

Background Report to the presentation: "Climate Vulnerability and Capacity Assessment" (CVCA) conducted in Boila, Tamoli and on Buzo in Angoche district, as part of CARE/WWF's Primeiras e Segundas Project.



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November 2008**

Summary:

This background report compliments the PowerPoint Presentation (PPP) on vulnerability to climate change, which was created for CARE's and WWF's project on sustainable livelihoods in the area of the Primeiras and Segundas in Angoche and Moma districts, Nampula Province, Mozambique. The report repeats and elaborates on the content of the PPP, in order to prepare any presenter with the necessary knowledge on the topic of the presentation.

The analysis is based on CARE's Climate Vulnerability and Capacity Assessment tool (CVCA) and discusses the different aspects of vulnerability to climate change, exposure, sensitivity and resilience, among possible future project participants. The report concludes with a list of barriers and opportunities to the improvement of adaptive capacity in the project area and on this basis, states several recommendations for a community-based adaptation approach to the project.

Abbreviations:

AENA: Agricultura Extensionistas Nampula

CDL: Comité de Desenvolvimento Local

CVCA: Climate Vulnerability and Capacity Assessment

FFP: Fundo Fomento Pesqueiro

IDPPE: Instituto de Desenvolvimento de Pesca de Pequena Escala

INAM: National Meteorological Institute

INGC: National Institute for Disaster Management

MICOA: Ministry for Coordination of Environmental Affairs

NAPA: The National Adaptation Program of Action

PARPAII: Action Plan for the Reduction of Absolute Poverty, 2006-2009

PRA: Participatory Research Assessment

WWF: World Wildlife Fund

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1. Introduction to the background report

The report is based on a Climate Vulnerability and Capacity Assessment (CVCA) made for CARE's and WWF's newly established program on sustainable livelihoods in Angoche and Moma districts. This background report is intended as a complimentary tool to a PowerPoint Presentation (PPP) on the same analysis. The background report repeats and elaborates on the content of the PPP in order to support any persons giving the presentation. As such, the PPP is designed as the major output. The objective of the PPP is that CARE and WWF can use this presentation in their work with program stakeholders. It also serves as an example of a locality specific climate change vulnerability analysis to CARE's audience in general.

The report and presentation is based on data collection in Angoche district in November 2008 by Liv Helstrup Østergaard, master student from Lund's University, Sweden. Several of the project staff has also contributed to the data collection and analysis. While the majority of the content is from data collection, the assessment has also drawn on secondary literature. The PPP, the background report and secondary literature are saved on a CD presented to the program manager.

Due to practical circumstances, the district of Moma has not been included in the assessment. However the assessment includes both riverside, coastal and island communities (the two latter will be referred to as seafront communities onwards). These types of communities represent two out of three of the types of communities in the project area identified in the qualitative situational assessment for the project.

2. Introduction to the program

This assessment has been carried out for CARE's and WWF's joint program in Angoche and Moma districts, Nampula Province, Northern Mozambique. The program focuses on identifying and supporting sustainable livelihood strategies in the project communities and reducing the current burden on the natural resource base, primarily the marine resources. It is therefore a combined program of poverty alleviation and natural resource management. The program takes place from October 2008 - October 2011. The program is built upon a former CARE program, VIDA, and introduces conservational agricultural techniques to the communities as one of its major program activities (CARE/WWF Project Proposal 2007:2).

3. Definitions relevant to the study of climate change

'Vulnerability' to climate change is defined as:

"The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity" (CVCA 2008:3).

The concept 'Exposure' concerns which climate events that are affecting any community, household or individual. 'Sensitivity' concerns how a system is experiencing a change in livelihood due to the exposures. 'Adaptive capacity', also referred to as 'resilience', concerns which assets that a system possesses and which obstacles they encounter in coping with climate change (obstacles can be structural and institutional and do not only concern the household sphere).

The CVCA incorporates all these aspects into the analysis to get a holistic impression of the level of vulnerability in the given area.

‘Adaptive capacity’ is defined as:

“The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences” (CVCA 2008:3).

4. Methodology:

The section is based on the CVCA tool written by Angie Dazé, Regional Climate Change Coordinator in Sub-Saharan Africa for CARE.

The tool was created based on the realization that development initiatives have the potential both to increase and constrain capacity to adapt to climate change. The tool can help ensure that projects and programs in their poverty reduction efforts simultaneously increase project participant’s adaptive capacity to climate change.

It is a package of approaches and tools that are specifically targeted to the design of climate change adaptation projects or projects, which seek to mainstream climate change issues into livelihood and natural resource management projects.

The purpose of the CVCA is threefold:

- I. Analyze livelihoods of vulnerable communities and the climate-related challenges they face.
- II. Help communities to understand climate risks and identify the resources available to them to adapt.
- III. Gather information to design adaptation strategies.

It is directed towards supporting community level adaptation and not regional or national level adaptation. However by developing capacity among the local stakeholders in the process and further improving the tool, which can be used in many kinds of settings, the scale of the tool is broadened.

Guided by a series of questions, the tool uses traditional participatory research methods with an applied climate lens and secondary research exercises. The secondary research exercises should be carried out before the PRAs in order to free up as much time as possible to discuss climate changes in the past and for the future with the communities.

The PRA is suggested to consist of the following tools:

- I. Semi-structured Interview
- II. Resource mapping
- III. Community timeline*
- IV. Seasonal calendar*
- V. Risk mapping*
- VI. Livelihoods strategy ranking
- VII. Cash flow diagrams

- VIII. Venn diagram
- IX. Vulnerability ranking*
- X. Gender/vulnerable group analysis

* These tools are seen as most useful in facilitating a dialogue on climate change.

