather and climate (8).

3.2 Climate, trends and projections – Angola overall

Angola's climate varies from 'tropical monsoon' in the north and central highlands, to 'tropical savanna' in parts of the south. The far south and west of the country bordering the Namib desert also have areas of dry arid and semi-arid climate. Figures 3 and 4 below show rainfall and temperature contours based on historical data. Rainfall follows the annual cycle of the Inter-Tropical Convergence Zone (ITCZ) (see Figures 5 and 6), which oscillates over the equator bringing 50mm to 250mm monthly precipitation to Angola between October and April. The winter months (June July August - JJA) are very dry and rarely receive rain anywhere in the country (22). Despite being tropical, Angola's average temperatures are relatively cool, ranging between 20^{o}C (winter) and 25^{o}C (summer) because much of the country is at high altitude (22).

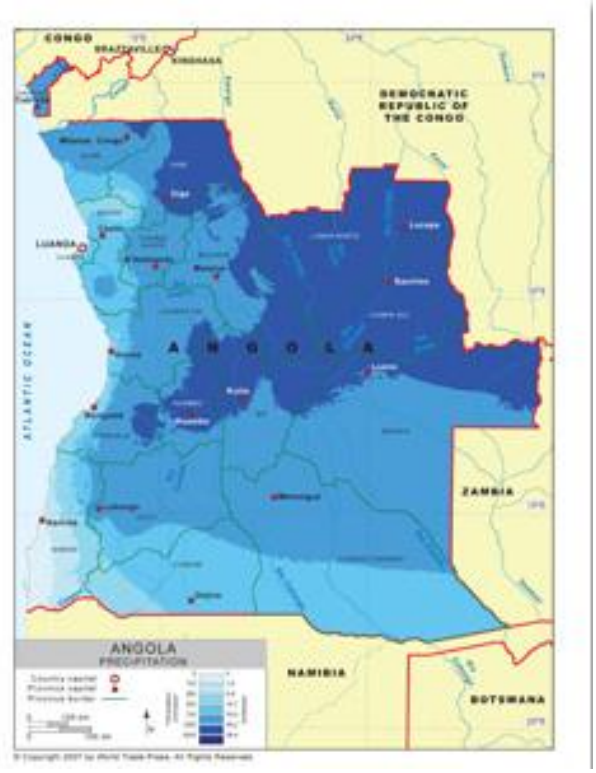

Figure 3. Angola rainfall distribution

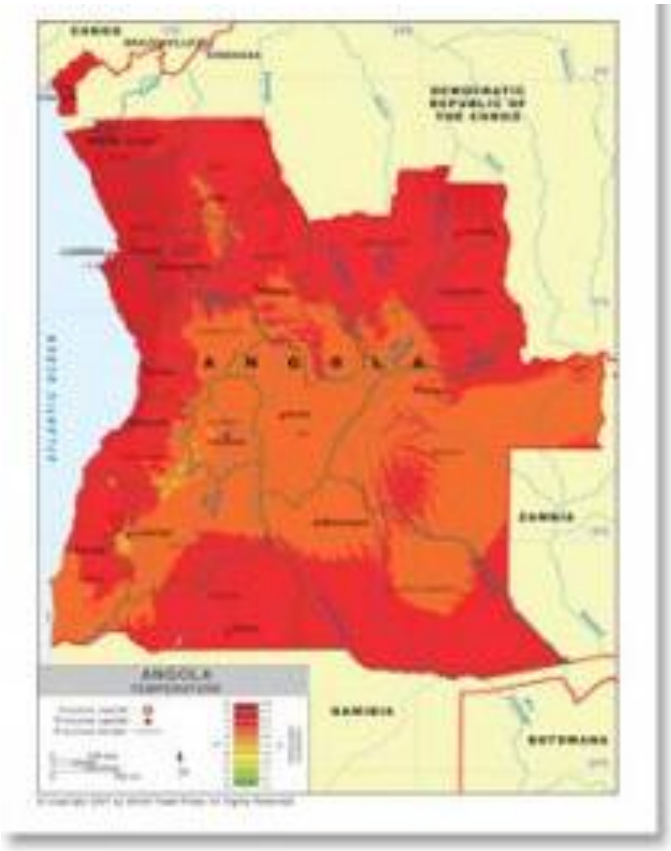

Figure 4. Angola temperature contours

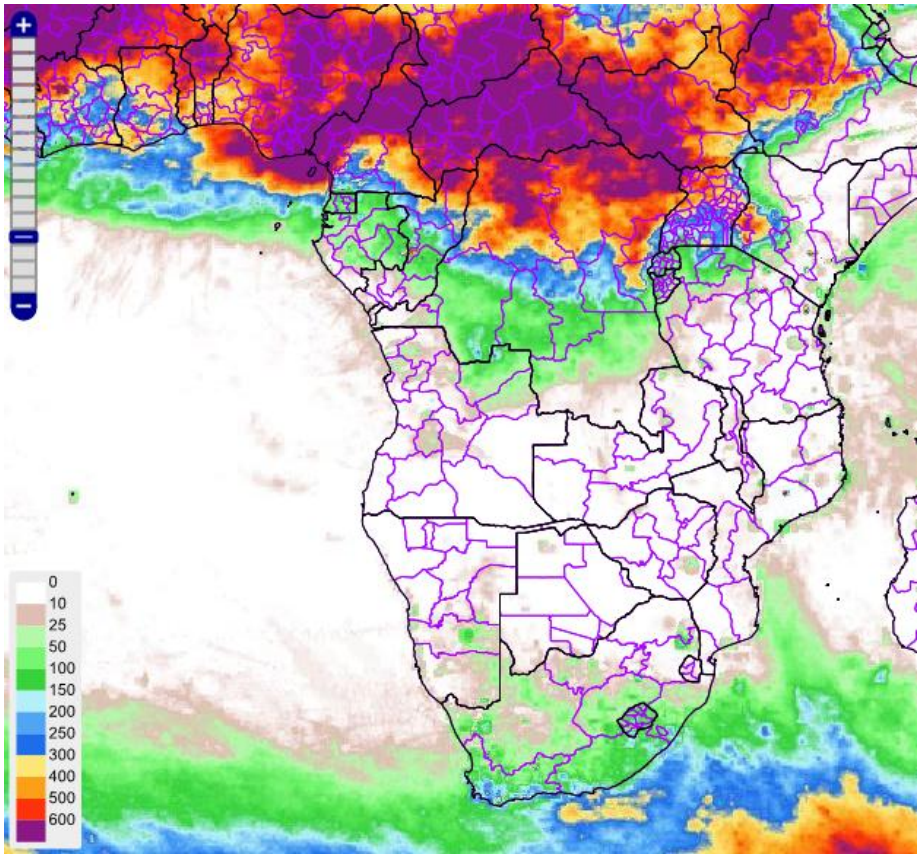

Figure 5. Winter ITCZ position (rainfall during Jun Jul Aug 2012)(23)

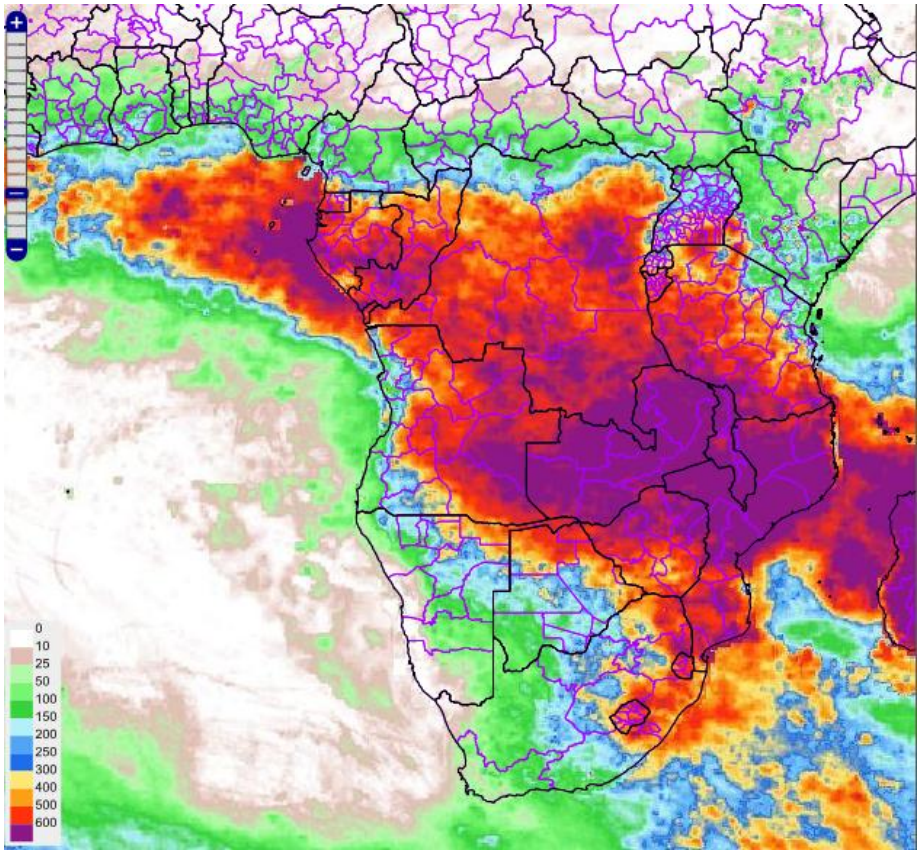

Figure 6. Summer ITCZ position (rainfall during Dec Jan Feb 2012-3) (23)

A combination of observational and model data (22) shows how climate change is affecting Angola. Over the whole country there has been a temperature rise of 1.5°C in the period 1960 to 2006, equivalent to a rate of change of 0.33°C per decade and higher than that in other southern African countries. Historic temperature rises have been higher in the winter (June July August – JJA) than summer (December January February – DJF) months. Projections under the most pessimistic Global Circulation Model (GCM) scenarios are for a temperature rise of up to 5.1°C by the 2090s (see Fig. 7 below) (22).

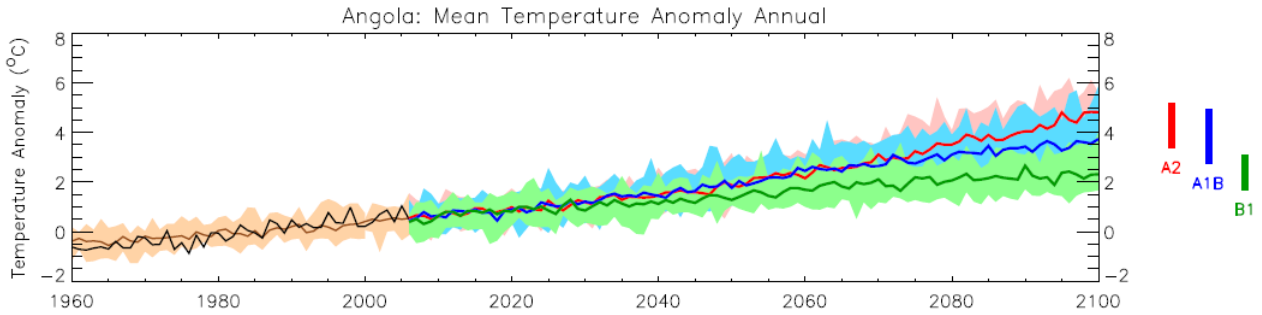

Figure 7. Historical and projected temperature anomaly (22)

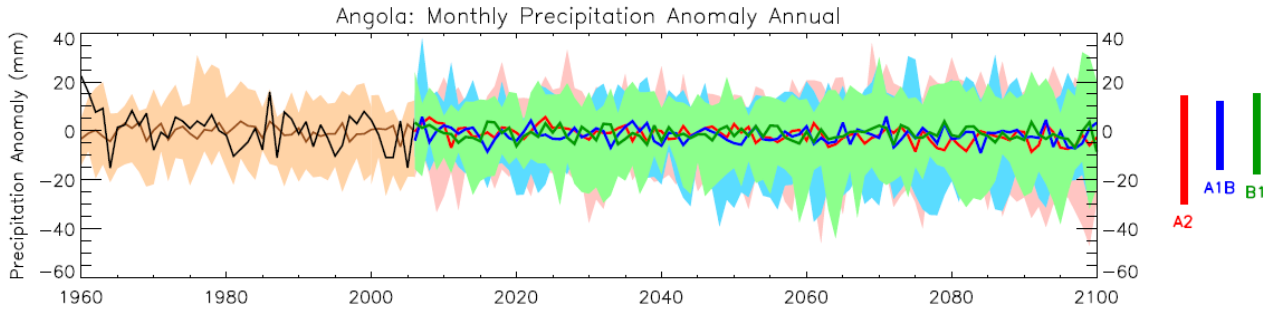

Figure 8. Historical and projected rainfall anomaly (22)

With respect to rainfall, data shows that overall rainfall in Angola has decreased by about 2mm per month, per decade, between 1960 and 2006. This has predominantly affected the second rains in March April May (MAM), during which precipitation decreased by 5mm /month per decade (22). Although there is anecdotal information about increased intensity of rainfall (i.e. a greater contribution to total rainfall from individual rainfall events), available data shows no such trends. Projections for rainfall over the whole country are less clear than for temperature and vary depending on model used from -27% to +20% by the 2090s, with greatest reductions in the early rains in September October November (SON) (see Fig. 8 above) (22).

Atlantic Niño effect

UNDP country climate change analysis for Malawi and Zambia mentions discernable effects of the El Niño Southern Oscillation (ENSO) (24, 25). The ENSO concerns the cyclical variation in temperature of the Pacific Ocean tropics and this affects the

weather in various parts of the world including Eastern and Central Africa. The Atlantic counterpart to ENSO is the Atlantic Niño or Atlantic Equatorial Mode. Atlantic Niño has similar origins to El Niño, namely lighter trade winds leading to higher sea surface temperature. Just as the ENSO impacts on rainfall in Eastern and Central Africa, the Atlantic Niño can affect rainfall in Western Africa. A warmer Atlantic Niño seems to slow northwards migration of the ITCZ, increasing rainfall in tropical areas possibly including Angola, at the expense of the Sahel. The Atlantic Niño effect has a shorter characteristic cycle length than the five-year ENSO cycle and is generally weaker than ENSO (26).

3.3 Expected climate change effects – Angola overall

Angola's National Adaptation Programme of Action (NAPA) (27) provides a high-level description of expected climate change impacts. Greatest profile is given to expected increases in flood risk from extreme rainfall events and from coastal flooding due to sea level rise. Agricultural productivity is expected to decline due to increases in soil erosion and evapo-transpiration, certain communicable diseases are expected to increase in prevalence and there are predicted to be negative impacts on the country's biodiversity. Recent examples of extreme weather events include major floods making 30,000 people homeless in southern Angola in early 2008, and a drought affecting 1.8m (government figures) in ten provinces in 2011-12 (4). It is interesting to note that in the period between 2005 and 2011, the number of Angolans affected by floods (517,000) significantly outnumbered those affected by drought (25,000) (3).

Key vulnerabilities will be explored in more detail in subsequent sections, as will the interaction between existing vulnerabilities and those exacerbated by climate change.

3.4 Climate, trends and projections – study areas

A major constraint to historical climate /weather analysis in Angola at specific locations is the absence of reliable field data. Data exist for the late colonial period from around 1953 to 1975; thereafter there is a gap that continues to the present day, as repair of the network of hydrological and meteorological stations is not GoA's first priority. What has been now available for some time however is reliable Earth Observation data that provides reasonably accurate precipitation data at a good resolution, interpreted from satellite imagery and verified through 'ground truthing' where possible (17). This has made it possible to compare historical precipitation monthly averages with monthly rainfall data from 1995 to the present day, at very specific locations. Temperature data is not as easily available unfortunately and so the analysis that follows focuses on rainfall. Temperature rises exacerbate water shortage and this impacts on agriculture in particular. In the analysis of rainfall changes and projections, temperature projections indicated in the country level analysis above will be taken into consideration.

The data underlying the analysis that follows was extracted from satellite images interpreted for dekadal (ten-day) precipitation, provided by the Early Warning Explorer under the US Geographical Survey (USGS) and FEWS Net (23), for the period June 1995 to March 2013. This was done by identifying the grid reference for the three study locations and manually estimating a precipitation value (in mm) from rain contours for each dekad (ten-day period) over the period in question, for each grid reference. Although some error can be expected using this technique there is agreement with both historical average precipitation data and with recent events. Most importantly, relative values and trends are made apparent. It should be noted that the rainfall anomalies presented below are against historical average rainfall for the period 1953 to 1975 and not against a running average.

3.5 Climate, trends, projections, impacts – Cela municipality, Kwanza Sul province

Kwanza Sul province straddles the coast and the central highlands and is historically highly productive of coffee, cereals, vegetables, fruit, dairy. The specific study area for this report is the municipality of Cela, principal town Wacu Cungo and an area in which Christian Aid continues to support partners in a variety of development projects. Climate varies with altitude with rainfall up to 1500mm annually in highland areas and significantly less along the coast. Average monthly rainfall from historical field records is illustrated in Fig. 9 below and clearly shows two distinct rainfall peaks, caused by the passage of the ITCZ southwards and back again.

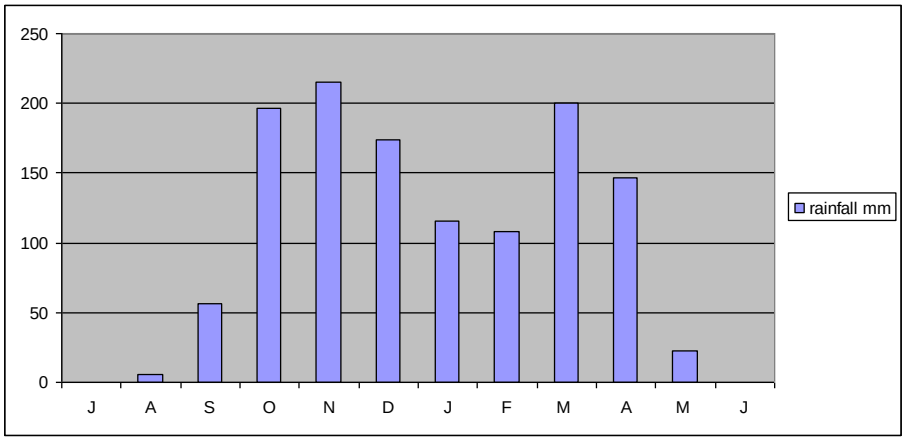

Fig 9. Wacu Cungo historic monthly rainfall averages 1953 to 1975

3.5.1 Rainfall anomalies – overall

Country-level modelling indicates a recent history of rainfall decline and projections that, while unclear, tend towards declining precipitation. Using recent field data and earth observation data up to the present day we can follow the month-by-month rainfall anomaly, reconcile this with observed events such as floods and drought and observe any trends emerging.

