Improving drought forecasting for Africa

Many economies and environments across Africa are vulnerable to drought, but better forecasting can help mitigate its effects. **Dr Micha Werner** reveals plans to improve advance warning systems

Firstly, can you explain the context from which the DEWFORA project emerged?

The project materialised from the need to address uses of forecasting and warning to gain lead time on forthcoming severe weather events. In the flood and water resources community such forecasting and warning concepts have been well established, but such use is less common in the drought community which has often focused on monitoring. The main principle is that if reliable information is provided with a sufficient lead time, action can be taken to mitigate the adverse effects of extreme weather. The lead time with which such a warning is provided should of course be enough for meaningful action to be taken. For flood forecasting the lead time is quite short (typically in the order of days), while for water resources forecasting and drought forecasting this is much longer – often 3-6 months or even into the next year.

Could you highlight some aspects of Africa's drought problem with regards to the scope of the continent's challenges?

It may be easier to first focus on some of these challenges that the project hopes to address. On the scientific side there is the challenge of what we can predict in the face of the variability of weather at the longer lead times typically required by drought forecasting. This must go beyond what we refer to as climatology – otherwise there is no added value. Understanding how the climatology will change is another great challenge, particularly in a continent like Africa where data coverage is low, so even understanding the current climatology is difficult. This latter issue is strongly related to scale – whilst scientists may be forecasting that a drought is happening because there is less than normal rainfall, the farmer on the ground may be using slow responding groundwater resources at the local scale during the critical growing season of the crop he has planted. Addressing these mismatches in scale of information is not easy.

An even larger challenge lies in the area of institutions and governance. Many water resources (rivers, lakes, aquifers) in Africa are transboundary, so not only are there issues on good governance of water at the national level; this in many cases stretches across borders. There are several excellent efforts within the water community in Africa to bridge borders, but the complexity of politics makes this very challenging.

What are the main routes by which you aim to improve existing methods of drought monitoring and forecasting systems?

Perhaps a quote from one of the project partners from South Africa best describes it: "If we can link predictions made by climate models and seasonal models to useful information in, for example, meaningful indicators that provide added value to how users such as local farmers make decisions, then we have made real progress". This is one of the lines through the project – developing ways to describe drought that are useful to base policy decisions on – which is in more difficult than it may appear. Another line through the project is the understanding of how well drought can be predicted at the seasonal and climate scale – and advancing methods where this is not the case.

What impact do you hope the project will have?

We hope to build understanding of how drought forecasting and warning can be effective, in particular to those at policy level, so such efforts are not only institutionalised but also used in effective decision making to cope better with the variability of weather we call drought. DEWFORA will not solve this – but we hope it will contribute. Another more internal (scientific) impact is that we hope it will bring new insight and methods in hydro-meteorological prediction of drought.

There is a focus in the project on bringing research to operations – but this is to the pre-operational stage only. The project does not go beyond the provision of this service; however, at the capacity building level there is such a goal. Through knowledge-sharing and networking – as well as courses that are later transferred to CapNet, for example – the knowledge and material we develop will live beyond the end of the project.