Data should be gender disaggregated, so it reflects CARE's commitment to gender equality. The suggestion is to use male and female focus groups consisting of 5 – 12 people, who are representative of different livelihood systems and/or vulnerable groups in the communities.

CARE's approach to adaptation consists of four pillars, which together comprise a holistic approach to adaptation. These are:

- I. Climate resilient livelihoods
- II. Disaster Risk Reduction
- III. Local Capacity Development
- IV. Addressing underlying causes of vulnerability

The adaptation process comprises the following steps:

1. Engaging stakeholders;
2. Assessing current vulnerability;
3. Understanding future climate risks;
4. Designing adaptation strategies to address current and future risks;
5. Implementing strategies; and
6. Monitoring and evaluating adaptation.

The CVCA methodology addresses the first three points and provides the foundation for acting on the latter three points of the adaptation process. For this purpose, CARE has also developed a Framework for Community-Based Adaptation, which presents the "enabling factors" which must be in place for vulnerable people to adapt.

5. Approach:

The baseline report suggests three types of areas, in which the project can work: Seafront, riverside and interior areas. This study has focused on the riverside and seafront areas.

Riverside: Boila, Namatoria. PRAs were conducted during a four-day period. The first two days consisted of training, then one day in the community and later analysis and the last day for group discussions of analysis and presenting the results to the community.

Seafront: Tamoli and Buzo. Due to practical limitations, the PRAs could not be conducted in seafront areas and this information has been drawn from the researcher's thesis research on one of the islands and in a seafront community, conducted two weeks prior to the PRA.

The one PRA was conducted in the simultaneous process of the project conducting their first PRA in order to design project activities. The team consisted of 11 members, which constituted four groups. The following tools were carried out from a climate change perspective by one group:

- I. Community Hazard Mapping
- II. Historical Timeline
- III. Vulnerability Matrix

The following tools were carried out from a general project perspective:

- I. Seasonal Calendar
- II. Problem Matrix
- III. Prioritization of problems
- IV. Socio-economic analysis
- V. Crop Matrix
- VI. Impact Matrix
- VII. Historical timeline (general)

In the end, the results were presented and discussed with the CARE/WWF project staff in Angoche and comments were added to the results.

6. Results:

I. Evidence of climate change as observed by the communities.

While the title of this chapter refers to evidence of climate change, it must be noted that the results presented here can be both indicative of climate variability and climate change and can therefore not be used as *evidence* of climate change.

Seafront communities:

- Soil erosion on Buzo caused by the cutting of mangroves and other vegetation, natural change, climate change (torrential rains), cyclones and strong wind. There is not a clear linear relationship between all of these phenomena.
- Differences in the intensity of cyclones: High waves at the last cyclone, which is particularly devastating to low-lying islands and coastal areas.
- A change in the wind patterns: wind is more frequent, stronger, lasts longer and changes direction more frequently than before = difficult fishing conditions, fruits fall from trees.
- Hotter temperatures, which they also identify as a cause for poor fishing conditions.
- More unpredictable rainfall pattern.



Former mangrove habitat on Buzo (picture by author)

Riverside community:

- A change in the wind patterns: the wind changes direction more frequently and is unpredictable.
- The northern wind is more frequent today as opposed to the southern wind before = difficult fishing conditions and fruits fall from trees.
- The rain comes later, causing seeds to dry up.
- Temperatures are hotter, which reduces soil fertility and increases human illnesses, for example through exposure to mosquitoes during hot nights, where people sleep outside to avoid the heat indoors.

Natural hazards in both types of communities:

The main natural hazards are cyclones and subsequent floods. Droughts were not identified as an extreme event in any of the participating communities. The occurrence of extreme events cannot be identified as climate change, due to their relatively infrequent occurrence. For example, cyclones happen quite rarely compared to the increased occurrence of drought in southern Mozambique.

However it is relevant to understand the impact of extreme events on the communities, as cyclones are predicted to become more frequent and intense; the latter of which has already been identified by some island inhabitants.

Impact from Cyclone Jokwe, March 2008:

Livelihood area of impact	Cyclone
Agriculture	The heavy wind causes the cassava plant to uproot and the subsequent flooding causes the plant to rot on the ground. The wind takes down all crops, particularly high crops (maize).
Fishing	Impossible 4-7 days after the cyclone. Trees and other objects float around the water, which gets caught on the nets. This lasted 2 months. Cyclone damages fishing opportunities more long-term.
Livestock	Large animals die because of fallen trees; smaller animals are vulnerable to the strong wind.
Health/working capacity	The riverside community identified an increase in diarrhea and malaria post-cyclone (coincides with the regular dis. prevalent months).
Assets	Loss of boats, fishing nets, houses, personal items, identification cards.

This matrix underscores the devastating effect of cyclones, as it shows how the cyclone permeates all their current livelihood activities and their home-base.

Seasonal calendar:

Month/ activity	Jan	Feb	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Planting											x	x
Smaller harvest				x	x	x						
Main harvest							x	x	x			
Food scarcity (agr.)		x	x									

Food plenty (agr.)										x	x		
Lack of fish											x	x	
Good fishing conditions	x												x
House proofing											x	x	
Occurrence of cyclone/floods		x	x										
Reconstruction of houses post-cyclone				x	x								
Disease			x	x	x								

The cyclones often hit right at the end of the hungry period, where people are ready to begin the small harvest. Hence their resilience is already low and further compounded by the reduction in harvest for the next six months. A project worker expressed it as such “the cyclone creates conditions of hunger for next season” (Interview with Abdul Haje).