The chart below (Fig. 10) shows the monthly rainfall anomaly at Wacu Cungo in comparison with historic data, in absolute terms, for the period 1995 to 2013. The data agree with known events. They show several months of above-average rainfall in late 2007 /early 2008, coinciding with a major flood in southern Angola. The 2011-12 drought is reflected in several months of below- average rainfall between December 2011 and June 2012. Over the 17-year period illustrated, there is a clear declining trend in rainfall of the order of 25mm /month per decade. This compares very poorly with the estimate above from UNDP historical models, which is 2mm /month /decade

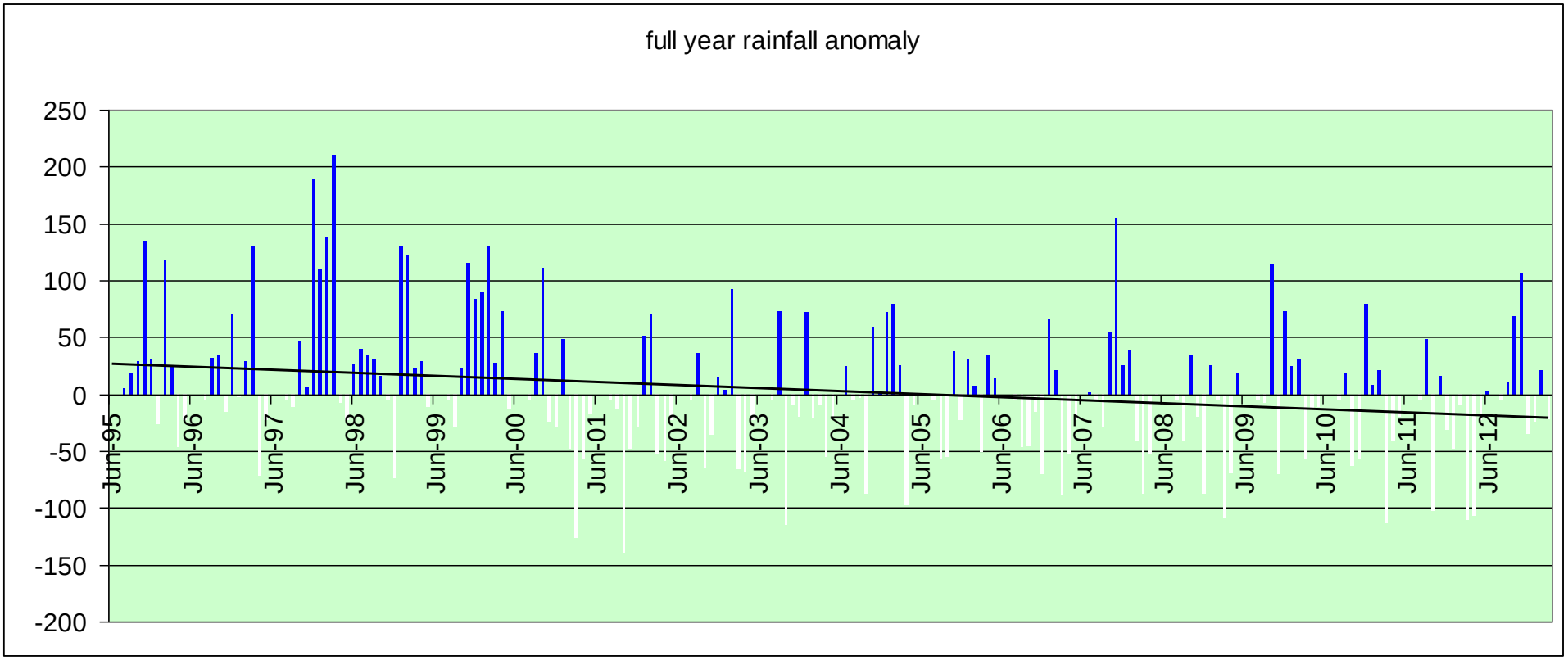

Figure 10. Estimated full year month by month rainfall anomaly in millimetres against historical averages: Wacu Cungo

for Angola as a whole. If taken at face value this is clearly of major concern. Data from this relatively limited period should not be used to form such a conclusion however and furthermore there are likely to be other cyclical factors at work. One interesting phenomenon emerging from the chart is an apparent shift at the millennium. The first five years of the series to year 2000 show higher-than-average rainfall, shifting to a twelve year (and counting) period of below-average rainfall. Whether this is a cyclical phenomenon is unclear. In any case the overall trend shows a clear decline in precipitation, agreeing broadly with reported history and country-level projections.

3.5.2 Rainfall anomalies – by season stage

The following three charts explore rainfall anomaly in more detail by following changes at start, mid and send season over the years. Country-level analysis (22) shows that the end of season (MAM) rains have declined most and this seems to agree with the results below.

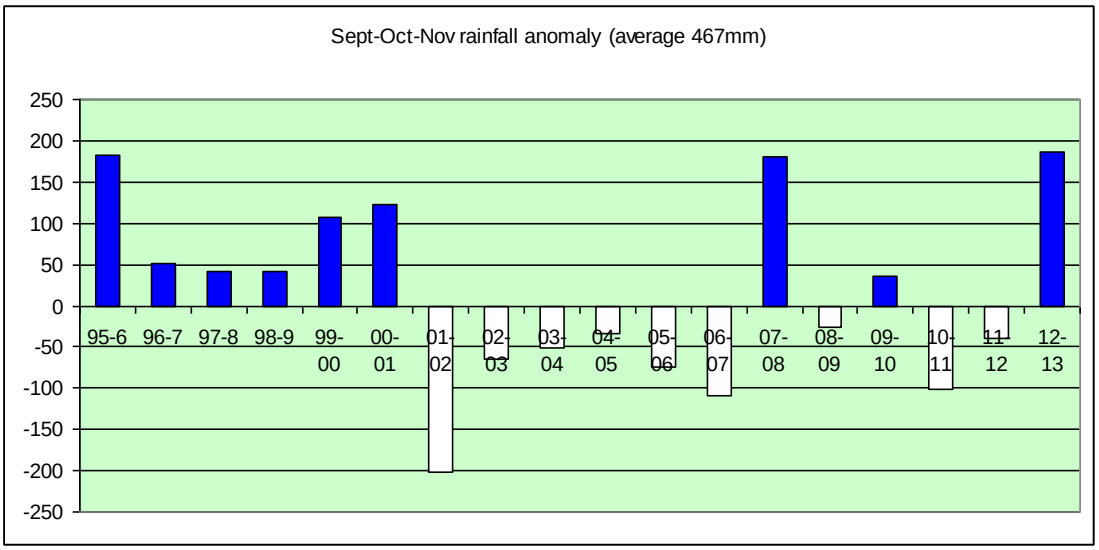

Figure 11. Estimated rainfall anomaly against historical SON average of 467mm

Average precipitation in SON was 467mm historically. Fig. 11 shows the change in rainfall anomaly at the start of the season over the past 17 years. There is no strong trend but the increase in year-to-year variability is striking, as is the extent of the anomaly which at up to 200mm approaches 50% above /below the average rainfall for the period. A 50% decrease in total rainfall in this part of the season is likely to result in widespread crop failure.

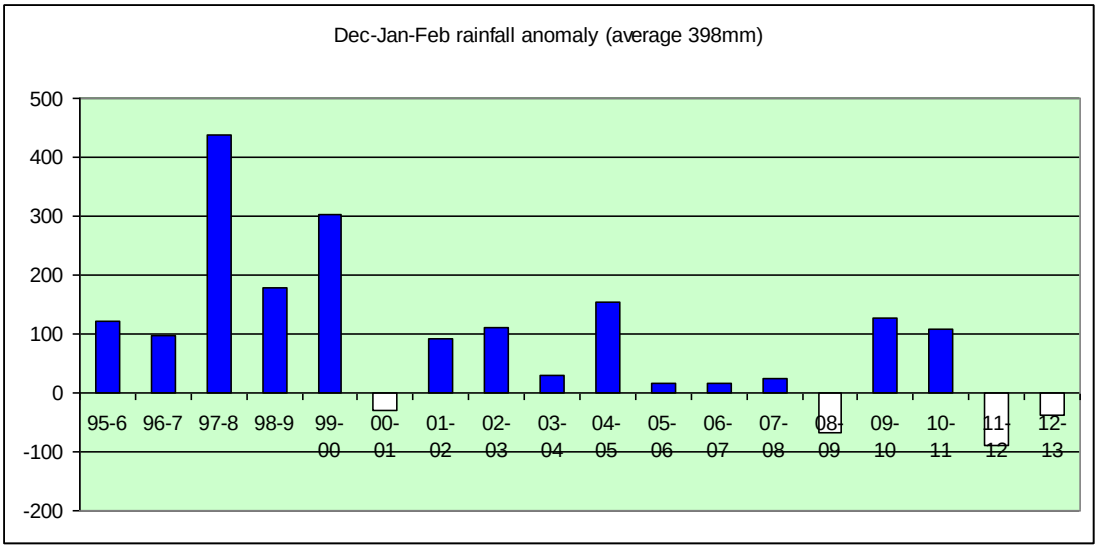

Figure 12. Estimated rainfall anomaly against historical DJF average of 398mm

In mid-season (DJF), historical average three-monthly rainfall was 398mm. Fig. 12 shows the mid-season anomaly which shows above-average rainfall if taken over the whole period, but with a declining trend. Recent years have also shown a trend towards less year-on-year variability. Rainfall excess in the late 1990s is striking in volume and may have led to flooding.

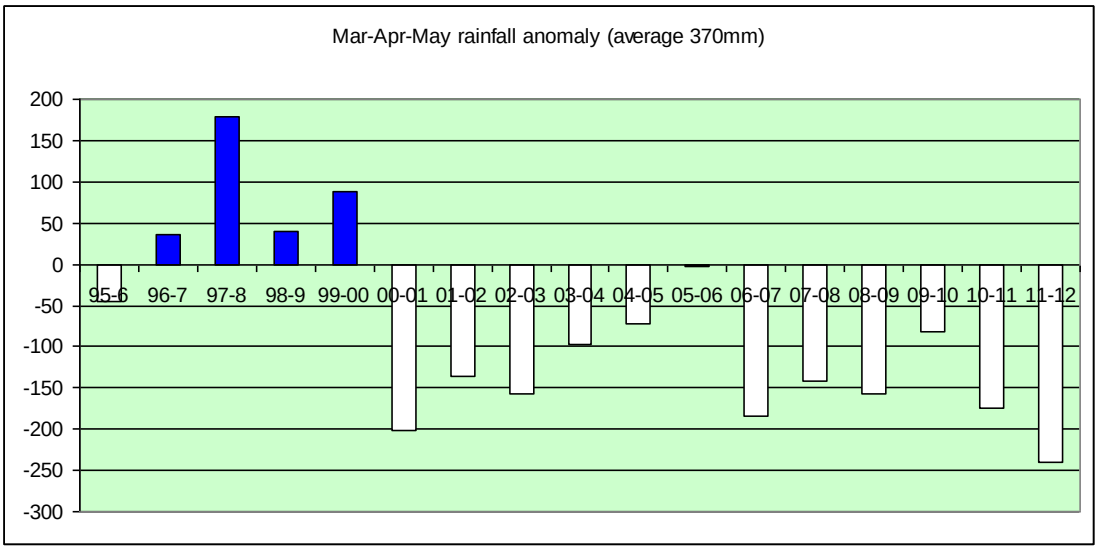

Figure 13. Estimated rainfall anomaly against historical MAM average of 370mm

Fig. 13 paints a stark picture. Following positive anomalies in the late 1990s, the chart shows frequent and significant shortfalls in rainfall of between 30 and 60% of the average figure of 370mm. This indicates that the principal contribution to overall decline in rainfall in Wacu Cungo in the past 12 years has taken place at the end of the season. The reduction in rainfall in MAM does not fall on any particular month i.e. it does not manifest as a shorter rainy season: simply one with reduced overall rainfall during this three-month period. This is a dramatic chart and warrants further monitoring.

3.5.3 Potential impacts of indicative trends

The downward overall trendline in rainfall in Cela, which is far steeper than that indicated in country-level analysis, is possibly of concern. However without data for the preceding period (i.e. pre-1995) it cannot be given too much credence as is clearly affected by the large positive anomalies in the late 1990s. Of greater concern may be the persistent negative anomaly from 2000 onwards, which seems to indicate a step decline in annual average rains. This certainly warrants further monitoring. In combination with expected temperature increases any decline in rains has serious implications for agriculture.

The season-stage analysis throws up interesting results that could lead to practical suggestions concerning rainfed agriculture. Broadly, the trend appears to be towards greater variability at season start in SON, less variability in rainfall in mid season (DJF) and a consistent and sharpening decline in rainfall at season end (MAM). In effect, if end of season rains cannot be relied on, this means a shorter agricultural season. This is a serious prospect for farmers. The conclusion concerning mid-season rains may contradict some anecdotal experiences recounted in Kwanza Sul in which a longer January dry spell was reported.

3.6 Climate, trends, projections, impacts – Bicuar National Park, Huila

Huila is in the south of Angola and links the central highlands of the country with the southern plains. Accordingly the climate changes from tropical monsoon in the north of Huila, where rainfall exceeds 1000mm annually, to the semi-arid south. Our study area is an area close to the Bicuar National Park, south of Lubango the provincial capital of Huila. This area receives about 800mm annually. Average monthly rainfall from historical field records is illustrated in Fig. 14 below and, unlike Wacu Cungo, shows one single peak. This is due to that fact that this part of Huila is nearer the southern limit of the ITCZ oscillation.

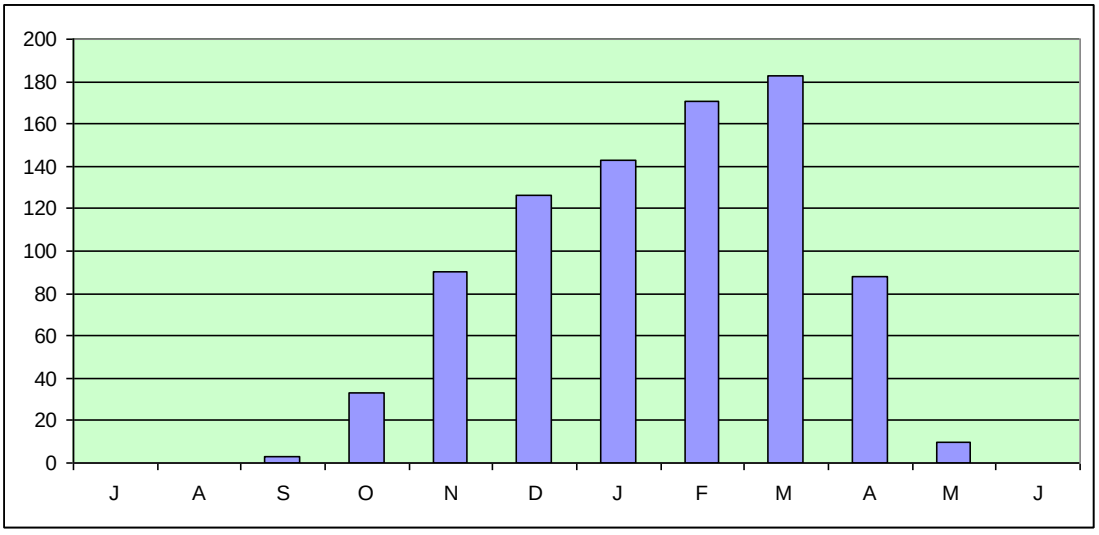

Figure 14. Bicuar historic monthly rainfall averages 1953 to 1975

3.6.1 Rainfall anomaly – overall

Fig 15 on the next page shows the monthly rainfall anomaly at the Bicuar National Park in comparison with historic data, in absolute terms, for the period 1995 to 2013. Over the period of the chart the trend line shows a decline in rainfall of the order of 10mm /month /decade, lower than for Wacu Cungo but still significantly higher than the rate of country-wide decline presented in UNDP climate analysis for Angola. As for Wacu Cungo, the chart shows a lasting downward shift in rainfall after year 2000, however here rainfall seems to recover again in 2005 or 2006. Most recently, the first three months of 2013 appear to be the driest in the entire period covered.

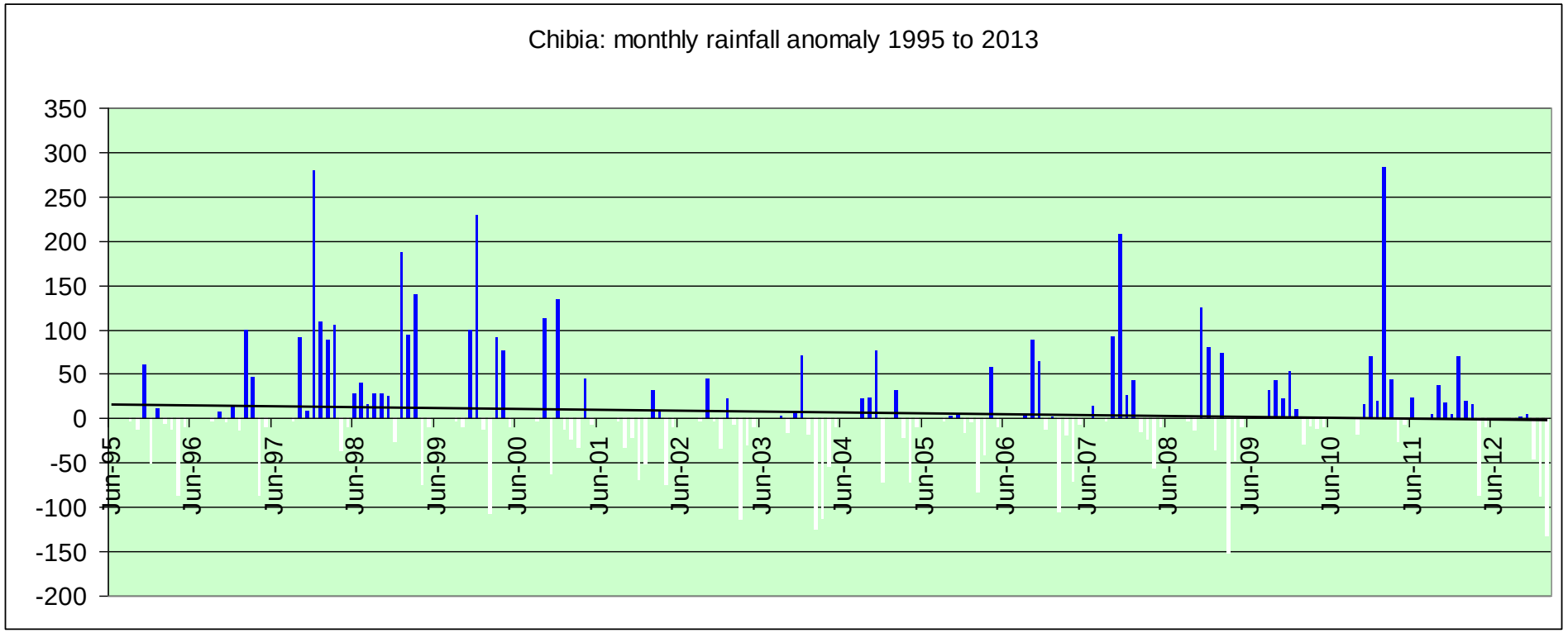

Figure 15. Estimated full year month by month rainfall anomaly in millimetres against historical averages: Bicuar National Park

3.6.2 Rainfall anomalies – by season stage

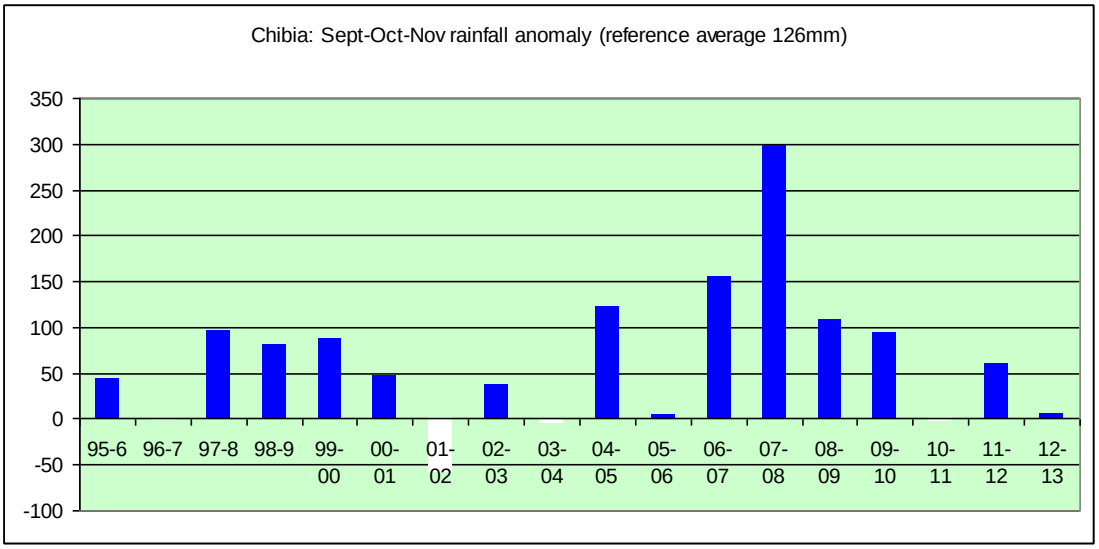

Figure 16. Estimated rainfall anomaly against historical SON average of 126mm

Fig 16 above shows the rainfall anomaly at season start against the historical average. This shows significant above-average rainfall with a slightly increasing trend. The extent of rainfall excess is significant, frequently reaching double and in the 07-08 season almost triple the average rainfall for the period.

Mid-season rainfall in this part of Angola (at 440mm in three months) provides more than half the annual precipitation, so significant anomalies in DJF have a major impact on the whole growing season. Fig. 17 below shows a cyclical pattern over the past 17 years with significant year on year variability and a negative trend. Rainfall deficit to the extent of certain impact on rainfed agriculture has taken place at least once and most starkly in the current 12-13 season.

