FOCUS-AFRICA

Full-value chain Optimised Climate User-centric Services for Southern Africa

3rd STAKEHOLDER WORKSHOP
Focus on South Africa & Mauritius

1-2 June 2022, Pretoria, South Africa (hybrid)

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Contents

Acronyms 2
1. Introduction 3
   1.1. Overview 3
   1.2. Objectives 3
   1.3. Expected outcomes 4
2. Information about participants 4
3. Contents 7
   3.1. Workshop Programme 7
   3.2. Part 1: Focus on South Africa 7
   3.3. Part 2: Focus on Mauritius 12
   3.4. Part 3: NMHS Capacity Building Session 16
4. Conclusion 20
Annex 1: Workshop Agenda 21
Annex 2: Poster of the project 25

Acronyms

ACMAD	African Centre of Meteorological Application for Development
ASAP	Anomaly Hotspots for Agricultural Production
BSC	Barcelona Supercomputing Center
CEB	Central Electricity Board
CS/ CSL	Case Study/ case Study Leader
CSC	Climate Services Centre
CSIR	Council for Scientific and Industrial Research
DCCMS	Department of Climate Change and Meteorological Services in Malawi
CWA	Central Water Authority
DALRRD	Department of Agriculture, Land Reform and Rural Development (South Africa)
DARD	Department of Agriculture & Rural Development (South Africa, North West Province)
EC	European Commission
ENSO	El Niño-Southern Oscillation
EDF	Électricité de France
FA	FOCUS-Africa, Full value-chain Optimized Climate User-centric Services for Southern Africa
FAREI	Food and Agriculture Research and Extension Institute
H2020	Horizon 2020
IA	Irrigation Authority
MO	United Kingdom Meteorological Office
NMHS	National Meteorological Hydrological Services
Q&A	Question and Answer
SADC	Southern African Development Community
SFWF	Small Farmers and Welfare Fund
SSSA	Scuola Superiore Sant'Anna
TARI	Tanzania Agricultural Research Institute
TMA	Tanzania Meteorological Authority
WEF	Water-Energy-Food
WEMC	World Energy and Meteorology Council
WMA	Wastewater Management Authority
WMO	World Meteorological Organization
WP/WPL	Work Package/ Work Package Leader
WRU	Water Research Unit

1. Introduction

1.1. Overview

FOCUS-Africa (FA) project's main objective is to demonstrate the full value chain of climate services in the Southern African Development Community (SADC) region in four key sectors: agriculture and food security, water, energy, and infrastructure. The full value chain of climate services will be demonstrated by piloting eight case studies in five countries involving a wide range of uses and stakeholders. FOCUS-Africa project began implementation in September 2020.

Planning and organizing stakeholders workshops, as part of the project's Work Package (WP) 1 activities and in collaboration with other WPs, is instrumental for collecting inputs from internal and external entities that are engaged in the development of the FOCUS-Africa climate services. Workshops are being organized approximately every eight months, each time featuring at least one of the countries involved in the case studies. Depending on the travel limitation imposed by the COVID pandemic, the workshops are hosted virtually or in person in the focus country. In the latter case, online access is organized too, to allow for a broader and inclusive participation.

The first workshop took place virtually in November-December 2020 and had one day dedicated to the FOCUS-Africa external stakeholders, focusing on South Africa and the related food security case study. For the second stakeholder workshop, Tanzania was selected as the theme country, and the workshop was co-organised with the Tanzania Meteorological Authority (TMA) as the institution mandated to provide climate services in the country. The workshop focused on three sectors: agriculture and food security, energy and infrastructure.

The third Stakeholder Workshop took place in Pretoria (South Africa), 1-2 June 2022, in a hybrid mode. The focus was again on case study 1 on food security in South Africa, and the wider region, as well as around case study 8 on water management in Mauritius. The workshop brought together the consortium members, close partners, advisory board (AB) members, European Union (EU) officers, and local stakeholders in South Africa and Mauritius to better understand the local needs and requirements for related case studies in food security and water. The workshop explored local gaps, opportunities, and activities especially in South Africa and Mauritius, but covered broader regional perspectives whenever possible.

It should be noted that the third stakeholder workshop was run immediately following an internal project 2-day meeting, at the same venue. As a result, some of the statistics and commentary in this report may present partial overlap from time to time.

