RESPONDING TO CLIMATE CHANGE IN MOZAMBIQUE

REPUBLIC OF MOZAMBIQUE
MINISTRY OF STATE ADMINISTRATION
NATIONAL INSTITUTE OF DISASTER MANAGEMENT

Instituto Nacional de
Gestão de Calamidades

THEME 1

National Institute for Disaster Management (INGC)
PHASE II

THEME 1
Early Warning at a Different Scale:
Information Management Component

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Theme 1: Early Warning at a Different Scale Google Component Final Report

" The demands of addressing climate change are such that senior officials and policy makers must constantly learn and retain information about an enormous range of topics and issues, which change rapidly. The only way they can do this is to rely on concise, clear, reliable information from various sources. The presented storylines, viewable in a Google Earth platform, offer a pragmatic methodology to l help decision-makers share, and leverage the best available data and knowledge when making decisions. "

KEY RECOMMENDATIONS

The Google Earth platform could provide a collaborative bridge between specialist departments such as DPM and regional offices.

Given its ease of use and powerful visualization and analysis tools, Google Earth could be easily implemented as a platform for data sharing and digitization of ongoing activities both within the INGC as well as with other partners.

- The tool provides a sound foundation to enable rapid field check of regularly compiled datasets (such as the CLRG database) to be ground-truthed, corrected on the fly by experts in the field offices, and promoting ownership of responses, thereby facilitating the process of building a collaborative institutional memory.
- A second benefit is the ability to share, in digital form, interim and working datasets between experts in GIS departments and non-experts in the field, facilitating dialogues around vulnerability, monitoring climate dynamics and planning adaptation processes.
- As an 'out of the box' no cost option, it could improved a sometimes lagged response on the ground by accelerating information sharing even in more remote INGC offices throughout the country, many of which nevertheless have 3G internet access.

The need to improve partner communication and collaboration in the area of knowledge management will grow in importance under a changing climate

There are many initiatives and active organisations in disaster management climate change related issues and environmental action across Mozambique, however, weak institutional arrangements and lack of co-ordination between sectors threatens to create stakeholder 'assessment' fatigue, especially at the community level. Stakeholders often lament that 'lack of action' on the ground as 'the viscous circle of projectisation'. Furthermore, little on the ground experience is available to guide the delivery and communication of climate data to inform decisions at levels outside of INGC headquarters. Synthesizing the best available information to define a series of possible impacts, while allowing the potential user of the information to evaluate how best it may be applied requires innovative approaches that to date have been little explored. Neither in Xai Xai nor in Nacala were the technical teams aware of the actions and activities of the INGC as a whole in climate change and few had seen the Phase I study or were

appraised of a second ongoing phase. Even in the case of management where they were aware of these studies, decision-makers claimed to be given limited guidance on how, when and in what context should a rolling re-assessment of their decisions be applied in light of emerging scientific findings on climate variability and change.

Ongoing initiatives of the INGC should be integrated to promote improved disaster management

→ **Integrating initiatives can address the current lack of clarity in matching decision-making needs to the available array of climate change information.** For example, the GRIP initiative (http//moz.gripweb.org) catalogued disasters and their impacts across Mozambique from 1979-2009, but it has yet to be effectively integrated with climate change information to guide decision makers on the risks and opportunities posed by climate change.

→ **Promote simple data sharing standards** - The growing availability of available vulnerability, climate science and disaster impact data, coupled with novel analytics tools are set to significantly advance the available analytics for adaptation decision making. However, there is a need to encourage data standards for collaboration among institutions, to enable rapid integration and assessments. For example, UNOSAT regularly compiles flood extent maps from high resolution satellite images for many of Mozambique's rivers during the flooding season; however, these are only made available in image (PNG, BMP) or document (PDF) format to the CENOE team, where digital distribution would make response planning more effective and reduce a duplication of efforts.

→ **Maps should not be viewed as final products but rather as part and parcel of a process of decision making which involves moving beyond data to understanding how these will drive decisions.** Mapping and understanding the impact (e.g. loss of lives, numbers displaced, number of homes destroyed), of the hazard as a function of exposure and dose response (sensitivity) of those exposed. This is the purview of many disaster risk management initiatives including INGC's CENOE, the USAID Famine Early Warning System and the World Food Programme. A reliance on analytical, often spatial and statistical methods to quantify risk and impacts is characteristic of their approach, whose information is used to develop spatial models of hazards and impacts using a combination of field and satellite observations. Answering the central questions of 'where' and 'what', is essential to deal with challenges in a general disaster management. However, a 'map' is not a solution at its own, as it also requires certain structures, commitments and technical expertise to enable effective responses on the ground.

→ **Promote broad collaboration among institutions** – collaboration is often informal and linked to individuals rather to an institutional culture, often making requiring repeated awareness raising and training and making it difficult to move forward the dialogue on what to do about climate change.

Efforts currently in place to reduce the impacts of disasters need to be increased and/or reinforced to continue with the successes observed to date

The impact and effectiveness of the INGC have improved dramatically, both in terms of response planning and early warning, where seasonal forecasts are readily employed, and also at the community and administrative level, where flood simulations have increased cooperation and the effectiveness of readiness on the ground. However, much remains to be done to scale up such efforts. A few insights on these lessons, developed more fully in the relevant storylines, are listed below.

- The central Local Committees for Disaster Risk Management (CLGRC's) need more resources – In the southern region offices of the INGC, 103 Local Committees for Disaster Risk Management (CLGRC's) have been established. However, of these only 18 are fully equipped and 40% are considered properly prepared to deal with disasters. This appears to be consistent with other regions of the country, as shown in the table below, which provides a summary of the planned and created CLGRC's, along with a status report on their 1) training, and 2) equipment by Province.

Table 1: CLRGCs Status Report- DPM (INGC)

Province	Planned	Created			Training		Equipment						Located in resettlement areas
		# Created	Nº of Members	Still left to establish	Trained	Still left to train	With KITS		Badges		Vests		
							Equipped	To Equip	Equipped	To Equip	Equipped	To Equip	
MAPUTO	50	39	335	11	0	50	0	50	0	45	0	50	**0**
GAZA	36	103	1451	11	72	33	15	80	30	10	24	61	**0**
INHAMBANE	0	0	0	0	0	0	0	0	0	0	0	0	**0**
MANICA	30	19	242	4	24	5	19	8	10	14	7	28	**0**
SOFALA	0	0	0	0	0	0	0	0	0	0	0	0	**0**
TETE	66	48	975	17	31	35	4	61	5	60	11	51	**40**
ZAMBEZIA	0	0	0	0	0	0	0	0	0	0	0	0	**0**
NAMPULA	28	28	420	0	12	16	5	23	2	26	0	28	**0**
NIASSA	31	17	291	14	8	14	5	14	6	14	0	15	**1**
CABO DELGADO	22	28	344	0	14	8	5	17	0	25	0	25	**1**
Total	**263**	**282**	**4058**	**57**	**161**	**161**	**53**	**253**	**53**	**194**	**42**	**258**	**42**

- Furthermore, according to the DPM database of Committees for Disaster Risk Management (CLGRC's), nearly 51 of the 79 priority arid lands districts are without Committees and over 50% of those created have not been properly trained or given the necessary kits (Figure 1 below).