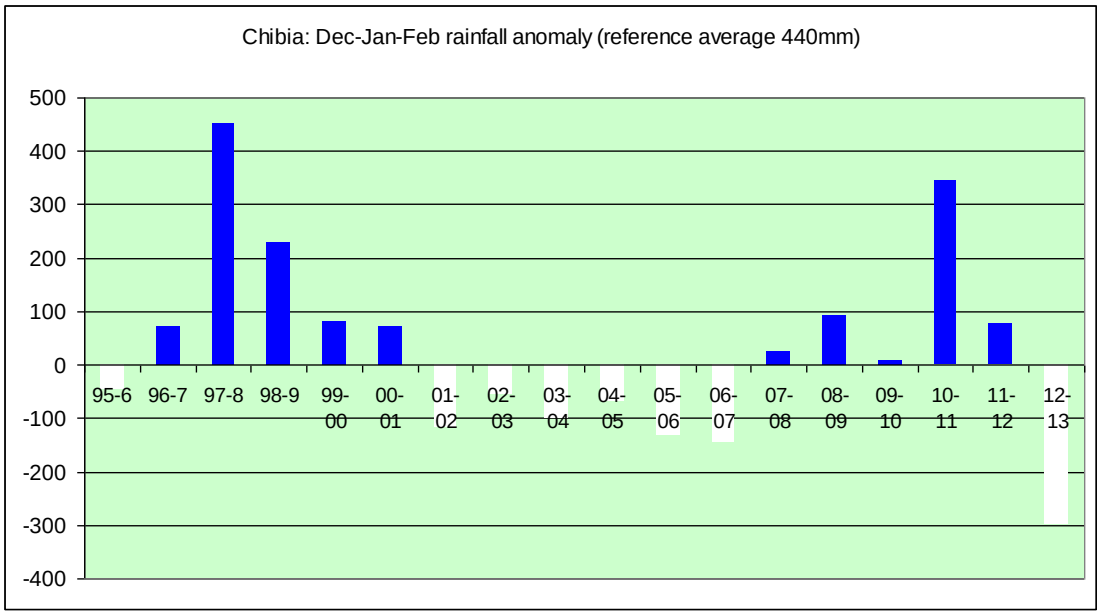

Figure 17. Estimated rainfall anomaly against historical DJF average of 440mm

The end-of-season rainfall anomaly from the historical average of 281mm is shown in Fig 18 below and shows frequent rainfall deficit of between 30% and 60%, high year to year variability and a negative trend. Month-by-month analysis indicates this may be leading towards a shorter rainy season overall but the evidence for this is not conclusive. Most of the deficit years are likely to have had an impact on agriculture.

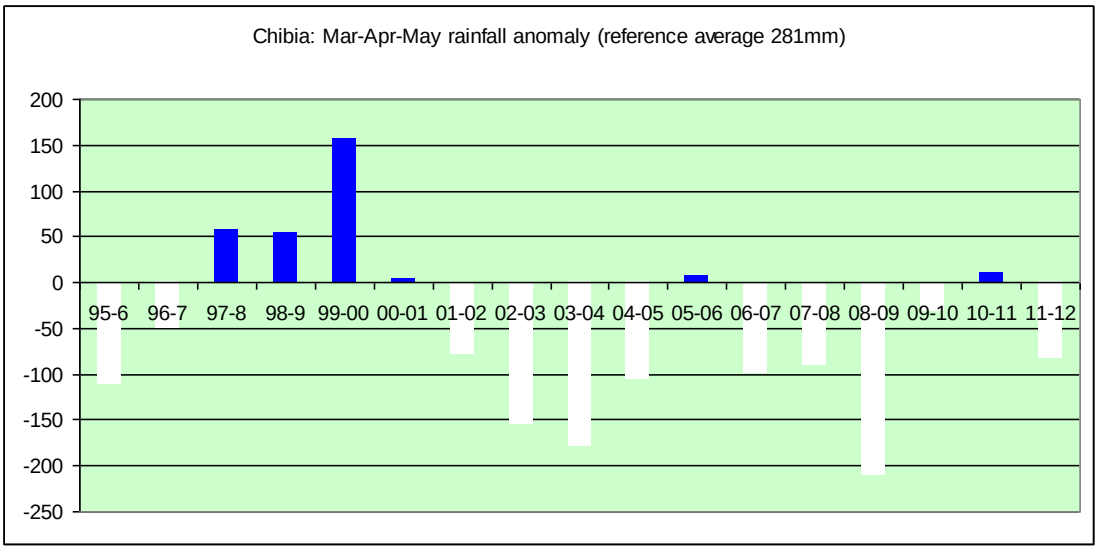

Figure 18. Estimated rainfall anomaly against historical MAM average of 281mm

3.6.3 Potential impacts of indicative trends

There appears to be a cyclical element to the year-on-year rainfall variation in Bicuar, with a return period of about five years. This may be worth monitoring. As with Cela

there is a downward trendline in rainfall and increasing temperature will exacerbate the effect of this on rainfed agriculture.

Season-stage analysis shows consistent positive rainfall anomalies in SON that raise the possibility of an earlier start to the agricultural season if this persists. However this may be unlikely given the low average rainfall volumes in SON. Mid-season rainfall in DJF shows a possible trend to increasing variability and there are numerous years with a >20% rainfall deficit in this period. As with Cela the end-of-season rains in Bicuar NP show a decline and although not as stark, this may be significant given the historic contribution of MAM rains to the overall growing season.

3.7 Climate, trends, projections, impacts – Mavinga, Kuando Kubango

Kuando Kubango province borders Zambia and Namibia and is the second largest Angolan province. Its climate is 'tropical savanna' and is affected by altitude, with 1200mm rainfall towards the northern borders with Moxico and Bié provinces; 600mm nearer the Namibia border. Rainfall in Mavinga municipality averages about 800mm annually and falls over a shorter overall period than in Bicuar and Cela. It is not uncommon in Mavinga for six months to pass without significant rainfall. Historical monthly rainfall averages show a single annual peak in January (Fig. 19).

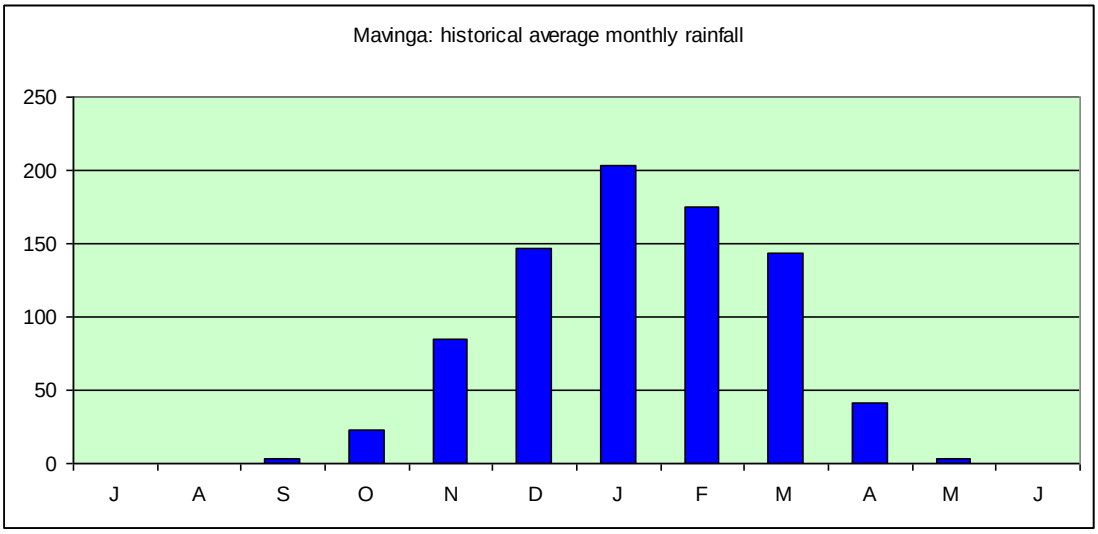

Figure 19. Mavinga historical monthly rainfall averages 1953 to 1975

3.7.1 Rainfall anomaly – overall

The month-by-month rainfall anomaly against historic data for Mavinga over the period 1995 to date is below in Fig. 20. The indicative trend line is virtually flat; if

anything it shows a slight increase in precipitation. As for the other areas the first five years of the millennium seem to show a persistent rainfall deficit however Mavinga then exhibits a more or less complete recovery from this decline.

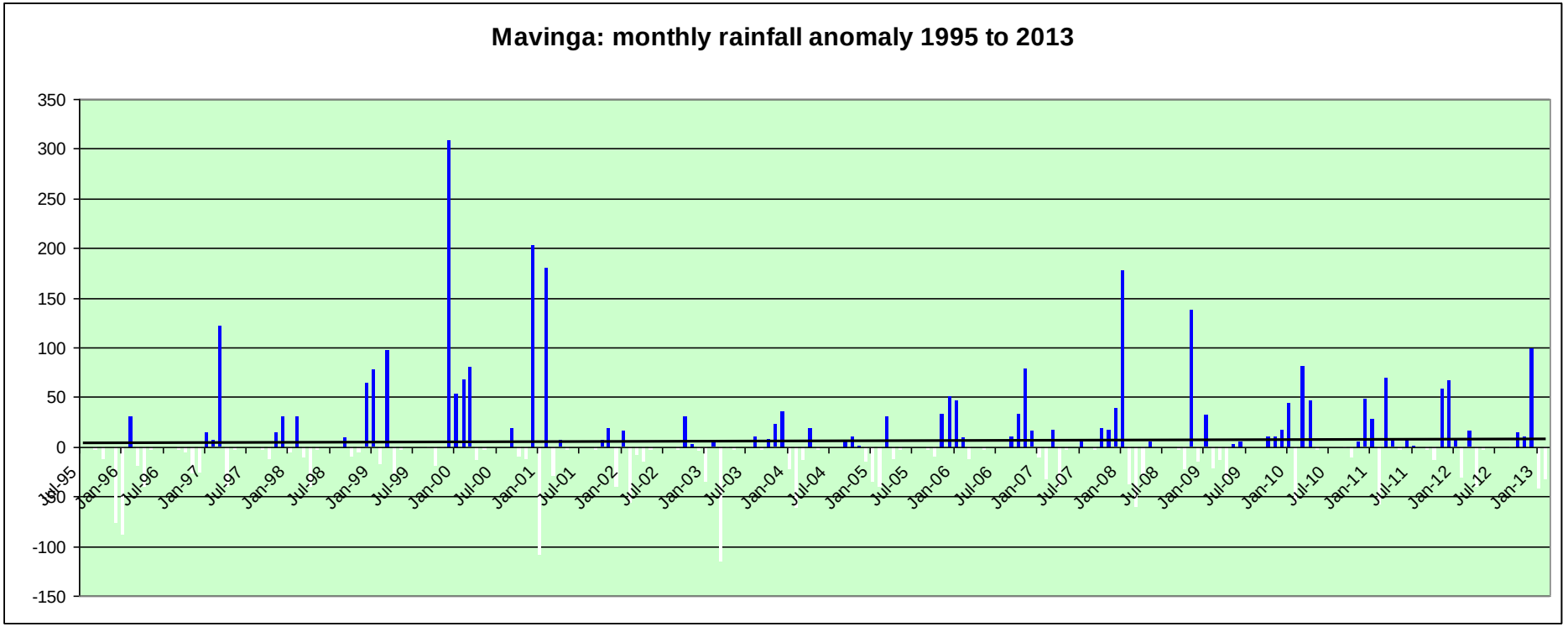

Figure 20. Estimated full year month-by-month rainfall anomaly in millimetres against historical averages: Mavinga

3.7.2 Rainfall anomalies – by season stage

Fig 21 charts the anomaly for season start in Mavinga and shows a positive trend over the period. Notable is also the conclusion that, with the exception of two seasons of significant excess, rainfall anomalies are relatively minor.

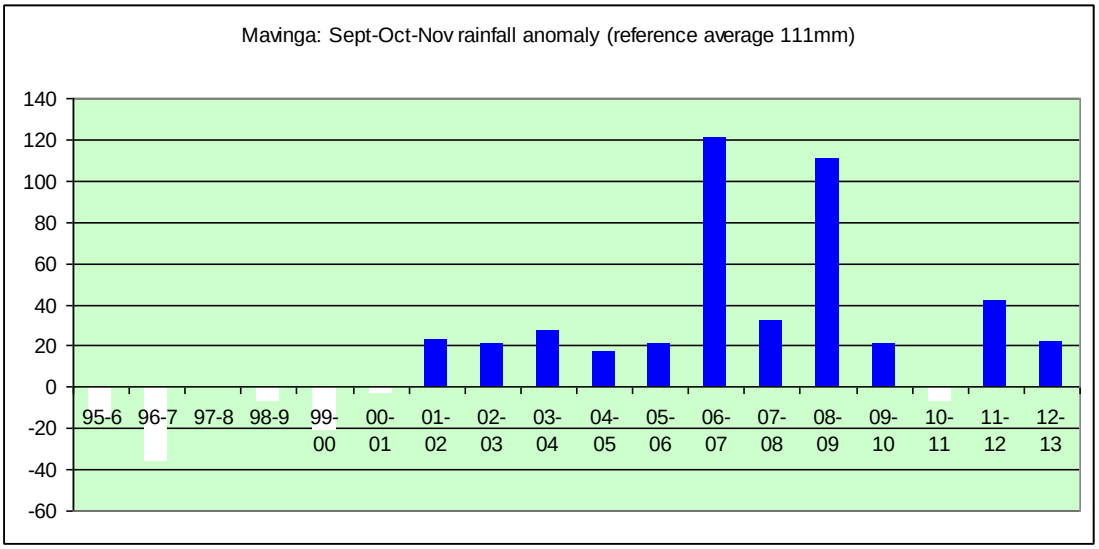

Figure 21. Estimated rainfall anomaly against historical SON average of 111mm

The months of DJF release more than half Mavinga's annual rainfall and are critical to the success of rainfed agriculture and for the wider environment. Rainfall anomaly charted in Fig 22 again shows reasonable year-on-year stability, with few deficit years and none greater than about 20%.

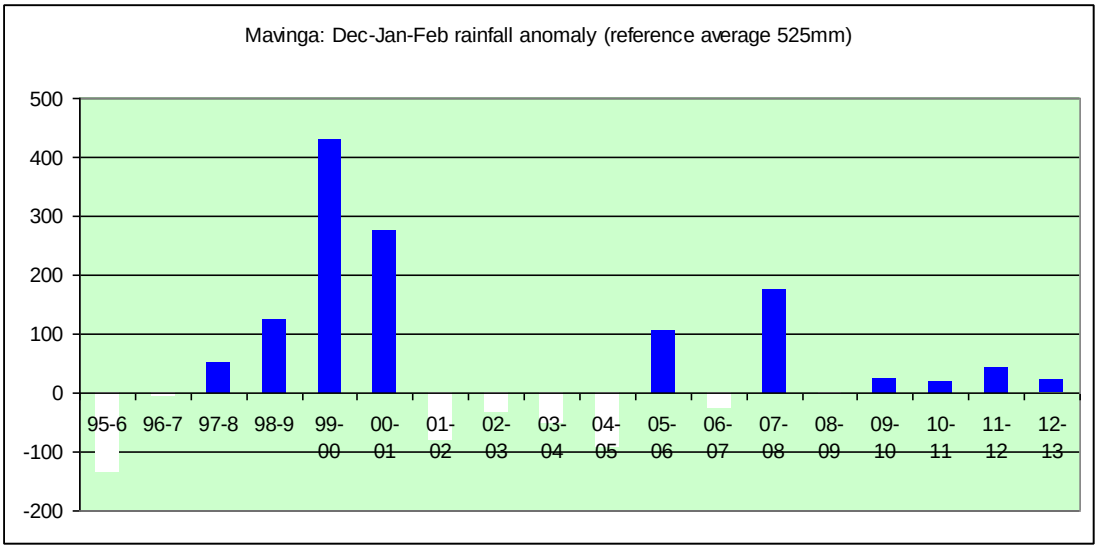

Figure 22. Estimated rainfall anomaly against historical DJF average of 525mm

End-of-season rain in Mavinga in the months of MAM historically sees 188mm over the period, the bulk of which falls in March. The rainfall anomaly picture in Fig. 23 below again shows no clear trend but has the greatest variability from year to year.

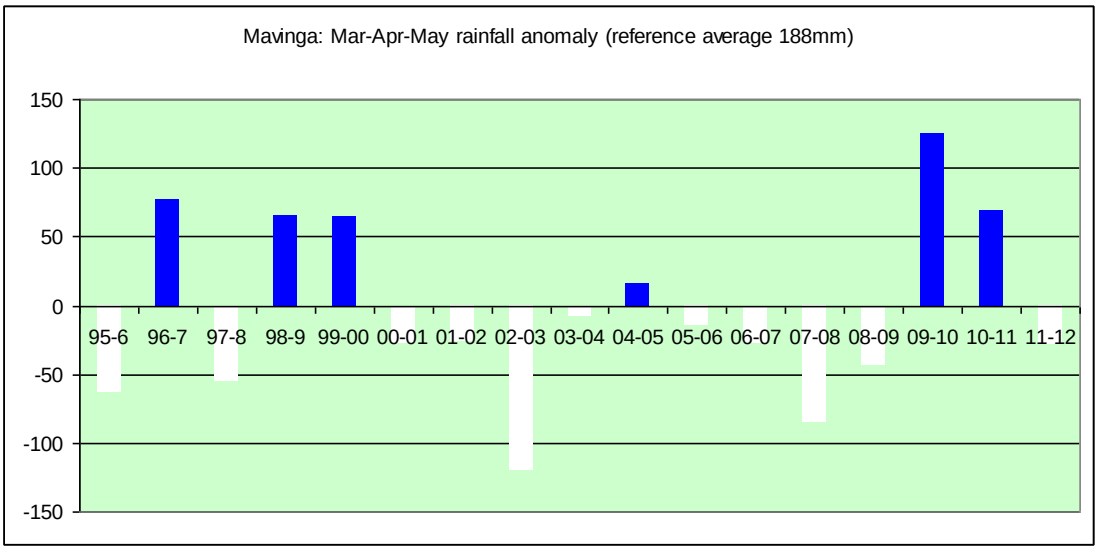

Figure 23. Estimated rainfall anomaly against historical MAM average of 188mm

3.7.3 Potential impacts of indicative trends

The overall average rainfall anomaly over the entire period, in comparison with historical averages from 30 years previously, is positive. The start-season anomaly is also positive with an upward trend. The high volume mid-season rains in DJF appears to be becoming less variable from year to year and while there is variability in end of season rains, this is less significant due to the low overall volumes in that part of the season.

The implications of these results for rainfed agriculture in Mavinga are positive and seem to indicate a degree of reliability in rainfall that may be unexpected. Clearly this needs to be carefully checked against local knowledge and perceptions.

3.8 Conclusions – significance of climatic effects in the three study areas

There are gaps in this analysis but it may provide useful information for smallholder farmers. Changes in year-to-year variation in rainfall may reveal trends over time and allows a degree of comparison with historical precipitation. This allows an assessment to be made of the likely parameters of change from year to year and the probability of extreme events. The different outlook in each of the three areas is interesting and points to the likelihood that climate change impacts differently depending on local conditions; also to the potential to affect the local 'microclimate' through appropriate natural resource management (28).

Trends emerge from the season-stage analysis in all three areas. These are potentially adverse for rainfed agriculture in Cela and Bicuar NP, and positive in Mavinga. Results could inform a detailed local climate analysis by working together with partners and communities to incorporate local knowledge. A major step will be to develop ownership of a comprehensive climate analysis by local communities /local government. Use of earth observation interpretation data can help build a local picture of climate change much more quickly.

Concerning significance of climate change impacts for the three study areas the picture is mixed. Certainly for Cela there has been a clear shift towards reduced rainfall over the past 17 years and a sharp trend towards declining end-of-season rainfall that will impact on agriculture. The effect of rising temperatures on top of declining rainfall will exacerbate effects in terms of crop viability. But further south in our study areas in Huila and Kuando Kubango, the indication is less about an overall decline in rains and rather towards more variability in parts of the season – but maybe more rainfall stability at times as well.

4 Aspects of vulnerability

4.1 Introduction

Human vulnerability is intrinsically linked to poverty; poverty in Angola as elsewhere in Africa is multidimensional. This chapter looks at a few key areas of vulnerability affecting rural smallholders and tries to disentangle causes, amongst which those of both socio-economic and climatic origin. What are the key sensitivities, now and into the future? How critical are climate change impacts amongst them?

Angola's position in the UN Human Development Index (HDI) shows persistent and widespread poverty, and basic social indicators on health, nutrition, education, access to water and sanitation that are amongst the world's worst (3). Although recent years have seen some improvements in basic development statistics, progress is slow. The current pace of change will leave too much to be done by the time the oil runs out.

Rural women are particularly badly affected and therefore in a poor position to adapt to any form of external shocks. So gender is a major consideration in analysis of rural vulnerability, as are secure access to land, approach to agriculture, access to markets, access to water and the state of the environment.

