DROUGHT MONITORING IN EASTERN AFRICA

SUMMARY

Title
Drought monitoring in Eastern Africa

Service
Seasonal climate outlook for the Greater Horn of Africa countries

End users
Decision- and policymakers from a variety of sectors in the member countries of the Intergovernmental Authority on Development (IGAD)

In Kenya:
County directors of meteorology, hydroelectric power sector, Ministry of Agriculture, Ministry of Water and Irrigation, farming community (large- and small-scale), general public, commerce sector, transport sector, researchers, academia, Red Cross, Ministry of Health, Ministry of Devolution and Planning, private sector

Intermediate users
NMHSs in IGAD member countries, ICPAC, ACMAD, UKMO, International Research Institute for Climate and Society, University of Nairobi

Application(s)
Seasonal forecasting, adaptation to climate variability and change

Models used
– Empirical statistical models
– Models from Global Producing Centres (UKMO, NCEP)

Climate data records used
– Precipitation, air temperature, wind speed and direction, water vapour, pressure, sea-surface temperatures, cloud cover, NDVI, outgoing longwave radiation
– Derived climate indices (e.g., Indian Ocean Dipole)

Satellite observations used
In addition to the use of many satellite data used in Global Producing Centres, the service uses:
– Quantitative precipitation estimates (SEVIRI, TRMM);
– Cloud cover, NDVI (SEVIRI)

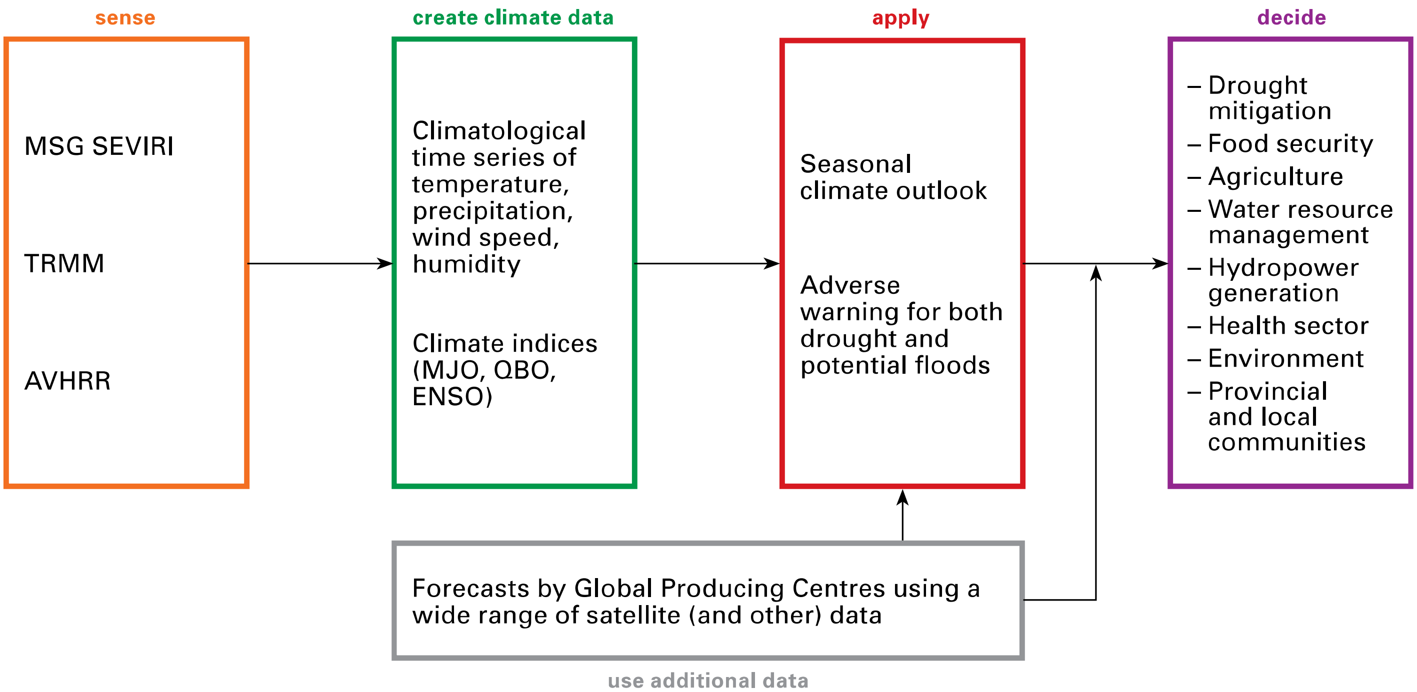
Agencies that produce records
– All satellite operators providing data to Global Producing Centres
– NASA (TRMM), NOAA (AVHRR), EUMETSAT (SEVIRI)

Sustainability of service (demonstration or ongoing)
Operational and ongoing

OXFAM EAST AFRICA

The village chairman, Waridaad, Somalia

INFORMATION FLOW



DESCRIPTION

Context

Drought leads to serious consequences. The severity of drought, often defined by its length, affects many sectors of society, such as agriculture (in terms of crop production and livestock rearing: Figure 1), water resource management, hydropower generation, and the health sector. This can lead to significant economic, environmental and societal loss if preventive or mitigating measures are not taken in time. Seasonal forecasts, together with satellite monitoring products such as a vegetation index, can help to detect drought conditions at an early stage and to assess the likelihood and extent of droughts in the Greater Horn of Africa region.

