

Implementing drought early warning systems: policy lessons and future needs



Key policy Messages

- Effective drought forecasting and warning requires the adoption of a protocol that includes the science of monitoring and forecasting and can give a wealth of information on how different groups can use the forecast in support of their decision making. A protocol for drought forecasting and warning has been developed in the DEWFORA project.
- Advances in the skill of seasonal meteorological and hydrological forecasts are promising, with an important contribution being made by DEWFORA. High resolution simulations of the projected future climate in Africa show considerable variation in the expected change across the continent. Drought forecasting and early warning remain an effective drought management tool in the future climate.
- Key limitations to planning for drought are the social capacities to implement early warning systems. Vulnerability assessment contributes to identify these limitations and therefore provides crucial information to policy development.
- To realise the full potential of the available science in forecasting and warning, additional effort is required. Understanding of the spatial and temporal patterns of drought impacts and socioeconomic trends, needs to progress further to increase the use of forecasts.
- Considerable investments in drought monitoring systems, data and (institutional) infrastructure are necessary across all regions.
- Drought forecasting and warning contributes to the effectiveness of development policies on access to water and food security by ensuring that investments made will not fail under drought conditions. For example drought response actions such as increased efficiency in water use or recommendations on the type of crops to cultivate, also contribute to environmental conservation, rural development, and climate adaptation.
- A consensus on the need to emphasise the social component of early warning was reached when testing the DEWFORA early warning system protocol among experts from 18 countries, underlining that this requires significant attention as do the technological developments of drought forecasting.

“What’s the use of having developed a science well enough to make predictions, if in the end, all we’re willing to do is stand around and wait for them to come true?” (Sherwood Rowland, Nobel Laureate, said upon accepting the prize)

Why do we need drought forecasting and warning?

The science of drought monitoring, weather forecasting and climate change is advancing every day. At the same time worldwide losses due to drought are increasing and the tragic consequences of droughts in Africa are a reality. There is a need to manage droughts more effectively and develop protocols to understand drought vulnerability and to cope with the environmental, economic and social impacts of drought.

Early warning systems and the use of local knowledge can contribute to decreasing drought impacts, make planning more robust, and reduce social vulnerability. Early warning systems also provide an additional opportunity to planning adaptation to climate change.

United Nations drought policy

2004

The United Nations International Strategy for Disaster Reduction (UN ISDR 2004) highlights the challenge of the implementation of early warning. Failing, or non-existent drought mitigation and management policies, as well as the lack of institutional frameworks, makes implementation difficult. DEWFORA shows that there is considerable diversity in the institutional frameworks and social capacities, and synthesizes the lessons to develop an effective drought management protocol that may be used across Africa and provides insights to European countries.

2013

The Final Declaration of the High Level Meeting on National Drought Policy (UN HMNDP) that was held in Geneva in March 2013 encouraged all Governments around the world to develop and implement National Drought Management Policies, consistent with their national development laws, conditions, capabilities and objectives. A key element in the recommendations was to promote greater collaboration to enhance the quality of local/national/regional/global preparedness for drought.

A protocol for developing early warning systems

Drought forecasting and warning provides a key strategy in support of preparedness for drought, but effective implementation can only be achieved through adopting a protocol that includes both the science that is required through to policy development and institutional responsibilities. We propose an effective protocol to develop early warning systems that address the scientific knowledge and the social capacity to use the knowledge. The four main questions addressed are:

What is the science available?

What are the societal capacities?

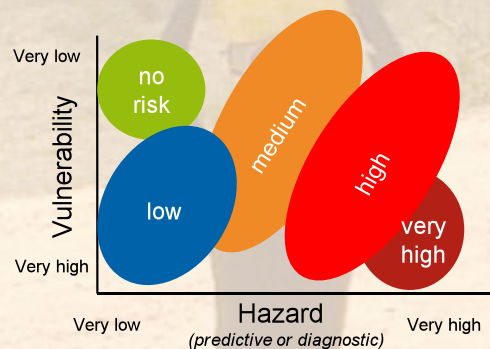
How can science be translated into policy?

How can society benefit from the forecast?

- What is the science available? 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.