"It's not about rain" was a key message from a 2011 SCF report to a conference about climate change adaptation (29). Rain IS clearly a critical factor for rural smallholder farmers depending on rainfed agriculture: however the point is that climatic effects may act merely to exacerbate existing vulnerabilities. In areas of rural Angola, as well as many other of Africa and elsewhere, existing systems and livelihood approaches may not be viable even without climate change. There is a danger that development actors "pretend to assist the adaptation of rural economies that are already in crisis". One option may therefore be organised withdrawal from the rural economy (30).

It's important to understand the nature of vulnerability and to recognise differences in vulnerability between communities (31). In our three study areas – specific locations and communities in the provinces of Kwanza Sul, Huila and Kuando Kubango – there are clearly common factors such as gender bias in vulnerability, but also distinct differences such as access to markets.

This chapter explores key vulnerabilities of rural smallholders in Angola and more specifically in the three study areas. It considers the in-combination effect of 'baseline' vulnerability together with climatic impacts. Separate sections will look at agriculture, gender and power, land rights and environmental degradation.

4.2 Aspects of vulnerability – land rights

Land rights and tenure in Angola are poorly defined and enforced, subject to abuse and corruption and can be a significant contributor to the undermining of rural livelihoods (32). Despite a low population density and large areas of under-exploited land suitable for agriculture (18), rural smallholders and pastoralists often do not have access to the land they need to grow crops or seek pasture for cattle. In combination with other pressures on rural livelihoods, insecurity of land tenure adds a significant additional element of uncertainty and risk.

This is an issue particularly for rural women (14). In wider Sub-Saharan Africa, women have less control of land than anywhere else in the world (Fig. 24). Discriminatory inheritance laws and customs are at the root of this and Angola is no exception to the wider picture in Africa (18).

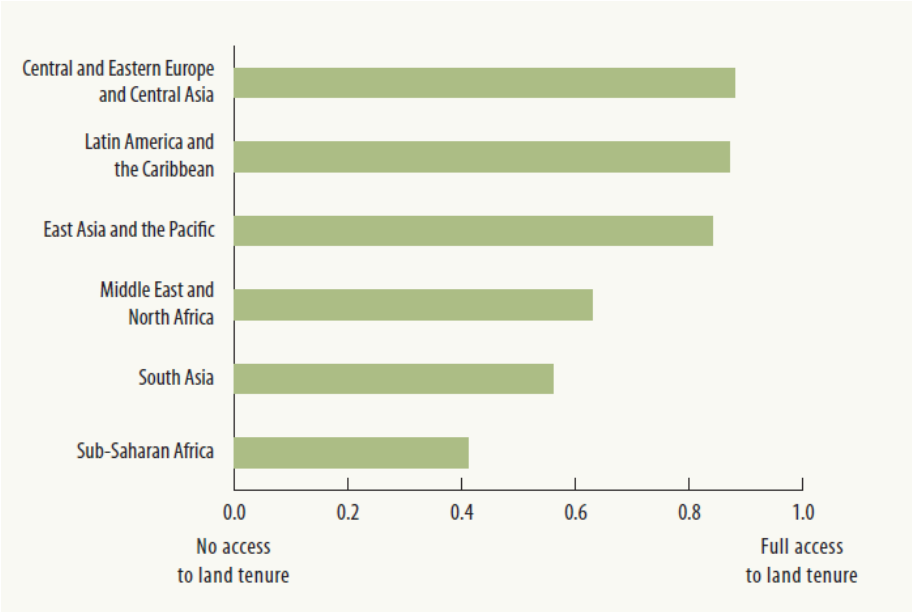

Figure 24. Women in 2009 have less control of land in SSA than anywhere else (3)

The legal right to land underpins agricultural development and this needs to be accompanied by a functioning administrative and judicial system to make it a reality. Little of this is in place yet in Angola and while traditional /customary approaches to land access are functioning reasonably in some areas, numerous abuses have taken place and these create present and future uncertainty for rural farmers.

4.2.1 Angola's new land law

Towards the end of the civil war and in recognition of gaps in existing land law (in particular concerning community land use in rural areas and the role of customary practice), the Angolan Government entered a period of debate on a revised land law

and a new law (Lei de Terras de Angola, 9/04) was adopted in November 2004 (Box 1 below) (33).

Box 1. Angola's 2004 Land Law

Lei de Terras de Angola 9 /04

The 2004 Land Law rules on property rights, rural community rights, natural resource use and protection measures, land expropriation, land concession, territorial planning, land classification and registration procedures. It indicates competent authorities and their related functions and provides procedural guidance.

Four key provisions are as follows:

- All land is originally the property of the state and only state is responsible for establishing the conditions under which land can be the subject of a concession, while protecting the country's national interests and development.
- Privately-owned land is rare and the more common option is leasing. The State grants leasehold concessions for 45 years or more, while requiring a guarantee of efficient use of the land and offering guarantees to any people who originally occupied and cultivated the land.
- For smallholder farmers, the law provides rural residents with a space to live and produce, but for subsistence purposes. Access to land for cultivation is still governed by the law mentioned above, but in rural areas, customary laws have a very important role: lands are ceded for cultivation by either the traditional leader or passed down as inheritance, which are then approved by formal institutions.
- The State can only expropriate land for specific stated public use and must pay appropriate compensation. There is a duty to publicise plans for expropriation widely and any significant infrastructure project must be subject to environmental and social impact assessment which must include local consultation.

There was broad NGO input into the debate on the 2004 Land Law and although many activists expressed disappointment with the final product, there is some agreement that the new law provides some basis for protection against arbitrary land expropriation and eviction (34). But major gaps in the law and in the broader institutional and policy framework around land tenure remain, as outlined below (32):

- The legal framework fails to recognise the unique circumstances and needs of the economically and socially marginalized, including women;
- The lack of national land policy means there is no clear foundation of principles underpinning new legislation, coordinating existing legislation, and prioritizing actions at national, provincial, and local levels;
- The Land Law has internal contradictions with respect to social and economic development, environmental protection and sustainable utilization of land, in that expressed objectives concerning these conflict with some actual provisions;

- There is limited institutional capacity to implement the new legal framework.

4.2.2 Land conflicts in Angola

In parallel to development of the new land law and following its adoption, conflict over land in Angola has manifested itself in a variety of ways:

- *Forced resettlement for development.* Most extensively in Luanda and also in some provincial capitals this has involved the state as primary actor, sometimes via intermediaries, forcibly removing urban and peri-urban residents in preparation for major housing or industrial development, most recently in Feb 2013 (35). Although often resident for a decade or more, few of those resettled had any form of formal title to their land; compensation when offered was inadequate and where land was offered as replacement it was remote from services such as water, markets, transport. Although primarily an issue affecting urban residents, the implementation of these higher-profile resettlements in the face of NGO and international pressure does not augur well for those in similar situations in rural areas.
- *Non-transparent granting of land concessions.* After the end of the war, parcels of land in the most desirable parts of the country started to be enclosed following concessions granted at high level in state and military without clear process, potentially affecting rural communities' traditional rights and access (34). After the adoption of the 2004 Land Law, a limited period of time was given to legacy claimants to land and this process, although clearer and more transparent, was still deeply problematic and inconsistent (34).
- *Prejudicial treatment of pastoralists.* Ethnic groups in southern Angola such as the Mucubais, San, Humbi, pursue pastoralist and semi-nomadic livelihoods including transhumance. They undertake seasonal movements with cattle in search of good pasture, over an area of tens or hundreds of square kilometres (ref transhumance project). Private and state enclosure of land prevents this. Physical abuse, by landowners and their agents, of individuals objecting to enclosures and encroachment have taken place with relative impunity (e.g. 36).
- *Granting of land rights to international or national commercial interests without due process.* A wide range of foreign investors, companies, sovereign wealth funds have expressed interest in Angolan land for agriculture. Given experiences elsewhere in Africa (37) this has potential to result in loss of traditional land rights, forced settlements, inadequate compensation and physical abuses. Furthermore whilst there is potential for employment creation, the vast bulk of proposed projects concern production to meet food demand outside Angola and outside Africa, so will not contribute to local food requirements. Some NGOs have argued that foreign investment in commercial agriculture in Africa is necessary and potentially helpful, but if pursued needs to comply with strict guidelines and also involve support to smallholder agriculture (38). This area is expanded on below.
- *Social and political manipulation through population resettlement.* More about access to land than land rights, this phenomenon concerns forced resettlement,

implemented by the state, of existing settlements or of groups of people (for example menfolk) in pursuit of political or other aims. One result has been that resettlement makes access to traditional agricultural land unviable. This has taken place in parts of Angola – essentially the old UNITA heartlands – in which GoA fears a re-aggregation of political opposition. This has manifested itself in a variety of ways including (a) uprooting, moving, merging villages to allow easier monitoring (b) attracting away /moving menfolk in sensitive areas to work on remote projects (c) encouraging /organising internal migration into sensitive areas to dilute existing political sympathies (39).

4.2.3 Land grabbing: foreign investment in land and agriculture in Angola

Large-scale land acquisitions in Africa and elsewhere in the global South have made headlines in recent years, for example the abortive Daewoo deal in Madagascar for a 1.3m hectare concession to be used for biofuel production and the fact that more than a quarter of all the land in Liberia is leased or owned by agricultural, logging or mining companies (40). The Angolan government is clearly also attracted to the foreign direct investment that land concessions bring (33) and a steady stream of reports has emerged over the past few years about discussions and deals between the government of Angola and foreign companies or their local representatives (see Table 1 below). In reference to ongoing discussions with US fruit conglomerate Chiquita, Minister for Agriculture and Rural Development Pedro Canga stated in 2009:

"Major food producers have taken note. Chiquita Brands International should soon start growing bananas in Angola's southern province of Benguela. They will partner with Angolan investors to start this project," said Pedro Canga. "There was a problem with land ownership rights but that has been overcome." (41)

Table 1. Timeline of events concerning commercial investments in Angolan land (42).

Date	**Event reported**
Aug 2008	Dole and Chiquita to invest in fruit production in Benguela, Odebrecht to invest in sugar and ethanol production.
Oct 2008	GoA announces plans to attract $6bn in foreign agricultural investment by 2013.
Jan 2009	Lonrho signs development agreement with GoA for 25,000ha concessions for rice growing in Uige, Zaire and Bengo.
May 2009	China plans on agricultural investment in Angola in beef, coffee, spices, fruit, sugar, cotton for export.
June 2009	India's Yes Bank considering investment in Angola to grow and process lentils, cereals and oilseeds for export.
June 2009	Cape Verde sovereign fund invests in Kwanza Sul province for agriculture for export.

Aug 2009	Emergent Asset Management building portfolio of land in Southern Africa and will not invest in land with less than a 99-year lease.
Aug 2009	Gulf States targeting land in Angola are starting to be 'more covert' in approaches, due to perception of negative media spin.
Oct 2009	South African farmers offered land for agriculture in Angola – 48 square miles in Angola and Uganda – but have concern about security of tenure.
May 2010	US company Gaiacor develops a Memorandum of Understanding with Angolan firm MITC Investments to manage large farming operations in Angola.
May 2010	Agricultural group Demeter International propose a 10,000ha irrigation scheme in southern Angola that abstracts from the Okavango River and may threaten the water supply to Namibia and the Okavango Delta.
June 2010	Ridge Solutions (Angolan company with South African owners) investing in Huambo province, starting with a 3000ha farm with the intention to invest $1bn in farming in five years.
Oct 2010	Indian rice exporter Amira Group discusses farmland acquisitions with GoA.
Nov 2010	Angolan president accompanies other African leaders to Riyadh for talks with Saudis about land deals, to answer questions such as "Can Africa, being a net food importer, be a credible and long term source for the Gulf's soaring food imports?"
Feb 2011	Brazilian company Quifel, which has farms in Angola, says Africa has potential to be like Brazil and become an agricultural exporter. But for the time being, Quifel has a stated focus on selling to the local market.
Apr 2011	Chinese engineering company CAMCE to produce rice in a 1500ha project in Cuito Cuanavale municipality, Kuando Kubango province using irrigation from the river Longa.
Feb 2012	Japanese company Marubeni signs agreement to build two factories for production of sugar and alcohol and to grow sugar cane on 66,000 hectares in Humbe municipality, Cunene province. Project will employ 15,000 people.
Mar 2012	Cape Verde awarded 7500 ha concession in Kwanza Sul province for production of livestock and staples for export.
Mar 2013	Angolan Economy Minister to visit United Arab Emirates to discuss UAE investment in agriculture in Angola.

Some of the issues raised by large-scale land investments are mentioned above and include production of food for export and impact on local food security, creation of employment, environmental impacts, covert approaches to land deals, ethics of biofuel production, the impact on indigenous farmers and, somewhat ironically, questions over land tenure for investors.

If local concerns can be overcome, there may be advantages to such investments and indeed a recent Oxfam discussion paper maintains that private investment in land is essential for development and poverty reduction, as long as certain conditions are met. These conditions include adequate regulation and adherence to some key principles such as focusing on local food markets, working with producer organisations and respecting the rights of small-scale producers, workers and communities (38). Amongst the potential land concession deals above, some (for example World bank funded and bilateral deals) may fall under requirements for social and environmental impact assessment that incorporate some of the recommendations of the Oxfam discussion paper. However this is by no means clear and with this ongoing uncertainty, land deals under discussion are likely to be more of a threat than an opportunity for rural communities in Angola.

4.2.4 Land and gender

"Years of focusing on household coping strategies have resulted in a segment of the population which has had no access to education, skills training, productive resources such as land or microfinance, and are increasingly vulnerable to disease and other forms of external shocks." (14).

Angolan women are at a significant disadvantage with respect to land rights and women's access to land is most often via their husband. The customary village-level land allocation process made by village heads (*Sobas*) rarely involves women and rarely benefits women (43). Widowed women might inherit land in trust for their sons and this may then be allocated to the sons when they marry. Following divorce, women often retain responsibility for any children but lose access to land and assets, having instead to return to their families for support. Women may often have to negotiate use of land for every season and this highlights the vulnerability in particular of female-headed households (14).

4.2.5 Land rights issues in the three study areas

Cela, Kwanza Sul

While there is some indication that security of land tenure is improving in Kwanza Sul as a whole, issue remain due to unclear land rights, land alienation by powerful individuals and lack of awareness of the law (44). Outside areas directly controlled by local government or large ranches, land title is organised through customary practice by village elders.

The end of the war saw swift and often opaque allocation and enclosure of large areas of land, often in close proximity to existing villages. Kwanza Sul province as a whole and Cela municipality in particular are subject to considerable private and

commercial interest due to reasonable access to Luanda and favourable climate and soils. Tensions between influential commercial /private interests and resident villages over land have been reported since the end of the war and on occasion resolved through joint action with international NGOs (46).

Attempts have been made to bring together local NGOs around the issue of land rights and tenure under the umbrella 'Forum Terra Kwanza Sul'. This grouping aimed to educate about land rights, map land conflicts and use the community land delimitation approach developed by the FAO to achieve land title for communities however it appears to be moribund at present (45).

Chibia /Bicuar, Huila

Huila has seen high profile human rights abuses associated with land conflict, most recently in an urban setting with forced resettlements in Lubango and previously on the fringes of the Bicuar national park and large private estates in the region of Tunda dos Gambos. With respect to the Tunda dos Gambos abuses, a farm manager was found guilty and imprisoned following the illegal incarceration, torture and killing of members of the local community in a shipping container on the Kamphanda estate.
The major concern in our study area is enclosure and encroachment of land used by transhumant communities pursuing pastoralist livelihoods is search of pasture for cattle grazing. These communities are also increasingly constrained in their settled locations where they practice agriculture. Enclosure and encroachment is carried out by state and private actors. The narrative on dryland pastoralism and in particular semi-nomadic livelihoods continues to be negative and characterises these groups as backward, difficult, a problem to be dealt with (48).
There is some positive movement in this area in part through campaigning and legal work by the communities with their own resources and with the support of local NGOs. In addition there is an indication of more recognition by the state of the right to a pastoralist livelihood through its support and facilitation of an EC-funded project to support transhumance in Huila (49). This project, entitled 'Project to improve access to water and pasture in transhumance corridors' covers a wide and contiguous area of Namibe, southern Huila and western Cunene provinces and is predicated on close collaboration with the Angolan government at the level of various Ministries and local municipalities.

Mavinga, Kuando Kubango. Land allocation for dwellings and agriculture is by traditional authority but the local municipal government and police maintain a close interest in the way agglomerations develop and in particular regarding the ethnic /political mix of villages. This area is historically strongly linked with UNITA and the main UNITA military headquarters was in Kuando Kubango province. Forced resettlement of villages in recent years is related to state fears about political

challenge locally and this has impacted on people's ability to access land for agriculture. An internationally-designated protected area covers much of the area around Mavinga and although this does not appear at present to affect smallholders' access to land for various uses, future decisions on use of this protected area could prevent shifting agriculture, scrub burning, grazing etc thereby threatening existing livelihoods.

4.2.6 Land rights and tenure conclusions

- Gaps in the revised Land Law and in the institutional and policy framework result in inadequate provision for women and marginalised groups and make any form of enforcement of new powers largely non-existent;
- Projects on community delimitation and title of land such as that developed over time by the FAO are useful to raise awareness of land law and provide greater land security for communities.
- The Government of Angola has a clear policy to encourage foreign direct investment in commercial agriculture for export and for local production and appears to prioritise this over support to local farmers and in particular smallholders. This gives rise to risks for rural smallholders in particular those living and working on higher value /quality agricultural land.
- In parallel with this there is broad international recognition of the potential of agricultural investment in Angola and a lot of interest from companies and sovereign wealth funds.
- There is potential for commercial investment in land and agriculture to benefit rural smallholders but only if strict conditions are agreed to and closely monitored.
- There is a history of human rights abuses associated with land conflict and this continues. However there is also a strong track record by local and international NGOs in profiling potential and actual abuses and protecting human rights defenders working on land conflict.
- Communities in all three study areas experience vulnerability because of insecurity of land rights /tenure /access, though in very different ways. There is good potential to continue addressing this insecurity through local and international campaigning and use of communications technology.

4.3 Aspects of vulnerability – agriculture

4.3.1 State of Angolan agriculture

Angola has been a food-exporting nation and in addition to extensive agricultural production the country also had a food transformation industry (drying, juicing, packaging etc). In 1973 Angola was the world's fourth largest coffee producer. Both the infrastructure required for mechanised agriculture and the transformation industry were largely destroyed in the war. The country has for some time now been a net food importer and imports more cereal per capita than the SSA average (3).

However agricultural production has grown faster than the wider economy since the end of the war and represented about 10% of GNI in 2011, up from 6% in 2005 (18). 69% of Angolans are involved in agriculture (33) and the bulk of this activity is traditional smallholder agriculture using shifting cultivation dependent on adequate rainfall. In 2007, 80% of agricultural production was estimated to be from traditional smallholder farmers with 2-3ha of land, 18% from medium-sized family farms and 2% from larger commercial farms (14). Despite the increasing contribution to GNI, vast majority of rural farming population is in poverty.

Angola is increasing its agricultural production faster than almost anywhere in Africa and in this is second only to Sierra Leone (3). But Angolan average yields at 0.65t /ha (2008-10) are still less than half the SSA average and per-capita production of 50kg (2008-10) a third the SSA average (3).

The smallholder agriculture that makes by far the greatest contribution to Angolan food production receives little in the way of support from the state, whose priorities are more aligned with modern extensive farming associated with national and international commercial investors (50). State /World Bank supported programmes to support rural smallholders have been hampered by lack of GoA capacity (51).

4.3.2 Risks to smallholder agriculture

Poverty levels are far higher in rural than in urban Angola (94% cf. 57% in urban areas (14)). Rural poverty obviously includes subsistence smallholder farmers and this is reflected in the low crop yields described above. In general terms and over an average year, traditional subsistence farming often does not provide enough food for a family's needs. Evidence from wider SSA shows that this is most likely to affect poorer families, so only better-off smallholders produce enough food annually for family sustenance (52).