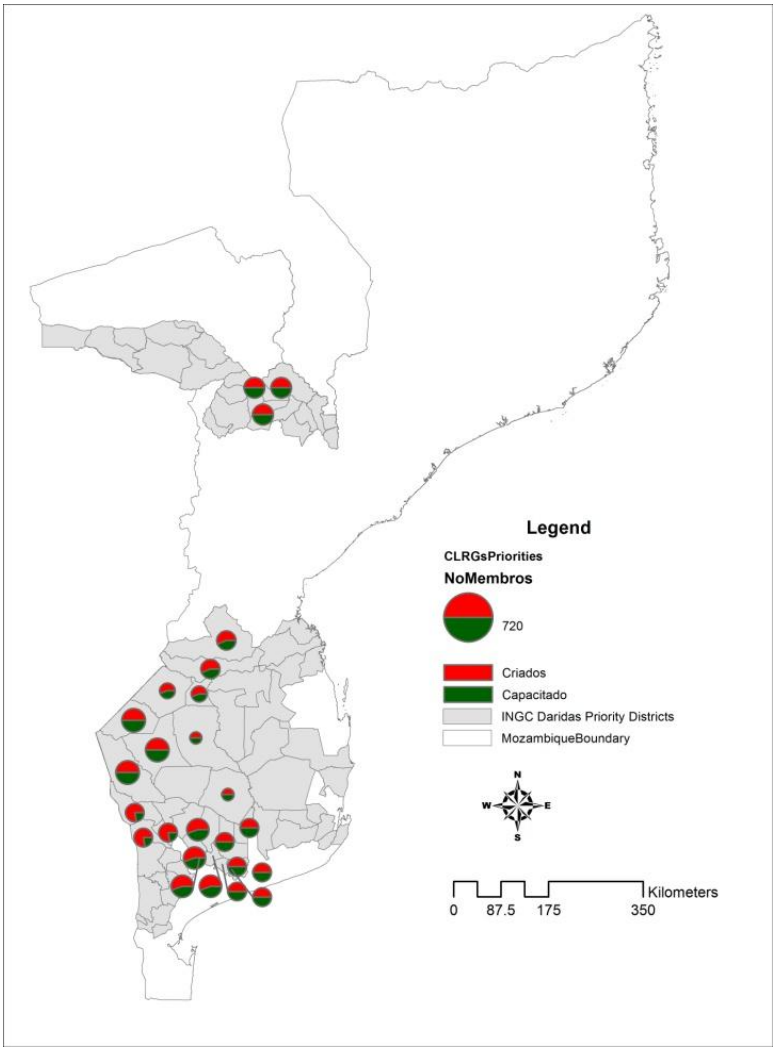


Figure 1: Status of Communities for Disaster Risk Management. Source, DPM

As climate variability and extreme weather events continue to impact Mozambique, decision makers will increasingly face new challenges about how to manage these risks.

The capacity of the country to cope with the impacts of disasters on its already vulnerable areas has improved due in part to the actions of the INGC, where an early warning system, coupled with improved preparedness and communication has been implemented. However, as climate variability and extreme weather events continue to impact Mozambique, the INGC will increasingly face new decisions about how to manage these risks.

Many extra points exist for the use of Google Earth Technology in Disaster Risk Management under a Changing Climate

In practical terms, many entry points for incorporating Google Earth technology exist at all levels of activities and governance, including those implemented at the:

- → ***field level (regional and district offices)*** – sharing information on existing livelihood systems, ideas on diversifying existing sources of income and changing livelihood strategies, awareness raising on climate change issues and providing an enabling environment for data sharing;
- → ***project level*** **–** effective use of climate information and results from INGC Phase I and Phase II studies of climate change, sharing information on improved infrastructure for small scale water capture, storage and use, and improved soil management practices;
- → ***policy level*** – facilitate communication exchange and proactive, fiscal responses that include strategic interventions for high probability impacts, strengthening the level and policy framework.

Targeted and appropriate capacity building relies on understanding local capacity and selecting efforts that correspond best with those needs. The initiatives from which to choose include:

- → Building the analytic base to support the collection and analysis of relevant information to support adaptation planning.
- → Providing support, including harmonizing approaches, promoting an enabling environment and resources to those responsible for carrying out the tasks of adapting, and
- → Promoting the sharing of knowledge and experiences to support adaptation as a "learning by doing" process rather than an end point.

OVERVIEW

> *"the most important thing is to make sure the world doesn't change without your being aware of it!!"*
> *CLRG Leader, Limpopo Basin*

Climate change poses a significant risk to the sustenance of future generations in many places and a challenge for sustainable development planning everywhere. Adaptation to these risks and challenges is a social process, which when supported by data, tools and examples can provide a flexible avenue for exploring robust responses. One of the major challenges facing the development and adaptation communities alike is the paucity of tools and established methodologies to understand the nature of the risk. There are volumes of data available on climate change and climate variability; as well as impacts on economically relevant and vulnerable sectors; however, non-technicians have neither the time to track down such data sources nor the expertise to reformat, re-project and load them into appropriate information system tools. There is a serious bottleneck in delivering information, much of which is spatial in nature, to decision makers in a manner that allows them to turn climate change research results into effective climate adaptation decisions and policies.

Analytical technologies are rapidly evolving to provide new tools, which are more transparent and more powerful, for analyzing, visualizing, managing, and disseminating information. Successful integration and dissemination of information into decision making is dependent on creating flexible and scalable tools and methodological frameworks that enable communication of data and analysis in a systematic way that is both useful to researchers and accessible to decision makers. Google Tools are one of the most exciting examples of these evolving technologies.

MOTIVATION

An effective early warning system requires effective communication channels between inter-related elements, spanning knowledge of hazards and vulnerabilities through to preparedness and capacity to respond. The objective of an early warning system is to empower people and institutions to act in sufficient time and in an appropriate manner to reduce the possibility of injury, loss of life and damage to property and the environment. It requires data and an awareness of the issue to be translated into actionable knowledge (Figure 1). Dissemination and Communication is thus a central part of the early warning system. Warnings must not only be evidence based, converting data into information, but must also reach those at risk and those with the capacity to respond. This work convened dialogues about spatial and actor-specific models of communication and response with the objective of identifying the weaknesses in the current early warning system and offers suggestions on how these may be improved.