The extension of the hungry period is further complicated by the onset of the most illness-prevalent months. Taking time to rebuild the houses post cyclone also coincides with the harvest period, and many farmers are not able to work full-time in their fields due to the reconstruction: “He is trying to solve the problem he has here, but creating new ones over there” (interview with Abdul Haje).

II. Climate change impacts on the communities in the future.

Past and present climate conditions:

Precipitation:

- Average annual rainfall: 1000-1300mm of rainfall in the north of the country (Norfolk and Cosijn 2008a: 43)
- Mean annual rainfall over Mozambique has decreased at an average rate of 2.5mm per month (3.1%) per decade between 1960 and 2006. This annual decrease is largely due to decreases in December/January/February rainfall, which has decreased by 6.3mm per month (3.4%) per decade (UNDP 2008:2).

- The proportion of rainfall falling in heavy events has increased at an average rate of 2.6% and 5-day annual rainfall maxima have increased by 8.4 mm per decade, with largest increases in the wet season, DJF (UNDP 2008:2).

Rainfall 1-20 Oct. 2008	Observed	Normal
Angoche	0.0mm	24.2mm

Data Source: INAM

Temperature:

- Average annual temperature in north-eastern part of Mozambique: 24 to 26 °C (UNDP 2008:1f).
- Mean annual temperature has increased by 0.6°C since between 1960 and 2006, at an average rate of 0.13°C per decade (UNDP 2008:1f).
- The number of hot days and nights has increased yearly with 25 days and 31 days respectively (UNDP 2008: 1f).

Extreme events; cyclones

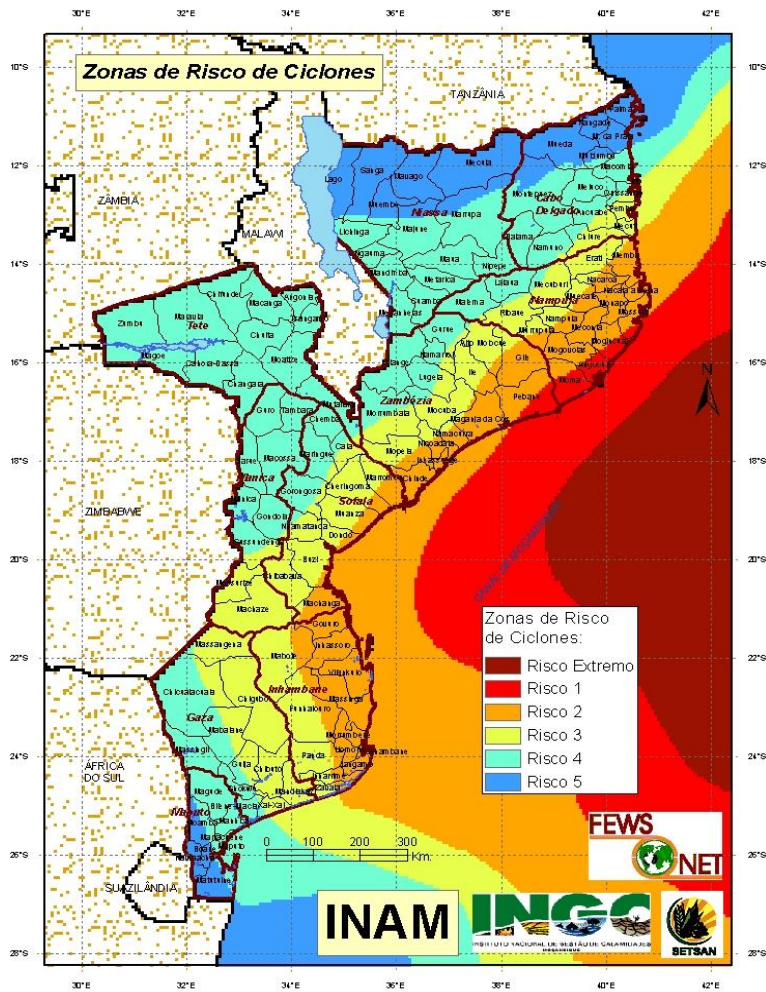
Years	Cyclones	
	Name	Affected area
1976	Claudete	Maputo and Gaza.
1978		
1979	Angelle	Nampula.
1982/83		
1984	Demoina	Map, Gaza, Inhambane.
1988	Filão	Zambezia.
1991/92		
1994	Nadia	Nampula.
1996		

1997	Bonita	Zambezia.
1999	3 S	Inhambane.
2000	Eline	Maputo, Gaza, Inhambane, Sofala and Manica.
	Hudah	Zambezia and Nampula.
2001		
2002	Atang	Cabo Delgado.
	Delfina	Cabo Delgado, Nampula and Zambezia.
2003	Japhet	Inhambane, Manica, Sofala and Gaza.
	Storm	Maputo City and Province.

Source: INGC

- A further cyclone hit in March 2008.

Illustration of Mozambique's exposure to cyclones



- There have not been any droughts, severe earthquakes or separate floods identified.
- Frequency and intensity of wind storms have increased (storms that begin inland) (Interview with Sergio Buque, INAM).

Sea level rise:

No available data.

Projections for climate changes

Precipitation:

- Seasonally, the projections are tending towards decreases in dry season rainfall (JJA and SON), offset partially by increases in wet season rainfall (DJF) (UNDP 2008:3).
- The models consistently project increases in the proportion of rainfall that falls in heavy events, 1-day or 5-day ranges in the annual average under the higher emissions scenarios, of up to 15% by the 2090s (UNDP 2008:3).