Evidently agriculture (in particular agricultural productivity) is a key element in the vulnerability of the rural poor. Factors affecting the success of agriculture as the basis for resilient rural livelihoods include:

- Choice of crop and approach to agriculture

Shifting cropping with limited use of external inputs is a common approach to subsistence agriculture in Angola and involves burning of existing vegetation on a plot for fertiliser, use of the plot for two or three years then allowing the plot to lie fallow for some years before returning. Maize is the staple of choice in many areas but due to its vulnerability to drought other staples such as sorghum, millet or cassava may be sown instead. Intercropping of maize and beans to maximise the fertilising effect of the legume is common however greater use of conservation agriculture approaches such as low tillage, basin tillage and targeted use of manures is limited. Shifting agriculture provides inadequate soil fertility for good yields over the period of use of the plot; is environmentally destructive and does not provide resilience to drought and other weather extremes. Furthermore if land is not allowed an adequate fallow period, soil fertility and crop yields decline further and this is frequently seen. Smallholder farmers commonly 'hedge their bets' with respect to rainfall and weather extremes by planting close to rivers in case of drought and in uplands in case of flood. While this may be effective in terms of providing some guarantee of a useful crop, it is wasteful of precious effort and resources. High yielding crop varieties such as those used in intensive commercial agriculture may be effective in ideal conditions of soil, fertiliser and water availability but are vulnerable to drought and sub-optimal nutrient regimes (28).

- Availability and cost of external agricultural inputs

Agricultural ambitions of smallholder farmers understandably often lie with the intensive approach promoted by western agriculture and the Green Revolution, namely the use of machinery and external inputs (fertilisers, pesticides, high yield seeds, irrigation using (for example) diesel water pumps, tractors) to maximise yields and return. This in part reflects also the wartime approach to food security assistance, which supplied high-yielding seeds and fertiliser. This approach continues to this day (e.g. 53). However everyday reliance by rural smallholders on external inputs creates significant vulnerability due to price volatility. On the global market, diesel fuel, pesticides and fertiliser are all increasing in price at a rate higher than wider inflation (54) and such increases are magnified in areas of Angola without easy access to markets.

- Dependence on timely and adequate rainfall

Recent rainfall history as set out in Chapter 3 shows periods of rainfall deficit in all three study areas at key points in the growing season. This is exacerbated by the expected gradual increases in temperature due to climate change. Deficits in water balance have the effect either of reducing the effective length of the growing season, or of depriving crops of water at a crucial point in development and thereby increasing the likelihood of crop failure. There is potential to mitigate this either through conservation agriculture or through introduction of appropriate technology to harvest and store rainwater, or abstract groundwater from underground aquifers. In the absence of this, it may be that some areas of the country that traditionally sustained two harvests between October and May will, in the future, only be able to sustain one harvest. Erratic and unpredictable rain makes the decision about when to commit your precious seed to the ground very difficult.

- Gender and access to agricultural labour

Africa-wide, farming is becoming 'feminised' as the result of conflict or as men migrate in search of work (55). Angola is no exception and it is estimated that 35% of rural families are female-headed (55). This places even greater pressure on rural women who, in addition to all the tasks associated with caring for the home and family, have to bear the full and intense burden of agricultural labour. This is covered in more detail below.

- Availability and quality of agricultural extension support

The Angolan government provides extension and agricultural support services including (in some areas) credit, veterinary support, training and access to inputs. However the service is patchy at best and, anecdotally, does not respond to the needs of smallholder farmers. There is very limited consideration by state extensionists of the principles of conservation agriculture. Training and support is less likely to be offered to women farmers (55). Problems in the state extension service are illustrated by demonstrable weakness even in flagship projects with multilateral support (51).

- Resilience to extreme weather events

This area of vulnerability emerges from issues described above but is worth highlighting because climate change is expected to lead to increases in extreme weather events (22). The interaction of agricultural approach, climate /weather and environment is important and resilience can be improved by changing certain agricultural and natural resource management practices, for example deforestation (28).

- Availability of, and access to, suitable land

Nearly 35% of Angolan land is considered suitable for agriculture; at the end of the war in 2002 only 3% of land was being farmed (18). With a low population density, access to land for smallholder agriculture in Angola should not be a problem. However and as indicated in the previous section there are competing demands on the highest quality land suitable for agriculture, where quality is determined by soil, access to and reliability of water, access to markets, access to transport. These demands impact disproportionately on poor rural farmers with fewest resources to defend their land rights.

4.3.3 Vulnerability of agriculture in the study areas

Informal surveys in villages in each of the three study areas in 2011 gave a snapshot of the state of smallholder agriculture and this is reflected in the boxes below.

Cela, Kwanza Sul

A glimpse of the wider provincial picture with respect to (commercial) agriculture in a historical context is provided on a Government of Angola website and this shows both the extent of irrigation networks in place before the war and their current condition. Of the 55 irrigation /hydropower dams in place, only 3 have been repaired

to date (19).

State support has been reported for a series of large commercial-scale farms in Quibala municipality, totalling 39 units over an area of 20,000ha and proposing both rainfed and irrigated agriculture. The aim of the project is to train agricultural business people to produce food for local consumption and for export (57). It is not clear how this project is working with resident farmers in the area.

With respect to the Christian Aid study area, villages visited had abundant fruit trees (mango, avocado and banana) and the main crops cultivated were maize, beans, cassava, peanut, soya, onion, greens, garlic, sweet potato and potato. Tillage was mostly by hand and some farmers had access to animals for ploughing. There was some limited evidence of use of conservation agriculture techniques such as green mulching, use of manure and intercropping. However the principal approach to maintaining soil fertility continued to be shifting agriculture and villages reported no shortage of land on which to continue this. Cooperative working was used on occasion, for example to get produce to market. All villages in the study area were within 20km of the main town Wacu Cungo and although there was clearly dependence on externally-provided transport, access to a local market was reasonable (56).

Principal vulnerabilities in this area are the use of shifting rainfed agriculture, reliance on external inputs and inadequate resilience to changing climate and weather patterns.

Chibia /Bicuar, Huila province

The agro-pastoralist communities in the Christian Aid study area have considerable access to resources in the form of cattle. This differentiates them from other vulnerable communities, as they are able to use these resources both as a coping mechanism in times of need and to pay for legal and other support in their conflicts with private and state actors over land.

As well as cattle-rearing, these communities also practice subsistence agriculture and their approach reflects that seen elsewhere, using shifting agriculture with basic staples such as maize, sorghum, millet. Agriculture had been affected both by flood and drought in recent years and although some conservation agriculture techniques were in evidence this was not widely applied. As not all individuals own cattle, these communities require agricultural produce both for sale and exchange and to provide for family nutrition.

Vulnerabilities are as seen above and principally concern the basic approach to agriculture and resilience to a changing climate. In addition, insecurity with respect to land rights and access is an issue here as much with respect to agriculture as it is

with respect to transhumance.

Mavinga, Kuando Kubango

Some of the communities in the study area around Mavinga had returned to live in the area only in the past five or so years. This relatively recent return to a settled existence was reflected to an extent in the approach to agriculture which was on occasion more basic than that seen in Huila and Kwanza Sul. Agricultural techniques used were fundamentally as described above i.e. shifting rainfed agriculture, with maize, millet, sorghum as staples. Communities used both riverside and upland planting to protect part of their crops against both flooding and drought. For outlying villages a key issue was access to the local market at Mavinga.

In addition to poor resilience afforded by the existing agricultural practices, vulnerability in villages in this area is increased by a poor level of basic services and infrastructure including transport and access to markets.

4.3.4 Vulnerability in agricultural practice - conclusions

- Poverty creates a vicious cycle in rural communities, as men migrate leaving women with a greater burden of agricultural and domestic work. The issue of migration from rural areas is exacerbated by lack of alternative livelihoods in many rural areas and amongst our study areas this particularly affects Mavinga;
- Anecdotally, only those with a reasonable level of resources manage to feed their families for most of the year from their own fields. The poorest on the whole manage fewer months of subsistence;
- Poor agricultural practice is a key issue as this limits harvests (both in quantity and quality) and reduces resilience to shocks;
- Conservation agriculture has many of the answers to problems of productivity and resilience, but (beyond conservation agriculture) basic practice needs to be improved;
- Access to markets and services such as government extension support will be key in supporting development of smallholder agriculture.

4.4 Aspects of vulnerability – gender and power

4.4.1 Gender inequality in Africa and Angola

Women make up 70% of the world's poor. In LDCs, the unpaid work of women amounts to 35% of GNI (58). Women's time poverty due to unrecognised and under-valued work leads to under-education, lack of voice and fewer life opportunities. These factors in addition to cultural discrimination place women at significant disadvantage in particular in LDCs. This in turn has wider impacts on family nutrition and health: women's lack of power affects the next generation, for example when the father controls the household budget, a child chances of survival decline by 20% (58). Women are discriminated against by the patrilineal customs and laws that apply in many parts of Africa including Angola, under which inheritance passes to the eldest son or in his absence to the husband's family. At best the woman may often only be the temporary custodian of land and assets. Following divorce, assets remain with the male while the woman retains responsibility for the children (14).

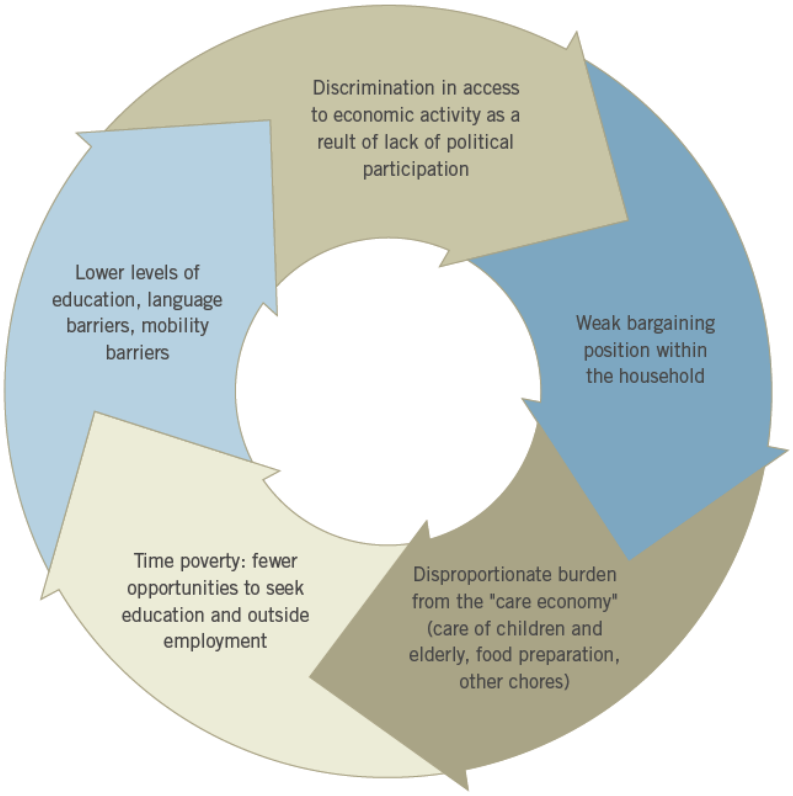

Figure 25. Cycle of inequality for women (58)

The war placed huge additional burdens on Angolan women. Two-thirds of the 4.1 million internally displaced persons in Angola were women or children. Men were taken by the war so women took up new responsibilities in communities and at

home. More than 30% of households continue to be female-headed and the majority of these live in extreme poverty (59). Additional wartime responsibilities did not reduce women's other tasks however, and furthermore women had little role in peacebuilding initiatives, nor were women significantly recognised in demobilisation and resettlement programmes (14). Despite some national-level initiatives to redress the gender imbalance amongst politicians and ministers, there is little evidence in rural areas of state recognition of gender inequality.

From the ADB's Angola Country Gender Profile 2008 (14):
"Women are affected by war more than men as they have carried the burden of raising the children, taking care of the household, including the sick and elderly, generating income, providing household food security, and generally ensuring that family continues to survive. Years of focusing on household coping strategies has resulted in a segment of the population which has had no access to education, skills training, productive resources such as land or microfinance, and are increasingly vulnerable to disease and other forms of external shocks."

Health and education indicators emphasise the poor position of Angolan women, with illiteracy at around 80% against 70% for men. The average duration of schooling for adult rural women in Angola is less than one year. Maternal mortality has declined from 1000 per 100,000 births towards the end of the war to 450 in 2012: still three times the global average. Adolescent (16-19) fertility in Angola is in the top five in the world at 148 per thousand women with multiple likely causes including lack of education and unequal power relations (3).

4.4.2 Gender in agricultural livelihoods

Disaggregation of on- and off- farm working hours amongst rural smallholders in Angola has shown that adult men work five hours a day on the farm and three hours off- farm, while women work 6 hours on and 2.5 hours off. These figures do not take into consideration household /domestic work. Total daily working hours for women have been estimated at 14 hours a day if there is a husband and 15 hours a day if not (14).

War meant that women had greater responsibility for agricultural production; however this was not accompanied by greater rights to land or assets. A frequent picture in SSA is that agricultural plots maintained by women are poorer and less productive than those maintained jointly or by men. There is a variety of reasons for this, key amongst which is reduced access to land rights and assets. Additionally women have less access to agricultural inputs, extension services or labour. Women are less likely to put in place climate change adaptation measures, such as water-retaining walls. Climate change impacts affect women more than men and add to their productive role, without reducing their other tasks and commitments (58, 60) yet women are far less likely to part of decision-making process on climate change adaptation and disaster risk reduction (31). Equally women in their work are more dependent than men on the existence of natural resources such as water and wood

as, for example, it is mainly women and children that gather firewood and fetch water (31). But women have less control over natural resources than men due in part to fewer rights over land. Table 2 below sets out how existing vulnerabilities are exacerbated by gender inequalities.

To this background, the continuing omissions in terms of gender analysis in state, NGO and agency policies and projects concerning agriculture is worrying. There is no specific Ministry of Agriculture policy concerning the situation of women farmers. The local and international humanitarian response to the 11-12 drought consisted in large part of agricultural interventions but was limited in terms of gender analysis (61, 4, 17).

Table 2. Vulnerability of women to climate change and other factors

Area of risk /vulnerability	Underlying socio-economic risk factors	Vulnerability of women
Crop failure	• 35% of rural farming households are female-headed and are the poorest in society	• Increased strain on family food provision • Increased agricultural workload
Access to safe water	• Gender division of household labour	• Additional time to fetch water in times of shortage
Disease	• Gender division of care giving	• Additional time in caring for sick family members • Lack of access to healthcare services
Resource scarcity	• Poverty affects women more than men • Women have lower levels of educational attainment Women are discriminated against by inheritance customs • Women have fewer assets	• Limited time and resources to invest in more resilient land and in alternative livelihoods
Disaster	• Women often lack skills knowledge and resources	• Women and children are more likely to be adversely affected by disaster events
Migration	• Males may contribute little to household income (e.g. remittances) • Women who become de facto household heads may face difficulties in retaining control over	• Increased domestic /agricultural workload • Decreased coping capacity and insecure tenure

	land and other productive assets due to unequal property and land rights	

4.4.3 Hierarchy, power and voice

Authoritarianism in Angola has a long history. The Portuguese colonial regime operated a strong control system over the Angolan people with the help of a pervasive secret service. After independence, wartime exigencies combined with Soviet-style central planning philosophy (at least until 1992) ensured the continuation of a state that curtailed individual freedoms whilst aiming (less than successfully) to be a universal provider. At local level, models of decision-making based on customary consensus building approaches amongst village elders continue to be widespread however it is also not unusual for the village head (Soba) to be closely associated with local state or party structures thereby diluting this form of local democracy. Women are particularly poorly placed in terms of involvement in decision-making due in the first instance to their lack of access to education and then to the nature of existing decision-making structures.

The MPLA and the long-serving president dos Santos continues to dominate national politics with a controlling, paternalistic approach. Country-wide, the expectation of most Angolans is very much that if the state /MPLA will not or cannot resolve their problems, no-one will. Given the non-existent – to – weak state capacity in many areas following the 27 year war, this is an expectation unlikely to be met in many parts of the country at the present time and for some time to come.

Expansion in participation, democracy and voice has taken place steadily since the mid-1990s and civil society including local churches, NGOs, associations and pressure groups are a major part of this. New media play a role and the huge growth of mobile phone usage in Angola, together with country-wide network coverage, provides a critical tool for information dissemination and broader participation.

But the ability of ordinary (poor) Angolans to influence policy and local implementation remains nascent. State capacity to respond to basic needs – health, education, water and sanitation, transport, agricultural support, markets – will continue to be weak for some time to come especially in rural areas where poverty is most acute. The implications of this for rural smallholders are that vulnerability to shocks and to climate change are exacerbated by existing power structures and high expectations from a state that does not have the capacity to respond.

3.3.7 Conclusions:

- A legacy of war is that rural women have a greater range of responsibilities but continue to have few resources and little input into decision-making processes. Rural Angolan women have had little education, are time-poor, have few life

chances and are more vulnerable to external shocks than men as they lack the assets and rights that men have.

- This leaves women at greater risk from climatic effects and in a poorer position to implement adaptation measures that will improve their own resilience.
- Absence of gender analysis in key recent documents about CCA and disaster response is a major concern. There seems to be an assumption that an appropriate engendered response will be pursued without the necessary precision about what this actually means in terms of work programme and approach.
- Government and institutions in Angola are still authoritarian and strongly hierarchical with little opportunity to influence decision-making at national, provincial or municipal level. But state capacity to respond to basic needs is weak and this combined with lack of voice increases the vulnerability of rural smallholders.

5 Responding to vulnerability exacerbated by climate change

5.1 Introduction

This chapter considers possible responses to the vulnerabilities of rural smallholders in Angola described in previous sections. Following the widespread acceptance from the mid-noughties of the need to pursue adaptation to climate change in parallel to mitigation (62), a variety of development and disaster response approaches have evolved to ensure the pressures of a changing climate are incorporated into project and programme design.

Rural Angolan farmers suffer multiple risks and vulnerabilities as we have seen:

- Unfavourable socio-economic background despite increasing national wealth, illustrated by corruption, poor governance, weak institutions and state capacity, high poverty rates combined with poor access to health education water /sanitation, together resulting in low resilience and adaptive capacity;
- Concerning climate change, although impacts in Angola are not as starkly defined as in neighbouring southern African countries such as Malawi and Zimbabwe, the evidence presented in this report on extended rainfall history together with anecdotal evidence indicate some adverse trends in rainfall and a likelihood of more extreme events in the future. Temperatures will increase and this will affect water availability for agriculture;
- Rural smallholder agriculture is unproductive relative to other SSA countries and is vulnerable due to dependence on rain, soil impoverishment in shifting agriculture, lack of access to agricultural inputs and lack of support and training;
- Women suffer greater poverty than men and have lower resilience and adaptive capacity due to reduced access to resources and assets, education and support; while at the same time having more economic responsibilities (in part as a legacy of war) on top of unrecognised household and domestic tasks;
- Angola's 2004 Land Law has positive elements that encompass the rights of existing communities on land and that recognise the importance of rural communal lands. However a combination of weak judicial and administrative capacity and a strong national driver towards attracting foreign investment in agriculture places rural smallholders and pastoralists at risk;
- Although Angola is one of the least densely populated countries in Africa, anthropogenic environmental degradation due to activities such as charcoal production, uncontrolled scrub burning in the dry season, mining activities and riverside agriculture are having a significant effect on the natural environment and this in turn impacts on rural livelihoods.

These vulnerabilities encompass numerous interacting development challenges. The question arises as to whether these challenges are best addressed through a climate

change adaptation lens, or using a specific sectoral analyses. The remainder of this report considers a variety of possible responses to the vulnerabilities described and climate change adaptation (CCA) features prominently amongst them. In order to incorporate climatic effects, recent practitioner debate has produced a plethora of new angles on development and disaster response. There is broad overlap and understanding between these new development 'disciplines' and tools which include Community Based Adaptation (CBA), Climate Smart Disaster Risk Management (CSDRM), earth observation tools, regional seasonal forecasting and others. This author considers that the broad lens of CCA is still appropriate for a complex environment such as Angola as it looks at uncertainty, changing environmental parameters and encompasses work that addresses wider vulnerability. Fig. 26 below conceptually illustrates adaptation to a changing climate.

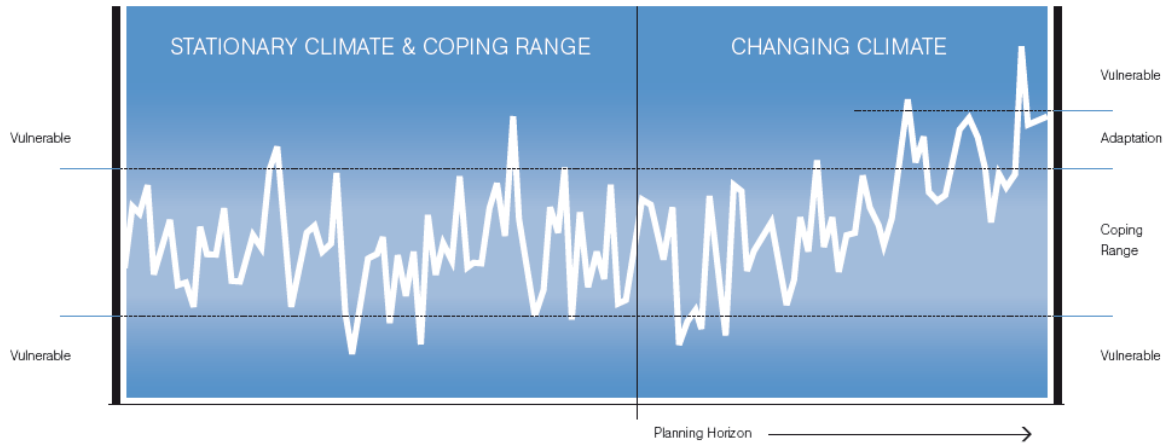

Figure 26. Conceptual illustration of coping range, vulnerability, climatic effects and the effect of adaptation (63).