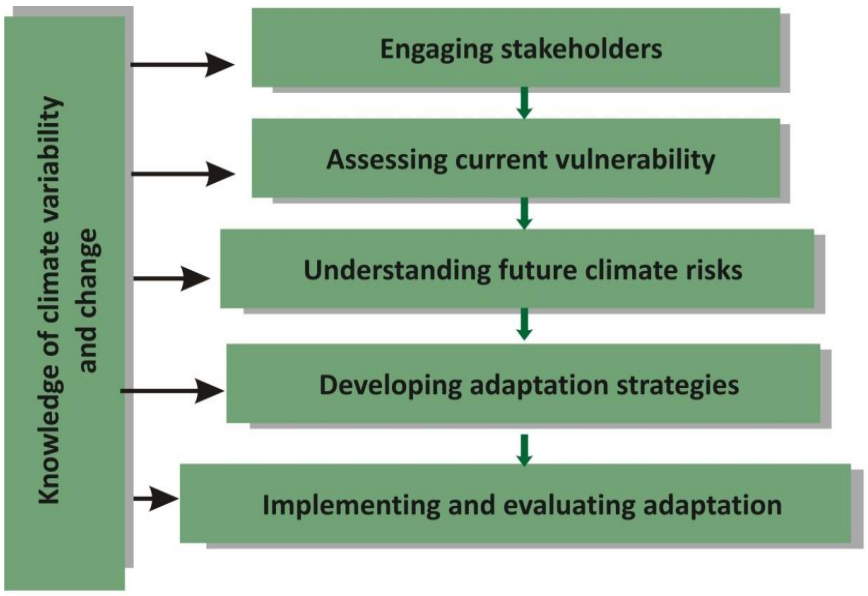
Building on interviews with key stakeholders in Maputo as well as in two field sites: Nacala and XaiXai, a series of storylines focusing on adaptation and disaster risk management were developed to demonstrate how various aspects of climate change information, from climate scenarios to impacts and vulnerability, might be deployed using Interactive Google Technology, enabling a wider community of users to access state-of-the-art climate science and guidance on its use in considering their decisions and to enhance a common platform on development and climate change adaptation information across the country.

A BRIEF LOOK AT WHAT IS ADAPTATION TO CLIMATE CHANGE

Adaptation is defined by the IPCC as, "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities". Note that the definition includes "actual" (realized- present and historical) as well as "expected" (future or anticipated) changes in climate. Thus adaptation can be happening in response to perceived change in climate or in anticipation of future change in climate. Many situations in which decisions will be made in light of climate variability and change (such as designing an adaptation strategy for agriculture) are typical of very complex problems, that is, problems which share a common set of characteristics:

- **Interdependency** –have many interdependent factors and are often multi-causal. For example, climate change combined with other drivers such as population growth and increasing water demands will likely intensify existing challenges in agricultural water management, which are themselves exacerbated by mean precipitation and runoff.
- **Complexity** - have no obvious solutions and are socially complex. Indeed, in many cases coping strategies such as asset liquidation and withdrawing children from school to work on farms or tend to livestock as a response to climate vulnerability can have adverse impacts on livelihoods.
- Requires a **multi-stakeholder perspective**, hardly ever sit conveniently within the responsibility of any one organisation or department and usually involves changing behaviour.
- **Controversy** - may appear to be intractable or at odds with other options. Efficiency of inputs, and hence profitability, for example, may need to be compromised in order to adapt agricultural productivity to certain climatic conditions.

The nature of the above can pose challenges to traditional approaches to policy making and programme implementation, forcing the decision makers to address and somehow integrate climate information within explicit definitions of time, context, vulnerability, and uncertainty in devising policies or strategies and in implementing actions. This requires an explicit decision framework that links vulnerability, climate variability, and future climate dynamics into planning adaptation processes. Decision-makers are often given limited guidance on how, when and in what context should a rolling re-assessment of their decisions be applied in light of emerging scientific findings on climate variability and change. Adaptation thus becomes a process as illustrated in Figure 2, at once an integral activity in agricultural development whereby risks and vulnerability are defined in light of both current and future climate.



Hammil, 2010

Figure 2: The process of ADAPTATION, adapted from Jones and Mearns, 2009.

Moreover, adaptation decisions themselves function within specific planning horizons, each with their own climate information needs (Figure 3). For example, farm level decisions on when to plant are dependent on forecast information on the onset of the rainy season, while information on longer term horizons (10+ years) is required when deciding on the location of new tree cropping projects.

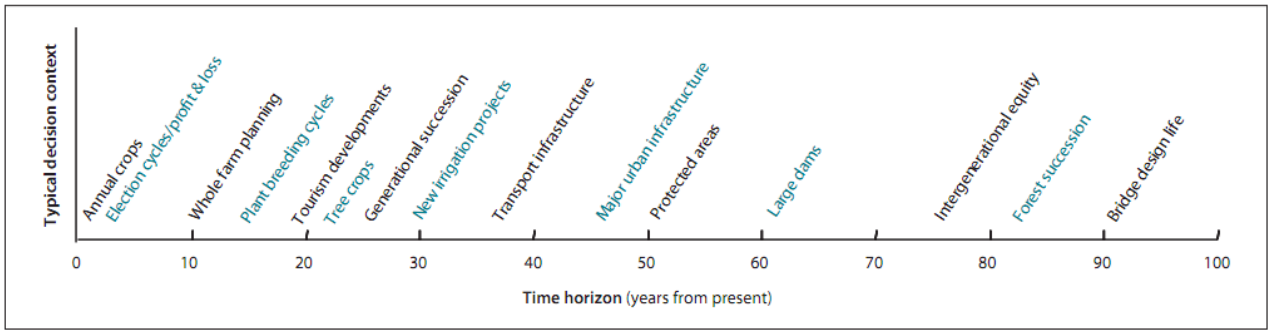


Figure 3: Adaptation Decision Contexts and their associated time horizons (from Jones 2007)

The INGC recognizes adaptation is as a process in itself which requires a comprehensive approach, engaging stakeholders, assessing current vulnerability, understanding future climate risks, developing strategies, and implementing and evaluating the results achieved. Such an integrative approach to adaptation should combine activities that support (Figure 4):

- → **Analysis** – analytic capacity to understand current hazards, emerging trends and the provision of tools to visualize, describe and identify target areas where multiple needs intersect, for example, drought prone areas, critical ecosystem service provision and vulnerable communities.
- → **Integration** – especially inter-sectoral collaboration between institutions at different scales to mainstream adaptation into development initiatives. This component supports the building of institutional know-how to manage risk and uncertainty based on robust rather than optimal decision making.
- → **Communication and Knowledge Sharing** – guiding the delivery of information to support decision making and the sharing of experiences to support learning by doing.

