The low down on high-tech forecasting

WISER is supporting two projects in East Africa that are harnessing technology to transform forecasting reliability and accessibility across the region. Both projects will help people on the ground make informed decisions – and could save lives and protect livelihoods.

Lake Victoria is the largest inland fishing area in the world, yielding a million tonnes of fish a year. The Lake Victoria Basin supports around 25% of the local population[1], with many families in the area dependent on fishing and related industries. Yet fishing here can be dangerous work.

The lack of reliable and easily-accessible forecast information puts many people in danger. Every year, up to 5,000 deaths occur due to accidents on the lake caused by wind and waves[2].

Joseph Omer explains the problems fishermen like him face. “We encounter strong winds, fog, heavy clouds and water spouts. They just show up unexpectedly, making it difficult for us to do our work well. We’re struggling.”

Led by the World Meteorological Organization (WMO), HIGHWAY (High Impact Weather Lake System) is a WISER (Weather and Climate Information Services for Africa) project that aims to improve the early warning of severe weather events across the Lake Victoria Basin. As it stretches across a number of countries, the project is bringing together the National Meteorological and Hydrological Services

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(NMHSs) of Kenya, Rwanda, Tanzania and Uganda, as well as the Met Office, the UK's national meteorological service.

In 2019, HIGHWAY carried out a field campaign – gathering observations from a range of networks and undertaking research flights for a defined period of time - to understand how thunderstorms evolved on the lake and what factors affected their severity. By gaining a fuller picture of dangerous storms, the NMHSs can improve their nowcasting or extremely short-range forecasting. It means that fishermen like Joseph can make informed decisions about when and where to fish.

By disseminating objective and reliable forecasts via local radio and mobile phones, HIGHWAY is improving safety and changing people's lives around the lake. "The NMHSs of the countries bordering Lake Victoria are now regularly issuing early warnings," says Hugo Remaury, Project Officer on HIGHWAY. "That's leading to increased access to weather information and improved uptake by end users."

Jay Wilson, Senior Portfolio Manager at WMO estimates that in Kenya alone, HIGHWAY has benefited 90,600 people directly and 543,600 people indirectly. The aim now is to roll the project out to other developing countries where unexpected weather events can lead to loss of livelihood or life.

A supercomputer for 11 nations

Another recent development under the WISER programme is the introduction of a high-performance computer for the Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC) in Nairobi, as part of the W2-SIP project.

The aim is to enhance information for seasonal forecasting in countries across the region, enabling governments to plan ahead and improve their responses to extreme weather events. By using climate model-based prediction systems, countries can embed objective science into their forecasts, making them more reliable and opening the way to further improvement.

"The impact is transformational," explains Richard Graham, Manager of Seasonal Forecasting International Outreach at the Met Office. "For 20 years, forecasts have been prepared using mainly statistical approaches and including a significant subjective component which has been shown to hinder effective use of the forecast."

The move to objective forecasting, along with a digital rather than a map-based format, means that end users are much more likely to trust forecasts and warnings.

The new high-performance computing platform has 32 computer nodes supported by 64 terabytes of shared storage, with a huge total processing power of 72 teraflops. The team at ICPAC use the computer to create ten-day, monthly and seasonal forecasts, as well as to predict the paths of tropical cyclones and develop early warnings for people and communities that might be affected.

All 11 member states of ICPAC can log in and use the data stored centrally on the computer. They can then access data to generate seasonal climate forecasting for their countries. The computer is also used as a training tool. For instance, meteorologists from the 11 states regularly meet at the Greater Horn of Africa Climate Outlook Forums (GHACOFs) to generate seasonal forecasts for the region. The supercomputer enables delegates to prepare for the capacity building workshops that take place before the GHACOFs begin.

By running models on the computer and generating several forecasts from different initial conditions, the computer enables users to quantify model errors and forecast uncertainties. So, for example, if a forecast predicts the dates of the next rainy season, it will also include margins for error so people can understand the forecast's level of accuracy.

Dr Zewdu Segele, Senior Climate Modelling Expert at ICPAC, has seen the transformation that the computer has brought to forecasting across the region. "The increased computing capacity enhances ICPAC's ability to research and implement new methodologies to improve forecasts," he explains. "Increases in forecast accuracy, for example reliability of estimated onset and cessation dates, generally improve the use of weather and climate services, which positively affects the user community, including farmers." By knowing when the rainy season is likely to begin and end, and by understanding just how accurate the forecast is, farmers can make informed decisions about what crops to plant and when to sow.

As there can be frequent power cuts in the region, the final piece of the jigsaw for Dr Segele now would be a high capacity generator. By having an incredibly powerful computing facility available 24/7, countries across the region will be able to fine tune

their forecasting capabilities and make a huge difference to people who rely on accurate weather information.

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Sources:

[1]https://public.wmo.int/en/resources/bulletin/hiweather-10-year-research-project

[2]https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/business/international/wiser/highway-brochure_final.pdf

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