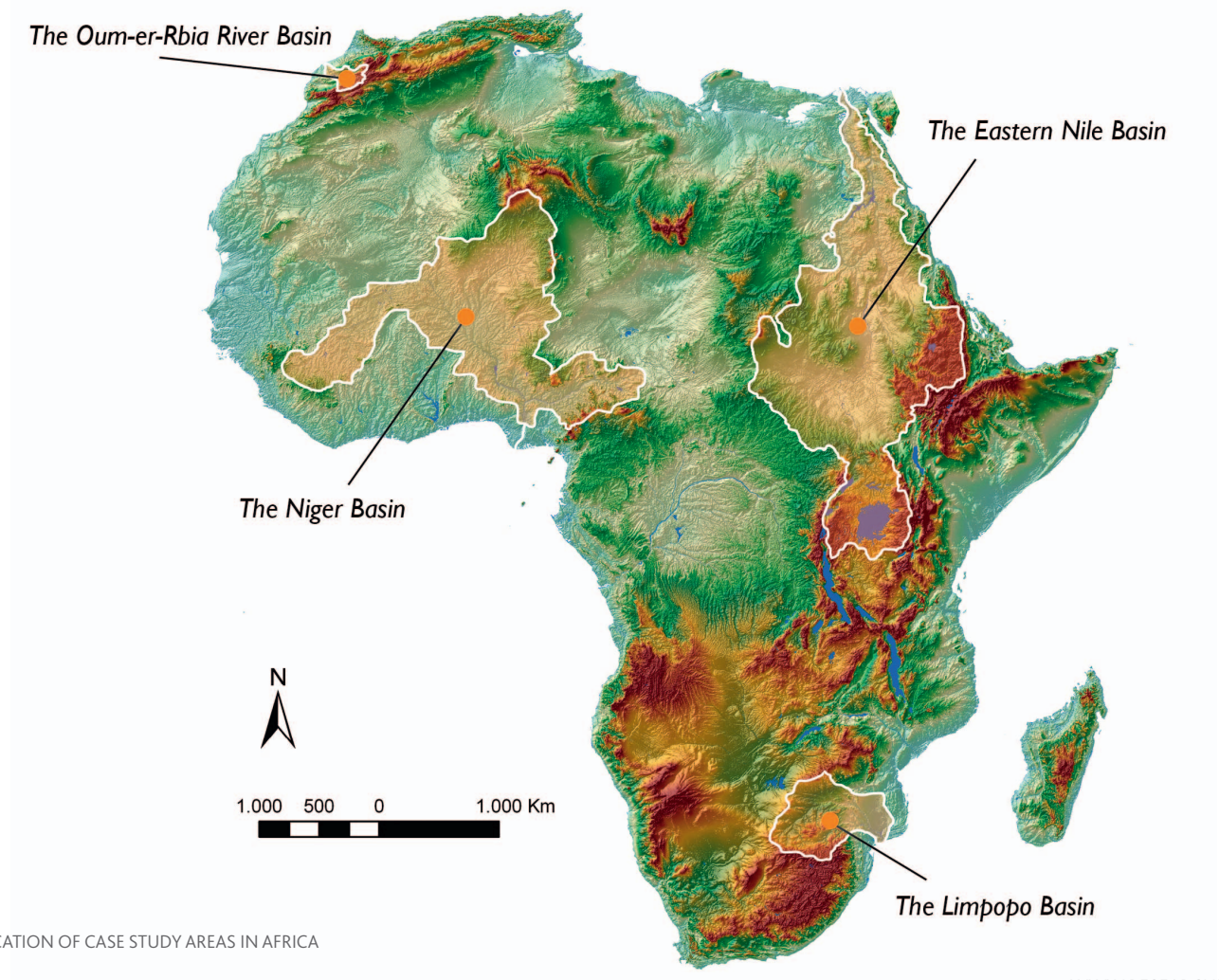
Moving from disaster response to risk management

DEWFORA brings together European and African scientists to improve drought forecasting and warning in Africa. It aims to provide better lead times to aid both preparation and mitigation strategies

DROUGHT IS A major natural hazard in many parts of the world, and Africa – a continent whose population relies so heavily on local agriculture for its food supply – is especially susceptible to its impacts. Drought events have resulted in severe damage to livelihood, economy and environment in many parts of Africa, and climate change is likely to exacerbate existing vulnerabilities with both increased frequency and severity of droughts. Effective risk management – notably advance warning and the introduction of mitigation strategies – can substantially reduce the harm caused by drought; education and preparedness at a local level can help societies cope and recover better from drought impacts. DEWFORA is a Seventh Framework Programme (FP7) research project aiming to improve both monitoring and response to drought in Africa by providing a framework that brings these activities together. By addressing the complete chain of monitoring, vulnerability assessment, advance warning, mitigation and knowledge dissemination, the project hopes to improve lead times with which drought warnings can be issued and thus help reduce adverse impacts through effective alleviation – the project will also look at adaptation strategies to increase the resilience of affected societies.

One of the major challenges in many areas in Africa is what could be called a disaster-response cycle, whereby after a major drought or other natural disaster, so much effort is expended in responding to it that preparation for the next event may be adversely affected, as Dr Micha Werner – project coordinator for DEWFORA – explains: "Just as regions have barely recovered from the previous disaster, the next one hits and the cycle starts again. Preparedness on the other hand helps reduce the impact, and thus also reduces the required response". In many parts of the world forecasting and warning systems are well-established for flood events, but drought research has tended to focus primarily on monitoring. Using recent advances in meteorological and hydrological modelling, DEWFORA aims to help bring the state of the art in drought warning and forecasting into the operational domain.

Launched in January 2011, DEWFORA will span a three-year period. The scale of the project's ambition – with its dual focus on both technical advances in forecasting, and mitigation strategies at policy level – has necessitated an intense collaborative approach across disciplines and organisations, drawing on the combined expertise of leading climate scientists, hydrologists, meteorologists and agronomists. The consortium will also form a research cluster with several other independent EU research projects, including AFROMAISON and EAU4FOOD which address related topics of water resources, agriculture



LOCATION OF CASE STUDY AREAS IN AFRICA

DEWFORA

DROUGHT EARLY WARNING AND FORECASTING TO STRENGTHEN PREPAREDNESS AND ADAPTATION TO DROUGHTS IN AFRICA

OBJECTIVES

To develop a framework for the provision of early warning and response to mitigate the impact of droughts in Africa.