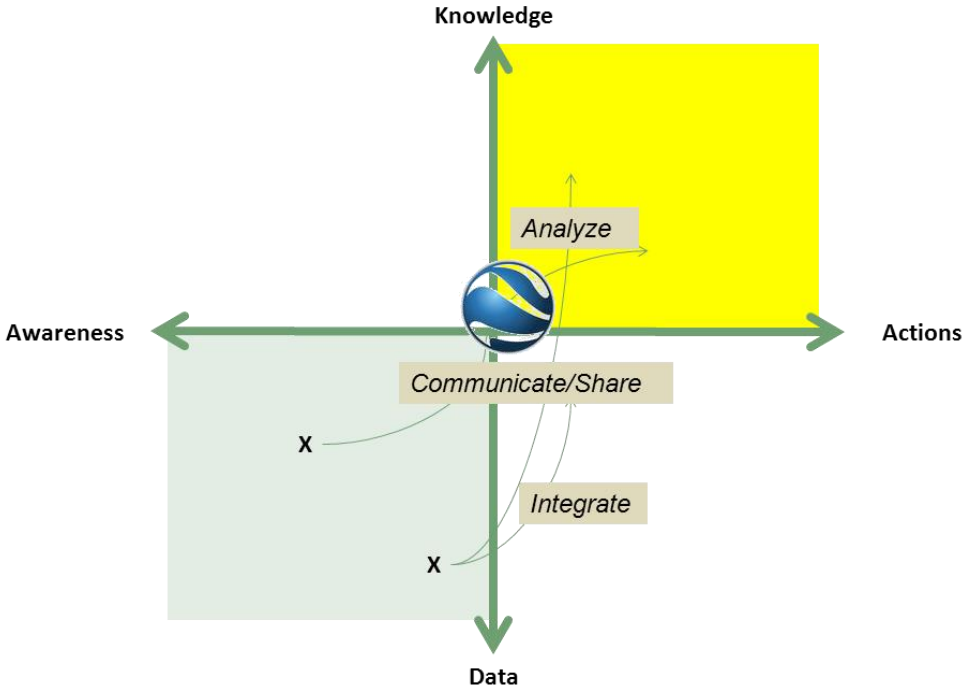


Figure 4: Objective of the Storylines

The output of this project are a series of storylines used to graphically:

- → Raise awareness of the issues surrounding climate change based on the latest evidence base including INGC's Phase I study of the Impacts of Climate Change in Mozambique.
- → Provide a starting point to begin the process of mapping the experiences, institutions and data on climate change and disaster risk management, which:

- **Capitalizes on people's experience and knowledge** – those living in marginal environments have a long history of adapting to climate variability . While traditional coping mechanisms may not be sufficiently robust in a changing climate, they can offer insights into effective strategies to address a changing climate and expand the available information base.
- **Scale up experiences and avoid the potential duplication of work** – disseminating the results and insights from technical and community approaches can promote the sharing of investments and avoid the duplication of work.
- **Promotes ownership of responses** - Establishing an effective dialogue for collaborative problem-solving, can provide for a shared understanding of concepts of risk, coupled with trust and credibility between the parties, whether they are internal to the INGC or partner organizations.

These storylines demonstrate the power of using Google Earth as platform for data dissemination and provide a basis for building a more comprehensive knowledge platform.

METHODOLOGY

The development of the storylines was based on a methodological approach that combined

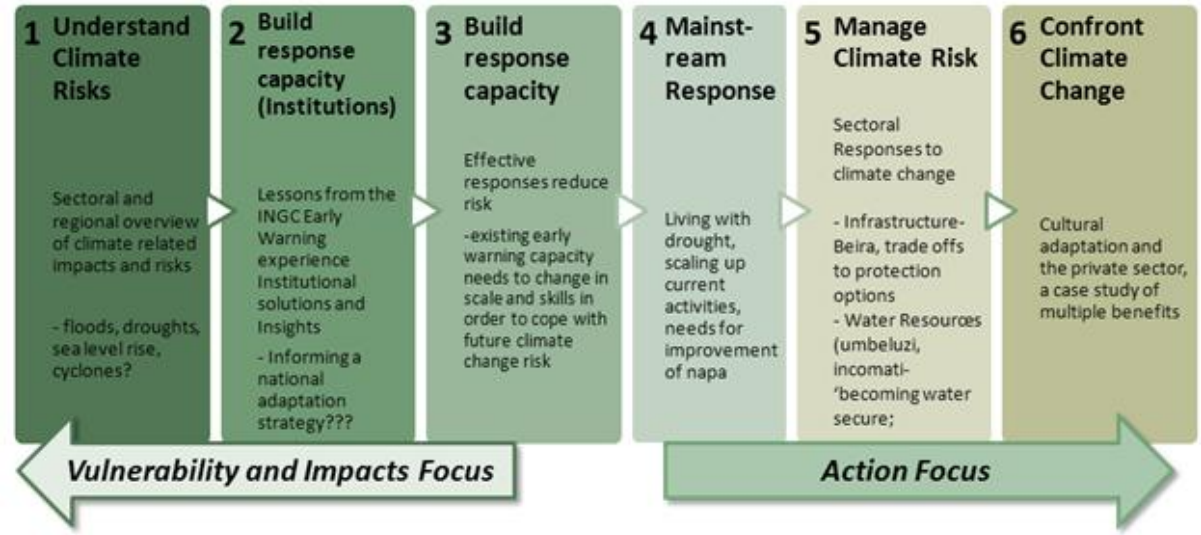
→ a series of ***informal interviews and dialogues*** with key members of the INGC, CENOE, district managers, community leaders and other institutions working in the field of climate change. Field level visits to the two sites where conducted, one to the southern region offices in Xai Xai and another to the Northern region in Nacala and a pilot study area in Cabo Delgado Province. Interviews and participatory discussions with INGC personnel and with local beneficiaries including leaders of the Community Risk Management Organizations in the south were conducted used to understand information flows and needs.
→ a comprehensive ***literature review of disaster risk management under a changing climate***
→ ***compilation and dissemination of a baseline and climate change database*** ..... Identify, and compile new data and information that can be usefully added to the current Google layers.
→ Analysis of these datasets to ***illustrate graphically the evidence base*** to be presented in the Google Layer.

