ENHANCING DISASTER PREPAREDNESS FOR RESILIENCE THROUGH CLIMATE INFORMATION MANAGEMENT

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Presentation Outline

- Overview of climate hazards
- Disaster typology and its effect
- Trends of disaster and its impacts
- Changes in DRR over time
- Examples of use of climate information and types of forecast in enhancing disaster preparedness for resilience
- Example of rainfall forecast/estimation based on the SWFDP
- Hydrological information
- Challenges to access and usage of climate information
Mozambique is highly vulnerable to natural hazards and disasters for a number of reasons. About 60 per cent of the population live along the coastline. This area is vulnerable to an increasing occurrence of **cyclones and rising sea levels**, because nearly 45 per cent of the country is 100 meters below sea level.

The country is also a lower riparian zone of nine international rivers, and more than 50 per cent of the country’s water flows depend on the countries upstream.

Drought particularly affects the southern and central regions in the **arid and semi-arid regions in the Gaza and Inhambane, Tete, Manica provinces**, while flooding mostly affects the **Zambezii, Licungo and Limpopo basins**. About a quarter of the total Mozambican population is at risk from natural hazards.

The main disasters affecting Mozambique are **floods, cyclones and droughts**.
Flooding scenarios in Mozambique have demonstrated a relatively well defined pattern with regard to their timing and geographical locations. They occur every two to three years along the seven major rivers that cross the country, namely the Incomati, Limpopo, Save, Buzi, Pungue, Zambezi and Licungos. The map shows critical flood prone areas in Mozambique. The extent of flooding depends not only on the amount of rainfall in the country but also on the amount of rainfall in neighbouring countries, where flooding rivers originate. In 2000–2001, Mozambique experienced its worst flooding in 150 years. It affected about 2 million people.
Cyclones and its effects

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>2017</td>
<td>Cyclone DINEO 550959 People affected (their houses and/or other properties such as crops partially or totally destroyed), 91 people injured.</td>
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<tr>
<td>2008</td>
<td>Cyclone Jokwe: 200,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>2007</td>
<td>Cyclone Favio: 160,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>2003</td>
<td>Cyclone Japhet: 100,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>2000</td>
<td>Cyclone Udah: 11,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>2000</td>
<td>Cyclone Gloria: 650,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>2000</td>
<td>Cyclone Eline: 650,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>1997</td>
<td>Cyclone Lisette: 80,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>1996</td>
<td>Cyclone Bonita: 200,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>1994</td>
<td>Cyclone Nadia: 900,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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<tr>
<td>1988</td>
<td>Cyclone Filão: 90,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
</tr>
<tr>
<td>1984</td>
<td>Cyclone Demoina: 350,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)</td>
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</table>

Tropical depressions or cyclones that enter Mozambique from the southwest of the Indian Ocean frequently hit the country’s long coastal area. The map (see figure 4) shows the geographical pattern of cyclone proneness in Mozambique. In red (along the coast) are the most highly prone areas, and in green (inland) the least prone areas. From January to March, there is a greater risk of cyclone occurrence. The National Meteorological Institute (INAM) monitors cyclone activity.
Droughts and its effects

Cyclical droughts, which occur every two to three years, have affected Mozambique. The south of the country has experienced drought for five of the last seven years. Droughts are likely to occur every year and are relatively chronic, particularly in the southern and central parts of the country. It is not only the total amount of rainfall that determines the occurrence of drought, but its spatial and temporal distribution as well. Prolonged dry spells can easily lead to drought, particularly in remote areas, where agriculture is absolutely dependent on rain-fed crops. As a result, vulnerable communities may experience reduced access to water, outbreak of communicable diseases, hunger and eventually malnutrition.

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>2015-2016</td>
<td>1,500,000 in need of food assistance in the southern and central regions</td>
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<tr>
<td>2015-2018</td>
<td>60 districts and 350,000 in need of food assistance in the southern and central regions</td>
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<tr>
<td>2015-2019</td>
<td>60,000 people requiring food assistance in the southern and central regions</td>
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<tr>
<td>2015-2020</td>
<td>520,000 requiring food assistance in the southern and central regions</td>
</tr>
<tr>
<td>2015-2021</td>
<td>600,000 people in need of food assistance in the southern and central regions</td>
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<tr>
<td>2015-2022</td>
<td>600,000 people requiring food assistance in the southern and central regions</td>
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<tr>
<td>2015-2023</td>
<td>100,000 people requiring food assistance in the southern and central regions</td>
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<tr>
<td>2015-2024</td>
<td>1.5 million people requiring food assistance in the southern and central regions with a high shortage of drinking water and cholera outbreak</td>
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<tr>
<td>2015-2025</td>
<td>1.32 million people requiring food assistance countrywide with a high shortage of drinking water and cholera outbreak</td>
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<tr>
<td>2015-2026</td>
<td>8,000 people requiring food assistance in the Inhambane province</td>
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<tr>
<td>2015-2027</td>
<td>Long dry period countrywide, combined with the civil war, claimed about 100,000 lives and put nearly 5 million people in need of food assistance</td>
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<tr>
<td>2015-2028</td>
<td>60,0000 people in need of food assistance in the southern and central regions</td>
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</table>

