



## Adapting to climate-change induced water stress in the Nile Basin

Flowing through ten countries and climates as varied as tropical rainforest and arid desert, the River Nile provides around 98% of Egypt's freshwater. A crucial resource for all the economies of North East Africa, the river supplies water for drinking and agriculture as well as hydroelectric power. Overall, millions of lives and livelihoods depend on it.

**The Met Office has been working with partners on several projects to help local decision-makers develop climate adaptation strategies for the River Nile. Carlo Buontempo, Head of the Climate Hazard and Impact Process Group at the Met Office explains:**

### What is the scale of the challenge?

Shared by ten countries, the Nile Basin is one of the world's most complex river basins due to its size and varying climate and terrain. As the main source of water in North East Africa, it's also one of the most critical shared water basins on the continent.

Although the Nile Basin countries account for only 10% of the continental landmass,

they accommodate 40% of Africa's population. The region is already faced with a series of challenges: high population growth, rising levels of water scarcity, and deterioration in the hydrological behaviour of the river system. Any future changes in water quantity and quality caused by climate change will have a dramatic impact on the economies and environment of the region.





## How is this problem being addressed?

Firstly, it's vital to get authorities engaged in these issues — on a national and intergovernmental basis. This is because the range of potential adaptation measures is large, while the cost-benefit tradeoffs among the different options are complex.

To help authorities decide what's right for them, tools and information are needed which is where we come in. For example, water managers not only need to consider measures that will have a local effect, but also those — such as the construction of reservoirs or raising of riverbanks — that will impact countries, authorities and populations downriver.

## How does the Met Office fit in?

The Met Office has worked on two projects to provide climatological and hydrological tools and information to help water management in the Nile Basin. The first involved working with the Nile Forecasting Centre — part of Egypt's Ministry of Water Resources and Irrigation (MWRI), and the Danish Hydrological Institute (DHI) — an independent, international consulting and research organisation. It saw our scientists providing information on the amount of water likely to flow into the Aswan High Dam now and in the future. This is important as it controls the amount of water reaching Egypt.

The second project sees the Met Office and DHI working together for the Nile Basin Initiative (NBI) — an intergovernmental organisation committed to the equitable and sustainable management and development of the shared water resources of the Nile Basin. Our latest task focuses on the potential changes to the frequency of drought and flood conditions — two phenomena that would have the most significant socio-economic impacts on the region.

## What is the Met Office's input?

Many current analyses of the impacts of climate change on water resources are based on Global Climate Models (GCMs). While GCMs successfully simulate many features of present day climate and climate variability, their resolution is too coarse to provide reliable estimates of localised changes or feed directly into local impact models. Accurate descriptions of orography and land use are particularly important for hydrological processes where it's essential to capture elements of the water cycle, such as precipitation and run-off.

To help with this, climate scientists at the Met Office Hadley Centre have been using a regional model called PRECIS — or Providing Regional Changes for Impacts Studies to give it its full title — that resolves smaller scale climate processes and provides output at a higher resolution. Taking climate projections

from the GCM and downscaling them using PRECIS provides us with the high resolution output needed for studies such as this. Using these climate scenarios in conjunction with the hydrological model we're able to determine river run-off in the present day and for 2020 and 2040.

## How will the results be used?

By providing relevant information and practical tools, these projects are helping to make sure that developing nations have the best data to hand with which to make informed decisions for their regions.

In the Nile Basin, demand for water is expected to increase due to population growth and improvements in people's welfare. Looking at the potential future demand for water in conjunction with the projected future changes in climate, we've been able to assess the vulnerability of the River Nile and its populations to floods and droughts. This should help those tasked with devising policies to manage water resources and reduce water stress in the Nile Basin, now and in the future.