SARCOF Review 2017

Climate features SADC

Southern African Development Community (SADC) countries are home to nearly 300 million people. It has fifteen Member States namely Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. SADC is, therefore, the region of Africa from the equator (DRC) all the way to the south shores of the subcontinent and the Island states of Madagascar and Mauritius out in the Indian Ocean, i.e. within 5°N to 37°S latitude and to 0°E to 60°E longitude.

It lies between the South Atlantic and Indian Ocean subtropical high-pressure cells in a region subject to the interaction of tropical easterly and extra-tropical westerly airflows. Both these high pressure cells change their longitudinal positions during the Southern Hemisphere summer and winter. The seasonal longitudinal shifts of the subtropical high-pressure cells have a direct effect on the weather systems over Southern Africa. Rainfall in southern Africa also comes from evaporation over the Indian Ocean. Moisture in the air is generally higher in the northeast of the region and lower in the southwest. Rainfall also increases towards the equator. Generally, there tends to be more rain in DRC, Tanzania and northern Mozambique, and less in Namibia into Botswana.

Rainfall is seasonal throughout most of the region. A five- to seven-month wet season occurs during summer (roughly November to April). The main systems that result in the distribution of rain in both space and time in the subregion are the monsoon trough, also commonly referred to as the Inter-Tropical Convergence Zone (ITCZ) and transient westerly cloud systems associated with cold fronts that regularly traverse southern Africa generally supports the former. The ITCZ is a zone of intense rain-cloud development created when the southeast trade winds (from the southern part of the region) collide with the northeast Monsoons (winds from the north). The movement of the ITCZ southwards away from the equator marks the start of the main rainy season in the southern hemisphere. The ITCZ is complemented by tropical upper troposphere troughs and tropical-extra-tropical interactions all of which singly, or in combination, spawn rain-producing clouds bands. Rainfall over Southern Africa is also associated with global Sea Surface Temperatures (SST) patterns in the tropical eastern Pacific Ocean and elsewhere among others. The onset of warm/cold phases of the El Niño/Southern Oscillation (ENSO) phenomenon tends to be associated in decrease/increase in Southern Africa's rainfall, leading to drought/flood-induced disasters in the region. However, El Niño/ La Niña affect the northernmost section, such as Tanzania in opposite manner to the rest of SADC. It is also important to note that extremes in weather and climate do also occur under neutral SST anomalies in the eastern tropical Pacific, i.e. under neither El Niño nor La Niña conditions.

Over the equatorial belt across the southwest Indian Ocean, within the influence of the ITCZ, tropical cyclones form. Their devastation on the communities is often quite dramatic. For instance, in 2000 the devastation of tropical cyclones Eline captured the mind of many due to extensive media interest. The rain-producing westerly cloud bands rooted in the troughs emanating from mid latitude weather systems, at times pushes northwards sufficiently to interact with ITCZ creating ideal conditions widespread rains over southern Africa. This occurs more frequently in the good summer rainfall seasons.

A middle level atmospheric anticyclone between three and six kilometers above sea level largely centred over Botswana, commonly referred to, as the Botswana Upper High (BUH), is an anathema to good rainfall distribution. The frequent occurrence almost always results in drought in some countries of the region. In some instances, like an expanding balloon, it tends to push the rain-bearing ITCZ and active westerly cloud bands out of the region and over the Indian Ocean. This is part of the subtropical high-pressure system, which will have failed to migrate sufficiently southwards as is generally expected in the summer months.

SADC is prone to adverse impacts of extensive and recurrent weather- and climate-related hazards, which invariably lead to disasters. The South West Indian Ocean tropical cyclones and severe tornado-like winds which associated the heavy rainfall produce flooding, lead to serious property and life damages. The region experienced other vagaries of weather such as frost and snow in parts of South Africa and Lesotho. The weather and climate hazards oftentimes constrain growth of GDPs of regions. Thus the understanding and multi-timescale prediction of the trends of these hazards is critical to sustainable socio-economic development.

Exposure to a number of risks resulting from floods, droughts, crop and livestock pests and disease, economic shocks at household and community levels and political risks/conflicts that necessitate humanitarian assistance to millions of people. The compound and contiguous nature of the risks mean that the ability of the vulnerable population to cope gets more eroded with each hazard episode. Vulnerability assessments in Member States have indicated that, even in good rainfall years, millions of people continue to require emergency aid, usually among the same populations year after year.