Temperature:

- The mean annual temperature is projected to increase by 1.0 to 2.8°C by the 2060s, and 1.4 to 4.6°C by the 2090s (more rapid in the interior) (UNDP 2008:2f).

Extreme events:

- An increase in intensity and frequency in extreme events, such as cyclones, floods and earthquakes, although this is still very uncertain in the projections, partly because of the El Niño southern oscillation, which is difficult to project. Cyclones appear to be the most likely, due to the area's exposed character (UNDP 2008:3, MICOA 2003).
- Increases in the frequency and intensity of droughts (MICOA 2003).

Sea level rise:

- Sea level projected to rise between .13m-0.56 m by 2090. (UNDP 2008:3)

Table of predicted consequences of climate change (Easterling et al. 2007, Nicholls et al. 2007).

	Seafront communities	Riverside community
Environmental consequences	Changes in fishing distribution and production due to cyclones, higher ocean acidity and rising sea-surface temperatures.	
	Increased human induced pressure on the natural resources.	
	Increased coastal erosion due to higher sea-level rise and as both cause and effect of mangroves and palm trees disappearing (human cutting, cyclones and soil erosion).	Increased direct damage to crops and livestock due to floods and cyclones (especially high crops, like maize and rice).
	Flooding of smaller islands due to coastal erosion and cyclones (also due to human-induced pressure on the mangroves and palm trees).	Death of livestock and threatened animal health due to change of vegetation, heat stress, and water availability.
	Coastal wetlands (mangroves) are reduced with sea-level rise.	Higher temperatures and decreases in precipitation cause heat stress during growing seasons, which results in declines in crop yields.
	Sea level rise raises extreme water levels with possible increases in storm intensity.	

Human consequences (Easterling et al. 2007, Nicholls et al. 2007, Norfolk and Cosijn 2008a):

- Food security is threatened when relying on marine resources as livelihood source; the result is malnutrition and micro-nutrient deficiencies.
- Food security is threatened when relying on agricultural products as livelihood source; the result is malnutrition and micro-nutrient deficiencies.
- Pollution of water sources causing outbreaks of cholera, diarrhea and other water-borne diseases.
- Physical capacity for work is reduced due to increased illness.
- Destruction of assets, including personal identification papers.
- Impacts from interruption of health services, education and infrastructure.
- Deaths (drowning, other causes), injuries, mental health disorders.

- Population displacement.

III. The most important livelihoods resources in the communities.

Seafront communities

Types of activities: small-scale fishing, collecting shells and crabs, animal husbandry, production of peanut snacks for selling, making mats and hats, agriculture (only coastal).

Availability: Most community members complain of a decline in the fish population. The communities can either not explain this change, or they blame the cyclone in March 2008 or strong winds. Other explanations are the wrong use of nets, which stops reproduction of the fish population, decadal variations and a general appearance of less fish, as there are more fisher folk today than earlier (Interview with IDPPE).

Access: Fishing boats and nets are expensive to acquire and maintain. Access to fishing boats and nets is often determined through kinship or friendship. Without access to a working spot on the fishing net, fishing becomes very difficult. Most of the men on Buzo had access to nets, but out of the relocated population in Tamoli, there were hardly any with access. They had been scattered around the area upon relocation and could therefore not use the 'traditional' access through kin- and friendships. Another problem was discrimination by their new community neighbors, which prevented them from being hired. The other communities that were well-established accused the new settlers of degrading the environment. They were a great deal more vulnerable, as collecting shells/crabs (their usual coping strategy) could not be carried out either, due to the physical character of the beach.

Riverside community:

Types of activities: Agricultural production (cassava, cow pea and maize), fishing, animal husbandry, small businesses, selling sand for construction of bricks, charcoal production, collection of medicinal plants in the reserve for/by traditional healers and building houses.

Availability: Soil in the area shows good soil fertility. However land in the community is very scarce and there is no possibility to expand. The land system is tenure based. The community is restricted by a community forest reserve on its western edge, which is resulting in a lot of disputes between community members and WWF rangers, who confiscate any tools, which community members use for agriculture on the premises. Community members are also unsure of the boundaries of the reserve and do not know of the potential for economic activities in the reserve.

The community has also been dealing with cassava brown streak since 2002. This is causing a large reduction in crop yield and the cause of diarrhea among the community members.



Picture of a Cassava Brown Streak affected cassava root and a health cassava root, Boila, Angoche District (Picture by author).

Access: Most people have to hire land from the owner, which discourages long-term investments, like planting fruit trees.

IV. The coping strategies, which are currently being employed by various members of the communities to deal with hazards.

Cyclones have up until now happened quite infrequently (1932/38¹, 1968, 1979, 2008) and there are therefore not many, if any, coping strategies for cyclones in particular. This constitutes a problem as cyclones affect all areas of livelihoods. Hence coping strategies that would work in a situation of poor agricultural or fishing outputs (where the main coping strategy is relying on the other of these activities), are negatively affected in the event of a cyclone. Many acknowledge the high risk, but do not see a way of adapting to the cyclones.

¹ The date of this cyclone is unsure as there is no available data on cyclones that dates back to the 1930's. The year of this cyclone is mentioned by several of the elderly participants, but there lacked a consensus on the exact year.