This chapter will look at range of responses using a CCA lens and consider their relevance to Angola and our study areas.

5.2 Responses to rural vulnerability – Community-Based Adaptation

Under the UNFCCC, the second Conference of the Parties (CoP) in Nairobi in 2006 focussed significantly on climate change adaptation; at the time still a somewhat controversial area of work due to the implicit acceptance that further climate change and the effects thereof were inevitable. The Nairobi Work Programme included a Call for Action that has led to the development of National Adaptation Programmes of Action at country level (62). The most recently submitted NAPA is from Angola which submitted its paper in December 2011 (64). The NAPA approach essentially identifies and targets significant high-level impacts resulting from anthropogenic

climate change. NAPAs are country-level documents that aim to address strategic risks, for example on large fisheries, agriculture, settlements and infrastructure.

Community-based adaptation (CBA) is a counter, or arguably a complement, to this top-down approach in that it works alongside existing community development frameworks in a participatory manner rooted in the lives and experience of vulnerable communities. As a development approach it plans for adaptation to the gradual changes expected from climate change rather than the high-level impacts described in national analysis (7).

Box 2 below sets out the key elements of CBA.

- CBA's entry point is the identification of communities as vulnerable to climate change effects;
- Looks very much like 'development as usual' but incorporates potential impact on climate change into its development philosophy and approach;
- Aims to increase the resilience of the poorest communities to climate change impacts through an empowering community-led process based on local, needs priorities and capacities;
- Adaptation as development means addressing the underlying socio-economic risk factors that exacerbate vulnerability;
- Prioritises use of local knowledge about climate, weather, crop development, natural resources…
- … and incorporates this into a broader local climate change analysis by bringing in also advanced information and data from climate models, meteorology, hydrology, earth observation analysis;
- CBA is participatory at its core and uses relevant approaches from community development and participatory risk assessment work.

Box 2. Key elements of CBA (31, 65)

CBA is an evolution of existing development approaches taking into consideration new risks associated with climate change impacts. It does not offer an array of radical new solutions and rather considers existing practice through a climate change lens. A new community of practice has grown around the concept of CBA and one central focus for this community is a regular series of CBA conferences organised by the International Institute for Environment and Development (IIED) (ref CBA 2011 notes). A number of the case studies in section 5.3 were shared at IIED CBA events.

5.2.1 CBA in Angola – relevance and application

Angola's NAPA has been recently submitted and accepted by UNFCCC and the first projects have been jointly funded by the GEF and the Angolan government (66). The complementary analysis and approach of CBA is clearly of relevance in the Angolan

context. With respect to Christian Aid's Angola programme, CBA can be seen to build on the type of development approach that CA with partners have been pursuing in Angola for many years (Table 3 below). Red /yellow /green coding represents an assessment of the extent to which the key element is currently implemented.

Table 3. CBA fit with CA's Angola programme

Key elements of CBA (from Box 3)	**Status /relevance to CA Angola programme**
Identification of communities as vulnerable to climate change effects	Climate change effects are of relevance to communities, as are other vulnerabilities that share common solutions
Looks very much like 'development as usual' but incorporates potential impact of climate change	Relevant to Angola and is being implemented at the community level
Aims to increase the resilience of the poorest communities to climate change impacts through an empowering community-led process	An empowering community-led process to development has always been the aim of CA and partner projects
Adaptation as development means addressing the underlying socio-economic risk factors that exacerbate vulnerability	For rural smallholders in Angola these risk factors include issues discussed in this report such as gender, agriculture, land rights but also education, health, water and sanitation
Prioritises use of local knowledge about climate, weather, crop development, natural resources…	Exists informally at present as an element of secure livelihoods programmes but needs to be built on and formalised alongside regional /global information and data
… and incorporates this into a broader local climate change analysis by bringing in also advanced information and data	Lacking at present due to shortcomings in information availability in Angola and because this has not formed a significant element of CA or partner project analysis to date
Participatory at its core	The participatory approach to disaster risk management and development is central to CA and partner philosophy

Many elements of CBA are in place in CA's Angola programme and what needs to be built on is integration of knowledge and data into a comprehensive local analysis of climate and other risks. CBA for Angola would be strengthened further by putting gender inequality 'front and centre' in each of the key elements as they are taken forward.

5.3 Responses to rural vulnerability – EbA

Ecosystem-based adaptation (EBA) has been defined as 'the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the effects of climate change (67).

The term 'ecosystems services' is a way of describing and ultimately quantifying the benefits to human wellbeing accruing from the natural environment (68). These services have been characterised and categorised as set out in Fig. 27 below.

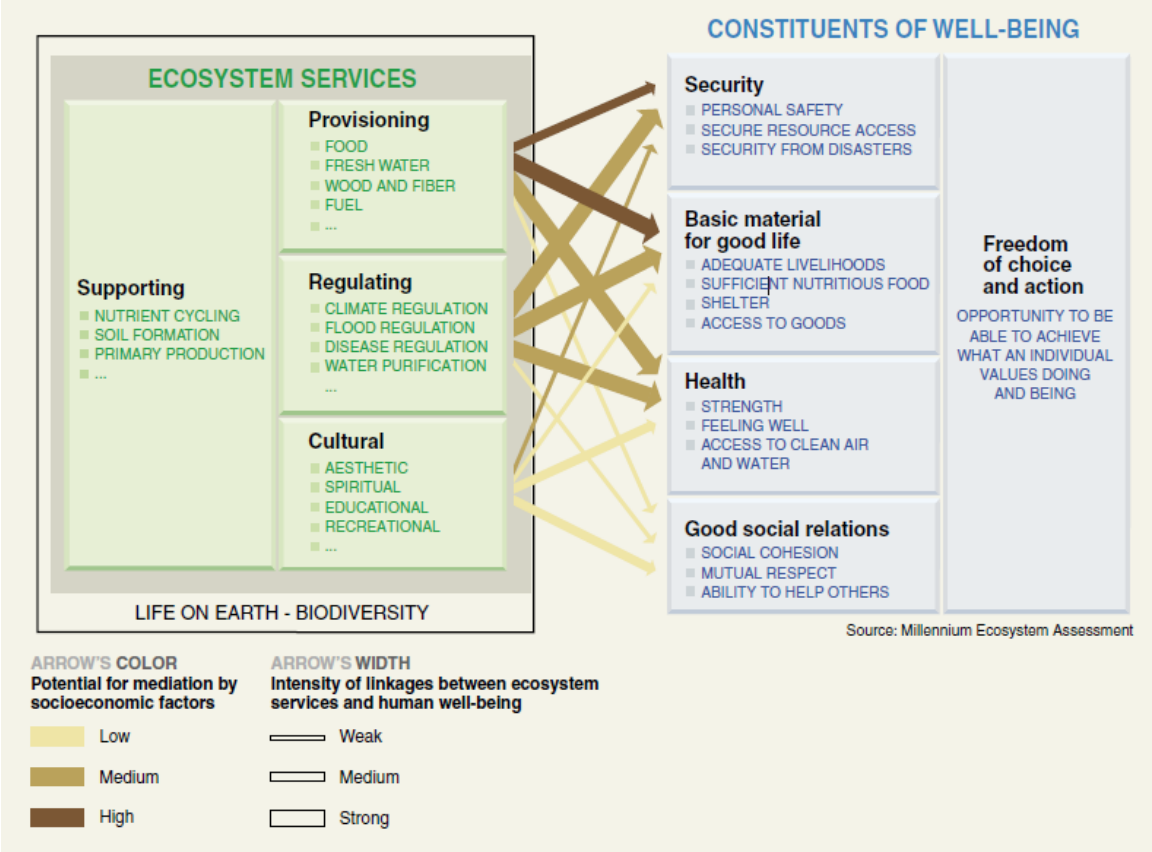

Figure 27. Ecosystems services and relationship with human wellbeing (ref MEA, 2003).

We have previously identified that the poorest people are likely to be most vulnerable to the effects of climate change and also that these people are likely to be most dependent on natural resources (i.e. ecosystems services) for their survival. Amongst this group, women are likely to be the most dependent on ecosystems services. It follows that any improvement in the quality and resilience of ecosystems will benefit the most vulnerable in terms of their own resilience.

Large-scale adaptation strategies can include e initiatives that damage ecosystems (and therefore the resilience of the poorest) and one example of this is the development of large-scale flood defences along rivers and coasts, which can

destroy habitats and species that local people may use for livelihoods. EbA recognises that ecosystems can be the first line of defence against climate change effects and that ecosystems need to be protected to enhance this defence. Examples of EbA include:

- Defence against coastal and river flooding and erosion by maintaining and protecting coastal /riparian land and vegetation;
- Sustainable management of wetlands and floodplains to maintain water flow and quality, protect sources of food and materials supported by wetlands, act as flood storage reservoirs, store water in times of drought;
- Conservation and restoration of forests and natural vegetation to stabilise slopes and regulate water flows, preventing flash flooding and landslides as rainfall levels and intensity increases;
- Use of conservation agriculture to produce greater yields while protecting soils from erosion and pollution with excessive pesticides, fertiliser.

From the definition and aims of EbA, key elements of this approach might reasonably be considered to be as follows:

- Awareness of the value of ecosystems to human health, welfare, development;
- Integration of local knowledge with global knowledge towards a useful and robust ecosystems analysis;
- Incorporation of ecosystems analysis into CBA or other appropriate climate change adaptation approach;
- Capacity in place to survey and monitor key elements of local ecosystems;
- Institutional capacity to monitor and enforce ecosystems protection (whether at state or community level).

5.3.1 Ecosystems-based adaptation (EbA) and Community-based Natural Resource Management (CBNRM)

The concept of CBNRM has been around for some time. Although not always associated with successful outcomes in terms of environmental protection, it is relevant to consider it now in the context of adaptation. There are significant overlaps between CBNRM and the EbA /CBA approach, in particular concerning the focus on information /knowledge about the natural environment (i.e. integration of local and global knowledge), participation of and ownership by the community and institutions /organisation (69). The key difference, and that which effectively brings CBNRM up to date both to the background of climate change and wider environmental degradation, is the ‘lens’. EbA provides a strong additional rationale for effective CBNRM by providing evidence that effective ecosystems protection /management forms an essential part of an adaptation strategy.

5.3.2 EbA in Angola – relevance and application

Field work in all three study areas revealed signs of environmental degradation (56). It has been established that not only does environmental degradation disproportionately affect the poorest, but also that the poorest and most vulnerable are most likely to cause further degradation of their environment due to heavy reliance on natural resources such as firewood, wild food, scrub burning in shifting agriculture (31).

A stark example of this is the reported 'disappearance' of rivers in Mavinga and Kwanza Sul. The river Cubia, a source of water and other resources for the rural populations around Mavinga, is slowly becoming ephemeral and has declined from a 30m-wide flow 20 years ago to a 2m-wide stream now. This appears not to be due to reduced flows, but rather to silting up of the river. Silting up was caused initially by diamond mining during the war and more recently by the use of the riparian (riverside) strip for both wet and dry season agriculture, which causes soil to be washed into the river.

Charcoal production is a lucrative business for rural communities, especially those that have good transport links with Luanda. It is largely uncontrolled in provinces such as Kwanza Sul, leading to widespread deforestation. Finally scrub burning in the dry season causes widespread uncontrolled fires that damage entire scrub and forest ecosystems. Field reports in 2011 indicated some common animal species are starting to disappear and aside from the environmental damage this has a direct impact on human welfare as involves some species used as food (56).

Better management of the natural environment as part of an adaptation strategy is clearly of great relevance to Angola and to our study areas. It's unfortunately the case that work in this area is not as advanced as other aspects of adaptation and Table 4 highlights gaps, based on elements of EbA outlines above.

Table 4. EbA fit with CA's Angola programme

Key element of EbA	**Status /relevance to CA Angola programme**
Awareness of the value of ecosystems to human health, welfare, development	Broad awareness exists at programme and partner level but little detail
Integration of local knowledge with global knowledge towards a useful and robust ecosystems analysis	Limited documentation available and limited incorporation into plans and projects
Incorporation of ecosystems analysis into CBA or other appropriate climate change adaptation approach	Not currently taken forward either as part of 'formal' CBA or separately
Capacity in place to survey and monitor	Not in place to a significant degree

key elements of local ecosystems	
Institutional capacity to monitor and enforce ecosystems protection (whether at state or community level)	Not in place to a significant degree

5.4 Responses to rural vulnerability – CSDRM

Climate change is affecting disaster risk in a variety of ways and disaster risk management without climate change analysis runs the risk of becoming less effective and may result in increased vulnerability of communities. Examples of ways in which climate change is interacting with disaster risk are as follows (8):

- Increased frequency and severity of hazards such as floods, droughts, hot and cold spells;
- Reduced baseline resilience due to slow onset effects such as on crop yields, water availability, impacts on food species;
- Increased uncertainty and unpredictability of events, which may cause cumulative effects with slow onset or rapid onset hazards.

CSDRM (Climate-Smart Disaster Risk Management) is an attempt by disaster risk managers to address possible gaps in analysis between specialists in each of CCA, community development and DRM. Its aim is to:

"Get people talking the same language about disasters, poverty and adaptation; use partner networks to fill our capacity gaps; and empower communities to learn and reflect by including them in discussions about their concerns, vulnerabilities and risks." (70).

Three pillars of work described by CSDRM are to tackle changing disaster risks, enhance adaptive capacity and to address vulnerability and its causes. These clearly overlap with other approaches and tools, and this is to be expected. Key elements of a CSDRM approach are as follows (8):

- Regularly triangulate local knowledge of changing disaster risks with evidence from the climatological and meteorological community and use this information to tackle people's exposure to these risks;
- Continually learn and reflect with partners and other stakeholders about the best approaches given changing hazards, vulnerability, exposure and capacities;
- Manage increasing uncertainty by working in partnership to build the capacity of people, communities and organisations to adapt to unexpected events in both the short and long-term;

- Build partnerships with the development community to ensure interventions to manage disaster risk also help to tackle the underlying drivers of vulnerability and poverty;
- Ensure that disaster risk management and development interventions are environmentally sustainable and (for example) do not unnecessarily emit greenhouse gases, something that will ultimately worsen people's vulnerability.

5.4.1 CSDRM in Angola – relevance and application

Angolan organisations have long experience in conflict-driven emergency response; less in disaster risk management (DRM) and disaster risk reduction (DRR) at community level. With the increased regional awareness of environmental degradation and climate change impacts, DRR work has deepened in Angola with a focus on community resilience in the face of climate variation and weather extremes.

As stated above, the key elements of CSDRM significantly overlap with development and adaptation responses both in the wider context in the South and in Angola. Table 5 below comments on the application of key elements of CSDRM in the CA Angola programme.

Table 5. CSDRM and the CA approach

Key element of CSDRM	**Status /relevance to CA Angola programme**
Regularly triangulate local knowledge of changing disaster risks with evidence from the climatological and meteorological community and use this information to tackle people's exposure to these risks	Reflects a key element of CBA and is not in place at present due in part to lack of data availability.
Continually learn and reflect with partners and other stakeholders about the best approaches given changing hazards, vulnerability, exposure and capacities	This is a particular focus of DRM and is in place within CA and to a certain extent in Angola (for example under ACT Angola).
Manage increasing uncertainty by working in partnership to build the capacity of people, communities and organisations to adapt to unexpected events in both the short and long-term	Central to the CA approach to disaster response and development.
Build partnerships with the development community to ensure interventions to manage disaster risk also help to tackle the underlying drivers of vulnerability	Encompasses a number of different areas amongst which tackling gender inequality is key and this is prioritised but needs further work

and poverty	
Ensure that disaster risk management and development interventions are environmentally sustainable and (for example) do not unnecessarily emit greenhouse gases, something that will ultimately worsen people's vulnerability	Projects and programme are subject to basic environmental screening /impact assessment which has scope for further depth.

5.5 Responses to rural vulnerability – knowledge, data and communications

A prominent thread in this report has concerned the importance of knowledge and data and communications as key elements in a community response to climatic and environmental vulnerability. Although local knowledge has often been embedded in analysis towards development and disaster responses, this has not always been formalised and there are numerous excellent resources on this (9). Broader climatic and environmental data has rarely been incorporated and this will be necessary to inform decisions and to provide a baseline for future monitoring. The integration of local knowledge with formal meterological /ecological /hydrological /observation /modelling data is a key element in climate change adaptation approaches. Regarding communication, new technology has opened up possibilities for information sharing and this can be used to benefit rural smallholders. This section provides a brief outline of key areas of knowledge /data input and communications.

5.5.1 Climate modelling

The 4th Assessment report of the Intergovernmental Panel on Climate Change (IPCC) collated predictions from a variety of Global Circulation Models (GCMs) under different greenhouse gas emission scenarios. This global reporting provides high-level indication of precipitation and temperature trends at continental and regional level (for example Fig. 28 below), with likely impacts on various sectors of human and environmental wellbeing. A finer national resolution is provided for some countries including Angola by UNDP country profiles (22) and this is set out in Chapter 3.

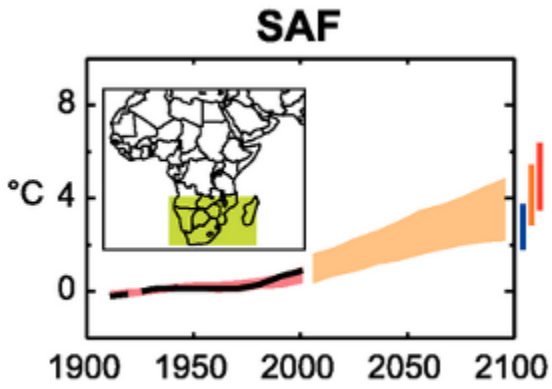

Figure 28. Southern Africa temperature anomaly (ref IPCC 4th Assessment)

Although global and high-level regional trends are useful background information, local detail is key for planning. The PRECIS (Providing REgional Climates for Impact Studies) initiative by the UK Met Office (71) supports local research institutes to develop Regional Circulation Models (RCMs) that provide more specific projections. In Southern Africa, the Global Forecasting Centre for Southern Africa (72) uses the PRECIS approach to provide seasonal forecasts of precipitation and temperature anomaly on a monthly basis. Figure 29 below shows an example of a seasonal precipitation forecast for the region, showing higher-than-expected rainfall predicted for south-eastern Angola in the months of June July and August 2013.

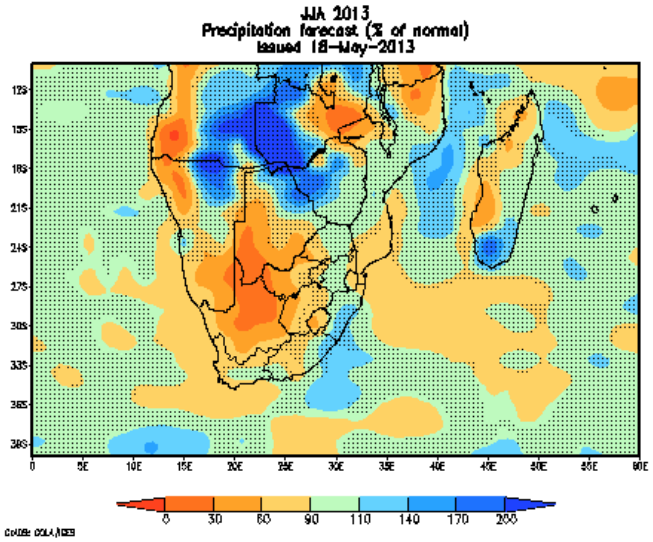

Figure 29. May 2013 precipitation forecast for June, July, August 2013 (72)

As models develop, processing power increases and available information improves, RCMs should improve in their resolution and accuracy and should become useful tools for smallholder farmers.