1.2. Objectives

The objectives of the stakeholder workshop, as agreed by the widely represented project organizing committee, were to:

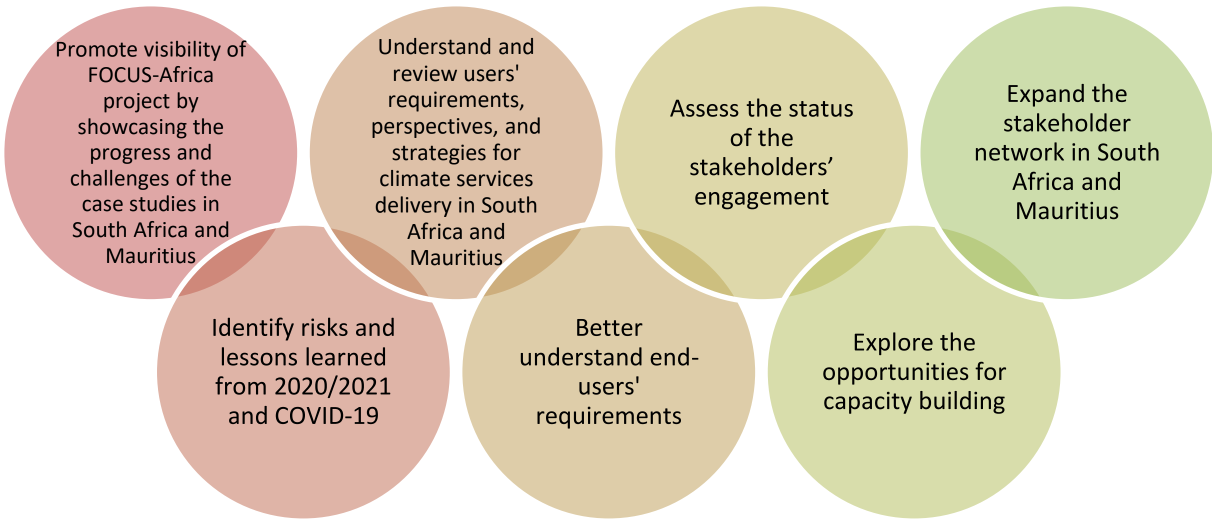

Figure 1: Objectives of the Workshop

1.3. Expected outcomes

Based on the above stated objectives, a number of expected outcomes were identified, building on previous stakeholder workshops and project activities:

- Identification of synergies and connections across all case studies for all WPs and CSs of the project;
- Lesson Learned from progress to date across the WPs and CSs of the project, particularly for the target countries and CSs;
- New synergies and connections between the project with the other regional projects enhance the implementation;
- Evaluation of already adopted plans of research and innovation (RRI) for all WPS and CSs of the project, particularly for the target countries and case studies;
- Refined users' requirements and co-production strategies for the target countries and CSs;
- The capacity development needs for climate services providers and end-users in the target countries and CSs inform the training plan;
- Strong engagement of additional stakeholders in South Africa and Mauritius in the sectors of food security and water, respectively.

2. Information about participants

A total of 137 participated both presential and virtually at the FA third stakeholder workshop, together with the preceding 2-day project meeting. For the stakeholder workshop days on 1st and 2nd June, 69 experts attended in person, of those, 41 were project members and the remaining 28 external stakeholders, whilst 68 registered to attend online. Figure 1 illustrates the distribution of attendees by country, as provided at the time of registering. A large proportion attended from South Africa (the location and focus of part of the workshop). Most participants indicated agriculture as their sector of interest, with water following closely behind. Some participants were also interested in the energy and infrastructure sectors. Overall, the programme saw the participation of over ten invited government representatives, climate services experts, international collaborators and scientists to make presentations addressing key issues for climate services provision in South Africa and Mauritius, in the target case study sectors of agriculture and food security and water. Answers provided for 'other' included: climate change, climate data, climate modelling, climate services, communication, disaster risk reduction, forecasting, health, media, meteorology, resource mobilization, UX design, data visualization and weather.

