Introduction

The Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC) is a specialized regional centre charged with the responsibility of climate monitoring, prediction, early warning and applications for the reduction of climate-related risks, including those associated with climate variability and change in support of national/regional poverty alleviation and sustainable development strategies.

This is achieved through capacity-building of both meteorologists and the users’ specific sectors; mapping of climate hazards; climate monitoring, prediction and early warning; downscaling of climate products; development and application of the climate tools required by various climate-sensitive sectors, among others, in order to reduce sector-specific climate risks. This article presents some of the lessons learned and experiences gathered from ICPAC since 1989 in the successful use of climate information in the decision-making process.

Applications of products from Regional Climate Outlook Forums (RCOFs)

ICPAC disseminates a seasonal climate outlook at the beginning of each season through an innovative process known as the Regional Climate Outlook Forum (RCOF) that was pioneered in Africa. The RCOF process was initiated by WMO’s Climate Information and Prediction Services (CLIPS) project, in collaboration with National Meteorological and Hydrological Services (NMHSs) and regional/international climate centres, among many other partners.

The RCOF process brings together national, regional and international climate experts, on an operational basis, to produce regional climate outlooks based on input from NMHSs, regional institutions, Regional Climate Centres (RCCs) and international climate institutions. This is done to catalyse linkages among meteorologists, users’ specific sectors, governments, non-governmental organizations and universities, among others. In so doing, the forums ensure consistency in the access to, and interpretation of, climate information.

Through interaction with sectoral users, extension agencies and policy-makers, RCOFs assess the likely implications of the outlooks on the most pertinent socio-economic sectors in the given region and explore the ways of making use of the outlooks. The RCOF process also includes a pre-RCOF capacity-building component for climate scientists to improve understanding of the regional climate processes; improvement of models and prediction of regional climate; verification and assessment of prediction skills; addressing the benefits of RCOF products, etc. RCOF sessions are followed by the regular production and dissemination of 10-day and monthly climate updates. It is expected that RCOFs will be integral components of the programmes of the various institutions and relevant partners.

ICPAC and partners have also undertaken a number of pilot application projects aimed at assessing and communicating examples of the successful use of, and impediments to, seasonal climate prediction products; the development of new methodologies for better production, dissemination, interpretation, use and evaluation of climate information and seasonal prediction products in the reduction of climate-related risks; and the development of new applications tools that enable decision-makers to take advantage of seasonal forecast information.

These have made an enormous contribution to the improvement of the quality of the seasonal
rainfall outlook; interaction of users from various sectors; and overall awareness, education and improved dissemination of climate information and prediction products for early warning and disaster management. Some successful examples are highlighted in the following sections.

Agriculture and food security outlooks

Seasonal regional agriculture and food security outlooks are now released regularly with Famine Early Warning Systems Network (FEWSNET) and other partners (Figure 1), based on ROF products. These are developed through pre-RCOF capacity-building workshops by climate and agriculture/food-security experts. Most areas where climate outlooks indicated drought risks had received below-normal rainfall for two successive seasons, exposing livelihoods to high levels of vulnerability and indicating high risks of food-insecurity levels. Some of the regional governments responded to the projected food deficits through advisories for mixed cropping, shifting of planting locations, changes in crop types (e.g. from maize to millet) and early food imports, among many other interventions.

Human health outlooks

Vector-borne diseases are sensitive to changes in meteorological parameters such as rainfall, temperature and humidity. Climate extremes such as floods and droughts are common in the Greater Horn of Africa (GHA). This makes GHA very vulnerable to outbreaks of malaria, cholera, Rift Valley Fever and many other vector-borne diseases. Other factors that contribute to the high vulnerability of the region to outbreaks of vector-borne diseases include poverty; poor health facilities; a high population rate beyond the coping capacity of available health facilities; deteriorating and poor economies that cannot adequately support the basic health care needs, including health insurance of all members of the society; non-preparedness and/or lack of integrated policies that adequately take the available climate information into consideration.

Recent IPCC assessments have shown that Africa is the most vulnerable continent to climate change. Other studies have also shown that some diseases such as malaria are spreading to areas that were in the past malaria-free, such as the relatively cool highlands.