Seafront communities:

- When fishing is not possible, many turn to collecting shells and crabs. This is primarily a job for women and children and is especially used as a coping strategy for elderly women, who are widowed or whose men cannot fish anymore due to old age or illness. However this coping strategy is very locality-specific and the beaches on the mainland are often too deep to collect anything from them. It is also dangerous for the elderly as the sand/mud can be very slippery at low-tide and accidents occur. The activity is also threatened by increasing soil erosion.
- Men engage in the cutting of mangroves for reconstruction of houses after the cyclone. This is a source of environmental degradation, as it negatively affects the fish reproduction, loss of forest habitat and contributes to soil erosion.
- A few of the elderly men were engaged with making hats and mats from straw for selling. There does not appear to be any negative effects of this activity on the scale which it is being employed now. However if the project chooses this as an alternative income-strategy for elderly, the environmental implications should be explored first.
- The entire household reduces food for consumption to cassava and maize. This coping strategy causes a reduction in the diversity of the dietary intake.

Riverside community:

- When fishing is not possible they intensify their agricultural production in order to cope. This coping strategy is also a livelihood strategy, depending on the scale of its use. It is very weather dependant and can be the cause of environmental degradation, if new land is cleared (often through slash and burn) for the up-scaling of production.
- After cyclone: Men engage as temporary labor on the construction of houses and selling sand for brick construction). This coping strategy is very time-specific and provides no security as a coping strategy.
- Men and women produce and sell charcoal and fuel-wood. This coping strategy causes loss of forest habitat and is there unsustainable, if not combined with agro-forestry.
- Men cut mangroves for the reconstruction of houses. This is a source of environmental degradation, as it negatively affects the forest habitat, the fish reproduction, and contributes to soil erosion.
- A few of the wealthier community members (2%) deal with small goods, like fuel, oil and sugar. As this coping strategy is only for the select few, it is as such not a viable coping strategy for most of the community. The community viewed themselves as representing three different socio-economic groups: the Taghiri (rich), the Namatentar (middle) and the Maziquine (poor). Definitions for each group were provided clearly by the community. Of the community members present on the day of the PRA, 89 % were poor, 9% were middle and 2% were rich. This was interesting as small businesses and selling sand were mentioned as important coping strategies after the cyclone. However it turned out that according to the definitions of the socio-economic groups, only 2% of the sample population could afford to engage in these coping strategies.

Gender:

- One of the major coping strategies in the riverside community is to intensify the agricultural production when fishing is poor. One of the major coping strategies in the seafront communities is to collect crabs and shells. The interesting part of this is that the main coping strategies in all types of communities rely on women, while men's contribution is reduced, which places even further stress on the women in times of weather crises. Therefore it would be sensible to promote adaptation strategies and income diversifying strategies, which both women and men can be engaged in, so that one gender is not over-burdened compared to the other during or after an extreme event or during times of hunger.

V. The differential impact of climate change on people in the communities.

Vulnerable groups:

- The elderly are particularly vulnerable due to their physical inability to fish or engage in agriculture. After soil erosion or a cyclone destroys their houses, they might also be physically unable to rebuild it. Many elderly in the seafront communities did not find that their children could help them with their livelihoods, as they themselves were struggling to feed their children.
- Widows are also particularly vulnerable as they cannot engage in fishing. It is considered a man's job and requires long hours away from the home, sometimes days. They will also find it difficult to rebuild their houses after soil erosion or a cyclone, due to other important tasks, such as fetching water, cooking, getting food, and looking after the children.
- The orphans are vulnerable, because no one can help them, as most people are only just able to manage for themselves (89% of the present riverside community members on the day of the PRA were characterized as the poorest group of the community).
- Families without access to fishing nets (often newcomers in the area). Their resilience is amongst the lowest of the participating communities.
- People living on islands were also identified as being particularly vulnerable, as they are excluded from some decision-making processes (elections)² and emergency assistance and due to their exposed position to the cyclones.

→ The geographically exposed position of some of the above mentioned groups coupled with a low level of resilience translates into vulnerability to climate change.

² While no one prevents the community members on Buzo from voting, they are not able to pay the fare and travel the distance for the elections.

Community Hazard Map:



- There were no particularly location specific impacts. The cyclones had destroyed all the main buildings (health post, school, church, and mosque) in the community, and the entire community had struggled with the post-cyclone flooding.
- However families with fields on the other side of the river surrounding the community (see left side of map) would find it more difficult to access their field as the river flooded post-cyclone.
- Discussions around the map also revealed that there are no sanitary facilities; hence the surrounding area is used for this purpose. This is a large source of water contamination post-cyclone and during floods. As revealed by the impact assessment, the community identified an increase in diarrhea following the cyclone, which in turn reduces working capacity at a critical time. In Angoche there are no available sanitary facilities for 84% of the population (Oliveira 2008:23).
- There is currently no adequate or safe water access for household consumption in the community. This forces women to either pay 10 Meticaís for 20 liters of water or to walk 7 km to a water source. This is an extra burden on women, especially after a cyclone or flood, where they have other important post-disaster tasks (for example repairing agricultural plots) and also suffer from increased levels of disease. In the district, 49.3% must walk more than 10 km to a water source (Nhancale and Mbeve 2007:40). This could worsen as temperatures rise and water becomes scarcer.

- Seafront communities engaged in agriculture often had two-three hour walks to reach their agricultural plots. The number of people walking more than 6 km and some over 10 km was 21% and 25% respectively for riverside and seafront communities respectively (Oliveira 2008:24).

VI. The underlying causes of vulnerability to climate change.

Three groups of underlying causes of vulnerability were identified. These were socio-economic and political, environmental and formal and informal institutions. The following list is not exhaustive of the underlying causes of vulnerability in the area.

