

# Implementing drought early warning systems in Africa:

## policy lessons and future needs



### Key policy Messages

- Current drought management practice in Africa focuses on mitigation and relief, and less on adaptation. A shift towards a risk based drought management approach offers opportunities to move away from expensive relief actions. This requires drought monitoring using suitable indicators, drought vulnerability assessment, seasonal meteorological and hydrological forecasts, user friendly early warning, training and public awareness, and improved data sharing.
- Clear institutional responsibilities are a prerequisite to effective drought forecasting and warning. Institutions involved in drought mitigation and adaptation should be connected to the formal frameworks concerning drought. A continuous and efficient collaboration of institutions and services involved is required and this should not only be limited to drought periods.
- Drought forecasts and warnings should be targeted to provide key information to users for them to base their decisions on. Traditional knowledge can be integrated to supplement drought forecasts and early warning systems.
- Advances in the skill of seasonal meteorological and hydrological forecasts are promising for most regions across Africa. DEWFORA shows that this predictability does vary across the continent, depending on the type of climate and scale. This should be considered when using forecasts to base decisions on.
- High resolution simulations of projected future climate show considerable variation in the expected change across the continent. Subtropical and extra-tropical areas are expected to become dryer to much dryer. Eastern Africa and the Nile basin are expected to become wetter. There is less confidence in the signal in Western Africa and the Sahel. The ability to forecast for example heat stress is expected to remain high, indicating that drought forecasting and warning should be considered an effective measure in both current and future climates.
- Capacity is required at all levels (policy and decision makers, researchers, meteorologists, technology transfer, farmers, communities, etc.) for effective interpretation and usage of forecasting and early warning products. Currently, the low level of applied knowledge of technical and managerial personnel in most organisations issuing early warning products is a major constraint.

# Introduction

Large parts of Africa are drought prone and are regularly faced with substantial economic losses and humanitarian suffering as a consequence of drought. The recent 2011 drought in the Horn of Africa is estimated to have caused up to a quarter of a million deaths, and left over 13 million people in the region dependent on humanitarian aid. Over \$ 1.3 billion was spent on relief.

The Final Declaration of the High Level Meeting on National Drought Policy (UN HMNDP) in Geneva (March 2013) encouraged all Governments around the world to develop and implement National Drought Management Policies. A key element in the recommendations is to promote greater collaboration to enhance the quality of preparedness for drought from local through to national and global levels. The recently completed DEWFORA research project, financed as a part of the EU 7<sup>th</sup> Framework Programme fosters such collaboration, thereby contributing to reducing vulnerability and strengthen preparedness to droughts across Africa.

## Towards a protocol for developing early warning systems

An early warning system that supports the timely implementation of drought impact mitigation is one key element of an effective drought management strategy. Within DEWFORA a protocol for implementing early warning systems, based on a suite of integrated data, analyses and research on drought forecasting was developed. This protocol covers the whole chain from monitoring and vulnerability assessment, to forecasting, warning, and response and knowledge dissemination.

The protocol includes four steps to assess the scientific knowledge and the social capacity to use the knowledge in a specific country, basin or region.

What is the science available?

What are the societal capacities?

How can science be translated into policy?

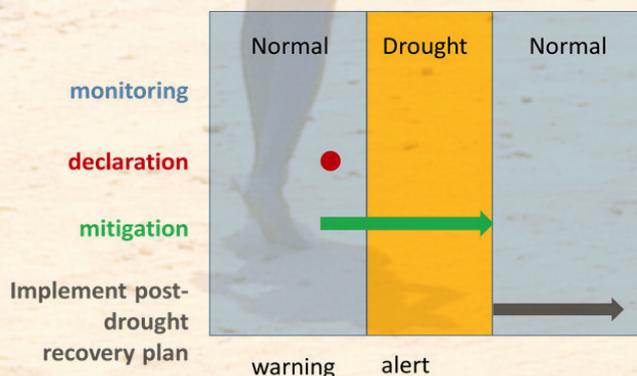
How can society benefit from the forecast?

- What is the available science? Evaluating the detection of the signs of impending drought. Defining risk levels and analysing the signs of drought in an integrated approach that considers both hazard and vulnerability.
- What are the societal capacities? Evaluating the institutional framework that enables policy development.
- How can science be translated into policy? Linking science indicators into the actions/interventions that society needs to implement. Evaluating the policy implementation.
- How can society benefit from the forecast? Evaluating the provision of information to potentially affected groups.

## Practical warning to avoid damage

Based on the assessment of drought vulnerability in a specific country or region we suggest thresholds for management actions to respond to drought forecasts and link predictive indicators to relevant potential mitigation strategies. The slow onset of droughts typically means that it is possible to determine vulnerability thresholds in advance that can be used to trigger mitigation actions in different social groups. For example, the manager of a reservoir could change operational rules to ensure urban water supply, while a farmer could change the feeding plans for livestock according to expected crop production.