5.5.2 Earth observation data

Satellite observation is central to weather forecasting. Similarly, satellite imagery can be used to build a precise picture of trends at a particular location. Earth observation bodies such as the European Commission funded DevCoCast (73) and USAID-funded Water Requirement Satisfaction Index (WRSI) under FEWSnet (Famine Early Warning System network) (23) provide a range of interpretations of satellite imagery at fine resolution that can be used in a variety of ways. In Chapter 3 of this report, historic precipitation data from satellite imagery at specific locations was used to derive precipitation trends. WRSI can be used to provide an early warning of rainfall anomaly (see Fig. 30 below) and DevCoCast products such as the Vegetation Index and Small Water Bodies Index can be used to assess the state of the agricultural season in comparison with historical benchmarks.

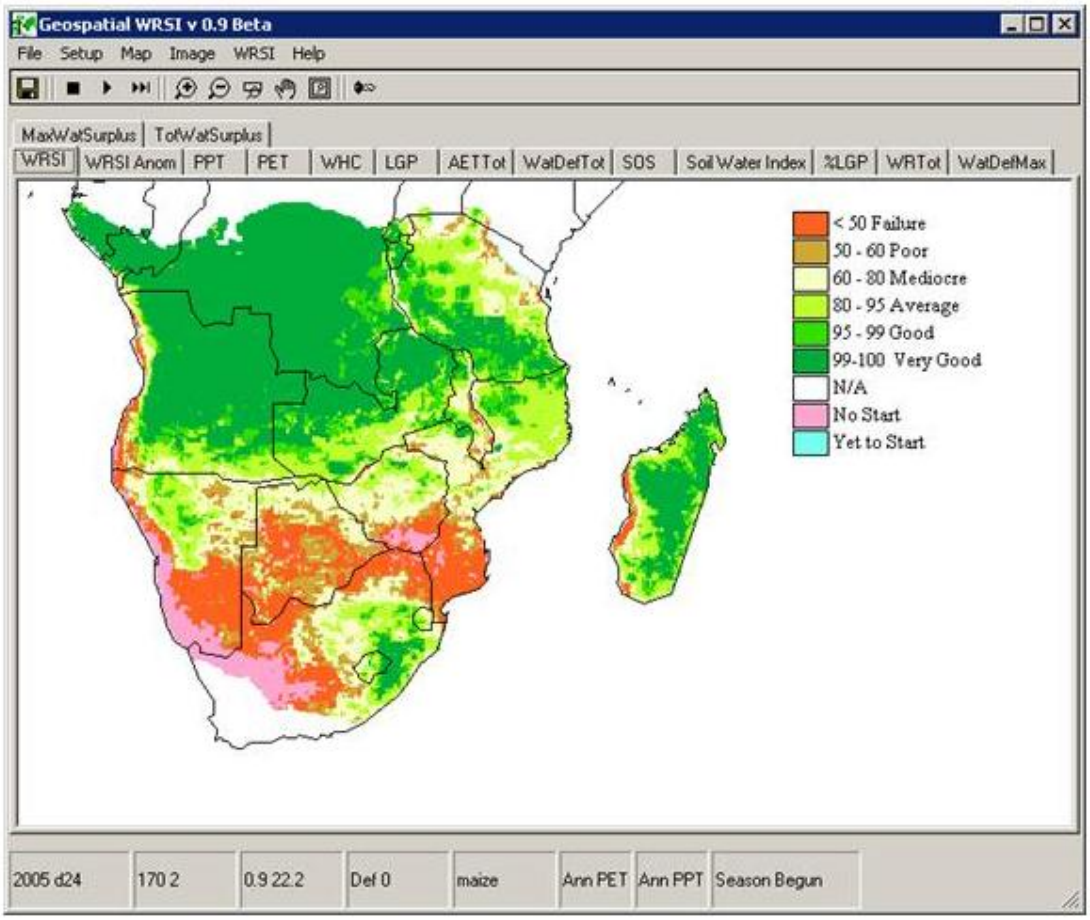

Figure 30. Sample WRSI output providing predictions of crop failure (23)

UNDP country profiles (e.g. 22) are developed from a combination of historic data, satellite interpretation data and climate modelling. In a similar vein, the suggestion now is that highly localised climate trend analysis can be developed along the lines set out in Chapter 3, using earth observation data, in order to help farmers 'fine

tune' their agricultural activities. Researched together with field data to provide ground truth to satellite interpretation, this could become a powerful tool.

5.5.3 Field survey and monitoring data

Angola developed a network of meteorological and hydrometric stations under the colonial regime and field data exists for the period 1953 to 1975. The network was no longer functional during the war and equipment was largely destroyed. A number of donor- and state- funded projects exist to rehabilitate the hydrometric network, for example the National Strategy Plan for the rehabilitation of the hydrometric network in Angola (74), with the aim of improving water management and also in preparation for hydropower schemes. GoA has recognised the importance of its National Institute for Geophysics and Hydrometeorology (INAMET) and announced investment in a new meteorological stations and new technology (75). However both national and local capacity in hydrometry and meteorology remain weak. This being the case there may be value in low cost or artisanal monitoring by partners and communities of key indicators, such as rainfall and river levels.

5.5.4 Communications technology

Angola was amongst the first countries in the world to install 4G mobile capacity and network coverage is steadily increasing, even to some remote rural areas. The company Unitel has by far the broadest network coverage and this is shown below for our three study areas.

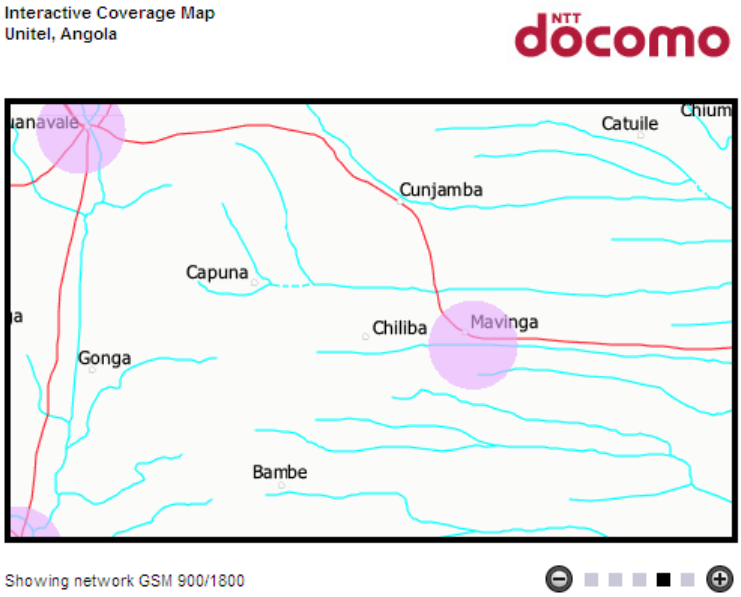

Figure 31. Mobile phone coverage around Mavinga, Kuando Kubango (76)

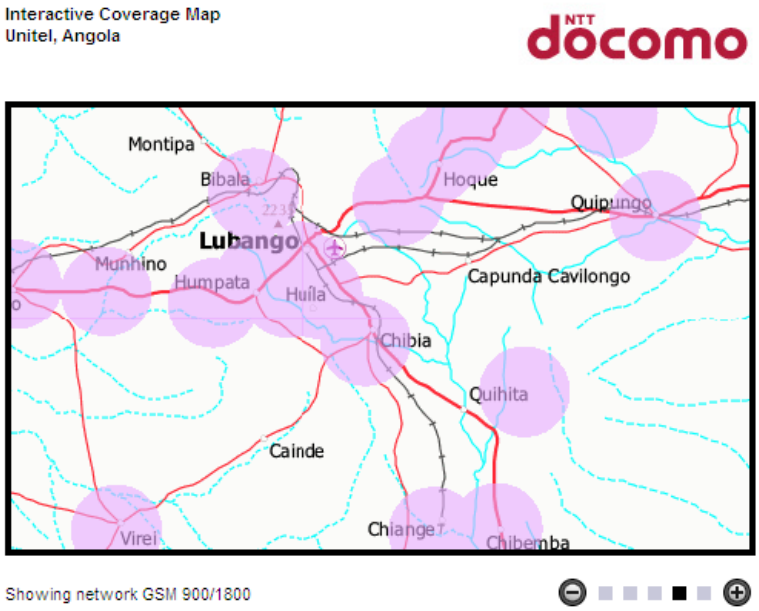

Figure 32. Mobile phone coverage around Chibia, Huila (76)

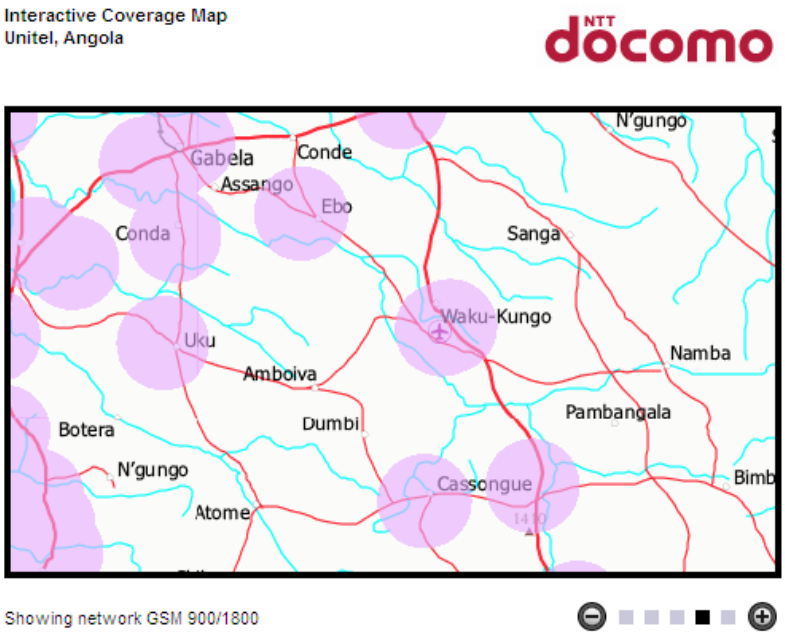

Figure 33. Mobile phone coverage around Waku kungo, Kwanza Sul (76)

Although high cost may make voice and data services inaccessible for poor rural farmers, organisations can budget for this. The existence of good communications networks in Angola complements perfectly the need to develop and share data and knowledge, for example about seasonal forecasting. It also allows easy sharing of news and experiences, for example videos about conservation agricultural techniques (77). Community-based adaptation places great emphasis on communication between communities as a means of embedding techniques towards greater resilience. Reliable and effective means of communication with /between

rural areas will also be a critical element in campaigning, for example over land conflicts.

5.5.5 Knowledge, data, communications and the CA approach

CA guidance on climate change adaptation provides comprehensive justification, suggested process and case studies on developing climate analysis based on integration of local knowledge and global knowledge /science (7, 8, 9). With respect to communications, CA is also at an advanced stage. However there may be areas in which further work could be done to enhance capacity to support rural smallholders in vulnerable areas. Table 6 below provides a brief assessment of current approaches.

Table 6.

Area of action	**Status /relevance to CA Angola programme**
Use of local knowledge towards climate change analysis	Good awareness in CA toolkit and has been used in Angola for some time
Use of climate modelling and seasonal prediction in developing climate change analysis and supporting rural smallholders	Good awareness in CA toolkit and starting to be used in Angola
Use of earth observation data in developing and supporting projects for example developing location-specific rainfall trends	Use of FEWSnet is widespread in CA for early warning of crop failure however the underlying detail is not significantly accessed or analysed
Developing partnerships with earth observation bodies (e.g. DevCoCast) to support rural livelihoods	Not significantly developed?
Accessing local field data or developing artisanal capacity in environmental monitoring	Not significantly developed
Use of up to date communications technology to share data and information between communities, projects	Some use for example in creating videos of farmers' experiences in addressing climate change

5.6 Responses to rural vulnerability – gender

Section 4.4 above provides some insights into the contribution of gender inequality in Angola to overall vulnerability, in particular of rural smallholder families. Gender inequality is a significant over-arching contributor to continuing vulnerability at a wider community level, climate change effects notwithstanding. This section provides a brief summary of possible ways to address rural gender inequality, an approach for which additional justification if provided by evidence that addressing just individual elements of gender inequality can have far-reaching benefits (58):

- In countries where women lack land ownership rights, there are on average 60 per cent more malnourished children;
- In countries where women lack access to credit, there are on average 85 per cent more malnourished children;
- If women had the same access to productive resources as men, they could increase yields on their farms by 20–30 percent. This could raise total agricultural output in developing countries by 2.5–4 percent, which could in turn reduce the number of hungry people in the world by 12–17 percent.

As an approach to addressing the multiple threats and vulnerabilities facing rural smallholders in Angola, the pursuit of climate change adaptation objectives through a focussed gender inequality lens is likely to be an effective way to work.

Table 7 below sets out a series of recommendations for initiatives in this area that have emerged from a variety of recent reports on gender, climate change and agriculture, and the status /potential of such initiatives in Angola (58, 60, 78).

Table 7. Addressing rural gender inequality

Addressing rural gender inequality
Analysis
Need to understand how climate change can intensify pre-existing inequalities
Involve rural communities, especially women, in the planning and implementation of climate change adaptation initiatives
A need for disaggregated data on livelihood strategies
Organisation
Strengthen women's organisations in rural communities and promote women's participation in community decision making
The strengthening of existing organisations and initiatives that already have gender equity objectives
Knowledge, communication, education, advocacy
Develop awareness and information campaigns about climate change and its effects for inhabitants of rural areas.
Promote awareness raising and training among those involved in rural

development (at national, regional and local levels) with regard to the specific impact that climate change has on women.
Promote women's access to agricultural-extension services and training on farming adaptation techniques.
Promote access for both men and women farmers to information about the climate, including weather forecasts, so that they can decide on the best time to plant seeds.
Raise women's awareness of communications technology.
Work on identifying and eliminating factors that limit women's capacity to adapt. Give women training so that they can develop their adaptation skills, and promote medium- and long-term strategic changes in order to achieve greater gender equality.
Natural resources and agriculture
Involve rural communities and women in particular in the sustainable management of resources such as water and forests.
Promote women's use of adapted farming systems, use of water- and soil-conservation techniques, use of improved seeds, diversification of crops, composting and horticulture.
Access to land and assets
Improve women's access to land ownership; develop awareness raising programmes within communities and among those involved in development at local, regional and national levels.
Promote the amendment of laws to grant women the right to ownership.
Improve women's access to credit and the inputs needed to increase agricultural yield.

Case studies in the following section include some focussed on gender inequality, including interesting analyses of projects that failed to achieve their principal aim. These emphasise the difficulty in addressing deeply ingrained cultural inequalities and the need both for long term investment in this work and continuity of pressure.

5.7 Responses to rural vulnerability – case studies

The practitioner literature on climate change adaptation and in particular community-based adaptation is expanding rapidly. New tools such a CBAx (80) provide swift access to lessons about CBA from around the world. This section aims to provide a selection of brief case studies illustrating work related to headings provided in previous chapters, with brief notes about possible applicability to Angola.

5.7.1 Community-based adaptation

1. Integration of seasonal forecasting in Zimbabwe (31).
   Use of Zim met office seasonal forecasts to inform annual participatory climate forecast workshops with farmers. Each year would reflect on harvests and previous year's predictions and combine Met Office forecasts with farmers data and perspective. Good increases in harvests.

   Applicability to CA's Angola programme? While the Angolan met office may still lack capacity, seasonal forecasting from the Global Forecasting Centre for Southern Africa provides usable resolution for Angola and could be incorporated into such an approach.

2. Climate field schools, Indonesia and Philippines (8). Based on the Farmer Field School model and involving state agricultural extension workers trained by staff from the Meteorology Department, farmers are taught the basics about weather, climate, CC, seasonal forecasting, measuring and monitoring.

   Applicability to CA's Angola programme? Constrained by lack of state capacity in agricultural extension and in meteorology but applied to a degree in partner-partner learning.

3. Seasonal analysis, climate timelines and changing climate and livelihoods risks (India, Sudan and Kyrgystan) (8). These participatory analyses document changes to seasons, changes to extreme events and impacts on agriculture, behaviours, traditions and ceremonies.

   Applicability to CA's Angola programme? Has been applied and included in PVCA exercises with most partners in Angola.

Early action workshops: bridging the gap between climate scientists and communities at risk in Africa (29).

Hydro-meteorological hazards are on the rise in Africa. Action to minimise the obstacles preventing community access to climate and weather forecasts has provided a useful element of CBA with frontline communities in Senegal, Mozambique, Kenya and Uganda.

Applicability to CA's Angola programme? Sharing climate and weather information is an essential part of CBA and even if there is limited local capacity, regional capacity may be able to fill the gap.

Enhancing Community Resilience Programme, Malawi (80).

Implemented by CA and Concern. Defines characteristics of a resilient community and builds towards this with a series of activities. Characteristics are Knowledge, Organisation, Connection, Infrastructure and Services, Economic Opportunities, Management of natural assets. Activities combine seasonal forecasting and early warning systems with a series of livelihoods interventions including agro forestry, conservation agriculture, low carbon technologies and financing, pre and post harvest management, small scale irrigation, village savings and loans (VSL), micro watershed management and small livestock production.

Applicability to CA's Angola programme? All applicable. An Angolan interpretation of a programme of this nature should place greater emphasis on ownership by women.

5.7.2 Gender

Post-flood food security support project in Burkina Faso (60).

With a focus on organisation and women, this project allocated a 1ha site to 25 women and within this, each woman tended two plots: one personal and one belonging to the organisation. The organisation agrees the calendar of activities and jointly funds the purchase of seeds and manure. Irrigation is done by hand and in shifts. The project also includes marketing, storage and credit elements and the organisation also raises money for women by finding work on other farms. The 1ha

site does not belong to the women but is allocated by a male head of household. However the project has contributed to a change of behaviour, roles, attitudes and helped change gender power relations in the home and community.

Applicability to CA's Angola programme? Highly relevant to Angola and many elements could be easily applied.

Participatory Digital Photo Storytelling (81).

Partners and communities are trained in the use of equipment and software to enable the creation of videos that tell stories about the impacts of climate change and what people are doing to adapt. This is used for learning, sharing, advocacy, media work. There is a particular focus on the gender dimension of climate change and the methodology places emphasis on the heterogeneous nature of communities by ensuring a variety of different and often unheard voices are heard.

Applicability to CA's Angola programme? In use and highly applicable, given the remoteness of communities and the expanding telecommunications network that facilitates sharing of videos.

Participatory action research on gender and adaptation to climate variability in Bangladesh, Uganda, Ghana (29).

This project aimed to improve communication of possible adaptive strategies to men and women in a variety of contexts, focussing on use of daily and seasonal weather forecasting and the use of climate analogues. Climate analogues are a representation of a possible future climate in the farmers' area of origin, seen in a visit to a different (more exposed, drier, prone to flooding etc) area. Farmers learn about adaptation approaches in the climate analogue area and can apply these.

Applicability to CA's Angola programme? The climate analogue approach is interesting and could be applied, with care, within Angola.

Village poultry farming in Burkina Faso (60)

Planned as an approach to swift post-disaster economic recovery, livelihood diversification and women's economic empowerment, this project provided participants with animals, materials, training and veterinary support to allow the

historic constraints to poultry farming such as lack of coops, disease, inappropriate nutrition, poor marketing to be overcome. Participants work as members of poultry farming organisations in order to pool learning and resources. Results were mixed as although aimed at women, the project also included men in the poultry farmer organisations. The effect was that the (additional) work was done primarily by women, but the income from the sale of poultry was shared and the project, although clearly well-intentioned, may have partially backfired. The conclusion is that control of income is critical and needs to be agreed from the outset.

Applicability to CA's Angola programme? Strong lesson for the Angola programme and always difficult to implement.

Women's mini farm, Burkina Faso (60)

Women were targeted as recipients of support in this project that combined cattle rearing, conservation agriculture, organisation and credit. Loans were used by women to buy cattle and to access building materials to develop water and soil conservation techniques. The project provided income through sale of cattle and boosted agricultural (cereal) production by increasing area under cultivation and soil fertility. Unfortunately the project did not ultimately benefit women, as the sale of cattle and cereals is traditionally controlled by men. Thus the project resulted in an increased workload for women while men benefited through increased income. Some benefits to women were seen from the project, arising from women's involvement in organisations and decision-making, which boosted women's standing in their families. The failing of the project was due to a 'Women in Development' rather than a 'Gender in Development' approach and specifically due to the fact that supported activities were historically controlled by men so men were more likely to benefit.

Applicability to CA's Angola programme? A key lesson is that projects that are seen to benefit livelihoods /income of the whole community may not improve the position or power of women at all, or may even further prejudice women if their workloads are disproportionately increased

5.7.3 Ecosystems-based adaptation

Farmer-Managed Natural Regeneration (FMNR) in Niger (52).

