ClimDev-Africa

Africa, sustainable development and climate change; the role of climate research

The 5th Assessment Report of the United Nations' Intergovernmental Panel on Climate Change (IPCC) - the most comprehensive view on scientific knowledge of climate change - laid bare the threat of climate change to Africa's recent development gains.

Increasing temperatures, rising sea levels and erratic rainfall put strain on climate-sensitive sectors such as agriculture, water and fisheries; more frequent and intense weather events can rupture the infrastructure supporting vital services including energy, transport and health. By threatening food, water and energy access as well as vital livelihood systems, climate change could severely undermine efforts to achieve the UN's Sustainable Development Goals (SDGs).

For Africa, delivering the vision of the SDGs is intrinsically linked to robust information on the continent's current and future climate. Demand-led climate research can plug gaps in our understanding of changing climate patterns and refine existing climate products and services. From improving climate modelling to sharpening seasonal rainfall predictions, climate research plays a vital role in building Africa's resilience to climate change and keeping the continent on track as it charts its path towards sustainable development.

Addressing the gap: long-term predictions

For Africa's development, climate information and services need to be improved over time; incorporating applied climate research is one of the key ways to achieve this.

With the potential to secure food for the growing population and power economic growth, agriculture is central to Africa's development. In its Agenda 2063, the African Union points to the transformation of the agricultural sector as being a key driver for growth and sustainable development. Yet climate change - most notably erratic rainfall patterns - impacts agricultural productivity and threatens this vision.

Knowledge gaps around longer-term rainfall predictions have been a major barrier for the agricultural sector in responding to these changes. However, integrating climate research into processes that generate subseasonal-to-seasonal[1] (S2S) and longer forecasts has been fundamental in refining vital information on rainfall. Regional Climate Outlook Forums (RCOFs) bring together experts from national and international climate centres who, using their own climate models, predict rainfall patterns over Africa. These predictions are merged to form a consensus used by practitioners and decision makers in agricultural and water resource planning.

Integrating user-driven research

An integral stage in improving the quality of predictions is conducting research within the context of users of the information, on how accurate the predictions proved in practice. For example in Africa, the Regional Climate Outlook Forums (RCOFs) have included sessions where users of climate of seasonal climate information or forecasts give feedback on how the information helped - or not - during the preceding season. Feedback on limitations of the previous seasonal forecast then informs user-led research priority areas to further refine

[1] between two weeks to two months

and improve the seasonal forecasting tools, including models to generate more robust predictions.

This continuous loop of pushing out science-based climate information and pulling in user-based feedback improves the quality of the rainfall predictions. With higher quality information, farmers can decide which seeds to plant and when; scientists and industry experts are able to develop new seed varieties in line with the changing conditions while policymakers are armed with the information they need to make properly informed decisions. From the local to policy level, higher quality predictions strengthen practices and policies to enhance sustainable food production.

> *"When working with climate information that is only 70 per cent accurate, applied climate research is essential for improving understanding of the processes influencing predictability and thus help refine prediction tools to fill the 30 per cent accuracy gap. Only by continually improving and refining climate information can we generate services that are really useful for decision makers."*
> *Dr. Richard Anyah, Coordinator, CR4D*

Improving access to renewable energy

Africa's green energy sector has the potential to provide universal access to safe and affordable energy as well as powering low-carbon economic growth. This supports the SDGs which recognise that access to sustainable, clean energy underpins health, education and livelihoods as well as increasing resilience to climate change.

Variability of rainfall patterns also presents major challenges for Africa's energy sector. Erratic rainfall and prolonged droughts can shrink river flows and drain reservoirs, limiting the provision of clean energy from the country's largest dams, with knock-on effects for food and water security.

More accurate rainfall predictions have helped inform water management strategies of many of Africa's dams, whereby authorities adjust water release schedules depending on the level of rainfall predicted. These strategies, based on more reliable rainfall information, help secure hydroelectricity for the region.

Climate research is also helping to develop alternative sources of renewable energy, in abundant supply in Africa. Models to assess patterns and trends in wind speed, which are shifting in the changing climate, can be used to generate new sources of wind energy. Mapping and modelling carried out in Kenya, for example, has become the gold standard for plans and investments to tap new wind energy resources.

Building resilience

Climate-related disasters are increasing across the globe and according to the IPCC, extreme weather events will become yet more frequent and intense as a result of climate change. Systems which enable communities across Africa to better cope with these extreme events is central to the continent's sustainable development. Building resilience to the growing

impacts of climate change and strengthening capacity to withstand the shocks and stresses of climate disasters is central to the achieving the vison of the SDGs.

Early warning systems help to predict and manage extreme climate events and build resilience to the negative impacts of climate variability and change. The Lake Victoria Basin for example, supporting the livelihoods of nearly 200,000 fishermen, has the largest number of thunderstorms anywhere in the world with storms occurring on average 300 days a year.

Due to climate change, the pattern of thunderstorms within the basin is becoming increasingly erratic, leaving fishermen on the lake – often in small fishing boats – more vulnerable to accidents. All too often, these accidents result in deaths; an estimated 5000 people from the local fishing community lose their lives each year by drowning.

Communities around the basin have worked with climate researchers to collate information such as the number of storm occurrences, incidents of deaths and changes in the strength of lake currents. This information has been combined with existing observations on wind and rainfall patterns to produce a comprehensive Early Warning System. More accurate forecasts incorporating communication systems such as radio and wireless telephone are able to warn fishermen on the lake of impending storms, thereby helping to reduce the number of deaths.

While Early Warning Systems can help communities prepare for extreme weather events in the immediate term; longer-term climate predictions can guide governments and city planners in how and where to invest in climate-resilient infrastructure. This is particularly important for building resilience in Africa's coastal towns, ever more vulnerable to hazards of climate change such as storms and flooding. These events damage infrastructure including housing – particularly informal housing – as well as energy, water, transport and health systems. Sea-level rises add to the vulnerability of these urban coastal communities. However, infrastructure based on accurate climate information can be designed, constructed and located, making these urban centres safer and more able to withstand climate-related risks.

Adaptation: taking the holistic view

Sustainable development for Africa hinges on the capacity to adapt to climate change. Developing effective adaptation policies requires a cross-disciplinary approach, incorporating analysis and synthesis of both climate and non-climate factors. Through an integrated approach that involves both modelling and empirical analysis it is possible to characterize how land use and land cover changes could, for example, enhance surface runoff, and thus amplify impacts of flash flooding even for 'normal' rainfall amounts.

Combining multiple layers of climate and non-climate information is vital for effective adaptation planning strategies.

Data on climate variables such as temperature, rainfall, wind and ocean conditions combined with other information such as land use change, crop yields and surface water flows builds up a holistic picture of climate variability. Integrating layers of climate and non-climate information in this way is critical for adaptation planning strategies.

Linking climate research and services

While the African climate research community is making steady strides to support the continent's pathway to improve the information needed to advance sustainable development, a myriad of challenges remain. One significant barrier is poor coordination between academic institutions, climate research centres and meteorological agencies. Due to this disconnect, new climate tools, applications and products are developed independently of user-based, demand-driven research; this has significant implications for the quality and usability of climate information.

Platforms to facilitate the exchange of climate knowledge and expertise within the African research community, currently being developed, are just one way to enhance co-produced, demand-led climate services and information, vital for Africa's response to climate change and furthering the continent's sustainable development.

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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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