Q&A

The African Climate Policy Centre (ACPC) advances the roll-out of weather observation systems in African small island developing States

A recent *workshop in the Seychelles* marked the latest stage in a project deploying high-resolution weather prediction and early warning systems across African small island developing States (SIDS). Joseph Intsiful, Senior Climate Science Expert at the United Nations Economic Commission for Africa's African Climate Policy Centre (ACPC) discusses how early weather warnings are enabling local communities to prepare for extreme climate events, while accurate and timely forecasts help safeguard productivity in key economic sectors such as agriculture and fisheries.

Figure 1: Systems deployment in African SIDS

Many countries across Africa are highly vulnerable to the impacts of climate change. Why does ACPC's deployment of these weather observation systems focus particularly on the small islands?

The unique geographical location of the African small island developing States – Cabo Verde, the Comoros, Guinea-Bissau, Mauritius, Sao Tome and Principe and Seychelles – makes these small land masses highly susceptible to extreme weather events including cyclones, hurricanes, droughts and storms.

But it is only by visiting SIDS that you can really understand their vulnerability and day-to-day challenges. Take for example Cabo Verde – it's essentially a desert in the middle of the ocean. Access to water is limited to the extent that almost all water sources come from desalination, a huge challenge not least because of the incredibly high costs involved. Low rainfall makes farming virtually impossible while the island's fishing industry – critical to the economy – is under constant threat from erratic weather conditions, most notably harsh winds.

Already grappling with entrenched poverty and related challenges of food, water and energy security, their resilience is being further

eroded by risks from climate change. As extreme weather events become more frequent and severe, homes, buildings and livelihoods are exposed to even greater risk. SIDS are often given the "broad brush" treatment where their unique yet varying vulnerabilities are overlooked. But their size, geographic position and remoteness combined with ever greater challenges from climate change, make the needs of these islands among the most pressing in Africa.

The high-resolution weather systems we plan to deploy across all SIDS operate at 1 km and can generate very fine details of climate information on variables such as rainfall, temperature, wind and cloud cover. With this information, the islands will be geared up to anticipate and prepare for extreme weather events. However, while the initiative has focused on the SIDS, the project also spans the rest of the continent, where systems operating at 9km will complement older versions with resolutions of 50-100km which are unable to capture very fine-scale features of extreme weather and climate.

What are the tangible benefits of these higher-resolution models?

Typically, weather prediction (and associated observation systems) across Africa have been able to predict only weather in sections of 50-100km resolutions. To put that in context, a system with 100km resolution will show that the weather and climate on an island with dimensions of 50km by 70km is the same in every location across the island and nearby oceans within a 100km domain; this is, of course, not true. Higher-resolution systems generate much more accurate predictions about the local climate. In cases where we have higher variations in surface characteristics – such as mountains and forests – length scales of 1-3 km exist.

With more detailed information, communities are able to anticipate and plan for extreme weather events. Flash floods, for example, leave trails of destruction across SIDS, damaging houses and roads, wiping out crops and often resulting in fatalities. Disaster management agencies know the levels of extreme rainfall that trigger flash floods and, using more accurate information to monitor this threshold, can alert citizens when to take action; with accurate, real-time information a local factory can ensure workers are evacuated and critical equipment is moved to higher ground, while farmers can prepare their fields to manage flows of flood water, helping to protect yields.

SIDS are also highly vulnerable to severe winds, with devastating effects particularly for the local fishing community. More accurate forecasts incorporating communication systems such as radio and SMS can alert fishermen to wind gusts and associated storms, safeguarding vital infrastructure and saving lives.

Figure 2: Climate refugees

Figure 3: Dry lake

Robust climate information can also help climate-sensitive sectors such agriculture cope with increased variability over the longer term; with more accurate information to predict the onset and duration of rains, farmers can decide when to plant and harvest, when to dry crops and look out for the outbreak of pests and diseases that can ruin yields. This information can be used to develop agrometeorological products to measure variables such as soil moisture content, critical in managing the cropping process. With access to high-precision information, farmers can safeguard productivity even in a changing climate.