Satellite-derived sea-surface temperature measurements play a major role in seasonal forecasting in the region, especially when extreme climate events take place. A La Niña occurs when sea-surface temperatures fall below average over the eastern and central Pacific Ocean. This is usually echoed by a similar fall over the western Indian Ocean. The net effect is a decrease in precipitation over most of the Greater Horn of Africa region, which in turn leads to drought. When similar conditions occur in consecutive seasons, the result is a devastating drought. The opposite conditions during El Niño result in increased rainfall over the region. Sea-surface temperatures rise above average over the eastern and central Pacific while similar conditions occur in the western Indian Ocean.

Empirical statistical models usually derived from linear regression analyses make use of independent variables or predictors to estimate seasonal rainfall probability. Those include sea-surface temperature, sea-surface temperature gradients, other climate indicators (such as the Indian Ocean Dipole, the Southern Oscillation Index, and the Quasi-Biennial Oscillation) and outgoing longwave radiation. Seasonal forecasts provided by WMO Global Producing Centres for Long-Range Forecasts (GPC) assist further.

The position, orientation and intensity of the intertropical convergence zone, which is a seasonal weather-determining feature, is easily identified by cloud imagery from the EUMETSAT geostationary satellite, Meteosat. Though such imagery is best for short-range weather forecasts, its strength, activity and evolution in a given season is a good indicator of the likely severity of an impending drought or flood.

The satellite-derived normalized difference vegetation index (NDVI) is a biomass indicator over a region and

Figure 1. Impacts of drought: herdsmen in search of water in a drying well for starving cattle, with vegetation also in dry condition

is obtained from a climate time series derived from the geostationary Meteosat. The NDVI and its anomalies play a big role in the determination of the amounts of vegetation likely to grow. In case of impending drought, vegetation indices from previous season(s) can be used to project the degree of the drought severity.

Flow of information

Satellite data from a wide range of instruments contributing to the WMO Global Observing System are received by various data-processing and numerical weather prediction centres, including GPCs. It is from these centres that the described service receives various datasets relevant to seasonal forecasting. Besides satellite observations and derived products, the service makes use of a variety of climatological data from in situ observation stations.

Long-term datasets of measurements derived from satellite observations of relevant variables are combined with atmospheric models and the model output from GPCs to generate tailored datasets of measurements relevant to drought, flood or general seasonal forecasting. In conjunction with ICPAC, the Kenya Meteorological Department and all other IGAD members organize regular sessions, usually corresponding to the main seasons in the Greater Horn of Africa region. There are normally two rainy seasons in most of the eastern African countries, corresponding to the seasonal shift of the Inter-Tropical Convergence Zone.

The seasonal forecasts start with a meeting known as Pre-COF, which is to prepare for a main meeting, the Climate Outlook Forum. Weather experts share their knowledge and make use of all the available tools, expertise and data to develop a seasonal outlook for the IGAD region.

Pre-COF plays the double role of developing the seasonal forecasts and delivering training to new professionals from the IGAD region. Local and international forecasters from the region thus ensure that professional capacity continues to be built up across the region. During pre-COF, prognoses are also referred to as a consensus forecast, since they involve resources and expertise from many countries.

Pre-COF is followed by the main Climate Outlook Forum usually held on a rotational basis in one of the IGAD member countries. Other partners are from time to time invited to the Forum, including NCEP, IRI, UK Met Office and WMO.

Based on the outcomes of the Forum, the Kenya Meteorological Department immediately calls a wide variety of meteorological application users for a briefing on the seasonal forecast. These include county directors of meteorology and radio and television media organizations. The Department goes a step further and translates the seasonal weather forecast into various local languages which are then aired on television and radio channels. The Department also broadcasts weather briefings via internet radio to local communities in their mother tongues, of which there are so many in Kenya.

Seasonal climate monitoring and forecasting has been going on for a long time in the region. Since the formation of ICPAC in the 1980s, both the Kenya Meteorological Department and ICPAC have always joined hands in developing seasonal forecasts for the Greater Horn of Africa region. Sustainability is achieved via funding from ICPAC member countries and other funding organizations and partners.