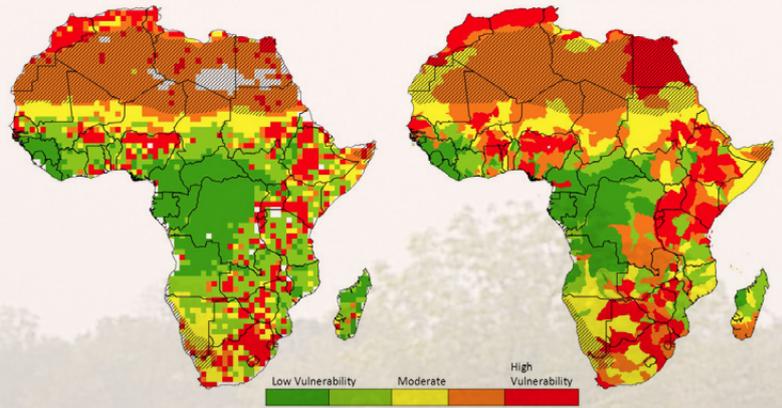
The DEWFORA protocol gathers information on vulnerability and pending hazard so that early warnings can be declared at sufficient lead time and drought mitigation planning can be implemented at an earlier stage. The concept is summarized in the figure below and entails the issuing of a drought warning before the effects of drought manifest themselves.





### Pan-African Drought Vulnerability

The DEWFORA team evaluated drought vulnerability of agricultural systems on a Pan-African scale (see figure) in a gridded model (left map) and in a sub-basin model (right map). Both models show large similarities: high vulnerability to drought in the climatic dry north and south of the continent as well as in parts of the Rift valley and parts of West-Africa which have a less dry climate. In the desert regions (Sahara, Sahel, Namib Desert) precipitation is extremely low, and management of natural and social systems is not based on early warning systems but rather on permanent measures (dashed areas in figures).



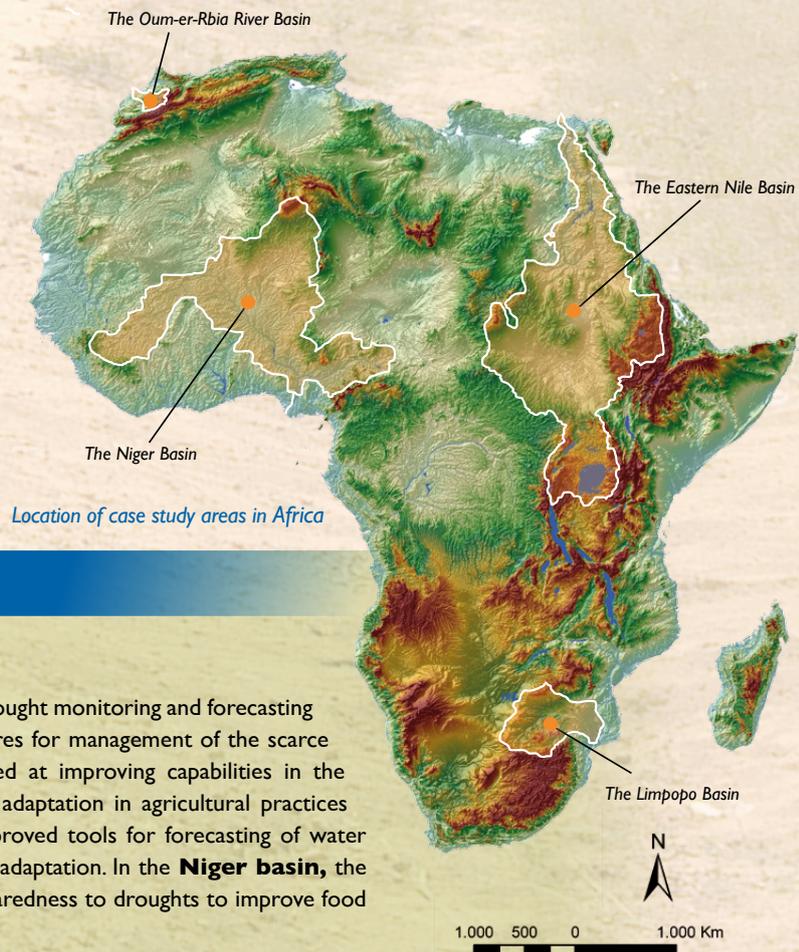
### Improving mitigation and adaptation practices

Currently, the most common drought mitigation actions implemented in the basins include food aid (Limpopo, Nile), seed supply (Oum er Rbia, Nile) and harvesting of rainfall water (Limpopo, Nile). Other drought mitigation actions include the use of Indigenous Knowledge Systems (Limpopo, Oum er Rbia), education and public awareness campaigns (Nile, Limpopo). Adaptation actions in the basins include construction of water harvesting infrastructure (multi-purpose dams at basin scale in Niger basin), water harvesting and improved dry-land farming practices (Limpopo, Nile). Supplementary irrigation is key in the Oum er Rbia basin.