OVERVIEW OF USERS OF TECHNOLOGY

The Google layer was employed as a tool to elicit discussion during a participatory series of interviews with key stakeholders at INGC offices in Maputo, Nacala and XaiXai, as well as other relevant partners in disaster risk management (IFRC, WFP, Save the Children, among others). The results of these discussions, where appropriate, are included in the final storylines and in the recommendations presented at the beginning of this report.

FINAL STORYLINES

The scope and emphasis of each of the available storylines are based on the INGCC report and initial outputs from the Phase II Work on responding to climate change in Mozambique. The storylines are meant to guide viewers through the results of this project. The storylines cover examples along the following axis of adaptation activities:



The following storylines are delivered digitally in KMZ format, viewable in their entirety using the Google Earth platform.

- Storyline 1: Sectoral and Regional Overview of Climate Related Impacts focuses in improving the knowledge base on climate variability and change
- Storyline 2: Lessons from the INGC Early Warning experience. Institutional solutions and Insights
- Storyline 3: Information flows and effectively responding to disasters- Floods case study
- Storyline 4: Reducing Vulnerability

These are discussed in detail in the following sections. It is important to note that while these are illustrative, rather than exhaustive stories of adaptation and disaster risk management, the framework provided will enable new users the ability to add information and data as it becomes available, building an institutional memory to compile and translate critical experiences and reports.

Storyline 1: Sectoral and Regional Overview of Climate Related Impacts

A lack of awareness on climate change issues and their relationship/relevance to priorities of decision makers was identified as one of the barriers to implementation of the Climate Change into policy and planning. This storyline summarizes the outputs from the "INGC Phase I Study: the Impacts of Climate Change in Mozambique" highlighting major impacts and trends in Climate Change across Mozambique. Information on vulnerability, impacts and projected trends in major climate related hazards from the report highlights and interviews conducted.

Emergent questions and their implications for disaster risk management are also explored under this storyline, as are response options:

- → Are the number of disasters growing?
- → How will agricultural yields be affected by Climate Change?
- → How are areas impacted by cyclones?
- → How does climate vary by region?
- → How will temperatures change in the future?

MOZ-ADAPT

Moz-Adapt, an online decision-support portal was developed as part of Theme 1: Early Warning at a different scale. The portal, available in both English and Portuguese, is organized around four key themes:

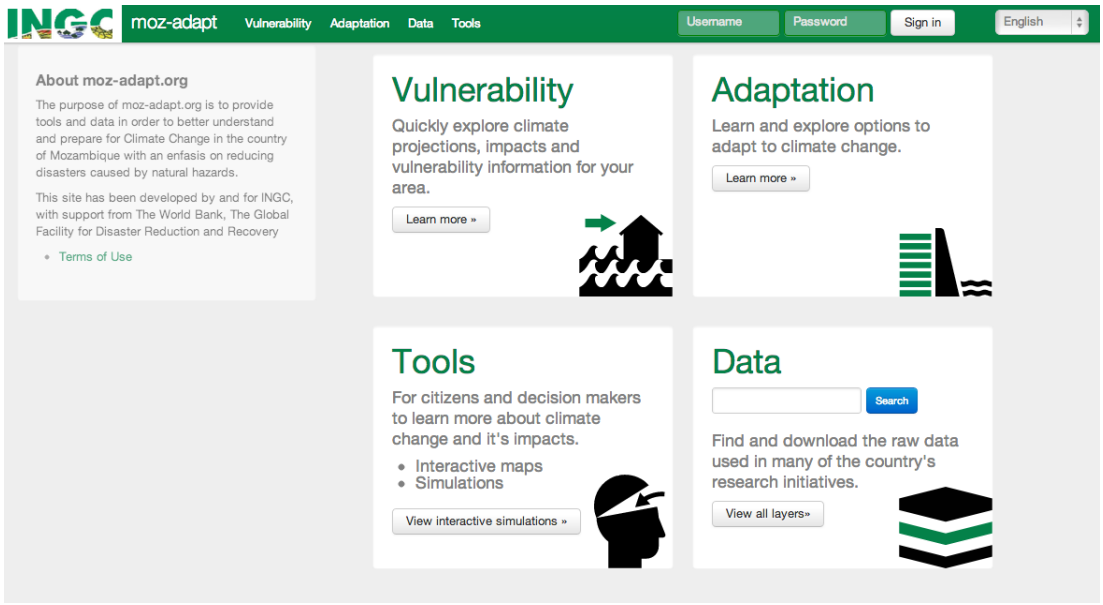


Figure 5: Primary Moz-Adapt Interface

- **Data**
  - A complete metadata solution for managing, sharing and storing spatial data.
  - Tools to facilitate the sharing of spatial information in multiple forms of output including PDF, Google Earth and others.
  - A data visualization and mapping interface to allow for integration
- **Impacts and Vulnerability**
  - Dynamic access and query to climate model information at the pixel and regional scale for the whole of Mozambique, including Access to 15 Global Circulation Models, 4 time periods, several variables
- **Tools**
  - Tools to support participatory map creation.
  - A Gateway to other decision support tools built for Mozambique, including the hydrological Tool developed under Theme 5, GripWeb, and others.
- **Adaptation**
  - –Storylines within Google Earth that provide information on opportunities and risks arising from climate change

About Moz-Adapt

Moz-Adapt is built with GeoNode technology, an open source platform that facilitates the creation, sharing, and collaborative use of geospatial data. The technology aims to surpass existing spatial data infrastructure solutions by integrating robust social and cartographic tools. At its core, GeoNode is built on a stack based on GeoServer, Django, and GeoExt that provides a platform for sophisticated web browser spatial visualization and analysis. Atop this stack are a map composer and viewer, tools for analysis, and reporting tools. A password-protected environment is available to provide access to restricted datasets to INGC partners.