Understanding vulnerability for effective policy

Vulnerability assessment is crucial to identify relief, coping and management responses that will reduce vulnerability and contribute to a more resilient society. The need for vulnerability assessment is addressed in DEWFORA by analysing a large number of indicators related to drought impacts and with synergies to long term sustainability. The DEWFORA conceptual framework is represented in the figure.



Drought vulnerability information reinforces the policy process of:

- Improving the implementation of Integrated Water Resources Management (UN Conference on Sustainable Development (Rio +20)).
- Promoting sustainable development by mitigating the effects of drought and promoting national drought policy (UNCCD, COPI0).
- Delivery and application of suitable science-based climate prediction and services (decision of governments to create the Global Framework for Climate Services (GFCS)).

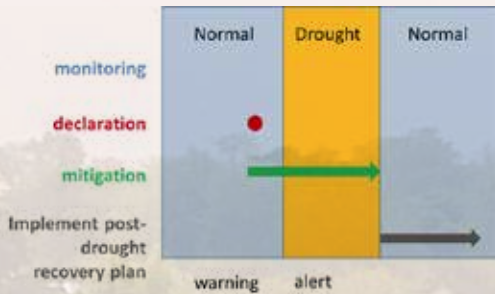
Practical warning to avoid damage

Based on the assessment of vulnerability 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 continuity of urban water supply, while a farmer could change the feeding plans for livestock according to expected crop production.

The DEWFORA protocol gathers advance information on vulnerability and pending hazard so that early warnings can be declared at sufficient lead time and drought mitigation planning can

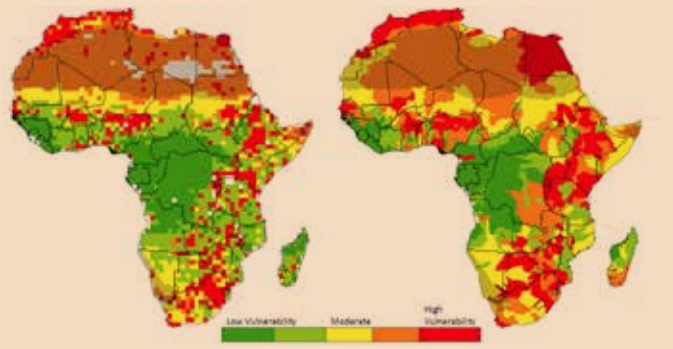


be implemented at an earlier stage. The concept is summarised in the figure below and entails the issuing of a drought warning before the effects of the drought manifest themselves.



Drought vulnerability on the Pan-African scale

The DEWFORA team evaluated drought vulnerability of agricultural systems on a Pan-African scale (see figure below) in a gridded model (left map) and in a sub-basin model (right map). The gridded model and the sub-basin model 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).



Implementation: public support and challenges

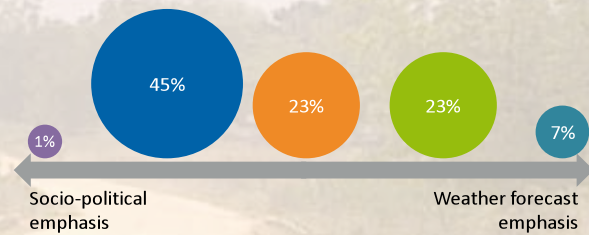
Public involvement and support for drought management options play a major role on motivation to change. The points of view of irrigation farmers, local water managers, international policies, and environmental organizations need to be taken into consideration. The DEWFORA protocol pays special attention to their motivation and barriers to policy implementation.

Drought planning is an important way to reduce disruptions due to recurrent lack of precipitation and water shortage, while potentially generating positive outcomes. Current planning responses to drought in Africa are submerged in challenges and complex interactions between climate and society and dynamic changes in society and institutions.