ICPAC, NMHSs, the World Health Organization and other regional partners now release regular regional malaria outlook information based on RCOF products. Verifications of the released products are undertaken during the following RCOF. As part of the verification assessment, Alfred Langat, Chief Public Health Officer of the Ministry of Health in Kenya, had the following to say about the successes of RCOF products:

Since 2001, when the health sector started participating actively in Climate Outlook Forums (COFs), the Ministry of Health in Kenya has optimally utilized periodical climate information released by ICPAC and the Kenya Meteorological Department (KMD).

Over the last four years, Kenya has not experienced a malaria outbreak. Previously, malaria epidemics occurred annually in the Kenyan highlands after the long rain seasons. With climate information from ICPAC and KMD, the Ministry has been able to prepare adequately to counter the epidemics. Adequate larvicides, insecticides and antimalarials are procured and distributed in time before the predicted climate extremes occur. The health sector in Kenya has therefore benefited immensely from COF products.

Water availability outlooks

Most of GHA may be classified as arid and semi-arid with an uneven distribution of surface-water resources. The quality and quantity of the available water resources have been linked to regional climatic factors. Climate factors also have significant impacts on hydroelectric power, one of the major sources of energy for most GHA countries. Hydroelectric power is highly vulnerable to fluctuations in
rainfall. Droughts lead to low water levels in the dams for electrical power generation, resulting in huge economic losses, loss of jobs and negative economic development. On the other hand, too much rainfall can lead to floods that pose threats of dam breakages and siltation, etc.

Some efforts have been made in the region to reduce climate risks associated with the negative impacts of extreme climate events on water and hydroelectric power resources through good understanding of the climate patterns of the previous events and their linkages with the regional hydrological cycle; enhanced monitoring; early warning; and effective and timely disseminated early warnings. Pre-COF sessions regularly include capacity-building workshops on streamflow forecasting that also address expected risks to regional hydroelectric power generation. Figure 3 gives an example of a simple model that is being used by ICPAC, KMD and the Kenya Electricity Generation Company to provide the company with regular seasonal climate risk information, based on RCOF products.

**Enhanced dissemination of climate early warning information**

Timely availability of climate information in user-friendly language is critical to the effective application of climate products and information.

Most of the users of climate information in GHA are illiterate and living in rural areas where tribal/clan languages are the only mode of communication. Women and children often constitute the sections of the society most affected by climate hazards and need to be appropriately targeted for disseminating early warning information on climate risks.

ICPAC, NMHSs and the media have developed partnerships to ensure that climate information is suitably downscaled, translated into local languages and disseminated in a timely fashion to enable the communities to develop community-specific disaster risk reduction strategies, including integration of indigenous knowledge (see Figure 3).

**Challenges**

Several challenges remain to achieving the successful use of climate information in the decision-making process in Africa. These include:

- Poor observation networks and databases that limit not only the accuracy but also the availability of data and products that are critical for the community-level decision-making process;
- Limited understanding of climate variability and change, including extremes, at regional and local levels;

**Figure 2 — Masinga Dam and the comparison between observed and predicted October-November-December (OND) inflow anomaly (source: ICPAC)**

**Figure 4 — Dissemination of seasonal climate outlook through local students and women’s groups**
Many climate risks have direct impacts on poverty alleviation and sustainable development challenges in the region, yet little research has been done in these areas. Integrated and sector-specific monitoring, prediction and early warning systems are constrained by lack of capacity;

- Lack of education and awareness regarding linkages among climate variability/change challenges, environmental resources availability/renewability; and socio-economic well-being;

- Lack of and/or non-implementation of relevant policies;

- Difficulty in the understanding and use of available climate products, particularly on the probabilistic nature of most climate advisories;

- Non-consideration of cost-benefit assessments in the use of available climate information and prediction products;

- Weak monitoring, modelling, prediction and early warning systems;

- Lack of effective institutional partnerships of NMHSs with national, regional and international users for integrated decision-making;

- Most users in the region are illiterate and still unable to interpret/understand the terminology commonly presented by climate scientists;

- Limited interdisciplinary research that includes hazards, impacts, vulnerability mapping, prediction and early warning;

- Limited human, as well as infrastructure, resources.