A well-documented programme involving stakeholders including farmers, herders, men and women, researchers, government services and the International Fund for Agricultural Development. Forestry management is overseen by village committees together with the state forestry department and illegal cutting has ceased, resulting in a halt to desertification, increased production of cereals and a dramatic increase

in (sustainable) wood production which provides an income during times of environmental shock.

Applicability to CA's Angola programme? Highly relevant and urgently required to slow deforestation and river silting but likely to be constrained by lack of state capacity.

LITETA (Local Initiative: Training for Enterprise, Transformation & Agriculture) project, Zambia (65).

An agriculture-based project that incorporates nature conservation elements working through community committees. A Traditional Leaders' workshop set up natural resource management committees that worked with local authorities to curb deforestation for charcoal production and also started a broader campaign against environmental degradation. Farmers were trained in conservation agriculture including compost production, green manures, use of fertility trenches etc. and have moved from shifting agriculture to fixed agriculture with rotation.

Applicability to CA's Angola programme? Highly relevant to Angola in particular the need to control deforestation for charcoal production. State capacity to enforce deforestation and charcoal production likely to be a constraint.

5.7.4 Pastoralism

Wells and passage for transhumance – Chad (29)

Following a lengthy and complex consultation process, Agence Française de Développement (AFD) together with local partners developed a network of 1000 water points and 500km of passage ways for transhumance, allowing pastoralists access to extensive rangelands previously inaccessible due to lack of water. This was a long term (15 year) project and results included increase in production and resources and reduced conflict.

Applicability to CA's Angola programme? Likely to be applicable to Angola as an area of advocacy for partners working with pastoralists. There is a similar project in place, funded by the EC, in Namibe, Huila and Cunene provinces (below).

Disaster Risk Reduction with pastoral communities in Niger (29)

A Tearfund partner worked with Tuareg pastoralists to increase resilience by (a) creating a network of camps or 'fixation sites' with basic infrastructure including wells, health, education where pastoralists would stay (as is traditional) for some months of the year (b) creating pasture management associations (c) creating grain banks and fodder banks (d) undertaking rainwater conservation measures to improve pasture and to capture water (e) developing an early warning system so that cattle is sold early when (for example) pasture is expected to be overstocked. Communities participating in the project lost far fewer cattle in a drought than those in non-participating communities.

Applicability to CA's Angola programme? Many elements are applicable as part of an advocacy programme for and with pastoralist communities.

Transhumance project: improving conditions for vulnerable pastoralist families in the South of Angola (49)

EC-funded project with the Angolan government, with the objective of identifying a strategy to improve access to and management of water and pasture by producing support instruments and guides. Participating government departments are Agriculture, Energy and Water, the Cartographic Institute and the municipal government. The project covers a large area from eastern Namibe, through southern Huila and Cunene provinces. Activities includes the rehabilitation of *chimpacas* (rainwater collection ponds), bovine vaccination campaigns, use of satellite imagery to map vegetation, baseline analysis of plant species in the area for use as fodder and natural veterinary medicines, awareness raising of issues for pastoralists through theatre, market studies for sale of beef /cattle.

Applicability to CA's Angola programme? Possible opportunities for collaboration with CA partners and communities in Huila province.

5.7.5 Other case studies

Warrantage (52)

Warrantage, increasingly used in the Sahel over the past 15 years, is a credit transaction whereby agricultural products brought to a storage facility serve as collateral for a loan given to a farmer. This means that farmers can avoid the low prices usually given at harvest time and benefit from higher prices at a later date. Credit given allows farmers to undertake income generating activities during the dry season (including for example migration). The difference in price for the agricultural products between harvest time and the lean season is often enough to pay for interest and storage charges. Because of fluctuations in price, the price differential will not always cover the cost of borrowing every season. Warrantage can also link farmers' associations to micro-finance.

Applicability to CA's Angola programme? Has potential in areas like Waku kungo with good access to markets and infrastructure.

6 Discussion, conclusions and recommendations

6.1 What are the biggest contributors to rural vulnerability?

The extent and depth of ongoing rural poverty in Angola is not in question. Responsibility can be laid at the door of the state for placing inadequate emphasis on rural development, as the impact of poor or non-existent basic services plays a significant role in maintaining poverty. These are areas largely for partner advocacy, although NGOs and churches may clearly have a role to play in *ad hoc* interventions in education, health and water /sanitation. This report has focused on other areas of vulnerability – namely climatic effects, gender, land rights, the nature of agricultural livelihoods and environmental degradation – that are linked to the nature of rural livelihoods in the study areas and in Angola more widely. They are also areas in which Christian Aid and partners are well positioned to effect change.

6.2 Prioritising issues

As difficult as it is to distil analysis down to a 'core problem', there may be value in prioritising different vulnerabilities in order to better inform a development response. Part of the task of this paper has been to 'better understand the equation concerning land rights and climate change adaptation' and the intention of the approach below is to start to respond to that task.

Prioritisation has been attempted here on the basis of the research that informed previous chapters. Three characteristics of these key 'vulnerabilities' have been considered and each area allocated a score /grading /significance level, as follows in Table 8.

Table 8

Characteristic of issue	**Possible description**	**Basis for assessment**
Current significance	Very low to very high	Analysis in the literature about overall vulnerability and the relative contribution of the issue in question
Likely trend	Improving, unchanging or deteriorating	Predictions and analysis in the political, scientific, geographical literature taken together with field data over the recent past
In-combination effects	Very low to very high potential	Judgement about potential and actual inter-relationships between vulnerabilities based on current analysis

There is clearly a degree of subjectivity in this approach, as well as significant variability between areas and contexts. Christian Aid's secure livelihoods approach

recognises the differential contribution of different vulnerabilities (6). However as well as providing some evidence for further work it is hoped this serves as a basis for debate. Each of the sections below considers the areas of vulnerability studied, provides an assessment on the basis of Table 8 and a justifying narrative including in-combination effects and some ideas for future work under different timescales.

6.2.1 Gender

Gender inequality and rural vulnerability		
High significance	Unchanging trend	Very high in-combination effects

Gender inequality in Angola contributes in a tangible way to overall vulnerability amongst rural smallholders and pastoralists. As we have seen, overall agricultural production and productivity are negatively affected by women's lack of land rights, reduced access by women to assets and resources, unequal division of household labour, unequal access to extension support training and information. Women's greater dependence on natural resources increases pressures on the environment and conversely a more degraded environment has a greater impact on women. Concerning climate change, women have less in the way of adaptive capacity and are more affected by climatic shocks due to greater family responsibilities and lack of resources. This is the case to greater or lesser extent in all three study areas; perhaps most in Mavinga.

Clear in-combination effects can be seen between vulnerability resulting from gender and other areas of vulnerability. Development pressures resulting from ineffective agricultural practice, a degraded natural environment, weak or non-existent land rights /access and climatic effects are exacerbated by gender inequality. In terms of impact significance, this author considers vulnerability arising from the unequal position of men and women in Angolan society to be the most significant contributor to rural vulnerability and the area that needs to be at the core of any response.

While recognising that the timescale to address gender inequality in Angola is necessarily long-term, there are immediate actions that can be usefully pursued. Aside from specific project work (more of which below), this should include a dedicated programme of advocacy aimed at ensuring that national programmes on rural development, climate change adaptation, agriculture explicitly incorporate gender analysis and solutions focussed on improving the position of women, and in particular rural female-headed households. The fact that this is not evident in very recent internationally-supported programmes of work concerning climate change adaptation is unfortunate and surprising, and will reduce overall programme effectiveness.

6.2.2 Agricultural livelihoods

Agricultural livelihoods and rural vulnerability		
High significance	Unchanging trend	High in-combination effects

Rural smallholder agriculture as practiced by communities in the three study areas (and all over Angola) is a major contributor to production of staples nationally, but per- hectare and per- capita productivity are amongst the lowest in Africa, contributing to rural vulnerability. Often it is only the better-off families that are able to produce enough food to last the year; poorer families rely on alternative coping mechanisms such as labouring, artisanal crafts, wild food gathering to survive. Low food security resilience in Angola was thrown into sharp relief by the poor 11-12 rains across the country, which swiftly caused food insecurity, under-nutrition and the need for a humanitarian response on a similar scale of to that seen during the war. Problems with the subsistence agricultural livelihoods in the study areas include dependence on erratic rains, declining soil fertility in shifting agriculture, unaffordable inputs including seed, traction animals, machinery, fuel, fertiliser and pesticide; inadequate government support for rural smallholders in terms of extension support and credit, frequent flooding of the *baixas* and poor access to markets. The historical legacy of strong authoritarian control (leading to an expectation of government or party response) and ubiquitous 'seeds and tools' food security interventions by government and NGOs may have contributed to a lack of adaptation and innovation in agriculture.

Considering the areas of vulnerability assessed here, there are clear in-combination effects between agriculture, climate change effects and gender. Better protection for land rights are likely to positively influence agricultural productivity, as would reduced environmental degradation but the links are less direct. Vulnerability arising from the present approach to subsistence agriculture is considered a significant contributor to overall rural vulnerability.

Traditional approaches to agriculture will take time to adapt and change to a more productive, more sustainable footing. Access to markets is important for farmers and this is an area largely in state hands, as is the repair /development of transport routes. Equally the rebuilding of government extension services and the redirecting of those services towards the needs of rural smallholders is a long-term project. Models for a conservation agriculture approach are commonly available and these should help increase productivity and resilience to climatic shocks. These propose, amongst other measures using appropriate local crops including drought-resistant varieties, using planned rotation instead of shifting agriculture, using manures and natural remedies instead of expensive chemical inputs, making the most of rainfall by manipulating water flow through small-scale earth works, replanting trees and shrubs to create a beneficial micro-climate.

6.2.3 Land rights /access

Land rights /access and rural vulnerability		
Medium /mixed significance	Unchanging trend	Some in-combination effects

The threat of land dispossession and /or prevention of access to land hangs over the rural population in all three study areas. It is a real and present problem particularly in Huila for the pastoralist communities using the area in and around the Bicuar National Park for transhumance. Mavinga has also seen creation of *de facto* land access pressures through forced population movement that has made access to traditional agricultural and horticultural plots difficult or impossible. Our study area in Kwanza Sul has experienced less in the way of direct threats to land tenure and access but there, as elsewhere, there are potential future pressures on rural smallholders from government plans for commercial estates.

It follows that the impact of land rights and access issues on overall vulnerability is mixed. For Huila pastoralists, increasing encroachment by estates, and enclosure through fencing of both estates and the National Park is a fundamental threat to livelihoods and resilience. In Mavinga, greater competition for accessible plots following forced resettlements contributes to vulnerability. In Cela, threats have yet to manifest themselves as direct impact on rural livelihoods with the exception of the impact on women, who with fewer decision-making and title rights over land are disadvantaged in all three areas. Land rights combine particularly with environmental degradation and with gender inequality to increase rural smallholders' and pastoralists' vulnerability.

Work on land rights needs to incorporate immediate and long-term actions. Human rights defenders can make use of modern information and communications technology, facilitated by the comprehensive mobile network coverage in Angola, to record abuses, enclosures, encroachment, forced resettlement. In Huila there is a strong history of organisation and pooling resources to use formal channels to challenge enclosures, encroachments and abuses and this should act as a model for elsewhere. National and foreign investment in land for large scale commercial agriculture for export should be monitored carefully and challenged to adhere to suggested codes of conduct for such initiatives to ensure they respect the rights of indigenous communities and maximise value for local people.

6.2.4 Climate change impacts

Climate change impacts and rural vulnerability		
Medium /mixed significance	Deteriorating trend	Some in-combination effects

At a country level, climate change trends and projections for Angola are adverse for rainfed agriculture, with rising temperatures and (slowly) declining rainfall. Specific work on the three study areas in this report shows a different and varying picture that seems most adverse in Cela /Kwanza Sul due to a sharp trend towards declining end-of-season rainfall that seems likely to curtail agricultural production in the 'second rains'. Around Bicuar NP and Mavinga there is no clear overall trend towards reduced rainfall: on the contrary greater year-to-year rainfall stability is indicated for parts of the growing season. Results from the analysis presented here should be taken as indicative rather than definitive and, more than anything, provides a basis for development of further monitoring and of a local climate analysis together with communities, CA partners and local government.

Climate change effects exacerbate in particular the vulnerability due to gender inequality and also agriculture. Environmental degradation may have potential to exacerbate or mitigate the effects of climatic extremes through the development of drought or flood-prone microclimates. Concerning contribution to overall rural vulnerability, climate change in these study areas in Angola is considered not to be as significant as other pressures /vulnerabilities but it clearly presents an existing and future threat.

Appropriate responses to climate change effects by rural smallholder farmers substantially include changing the approach to agriculture and are reflected in comments above. Timescale for additional work is likely to be in the medium-long term and may include working with state bodies to improve access to meteorological and hydrological information, developing and communicating seasonal forecasting and installation of appropriate technology to maximise rainwater harvesting and storage. More immediate work may be required in Cela /Kwanza Sul to monitor and address the issue of end-of-season rainfall declines. If it transpires that this reflects a real and lasting change in seasonal rainfall patterns, farmers in the study area may need to change their agricultural approach and rely less on the 'second rains'.

6.2.5 Environmental degradation

Environmental degradation and rural vulnerability		
Medium significance	Deteriorating trend	High in-combination effects

Country-level statistics and data from the field point to a significant degree of environmental degradation in Angola. This is likely to continue and increase in the future, in part due to development plans that include resource extraction, damming of watercourses for hydro-power and irrigation, extensive agriculture and opening up road and rail links to isolated areas. Subsistence farming and rural livelihoods contribute to environmental degradation through (amongst other causes) widespread scrub burning in the dry season, charcoal production and use of riparian

land for agriculture leading to erosion and silting up of rivers. Less apparent in communities around Bicuar NP, environmental degradation was clear in Mavinga and in Cela, where loss of species, silting up of rivers, loss of forest cover were reported.

As mentioned above, rural women depend more than men on natural resources (as principal collectors of water and firewood, gatherers of wild food etc), so environmental degradation exacerbates gender inequality. Environmental degradation also works in-combination with climate change effects and with land rights /access to increase rural vulnerability. Alongside other pressures on rural livelihoods, this area is of increasing significance but does not at this point contribute to vulnerability to the same extent as other pressures.

That said, the pending threat from extent existing environmental degradation in the study areas warrants an immediate response. This should include reduction in use of charcoal burning as a coping strategy, protection of riparian (riverside) vegetation, controlling cutting of forests and controlling scrub burning. There's clearly an overlap with conclusions concerning agriculture as replacing shifting agriculture with planned rotation will significantly reduce environmental damage. In the longer term these steps need to develop towards embedding ecosystem-based adaptation into the community development approach.

6.3 Discussion and recommendations

- *Yet another perfect storm...*

It is clear from the analysis that rural smallholders face a barrage of threats, including but not limited to those discussed above. In recognition from this it has been suggested that withdrawal from the rural economy is an option for smallholder farmers (3). There is a number of reasons why this is not a reasonable option for our study areas in Angola, and is unlikely to be reasonable in other parts of Africa: (a) Increasing the already high rate of urbanisation is likely to add to, not reduce, poverty and vulnerability as basic services are already unable to cope. (b) Investment in smallholder agriculture is one of the most effective forms of poverty reduction and is many time more effective than urban investment (3). (c) The environmental constraints (i.e. climate change effects, environmental degradation) in Angola are smaller contributors to rural vulnerability /poverty than in other SSA countries. (d) Culture and ethnicity are closely linked with land: often specific sites and landscapes. To undermine this is morally deeply questionable. **Recommendation – maintain support for rural livelihoods in situ by pursuing appropriate development responses and advocacy.**

- *Addressing gender inequality is the* sine qua non*…*

The pervasive effect of gender inequality contributes adversely to vulnerabilities in all other areas. African and Angolan women work hardest but have fewest resources,

least adaptive capacity and limited voice. This impacts directly on the next generation and the whole of society. It is deeply surprising – shocking even – that the very recent Angola NAPA and projects emerging lack a decent gender analysis. What is required at a project level at the very least is disaggregated data and a thorough gender analysis. Previous sections have shown that even projects aimed at empowering women can have the opposite effect. **Recommendation – gender inequality should be the primary lens through which to view development responses to rural vulnerability.**

- *Community-based adaptation (CBA) has a lot to offer….*

The CBA model, with respect to climate change, seeks to combine local and global knowledge about climatic trends and impacts into local adaptation initiatives that improve the resilience of communities to gradual change and to shocks. We have seen that the threats to rural livelihoods in Angola include climate change and due to the worsening trend this cannot be ignored, but other factors may be more significant in some areas at this time. A broader take on CBA may be appropriate for our study areas: one that incorporates climate and weather knowledge and also other areas of knowledge, such as environmental degradation. Incorporation of ecosystems-based adaptation (EbA) into local analysis in Angola may not be easy but would play a major role in improving community resilience. CBA has a huge body of international research and practitioner experience behind it, much of which will be useful to Angolan partners and communities. **Recommendation – evolve CA partners projects and programmes towards a CBA approach tailored to the local area and context.**

- *Agriculture has a long way to go…*

Smallholder agriculture in the study areas and in much of Angola still suffers from the hangover of wartime seeds and tools interventions. It causes environmental degradation through shifting /burning and erosion of river banks, lacks resilience to adverse weather conditions and is often dependent on expensive fertiliser and pesticides for decent yields. Women are frequently the main farm workers and lack time and resources to make enough from their plots. There are numerous African case studies about effective transition to more productive sustainable approaches to smallholder agriculture. **Recommendation – conservation agriculture through a gender lens as a central plank of CBA.**

- *Insecurity of land rights is a variable threat…*

In the current context, the threats to land rights in their various different guises as set out above are an unpredictable quantity. Each study area is very different in this respect, although the common factor is the lack of transparency with which state and commercial concerns operate with respect to land rights and tenure, resettlements, encroachment, enclosure, investments. Covert action is inherent in this problem. If NGOs and local associations succeed in exposing such covert actions, experience has shown they can be defeated, modified or appropriately mitigated.

Huila apart, this does not seem to be a daily threat to livelihoods in the same way as other vulnerabilities. Given the nature of abuses around land rights, exposure and challenge are effective responses and the use of technology can be key in facilitating this, as has been demonstrated many times in Angola around urban evictions. Mobile phone network coverage in Angola is improving steadily and this facilitates a communications response to land rights violations. With respect to commercial investment whether national or international, an approach more nuanced than simple opposition maybe be worth pursuing as if conditions are applied and enforced, investment in commercial agriculture can contribute to infrastructure development, employment and support to local agriculture. **Recommendation – monitor developments in land rights closely and develop the local capacity of men and women to respond to and prevent abuses using available communications technology.**

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Appendices

Appendix 1 – Full description of services to be provided, from agreed Terms of Reference

Land Rights and Climate Change in Africa raise long term questions, beyond the crisis in the present.

The Overall Purpose of this research is to develop a better understanding of the multiple pressures affecting rural communities and their ability and perspectives to maintain livelihoods. This is especially concerned with the plausibility of future(s) lived with dignity as thriving and resilient families, overcoming poverty and exclusion.

This desk study is focused on central /southern Angola, with the Aim of:

a) Helping partners and communities decide on their own informed choices / livelihoods trajectories / futures
b) Informing programmatic and funding decisions
c) Building an evidence base for funding applications, sharing learning, joint action & advocacy.

Specific objectives & tasks:

- Undertake a desk-based study of changes likely to affect rural communities in central & southern Angola that will mesh with field-based work and provide a meaningful basis on which to make programme decisions.
- Assemble latest climate change evidence to provide as clear a picture as possible of likely impacts on the ground (principally concerning rainfall) of expected changes in central / southern Angola.
- Review developments and trends concerning land rights and commercial land sales and leasing in Angola, as they might affect rural communities.
- Review any other factors (such as commodity prices, GoA planning, regional initiatives, political developments, …) that may impact on rural communities' ability to maintain and develop livelihoods in central / southern Angola.
- Reflect on experiences in marginal / semi-arid areas in other parts of the world (e.g. Sahel).
- Review funding opportunities for CCA work and potential entry points.
- Final writing, presentation (workshop) and debate, recommendations, changes of draft if needed.

Timescales and levels of analysis
The time horizons for this study are the medium and long term (as ref., up to 20 years). The levels of analysis and recommendations should refer to local / micro level, meso (zone, province, sub region) and macro level (national, regional and global).

Issues
The research should consider, amongst others, the following issues:

- Land rights and tenure security
- Power relationships
- Gender variations and variables
- Climate changes and adaptation(s)
- Natural resources management
- Management of Risks and Resources in self-empowering community development

Timetable of this research process – Starting December 2012, ending up to 31 May 2012.