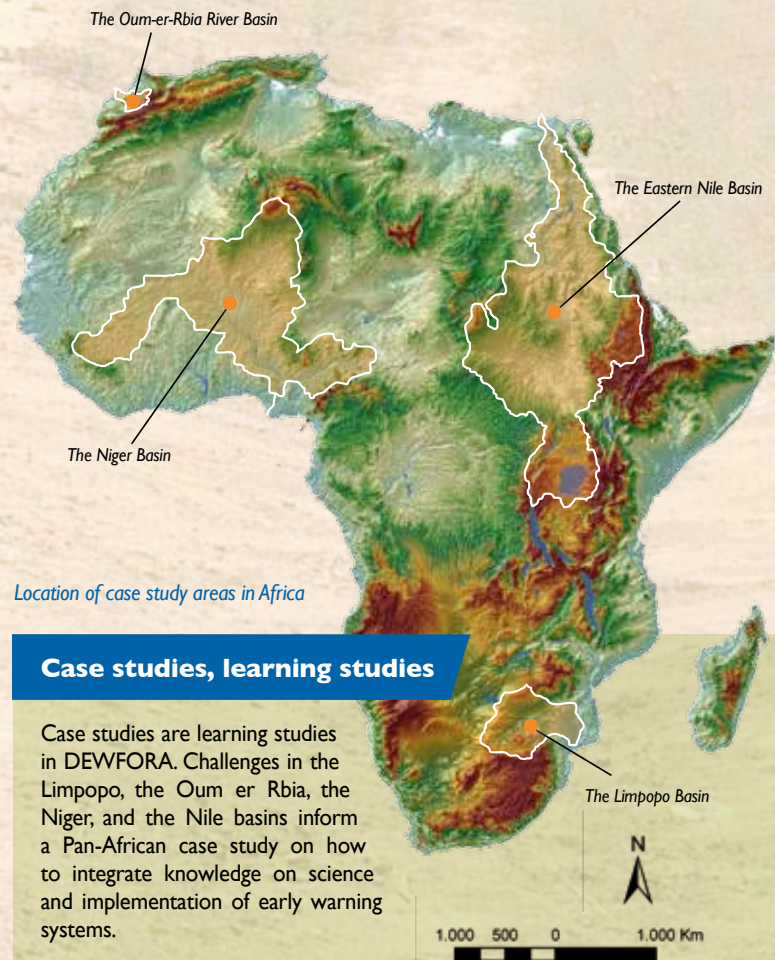
A public view of an early warning system

Drought forecasting systems create new opportunities for reducing drought vulnerability and improving drought management in Africa. However, they require the interaction of many stake-

holders, experts, disciplines and efforts, as well as leadership and political will. The DEWFORA team has gathered information in Africa and Europe trying to understand what is behind people's perceptions of early warning systems, by analysing responses of 40 relevant experts from 18 countries. The resulting figure below shows their view of where the emphasis should be in the implementation of early warning systems. Efforts to improve forecasting are required but focusing only on those would be wrong and social and policy embedding is equally if not more important.



Preliminary results show how social knowledge influences implementation, reinforcing the need for developing a common language between the scientists and the people that will use the forecast. A better understanding of people's behavioural barriers helps inform the next steps of public action and deliberation on drought mitigation policies.



The DEWFORA project

The main aim of the DEWFORA project was 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:

1st of January 2011 - 31st December 2013

Type of R&D:

- Collaborative project
- Small to 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

How to move forward?

The future is uncertain. However, it is clear that fundamental aspects of health, survival and development of people in Africa depend on water and food security. The need for mitigation and adaptation to drought and climate change is enormous. In the beginning of the 21st century we need to move from the wish to the will. Answers and opportunities can only be provided in integrating people's knowledge and cooperation.

The DEWFORA case studies have provided clear messages for moving forward and recommendations for improving monitoring and data collection, capacity and awareness, organizational structures, and developing a long term drought strategy.

Specific actions that will contribute to decrease the vulnerability of people and ecosystems to drought and climate change include:

- Facilitate data sharing by improving institutional harmonisation between policy and decision makers.
- Make data from National Meteorology Agencies available for education and research purposes at minimal costs. (Urgent need)
- Continue the efforts to improve weather forecasts. However, there is a need to simplify, downscale and package the information to cater to the users' needs.
- Integrate the components of drought monitoring systems, coupling multiple climate, water and soil parameters and socio-economic indicators to fully characterise drought magnitude, spatial extent and potential impact.
- Set up campaigns to increase public awareness especially where a country is approaching a drought season.
- Take into account traditions and customs, the know-how, the objectives and practices of farmers.
- Improve drought vulnerability assessment and the thresholds that trigger drought alerts and management actions.
- Connect institutions involved in drought mitigation and adaptation to the formal frameworks concerning drought.

Participating organisations/countries

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

Further information, scientific background and contact

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

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