Health sector is sensitive to climate since some studies underlined the spread of the malaria-carrying anopheles female to parts of Namibia and South Africa which until recent times, were spared.

The variation in the climate, climate change and other environmental systems influence agriculture, water resources, power utilities, disaster risk management, and health, among others in fundamental ways. Thus there is need to find ways to efficiently and effectively apply climate information and prediction services in Africa which remains highly vulnerable to the adverse effects of climate change and climate variability. This tends to invariably hinder socio-economic development. There is, therefore, need to address this inadequacy since sustainable human development fundamentally demands adequate food, water, clean air and shelter, among others. .

BACKGROUND SARCOF

The world-wide Regional Climate Outlook Fora (RCOF) were conceived from a workshop entitled “Reducing Climate-related Vulnerability” held in, Victoria Falls, Zimbabwe, October 1996. One year later, the Southern African Regional Climate Outlook Forum (SARCOF) is birthed and the first forum was held in in Kadoma, Zimbabwe, October 1997.

SARCOF is coordinated by the SADC Climate Services Centre (CSC) in Gaborone, Botswana, formerly Harare Drought Monitoring Centre (DMC) and hosted by any National Meteorological and Hydrological Services (NMHS) in the SADC Member States.

In addition to SADC NMHS, the collaborating partners include the World Meteorological Organization (WMO) and United Nations specialized agencies. National, regional and international research institutions such as the Inter-Government Authority on Development (IGAD) Climate Prediction and Applications Centre, the African Centre of Meteorological Application for Development (ACMAD), the United Kingdom Met Office (UKMO), the International Research Institute for Climate and Society (IRI), the National Oceanic and Atmospheric Administration (NOAA), Météo-France, the Beijing Climate Centre (BCC) and the Australia’s Bureau of Meteorology (BOM) provide valuable inputs into the forecast process including observed SST. The SARCOF caters for all the 15 SADC Member States.

Since 1997, it has been held annually during the last two weeks of August inclusive of the pre-SARCOF Climate Expert training. Mid-season update is held in December.

The SADC CSC in partnerships with international and regional stakeholders has developed a mechanism for beneficial application of climate information and prediction services in a gamut of climate-sensitive socio-economic sectors. Among the initiatives, spearheaded by SADC CSC and partners is the Southern Africa Regional Climate Outlook Forum (SARCOF) process. SARCOF has over the years successfully paved way for involving the user community in the seasonal forecast process. This has been made possible through efforts at the SADC Climate Services Centre (CSC) to maintain a unique partnership with research scientists, universities, national, regional and international climate centres worldwide.

The SARCOF process

SARCOFs provide platforms for Climate experts and climate information users to:

- be trained on the art of science on forecasting system and its interpretation;
- discuss on the current climate status;
- exchange views on scientific developments in climate prediction;
- develop consensus-based regional climate outlooks that can feed into national climate outlooks produced by NMHSs; and
- engage in climate information user-provider dialogue.

An important aspect of SARCOFs is the facility to bring together experts in various fields, at regular intervals, operational climate providers and end users of forecasts in an environment that encourages interaction and learning.

Capacity needs

The CSC needs to increase the capacity of SADC NMHSs in seasonal forecasting skills through the SARCOF process and on-the-job training to seconded staff. This is in an effort in contributing to build capacity in the region among the professional and technical staff to monitor and forecast drought, floods and other extreme climate events that meet with the user requirements.

The attachment of these professionals will help in developing the capacities of their NMHSs in monitoring and forecasting climatic trends, especially extremes such as drought, floods, etc. This will make the experts respond more adequately to the requirements of the ever-expanding national user communities. The objectives of the capacity building programme are among the following:

i. to enhance the capacity of the SADC national Meteorological Services in data processing, diagnosis, seasonal climate prediction;
ii. to carry out applied research on climate applications;
iii. to generate and publish advisories and bulletins such as seasonal; and
iv. to improve producer-user interface in order to tailor-make products.