Emerging Questions Explored in Storyline 1

Emerging Questions	Overview	Implications for Disaster Management and Preparedness:	Response Options:
Are the number of disasters growing across the country?	(Example from Sea Level Rise) Beira, Mozambique's second largest city is the capital of Sofala province. It acts as the business and transport hub for the central region of the country. The development of the city is closely linked to the port and the railway which were designed to serve most of Mozambique's inland neighbours - the Beira Corridor. This series of images, which depicts Beira by 2030 due to gradual sea level rise and more intense cyclone risk clearly shows the risks to infrastructure (yellow lines), the port system (yellow fill) and the coastal areas of the city - all at risk in the event of sea level rise and severe cyclones. Under all scenarios for Beira in 2030, the coastal land and the people living and working there are under threat from extreme sea level events, and will need to be appropriately protected. In a High Sea Level Rise these will lie below the new sea level. It is assumed that the old city of Beira will remain protected. If the new coast is not protected, the tide will flow over the land behind the city. In such circumstances, the river will take a new course to the sea, and the city and port area of Beira will become an island separated from the mainland by the flooded low lying land.	Some places in the *North* will experience floods more frequently the Centre requires greater monitoring for all type of natural disasters and weather related parameters in this region needs to be extended and improved as matter of urgency as climate change is happening. Southern Mozambique an integrated effort to deal with droughts and shorter wet seasons is needed.	Two responses are available to protect Beira from the projected changes of sea level and resulting impacts: → building solid and extensive coastal defenses to protect the port and city from the sea as well as building new road and rail links to the interior. → establish a policy of managed retry to older city limits, restrict new developments to higher ground and relocate port facilities upstream on the Zambezi. Choosing among these options will require considering tradeoffs such as the costs involved, political and cultural willingness to re-locate, as well as the relative value of protecting Beira in light of other areas which are also at a significant risk from these changes, including the town of Quelimane and urban area of Maputo.

Emerging Questions	Overview	Implications for Disaster Management and Preparedness:	Response Options:
Will climate change intensify the tropical cyclones that form the key hazard along the coast of Mozambique ?	(example on tropical cyclones) The prevalence of tropical cyclones in the South Western Indian Ocean is thought to be due to their association with the high sea surface temperatures in summer that provide the heat to drive the formation and development of the cyclones. This is borne out by the figures shown on the globe, which map the cyclone trajectories of the South Western Indian Ocean during the cyclone season of the period 1980-2007. Both recent trends in observations and long term modeling outcomes suggest that climate change will affect the characteristics of tropical cyclones in the South Western Indian Ocean in two distinct ways: cyclones are likely to become **less frequent** but their **intensity and associated precipitation** is likely to **increase**.	Some places in the *North* will experience floods more frequently the Centre requires greater monitoring for all type of natural disasters and weather related parameters in this region needs to be extended and improved as matter of urgency as climate change is happening. Southern Mozambique an integrated effort to deal with droughts and shorter wet seasons is needed.	The principal threat to the coastline of Mozambique, its people and its economy at the present time, comes from the damage potentially caused by the impact of a tropical cyclone. • If the proportion of intense tropical cyclones is set to increase, then the impact of individual intense tropical cyclones will be much greater whenever they do occur. • There is a need to re-evaluate the storm surge and flood risk, as well as the aggravating factors associated with mega-catastrophes, with an even greater loading on intense cyclones. Vulnerability to tropical cyclones depends on the nature of the coastline, whether the coast is hard or soft, rigid or yielding. In the same way, coastal infrastructure and services are protected from the sea in different ways for hard rocky coasts, for dynamic sandy coasts and for soft muddy coasts. There is a tradeoff that has to be made in terms of cost, feasibility and an acceptable level of risk when choosing among two engineering options to project coastal zones: **fortified seawalls** and **vegetated dune barriers**

Emerging Questions	Overview	Implications for Disaster Management and Preparedness:	Response Options:
Are the Impacts of Disasters Growing?	One crucial question alongside the climate change issue is whether or not the number of natural disasters is growing? The answer to this question was analyzed using historical data of the occurrence of four types of disasters: Floods, Droughts, Epidemics and Cyclones. According to the database, → **floods** are much common in the *Centre* and *South*; → **tropical cyclones** affect more of the *Centre* and *South*; → **Droughts** occur more frequently in *South* and *Centre* → **Epidemics** are likely to affect the *Centre* and the *South*. The *North,* while having incurred less damages in the past, is subject to **tropical cyclones** and **epidemics**. The report looked at the question by viewing the historical occurrence of disasters since the 1980's, and notes an increasing number of events have been reported during the last three decades. This may be due to the lack of good quality disaster information prior to the 1980s. The Figure above shows a significant increase in the number of disasters since the 80's, with the growing rate of floods and epidemics dominating the last two decades of 20th and early 21st centuries.		

Storyline 2: Lessons from the INGC Early Warning experience. Institutional solutions and Insights

The INGC Phase I Study of the Impacts of Climate Change reports that barriers to adequate mitigation of disasters included lack of institutional coordination to respond to extreme situations, weak communication mechanisms between different administration levels, lack of effective communication channels to communities, weak and inconsistent relationships between different authorities, and no clear definition of institutional roles. Following the flood events of 2000vents, the INGC was fundamentally restructured and streamlined both from a political as well as an operational perspective. But are the changes and structure sufficient to deal with future climate change?

The INGC case offers practical insight, among other things, on:

- Effective ways to encourage collaboration among distributed public and private organizations, enabling a rapid and effective response to disasters, both unexpected and those that can be monitored.
- The role of information flows, and coordination processes to improve multi-agency disaster management.
- Highlights areas where the successful integration of disaster management into operations could be used as a model for mainstreaming adaptation into development initiatives.

This storyline demonstrates the actions taken by Mozambique to respond to disasters under the restructuring of the INGC and draws attention to the need for scaling up lessons learned to regional and national levels, as well as for additional early warning capacity, planning and coordination in order to tackle future climate change. These steps follow from the National priorities of Mozambique as outlined in the NAPA, National Communication and Poverty Reduction Strategy and include: strengthening early warning systems, improving the adaptive capacity of the agricultural sector to deal with climate change, reducing impacts on coastal zones and improved water resource management. The storyline also highlights how this framework could form the basis for a national adaption strategy for climate change adaptation and risk management.

This storyline will be tied closely to 1 above, navigating users through projects and activities implemented by Mozambique within the INGC in disaster preparedness and response address the critical knowledge, communication and information gaps that led to the catastrophic events of 2000. It will offer insights into the organizational nature of the INGC and suggest ways in which the lessons from the INGC restructuring could inform an adaptation strategy.