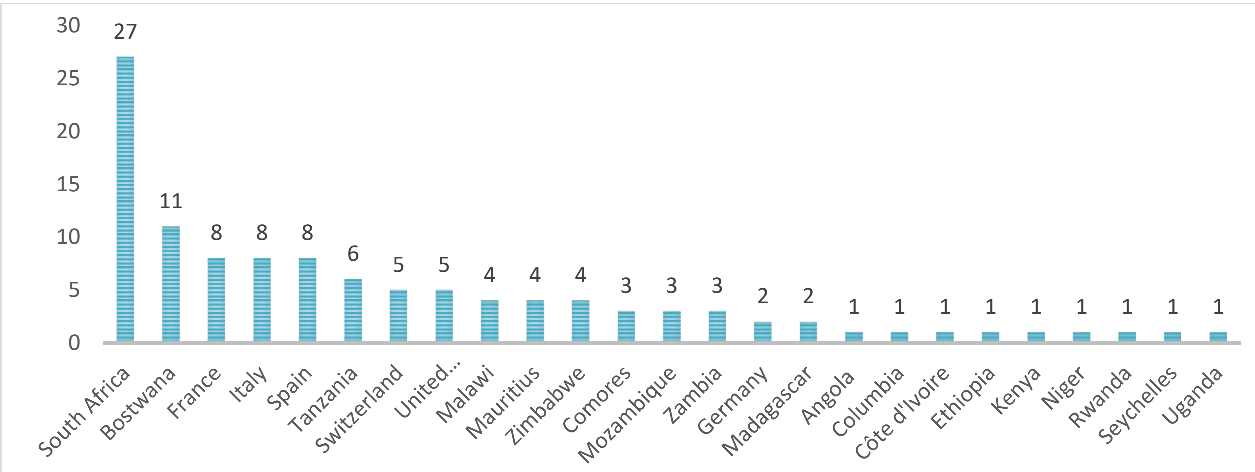

Figure 2: Distribution of attendees by country for both Consortium Assembly and Stakeholder Workshop

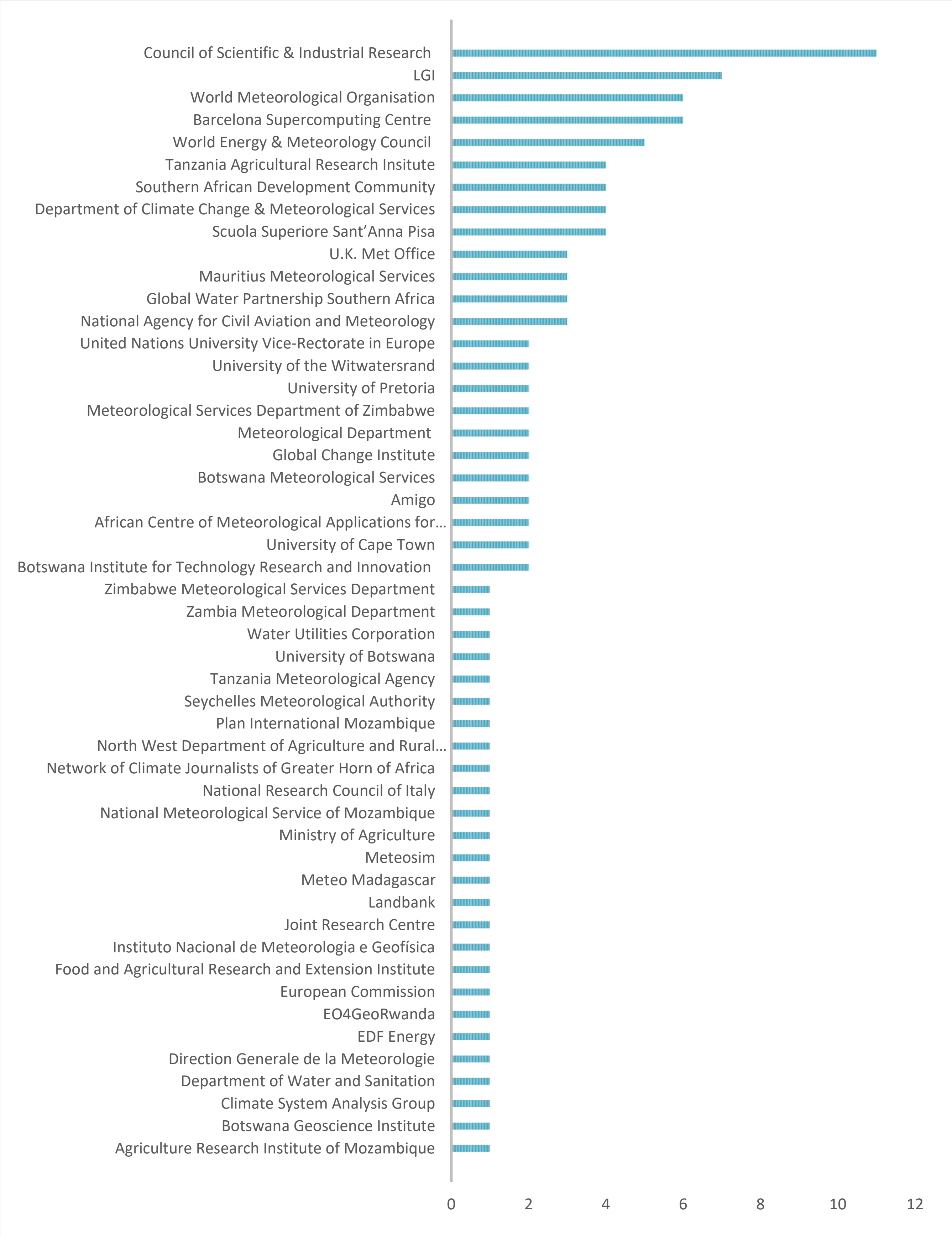

Figure 3: Attendees by Organization for both Consortium Assembly and Stakeholder Workshop