What lessons are emerging as the project progresses?

What's becoming ever clearer is that IT knowledge lies at the core of effective climate information services. New technology that manages the growing threat of climate risks is vital, but absolutely fundamental are the knowledge and skills to operate and manage these more sophisticated systems. ACPC's initiative is therefore two-pronged; one element focusing on installing more advanced weather systems, the other on training participants to become system administrators. This includes learning how to support forecasters by extracting information and translating it for use in different sectors. Training also covers maintenance of these systems once installed, including running tests to ensure the model is working properly and troubleshooting when a system goes down.

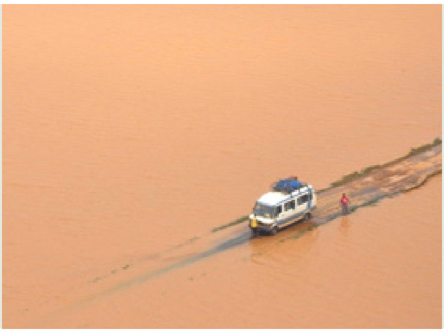

Figure 4: Flooded road

Feedback from participants also highlights that dissemination is key; accurate, localized climate information is useless unless packaged to meet user needs and distributed via the correct channels. The majority of the population across SIDS have, as with the rest of the continent, harnessed the rapid growth in mobile phone usage and access climate information via SMS. Radio also remains a powerful tool for broadcasting information widely. But user preferences are evolving all the time, with many - particularly the younger generation - moving away from SMS and radio to WhatsApp, Viber, Twitter and Facebook. With these shifts in information uptake, we discussed in the workshop how new weather systems can integrate these social media channels, emphasizing once again the importance of continuous dialogue between producers and users to ensure climate information services not only respond to the type of information needed but also that it is delivered in the right way.

The workshop included a session on the Internet of Things, which has been described as a "game changer". Can this really transform climate information services for the African continent?

Vast amounts of data are needed to drive high-resolution models and – owing to the immense computer power required and high associated costs - mining this data has been an ongoing challenge in Africa. However, major advances in information and communication technologies seen over the last few years include innovations driven by the Internet of Things. Broadly speaking, this refers to the growing number of devices – such as computers, mobile phones and sensors – that are connected to the Internet and can send and receive data, often without added costs of human intervention. With the Internet of Things, climate data can be collated and analysed in a much more powerful and cost-effective way: mobile phones, for example, can be turned into weather stations through the use of hundreds of tiny sensors, costing as little as 2 US dollars each.

Figure 5: Atlantic Ocean SIDS workshop

In the workshop our partners from the International Centre for Theoretical Physics explained how the Internet of Things can slash the costs of climate observing systems; each system costs around a tenth of traditional systems and running costs are about a fifteenth. The system that will be deployed in Seychelles this coming April will cover over 100 observing networks for about €30,000 – previously this would have cost in excess of €300,000.

What's the next stage of the project?

In the past, climate information services in Africa have not always been well understood. The average person has little awareness of the benefits on the ground. Part of this stems from an element of mistrust around climate information – unsure of how it is generated, users question its reliability. Weather and climate information for Africa has often been generated by global climate models with low resolution, unable to produce accurate information at the local level.

But the overwhelmingly positive feedback from project participants indicate that there is a high level of interest in these systems and the information they produce. In this African-led process, local communities are central in identifying the problem and playing an active role in designing the systems to solve them; they are highly motivated to sustain the momentum and advance the work done. So, efforts to generate interest and demand have been successful – the challenge going forward will be in mobilizing funding to continue the acquisition and deployment of these weather and climate systems that are proving so effective in helping local communities manage the escalating challenges of climate change.

About ClimDev-Africa

The ClimDev-Africa Programme is an initiative of the African Union Commission (AUC), the United Nations Economic Commission for Africa (ECA) and the African Development Bank (AfDB). It is mandated at the highest level by African leaders (AU Summit of Heads of State and Government). The Programme was established to create a solid foundation for Africa's response to climate change and works closely with other African and non-African institutions and partners specialised in climate and development.

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