Storyline 3: Information flows and effectively responding to disasters- Floods case study

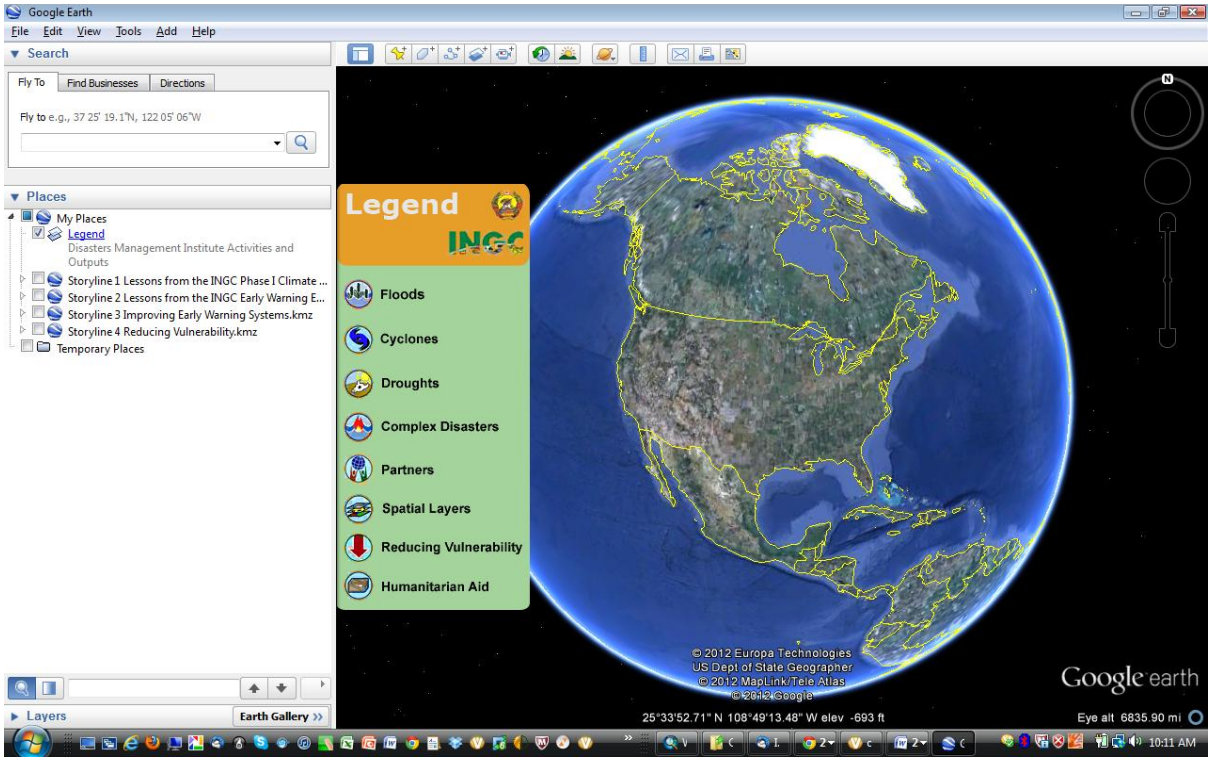
The INGC Phase I Study of the Impacts of Climate Change reports barriers to adequate mitigation of disasters included lack of institutional coordination to respond to extreme situations, weak communication mechanisms between different administration levels, lack of effective communication channels to communities, weak and inconsistent relationships between different authorities, and no clear definition of institutional roles. This storyline guides viewers through the process of information flow under the CENOE monitoring and response model of the INGC, noting the various data sources and actors involved in proactive and reactive responses and offering insights and lessons learned that could be useful in adaptation projects.

Storyline 4: Reducing Vulnerability

This storyline offers information on current projects related to vulnerability reduction, emphasizing the need to scale up the approaches to other vulnerable dry lands of Mozambique will be emphasized. Information about key adaptation projects is included and summarized using a prescribed format. A special emphasis is placed on highlighting the need to better prepare and equip community risk management organizations in dealing with disasters.