- Drought
- Flood
- Tropical Cyclone

Number of Events

Decade

ISDR Support Group Meeting, Geneva_23.10.2015
Trends of disaster impacts

**Human impact of disasters in Mozambique (2000-2014)**

- Deaths
- Displaced people
- Affected people

**Disaster Impacts on economy and assets in Mozambique (2000-2014)**

- Agriculture (ha)
- Education (rooms)
- Health (units)
- Houses (units)
Changes in DRM over time

The 2000/2001 floods – key lessons for:

i. Rapid investment for improving early warning network for climate and weather data collection (Central level)

ii. Focus of dissemination of risk information on end-users (District and community level)

iii. Strengthening of preparedness and response capacity at national and local level

iv. National leadership of DRR actions, including in disaster preparedness and response

v. Improvement of cross-sectoral coordination mechanisms for all DRR activities

vi. Policy reforms to foster DRR mainstreaming at national sector development planning
Examples of use of climate information and types of forecast in enhancing disaster preparedness for resilience

i. **Climate predictions for 2040–2060 (in 2009):** bases for conduction of Disaster Risk Assessments at national and sector levels (in 2012)

ii. **Seasonal weather forecast (SARCOF):** enables preparation of the Annual National/Sector Development Plan and the Contingency Plan at all levels

iii. **Weather forecast:** helps refine disaster response mechanisms

iv. **Warnings:** allows ignition of disaster response operations.

**Types of forecast**

i. Daily recorded Precipitation and next 24h forecast;

ii. Daily recorded maximum and minimum temperatures and 24h forecast

iii. Special warnings for heavy rain and strong winds, thunderstorms, tropical cyclones heat waves...
Example of rainfall forecast/estimation

past 10 days rainfall estimation (in mm)

24h rainfall estimation (in mm)
Example of rainfall forecast/estimation

48h rainfall estimation (in mm)

7 days rainfall estimation (in mm)
Monitoring of Cyclonic Activity
Forecast indicates that the disturbance could evolve to the stage of tropical depression and could reach the Mozambican coast along Inhambane and Gaza provinces with maximum winds that could reach 100 km/h
It is estimated that this system could affect, in a combined scenario of strong winds and rains, about 750,000 people in the districts identified above
The LIMPOPO basin shows a significant increase in the volume of flow due to the contribution of amount (4600 m³/s in B. Bridge and around 2000 m³/s in Mwanetse). As a result, the Pafuri, Chókwe and Xai-Xai stations tend to rise. The INCOMATI basin registers oscillatory levels with a tendency to rise, while UMBELUZI and MUTAMBA tend to lower.
Probable Wave Impacts (from 01 to 04 March 2017 (flood risk areas, Limpopo basin, levels 1 and 2))

Áreas de risco de inundação, Bacia do Limpopo (Níveis 1 e 2)

Cerca de 34 mil pessoas em risco (no nível 1)

Cerca de 98 mil pessoas em risco (caso atinja o nível 2)

Legend
- # Aldeias_Risco_de_inundacao(nivel1)
- # Aldeias_Risco_de_inundacao(nivel2)
- Blue Risco de inundacao (nivel1)
- Blue Risco de inundacao (nivel2)

Fonte dos dados: DNGRH 2017
Data: 01/03/2017
Pictures of Floods at basin of Licungo river 2015 (Zambezia Province)

Houses and roads flooded

Bridge flooded and destroyed
Pictures of destruction by DINEO cyclone (2017) – Inhambane Province

- House destroyed at Maxixe City
- Bridge destroyed (Maxixe–Inhambane crossing)
- House destroyed at Maxixe City
- School Destroyed
Challenges to access and use of climate information

• **INGC** has free access to climate information

**Remaining challenges**

i. Limited geographic coverage of hydro-meteorological network

ii. Lack of climate information products to timely respond to specific demands of end-users

iii. Technical barriers to translate and disseminate climate information in a clear and understandable language to all users

iv. Forecast and warning of meteorological events and potential impacts (multi hazard impact-based).

v. Impact matrix related to hazard (flash flood) occurrence

vi. Hourly or 6 hour forecast precipitation and possible location of flash floods occurrence.

vii. Forecast of macro scale events or phenomena's

viii. Estimate or identify vulnerable and needy persons among those affected
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