Socio-economic and political:

- 93% of the population in the three relevant districts live below the official poverty threshold of USD\$0.50 per day (CARE/WWF Project Proposal 2007:3).
- High population density 93 people/km² = increases resource scarcity (Norfolk and Cosijn 2008a:3).
- Loss of employment during civil war and due to structural adjustment programs (increased natural resource dependency).
- Few opportunities for employment. Only 5% of families in Angoche district have a wage earner (Nhacale and Mbeve 2007:19).
- Levels of education are extremely low. Only 31.1% of men in male headed households have completed primary education and for women in female headed households only 7.6% have completed primary education (Oliveira 2008:22).
- Little access to basic services such as schools, hospitals, clinics or even health posts, especially Praia Nova (long distances or no services available) (Norfolk and Cosijn 2008a:26).
- Chronic malnutrition is widespread (63% of children are stunted) (Norfolk and Cosijn 2008b:9). Over 90% of the population in all types of communities had an inadequate or very inadequate dietary diversity (Oliveira 2008:44).
- Island communities are further isolated (elections, school attendance after 5th grade, extension services, information and emergency aid).

Environmental:

- The populations of Angoche are almost completely dependent on the coastal zone and its resources.
- Declining levels of fish population, especially in Angoche, due to misuse of nets. Mosquito nets have been used for a number of years, which stops reproduction of the fish population. However part of the explanation could also be a change in fish movements due to decadal fluctuations or because more fishermen are drawing on the same resources (hence there appears to be less fish) (Interview with Mr. Saroj, IDPPE).

- Low soil productivity causes long distances to fields for seafront communities, which many have to cover on foot. This creates certain patterns in the households, i.e. some go every second day and some go the entire planting/harvesting period. As this is primarily a female activity, mothers are often away from their homes and children.
- Poor farming techniques and poor quality seeds. Only 9% produced enough agricultural output to last them throughout the year (Oliveira 2008:27).
- Low crop diversification: Only 25% of people planted two or more crops (Oliveira 2008:28).
- Cassava brown streak disease continues to affect cassava, a staple crop in the north.
- Government investment in the agricultural sector has fallen substantially over the years, and new developmental agriculture strategy is deemed necessary = limited extension services and lack of resistance in combating pests (Norfolk and Cosijn 2008:17, Interview with Peter Bechtel, WWF).

Informal and formal institutions:

- Gender specific roles regarding who practices certain activities: women are mostly occupied with agriculture and men with fishing.
- Access to nets determined through kin- and friendship.
- The markets are poorly functioning: Local traders have lower purchasing power than outside traders from the larger cities of Nampula, Quelimane and Alto Molocue. There is also a lack of local demand caused by the inflation in prices in Nampula Province during 2008 (Norfolk and Cosijn 2008:19, 41). Many complained that the prices have risen steeply and have become unavailable for purchase.
- Not enough meteorological stations exist around the country in order to get accurate climate data to make projections (Interview with Michaela Cosijn). Many collapsed during the civil war and they are poorly maintained. Angoche has an older weather station. The one in Lumba, north of Angoche, was destroyed during cyclone Jokwe in March 2008 and is yet to be rebuilt (Interview with Sergio Buque, INAM).
- Until yet, there are no permanent INGC representations in Angoche. INGC sets up a temporary station after a cyclone (Interview with Miguel Massunda Junior, SDAE).
- The relative newness of developing Disaster Risk Committees and therefore lack of experience of how to implement and ensure functionality. They severely lack funding for implementation and have mostly been supported in terms of capacity development. Two persons from each district that were affected during the last cyclone were trained in Nacala and were meant to use this training for the local risk management committees. However due to lack of funding, this has not yet happened (interview with Miguel Massunda Junior, SDAE).

VII. The policies and institutional capacity, which exist to facilitate adaptation.

- FFP (Fundo Fomento Pesqueiro/Fund for fishing loans): They give small loans to fisherman after cyclones, so they can re-acquire assets.
- IDPPE (Instituto de Desenvolvimento de Pesca de Pequena Escala/ Institute for the Development of Small-scale Fisheries): Raises awareness on the types of sustainable nets, social infrastructure projects, like the construction of wells.
- The District Risk Committee, which consist of the heads of different government departments. The director is now the Public Administrator. The risk committee was in charge of measuring the impact following the cyclone 2008. They coordinated the response together with a temporary INGC office and several aid agencies. However in terms prevention, they are moving slow (see above under underlying causes for vulnerability – formal and informal institutions).
- CDL (Comité de Desenvolvimento Local/Committee of Local Development). These committees approve applications for funds from the government (seven million meticaís a year) to individuals and associations up to village level. However the committees lack representativeness and might be selective in their choice of recipients.
- The National Adaptation Plan of Action (NAPA) was published in 2007. However the first report still has several faults or gaps, which needs to be addressed. The Napa focuses on strengthening early warning systems, strengthening the capacity of agricultural-dependant communities and reducing the impact of extreme events on coastal erosion and improving water resource management.
- MICOA: This institution works towards climate change mitigation and coordinating national level efforts.
- There is a growing focus on disaster risk reduction and long-term vulnerability reduction in INGC and with the joint UN program.

VIII. Framework of barriers and opportunities to improving adaptive capacity in the communities.

CARE has developed a framework for community-based adaptation, which states the enabling conditions that must be in place to increase adaptive capacity. After these conditions have been identified, CARE can take steps to address the barriers that exist. The framework that is presented below compares these enabling conditions to information retrieved from Angoche District. The framework contains four different categories. These are climate resilient livelihoods; disasters risk reduction; local capacity development and addressing underlying causes. The recommendations that follow are organized according to the same structure.