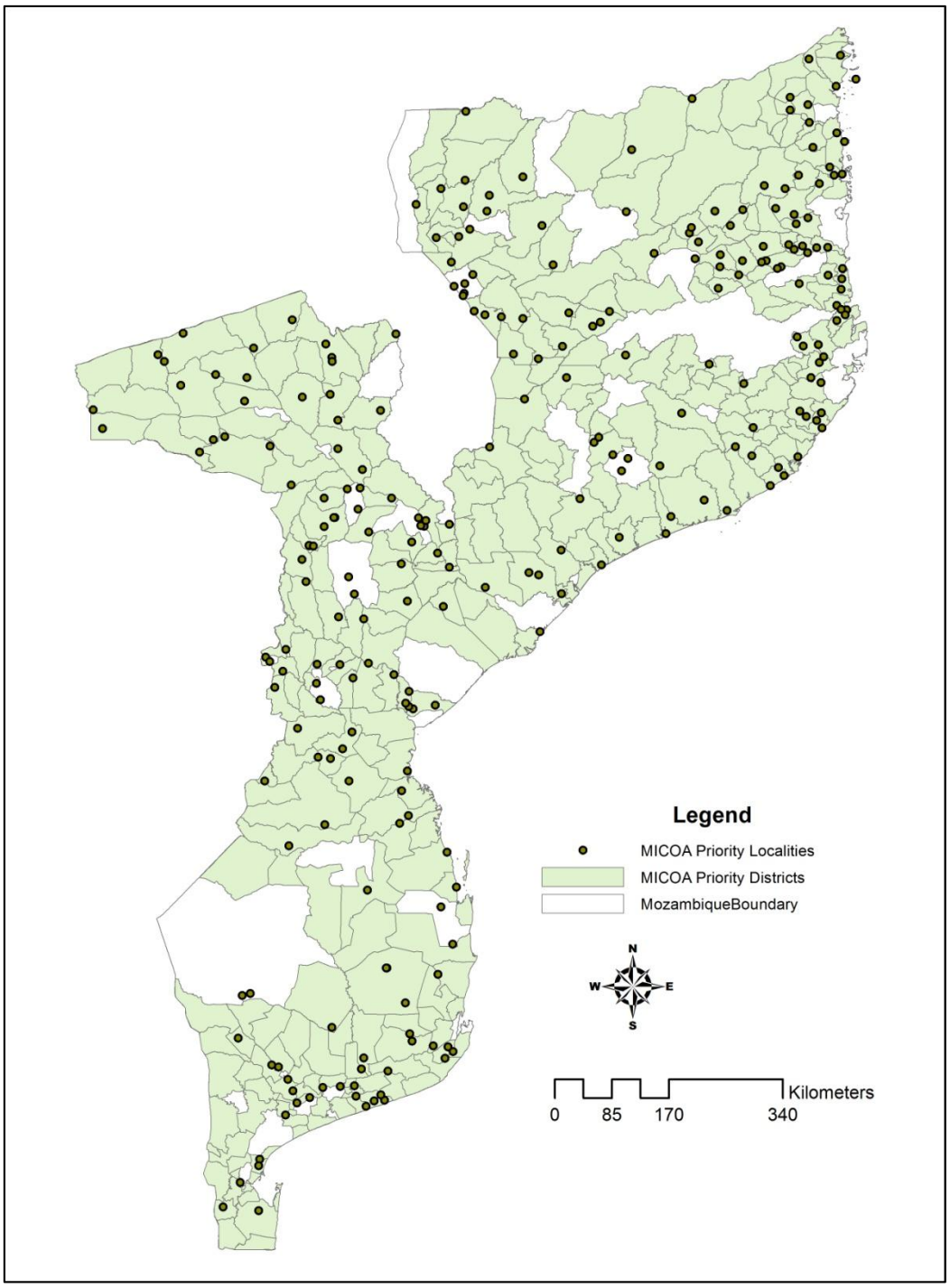
Annexes

Anatomy of a Storyline

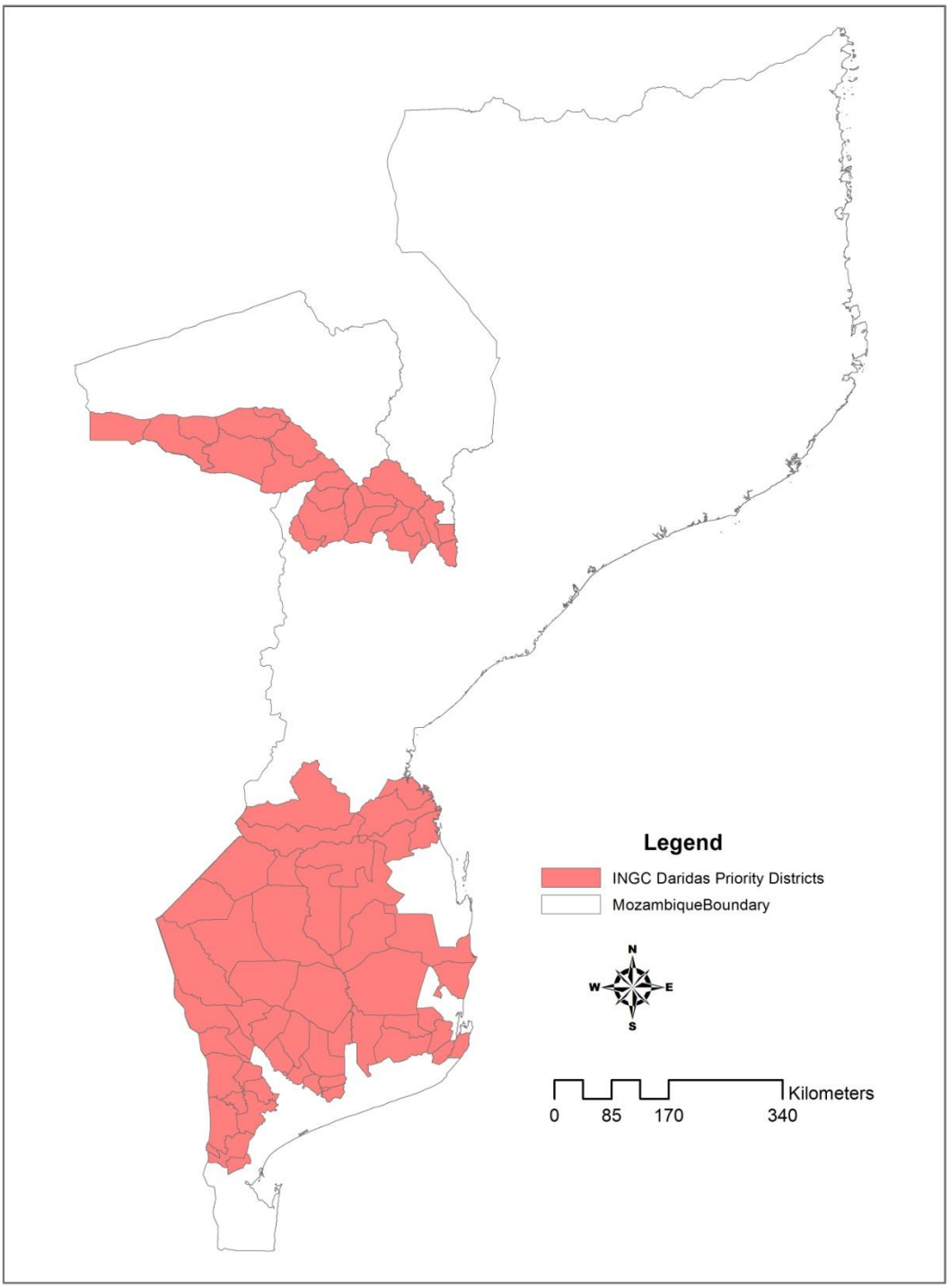


MICOA Priority Localities and Districts

File attached. Map below.



INGC priority Districts from the Director's Plan 2006.



List of websites Regularly Monitored by CENOE for Hazards

http://www.mtotec.com/
http://www.earthquake.usgs.gov
http://www.nrlmry.navy.mil/tc_pages/tc_home.html
http://www.accuweather.com/
http://www.hamweather.net/maps/globalqpf/480x360/afr.html
http://www.cenacarta.com/
http://maps.geog.umd.edu/activefire_html/checkboxes/moz_checkbox.htm
http://www.meteo.fr/temps/domtom/La_Reunion/
http://www.inam.gov.mz/
http://severe.worldwheather.wmo.int/tc/swi/
http://www.jornalnoticias.co.mz/pls/notimz2/getxml/pt/contentx/96072
http://paraguay.cptec.inpe.br/produto/queimadas/index.jsp;jsessionid=4EE02FF65D81E0F18494B3C524F4FB92?language=pt_br
http://www.cenacarta.com/
http://meteorologia.pt.msn.com/local.aspx?wealocations=wc:MZXX0003&q=Maputo%2c+MOZ
http://www.hamweather.net/cgi-bin/hw3/hw3.cgi?forecast=pass&pass=precipmap_gfs&dpp=0&size=480x360&i=24&type=qpf&s=afr&msg=1&fill=
http://www.nrlmry.navy.mil/tc-bin/tc_home2.cgi?YEAR=2008&MO=03&BASIN=IO&STORM_NAME=null&PROD=microvap&AID_DIR=/data/www/indian/southern/microvap/dmsp&PHOT=yes&ARCHIVE=active&NAV=tc&AGE=Latest&SIZE=Thumb&STYLE=tables
http://www.meteo.fr/temps/domtom/La_Reunion/
http://www.weathersa.co.za/RSMC/login.jsp
http://maps.geog.umd.edu/activefire_html/checkboxes/moz_checkbox.htm
http://www.meteo.fr/temps/domtom/La_Reunion/
http://www.gdacs.org/
http://www.nrlmry.navy.mil/sat-bin/cloud_tops.cgi
http://www.metoffice.gov.uk/weather/africa/lam/
http://www.ecmwf.int/
http://cimss.ssec.wisc.edu/tropic/real-time/tpw2/prodDesc/
http://firefly.geog.umd.edu/firemap/