The need for strategies to manage and mitigate drought vulnerability is generally understood in all the basins. During the DEWFORA project, drought forecasting tools were developed and operationalised. In the Niger case, for example, weekly drought bulletins currently allow people in the area to make no-regret investments that bring change to their livelihood. However, many mitigation and adaptation actions are still hampered by factors such as unclear institutional responsibilities, insufficient technical and scientific personnel and inadequate financial resources for adequate monitoring infrastructure and forecasting technology, and a lack of drought vulnerability analyses. Furthermore, different organisations could better

coordinate their activities so that measures taken become more effective.

Overall, the results from the DEWFORA project highlight that whilst early warning, mitigation and adaptation in the African region has been tackled in several ways, for it to be effective, there is a need to develop human resources involved in decision making, designing early warning systems and also to incorporate local knowledge. A discussion platform with a common language needs to be created to ensure effective communication between all stakeholders concerned.



## Case studies

The DEWFORA project focused on four case studies.

The **Limpopo basin** case study focused on improving existing drought monitoring and forecasting capabilities, as well as institutions, policies, guidelines and procedures for management of the scarce water resources in the basin. The **Oum er Rbia basin** aimed at improving capabilities in the forecasting of agricultural drought and establishing guidelines on adaptation in agricultural practices to reduce vulnerability. Emphasis in the **Nile basin** was on improved tools for forecasting of water availability and the impact of climate change and community scale adaptation. In the **Niger basin**, the focus was on mid-term climate forecasting and strengthening preparedness to droughts to improve food security and human welfare.

## The DEWFORA project

The main aim of the DEWFORA project is to develop a framework to reduce vulnerability and strengthen preparedness to droughts in Africa by advancing drought forecasting, early warning and mitigation practices. The framework addresses monitoring, predicting, timely warning and response to droughts at the seasonal time scale, applicable within the institutional context of African countries. The project contributes through improved methods for identification of vulnerable regions taking into account the increased hazard due to climate change, and feasible adaptation measures.

### Starting/Ending date of project:

1th of January 2011 - 31th December 2013

### Type of R&D:

- Collaborative project
- Small or medium scale focused research project

### Programme:

7th Framework Programme

Theme 6: Environment (including climate change)



### Selected related activities:

- EU Framework Projects:  
AFROMAISON, HEALTHY FUTURES, CLUVA, CLIMAFRICA, AfrICAN CLIMATE, AFRICA-GHG, CLARA, GLOWASIS, CIRCE.
- Drought initiatives:  
CIS-SPI, Drought R&SPI, GDIS, GEO community & GEOSS, NeWater project.
- Websites on drought in Africa:  
<http://www.unicefusa.org/work/emergencies/horn-of-africa/>  
[http://en.wikipedia.org/wiki/2011\\_East\\_Africa\\_drought](http://en.wikipedia.org/wiki/2011_East_Africa_drought)

## Participating organisations/countries

	Deltares (coordinator)   <i>Netherlands</i>
	Council for Scientific and Industrial Research   <i>South Africa</i>
	Dinder Center for Environmental Research   <i>Sudan</i>
	European Centre for Medium-range Weather Forecasts   <i>Europe</i>
	German Research Centre for Geosciences   <i>Germany</i>
	Hydraulic Research Institute - Nile Basin Capacity Building Network for River Engineering   <i>Egypt</i>
	Joint Research Centre   <i>Europe</i>
	Mediterranean Agronomic Institute of Zaragoza   <i>Spain</i>
	IGAD Climate Prediction and Applications Centre   <i>Kenya</i>
	Nile Forecast Center   <i>Egypt</i>
	Potsdam Institute for Climate Impact Research   <i>Germany</i>
	Institut Agronomique et Vétérinaire Hassan II   <i>Morocco</i>
	UNESCO-IHE Institute for Water Education   <i>Netherlands</i>
	Universidad Politecnica de Madrid   <i>Spain</i>
	University Eduardo Mondlane, Faculty of Engineering   <i>Mozambique</i>
	University of Porto, Faculty of Engineering   <i>Portugal</i>
	WR Nyabeze & Associates   <i>South Africa</i>
	WaterNet Trust   <i>Botswana</i>
	Wetlands International – Sahelian Sub Regional Office   <i>Mali</i>

## Further information, scientific background and contact

[www.dewfora.net](http://www.dewfora.net)

Peer reviewed HESS publication: Special drought issue (expected in 2014)

<http://edo.jrc.ec.europa.eu/dewfora/php/index.php?id=4119>

[www.euronews.com/2013/06/17/africa-is-always-at-risk-of-drought](http://www.euronews.com/2013/06/17/africa-is-always-at-risk-of-drought)

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