Below is the framework presented, which contains the information from Angoche district:

Framework for community-based adaptation				
	Climate resilient livelihoods	Disaster Risk Reduction	Local Capacity Development	Addressing underlying causes of vulnerability
National Level	<ul style="list-style-type: none"> - Climate change is not integrated into PARPAII, but extreme events are and environment is included as a cross-cutting theme. - Climate change is not included in the Ministry of Planning and Development's annual budgetary planning. - Emergency response is much more aid-attractive and adaptation projects are difficult to fund. 	<ul style="list-style-type: none"> - There is a 'Master Plan for Prevention and Mitigation of Natural Disasters (INGC)³. - Government is monitoring vulnerability for early warning and intervention on crises (INGC). - There are not enough weather stations to create an effective early warning system. - Disaster Risk Management is included as a crosscutting theme in PARPAII. 	<ul style="list-style-type: none"> - Climate change is not treated as a cross-cutting issue by the Government. - MICOA and INGC are engaged in planning for adaptation, but suffer from lack of funding, and lack of coordination. - There are not enough technically knowledgeable and skilled environmental professionals in Mozambique. 	<ul style="list-style-type: none"> - The Government does not recognize specific vulnerability of women and other marginalized groups to climate change. - The international NGOs are moving ahead on planning for climate change adaptation and identifying policy barriers and opportunities.

³ Master Plan for Prevention And Mitigation of Natural Disasters: This plan focuses on the mitigation of drought through water storage systems, controlling and preventing floods, reforestation to improve soil fertility, improving food security through food and seed reserves, R & E in drought-tolerant varieties of crops, domestication of non-conventional crops, production of industrial crops (bio-fuels) and promoting non-agricultural activities. It also focuses on improving emergency response through early warning systems, improvement of information management systems and communications systems, search and rescue operations and improved definitions of what constitutes an extreme event and responsibilities in the emergency response. In relation to cyclones they mention that the most exposed areas needs to be mapped and that infrastructure to all types of extreme events must be improved. Part of the plan is also to establish 3 Agro-Processing Centres and 3 Early Warning Regional Centres against floods and cyclones in Vilanculos, Caia and in Angoche.

<p>Local government / Community Level</p>	<ul style="list-style-type: none"> - There are not any local plans or policies which enable adaptation processes. - Local government extension workers are not promoting adaptation strategies. They are under-capacitated. 	<ul style="list-style-type: none"> - There are local disaster preparedness plans in place (INGC), but they lack funding for implementation. - Local government and/or community committees are monitoring vulnerability (Cabinet of District Governor). - There is a weather station in Angoche, but it is poorly functional. - There are no effective early warning systems for the area. - INGC does not have an office but plan to establish an Emergency Operations Centre in Angoche. 	<ul style="list-style-type: none"> - Social safety nets are not widely available to households⁴. - Only very limited financial services are available⁵. - Local planning processes are not participatory. - There is a small functioning civil society at local level. (Fishing and credit associations, churches, Aklizetho, Lowa Lowa, AENA, Ophavela). - There is a weak market infrastructure and low private sector engagement. - Local institutions do not have capacity to analyze climate risks and plan for appropriate action. 	<ul style="list-style-type: none"> - Women and other marginalized groups are under-represented in local planning processes (our PRAs being an example). - Local policies do not provide access to and control over critical resources.
<p>Household/individual level</p>	<ul style="list-style-type: none"> - Households are not employing climate resilient livelihoods. - Households have a low level of diversified income strategies (especially in seafront areas). - People are not managing risks by planning for and investing in the future. 	<ul style="list-style-type: none"> - Households do not have protected reserves of food and agricultural inputs. - Only a smaller number of households in the riverside community have brick houses. The rest are thatch or stick houses, which are not secure. - Key assets like boats 	<ul style="list-style-type: none"> - People do not have knowledge on how to apply for financial services. - People do not have knowledge to employ adaptation strategies (information is the large gap). - People do not have access to seasonal forecasts and other 	<ul style="list-style-type: none"> - Men and women do not consider each other equal partners and contributors in the household, especially in seafront areas. - Households do not have control over critical livelihood resources, especially in the riverside community.

⁴ 20.7-22.8% of the inhabitants of Angoche district participate in an association, but numbers were almost half for women, elderly and illiterate.

⁵ 6.4% in seafront and 7.2% in riverside communities received credit. This does not include family and friends, which is the most common source of credit (11.1-11.7%).

	People are concerned with the current hunger situation.	and nets are not protected from the cyclones. - People do not have access to well-functioning early warning systems. - People do not have mobility to escape danger, especially on the islands.	climate information.	- Women and other marginalized groups do not have equal rights to critical livelihood resources ⁶ . - Island habitants lack land for relocation. - Relocated communities have less access to critical assets (livelihood resources.
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7. Recommendations

Climate resilient livelihoods

Seafront communities

1. Include communities, which are relatively newly established (in 'sustainable' sites), in terms of identifying income diversifying possibilities based on available resources in the communities and surroundings (for example conservation agriculture)⁷.
2. In areas with fishing opportunities (and lacking other opportunities), access to sustainable fish nets can be supported. This can for example be done through awareness raising of the credit schemes available in the area.
3. As a livelihood diversifying income strategy, the project can build on the tradition among several of the elderly men to make mats (60-70 Meticais can be earned per mat) and hats. This would support one of the most vulnerable groups, the elderly. Another activity is pottery making by mostly young women.

⁶ A measure of this is reflecting in the statistics on chronic food insecurity, where 78.2% of all the women headed households were chronically food insecure as opposed to only 33.1% of the male headed households.