PARTNERS

Deltares (coordinator), The 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**, The 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

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CONTACT

Dr Micha Werner
Project Coordinator

Deltares
Rotterdamseweg 185
PO Box 177
2600 MH Delft, The Netherlands

T +31 88 335 8207
E micha.werner@deltares.nl

www.dewfora.net

DR MICHA WERNER is a Senior Hydrologist/Researcher at Deltares, where he has worked extensively in (operational) forecasting and warning. He also holds a position as Associate Professor at UNESCO-IHE.

and food security in Africa, as well as DROUGHT R&SPI, WASSERmed, CLIMB, and CLICO which focus on these topics predominantly within (Southern) Europe. Moreover, the consortium includes network organisations in Africa – notably WaterNet in the Southern African region and the Nile Basin Capacity Building Network in northeastern Africa. Perhaps most crucially, there will be a real focus on working with African policy makers at both regional and national level: "There is a strong emphasis on dissemination – with regional workshops for policy makers and other stakeholders. Key people in national and regional organisations will be invited to participate in these. The idea is to hold these events close to other events in Africa such as the African Conference of Water Ministers," Werner outlines.

BUILDING A FRAMEWORK FOR SCIENCE AND POLICY

The DEWFORA consortium has set itself a complex and multidisciplinary task. In order to deal with both the technical aspects of the project – reliably predicting how meteorological and hydrological conditions will develop – and the policy issues of mitigation and adaptation, the project has been structured into eight work packages. These include the reviewing of existing capacities in Africa for monitoring, forecasting and early warning of drought: the project will identify weakness and opportunities for improvements. There are separate work packages for assessing vulnerability to drought through newly developed indicators, including expected climate change, for drought forecasting at medium to seasonal time scales, and for early warning of drought. The establishment of scientific exchange with related research projects across Africa and Europe will also have a dedicated work package. Perhaps most crucially, the project will also focus on integrating its advances in six carefully selected case studies – four of which are African river basins (Nile, Niger, Limpopo and Oum-er-Rbia). Finally, it aims to embed new knowledge with African stakeholders through capacity-building programmes.

Comprised as it is of so many thematic elements, new technical ambitions and concrete local case studies, it is vital to DEWFORA's success that connections between these loci are effective and meaningful, as Werner stresses: "As well as scientific advancements, the project does have a clear objective to get things at least to a pre-operational stage. This cannot be achieved in isolation". Covering such a vast area of the African continent, however, presents a practical challenge in terms of managing the project's disparate strands. For Werner, local expertise is the key to success: "What is important in particular for the four case studies in basins across the continent is that we have partners that are local to the basin, have done research there, and have an established collaboration with the other consortium partners. This we have more or less achieved in building the consortium". He admits, however, that mobilising the required expertise "is a challenge we are still working on".

SUCCESS DEPENDS ON LOCAL ENGAGEMENT

While DEWFORA focuses on Africa, it has many links with Europe, as well the U.S. and Australia, and it is hoped the exchange of knowledge and expertise will benefit the drought community as a whole. Ensuring synergy with both scientific and policy bodies across Europe will be key. In one example, an event will be held in Brussels this November which will bring together drought projects and policy makers to help encourage this knowledge exchange. However, it is in Africa that the real and lasting benefits of this project will be felt. The capacity for adaptation and preparedness is lowest in the poorer regions of Africa, but by helping to embed sustainable mitigation strategies, DEWFORA aims to increase the resilience of drought-affected communities. Breaking the historical cycle of disaster-response will not be easy, but Werner is confident that, with sustained commitment, progress can be made: "Can this be achieved in the poorer regions of Africa? Yes, I believe it can. Maybe not overnight. Of course this does not require only knowledge and sound science, but also good governance – particularly in between disasters as it is then that preparedness happens".

It is critical to DEWFORA's success, then, that it engages with policy makers at regional, national and international levels, and helps generate the sustained commitment that will allow new technical concepts in forecasting and warning to be used in meaningful and effective ways. However, engagement at local level will be equally important, as Werner explains: "A good policy is one that is supported by the people in good times, but mainly in hard times. The latter needs local awareness to be strengthened, as nobody will sacrifice something in hard times to achieve a long-term goal they do not understand". In aiming for both the technical advances and the local engagement necessary for more effective drought forecasting, DEWFORA stands to make a significant contribution towards achieving this long-term goal for Africa.