User involvement

The users benefiting from the SARCOF are true stakeholders, contributing to the organization and growth of the sessions, thus ensuring their sustainability, and applicability to meeting user needs. SARCOF attracts the participation of climate practitioners and decision-makers from sectors including:

- Agriculture and food security
- Water resources
- Energy production and distribution
- Public health
- Disaster risk reduction and response
- Outreach and communication

In this regard, disaster risk management sectors, agriculture and food plans are now regularly produced based on the climate outlooks after SARCOF in SADC. This information is very important in planning food grain reserves and distribution. Needs of other specific sectors, such as the Malaria Control also hold Malaria Outlook Forums (MALOFs) in conjunction with SARCOF.

In general, many decision-makers, from a variety of socio-economic sectors, right up to the highest levels of government take into account the SARCOF and its related products as major factors in their various plans. These include agriculture extension services for food security planning and others organisms which present their experiences in applying seasonal climate prediction. Close interaction between the providers and users of climate information and products of the process has enhanced feedback from the users to climate scientists, and has catalyzed the development of many user specific products.

Verification of the SARCOF Forecasts

Many societal and economic systems are vulnerable to the impacts of climate variability and change. Decision-makers require high-quality, reliable, timely information on current, predicted and projected conditions for safety and security, and for adaptation strategies and measures. The requires that we evaluate and verify the forecast to assess their applicability. In this context, since the SARCOF session in 1997, there have been some changes in the content, methodology and presentation of the consensus forecast outlook for the southern Africa. Forecast evaluation schemes that reward or penalize the forecast based on likely user response to the forecast were used for SARCOF products. For instance, a forecast of normal to above normal with above normal observed is considered a good forecast because of correct forecast bias while a forecast of normal to above normal with below observed is considered a poor forecast because of incorrect bias and a forecast of above to normal with below observed is considered a false alarm or worse forecast.

A forecast with confidence in either above or below is not rated in the case of a normal event, because normal is always at least the second most-likely outcome. The analysis tried to focus only to the extreme categories. From ongoing studies, SARCOF forecast products have performed well 2001-2016. For instance, a positive trend of 13% of hit rate (HR) has been observed (62 to 75%) on OND period and 20% on JFM season (68-88%):

- A reduction of False Alarm Ration (FAR) of 10% has been noticed (35 – 25%) on OND period and 15% on JFM period (33-18%); and
- Certain areas appear to perform better than others, potentially due to erratic tropical cyclone activity.

The verification of the consensus forecast maps for seasonal rainfall issued during the 15 years (2001-2016) has shown improvements in the accuracy of SARCOF products. It may be important to mention that consensus forecasts were able to accurately indicate the below-normal rainfall (2015/16) and above- rainfall (2016/17) over most of the Southern Africa. This has enhanced the profile of SARCOF, at least in the SADC region.

SWOT Analysis

SWOT (Strengths, weaknesses, opportunities and Threats) analysis of the SARCOF activities are presented below.

(S) Strengths:

- Countries of the region with nearly similar climatic characteristic and large agrarian community have nearly similar requirements of seasonal and sub-seasonal forecast outlook,
- NMHSs of the region have long experience in providing weather services and have started extending climate services. Most of the countries have density (spatial) of the observational network is in accordance with WMO standards
- Seasonal and sub-seasonal forecast products are readily available from WMO RCCs, GPCs of LRF, and other climate research centres.
- SARCOF activity has been conducted every year since 1997
- Significant improvement in the understanding and predictability of the climate variability of the region due to long global and regional research efforts.
- Opportunity to create new products to comply with the end user's requirements
- Collaboration among met services and climate research centres/ institutions has created incentives for development and advancing the services
- Demand for NCOF in the country and sub country scales from local governments and user sectors.

(W) Weaknesses

- Climate services activity is new area for some countries and there is lack of general awareness about the existing of such services.
- Lack of funding from government (because not sure of benefits)
- Limited infrastructure and expertise (particularly in respect of seasonal prediction, which either absent or require further development) in some countries for extending the climate services.
- Non availability of long period, high resolution, and quality data bases.
- Low model skill for seasonal prediction as smaller spatial scale.
- Lack of coordination with end users (from various sectors like water, agriculture, energy, transport, etc,); messages also might not be understood by the end users.
- Lack of clear guidelines for fine tuning of SARCOF products for sector specific uses.
- Appropriate tools for verification of consensus products yet to be developed.