⁷ The project should remain sensitive to the stigmatization of the relocated communities and for example refrain from using the term "New Buzo", which is commonly used to describe at least one of the relocated communities and which is very offensive to them.

Riverside community:

- 1) If the decline in fishing remains, the current coping strategy is according to communities to rely more heavily on agriculture. However land expansion is not possible, so this analysis confirms the use of conservation agriculture techniques to increase yield output without increases land size.
- 2) For crop production, cow pea (Feijao Boer) was recommended by the community, as it caused them no problems to cultivate. Cow peas are currently only grown by 25% of the agricultural producers in Nampula Province.
- 3) For livelihood diversification, suggestions are bee-keeping in the reserve, and agro-forestry for house construction, fruits, or firewood (possibly specifically vulnerable groups). Forests also functions as wind buffers, regulates the water table, provides shade to crops and animals and stabilizes coastal areas (rehabilitation of mangrove areas).
- 4) Another livelihood diversifying income strategy (long-term) could be community tourism as the reserve has several sacred sites. The Angoche area is currently not developed for tourism, but has potential and several projects are underway.

Disaster Risk Reduction:

Individual and household level:

- 1) Explore the possibilities of creating food reserves, which can support communities in all times of extreme events, but especially after cyclones where most income strategies are halted.
- 2) Especially for the riverside community with access to sand, which can be used for bricks, introduce the possibility to construct brick houses rather than thatch or wooden pole houses. They usually prepare the house for the rainy season every October, so this could be an opportunity for them to slowly make more weather proofed changes.
- 3) Raise awareness on personal and asset safety during a cyclone. This includes:
 - Before: Inform yourself of whether there is an emergency and evacuation plan for the community and secure the house as much as possible
 - Listen to the radio when possible, stay calm, carry some water, food and important papers, make sure animals are not tied up and boats are sunk inside mangrove system, stay way from windows, do not exit the place of shelter before a clear message is given to do so (winds can return).
 - After the cyclone: avoid electrical lines, shaky trees and insecure/damaged houses and only drink water from a safe water source that has not been affected by the floods.
- 4) Identify and train community members, which can volunteer to monitor and disseminate early warning messages in the communities, for example through radio (and create a system for communication in the communities).

Local government and national level:

- 5) Collaborate with partners towards a better functional Early Warning System. The lack of a warning before the last cyclone can be prevented by establishing better and faster communication channels.
- 6) Advocate for a governmental emergency and evacuation plan as well as an early warning system for the islands. They have no way of leaving the islands and are further exposed due to the high waves caused by the cyclone, which consume much of the islands.
- 7) Explore possibilities of increased collaboration with INGC. They are in the process of down scaling climate change data to Mozambique. They are focusing on the impact of climate variability and change on water and agriculture, and linking it to vulnerability profiles in order to identify the most vulnerable areas (Interview with Barbara Van Logchem, consultant with INGC). They could possibly find this area interesting due to its exposed character to cyclones. This could be an opportunity to combine disaster risk reduction with climate change adaptation processes.

Local Capacity Development:

- 1) Empower local producer associations to facilitate direct sale. Although the 'middlemen' serve an important role in their business chain, they also reap high profits.
- 2) Include Government extension workers as much as possible in the identification of barriers to raising adaptive capacity and in the implementation process.
- 3) Support the creation of community-based risk committees, and support them in starting a dialogue with the District Risk Committee (they are currently very 'reactive' in their approach to extreme events).

Addressing underlying causes of vulnerability:

- 1) Promote livelihood income diversifying strategies, which do not carry an unsustainable burden on the natural resource base.
- 2) Investigate the possibility of introducing new cassava brown streak and drought resistant varieties of cassava.
- 3) Advocate for the distribution of new land on the mainland for island inhabitants (exposed islands) from the Government. The idea is to "encourage them to move, not force them to leave" (conversation with Lynette Simon, CARE). The new Frelimo mayor has used the relocation of Buzo inhabitants as a part of his campaign for the district elections in November.
- 4) Promote agricultural techniques and crop-varieties, which can function in the low-fertility soil in the seafront areas and explore the possibility of tree planting in these areas. This could reduce the

transportation time to far-away fields and the time mothers spent away from their households and children.

Gender:

- 1) Currently there are gender specific roles associated with the employed livelihood strategies. While men are mostly in charge of fishing and also serve as the decision-makers in the households, women are mostly responsible for agriculture and the household tasks. An example was evident from a male and female focus group interview in one of the relocated communities, where the men stressed that their livelihoods had become more insecure as fishing was not as good in their new location. Women, however, stressed that they enjoyed an increased livelihood security, as their relocation had enabled them to begin an agricultural production, which contributed to food security.

When promoting agriculture through the project, the project should be very sensitive to if and how that increases women's burdens and changes gender perceptions in the households and communities. Especially post-cyclone, where women's household tasks are further complicated (for example by fetching water), ensure that the project activities do not also rely heavily on the women.

8. Limitations to the study

- The analysis has been carried out by only one person, whereas it is designed to be by a team. It has been cross-checked with the project staff however.
- The analyst was not a local inhabitant and therefore not proficient in the local language.
- The assessment was not able to use all the suggested Participatory Research Assessment tools.
- The PRAs were carried out with mixed groups of women and men, whereas a gender segregated process is the most ideal option. However due to the possibility of only conducting one set of sessions, both genders were included.

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PRAs:

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- Miguel Massunda Junior, SDAE
- Mr. Saroj, IDPPE
- Abdul Haje, CARE
- Amilcar Lucas, CARE
- Peter Bechtel, WWF
- Michaela Cosijn

And thanks to the communities!!!

10. Literature

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