(**O) Opportunities**

- Keen interest from the NMHS and user sectors is an opportunity to develop sustainable SARCOF services
- Success in providing reasonably accurate climate forecast outlook in previous years (in particular, below-normal rainfall (2015/16) over the region and above-normal rainfall during 2016/17) has enhanced user confidence in SADC CSC and NHMSs ability to provide forecasting information/climate services about extreme events
- Opportunities to develop sector specific SARCOF products.
- The SARCOF activities are beneficial for the NMHSs for improving climate services at national level (Success in SARCOF activities will help NMHSs to demand more funding from government)

(**T) Threats**

- Lack of high resolution, long period and quality data reduces opportunities to develop tools for better understanding and prediction of the climate variability at various spatial scale
- Maintaining weather stations and expanding its scope to include climate observations.
- Rules and legislation might hinder development of climate service and data direct sharing
- Legal responsibility issues often unclear when weather/climate information is disseminated (is the situation different for probabilistic vs deterministic information?)
- Entry of private companies in the climate services.

Sustainability of SARCOF

The SARCOF process has facilitated a better understanding of the links between the climate system and socio-economic activities. Consequently, there is an increasing demand for climate services in SADC. Efforts are ongoing to raise awareness that climate information, including short-range climate predictions, is an essential element in mitigating against the impacts of climate variations. SARCOF has fostered interactions and exchange of information between the climate scientists, practitioner of climate services and the user communities, especially at decision making level. More importantly, they have facilitated the mainstreaming of regional cooperation and networking, and effectively demonstrated the immense mutual benefits of sharing of information and experience. Based on the discussions among the climate experts, experts from user sectors and other participants of the main forum and user forum meetings of SARCOF during the last 20 years (1997-2017), following points are important for further acceptability and usability of the SARCOF products.

- Development of high resolution and quality data bases over the region for better climate monitoring as well as bias correction and verification of climate forecasts.
- Make the process of preparing the consensus forecast map from various forecast inputs to be objective as much as possible.
- Skill map of such objective methods available for improving confidence in using the consensus forecast products
- Standard tools for verification of consensus forecasts
- Mechanism to update the consensus forecast regularly (say every month). An expert team of focal points from each NMHS lead by CSC can generate the forecast.
- The seasonal forecast to be supplemented by sub-seasonal/monthly climate forecasts.
- Conducting capacity training workshops on other topics such as the construction of long time series of gridded climate data over the region, extended range prediction, climate applications and climate impact assessment
- Providing increased interaction with the user community and generation of tailored climate products for the users.
- Providing specialised capacity building workshops for user community,

Taking into account the above, the SARCOF Process and its Sustainability was put on high priority by SADC Ministers responsible for Meteorology noted that the SARCOF products are important decision tools for the benefit of multi-sectoral user communities. The SARCOF products are input to NMHS seasonal forecast process. These seasonal

forecasts are used for decision-making and planning across multi-sectoral socio-economic development in Member States. SADC Ministers, therefore:

(i) directed SADC Secretariat to put in place measures that would attract necessary resources for organizing the SARCOF process; and

(ii) urged Member State to fund the participation of their experts in the SARCOF process in order to ensure the sustainability of the process as it is important decision tool that immensely benefits planning in many sectors of socio-economic development.

However, in the interim, Ministers directed the Secretariat was engage partners, in order to mobilize the needful resources to strengthen and sustain the SARCOF process.

WAY FORWARD

Prior to the implementation of the SARCOF, though the region is prone to climate extremes like droughts, floods, heat and cold waves etc. many NMHS from south Asia were not having either dedicated division for issuing seasonal or sub seasonal forecasts or capacity and infrastructure to generate these forecasts. Therefore, the proposal to conduct SARCOF was well received by these NMHS. After 20 years of existence of SARCOF and associated capacity building training workshop in seasonal prediction, now these NMHSs have not only gained some capacity to generate seasonal forecasts but also have started to issue seasonal forecast for the respective countries regularly. So this enhanced interest in the seasonal forecast has resulted in the active participation of all NMHS from the region in the SARCOF activities.

Plans are underway for the next SARCOF forum meeting (SARCOF-21) for the austral summer rainfall season will be hosted by Botswana the last week of August 2017. Thus importance given by the NMHSs to the SARCOF activities and their active participation in the meetings form the most important basis for sustenance of SARCOF. Extra-budgetary resources are required to support for participation of experts in the SARCOF activities from other NMHS from the region and invited experts and users, etc.