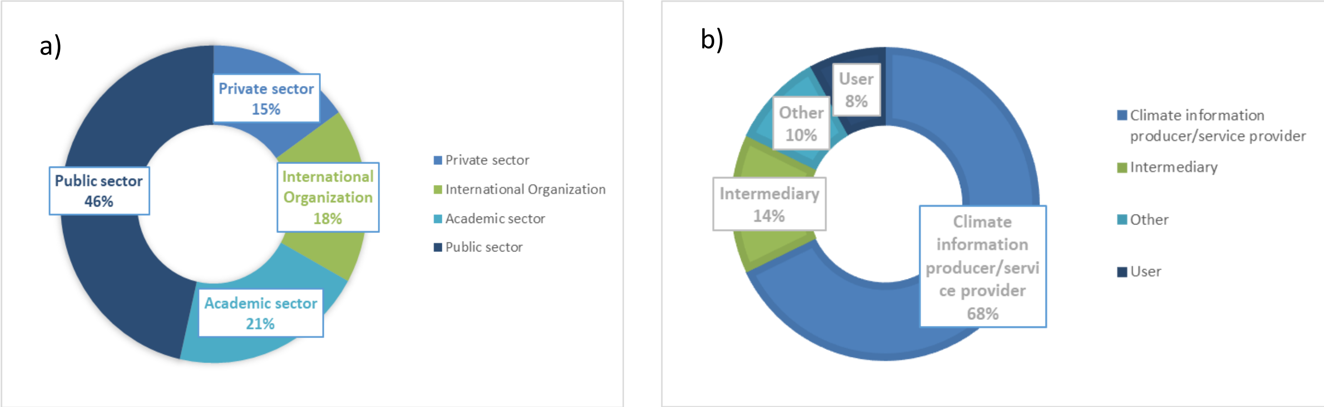

Figure 4: Attendees by a) organization type and b) climate services stakeholder type

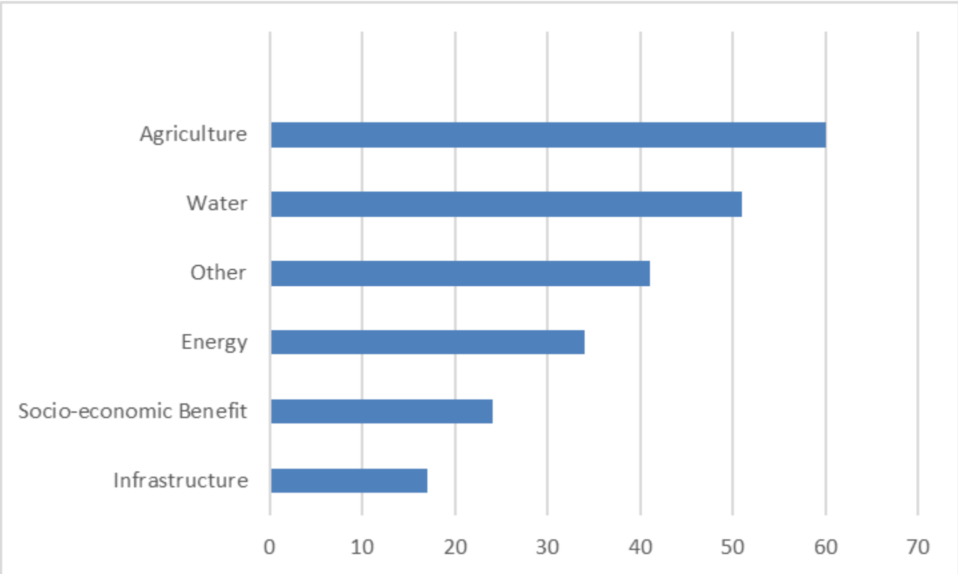

Figure 5: Attendees main sector of interest/ expertise

Figure 6: Stakeholder workshop participants

3. Contents

3.1. Workshop Programme

The workshop hosted by the Focus-Africa project team was structured around one and a half day, and composed by a mix of presentations, panel discussions and break-out group dialogues. The presentations served to introduce the specific case studies objective of the workshop, with case study 1 (food security, South Africa) on Day 1, and case study 8 (water, Mauritius) on Day 2. More specifically, day 1, which was fully devoted to case study 1, started with two presentations from the eventual beneficiary or user of the case study, the Land Bank, and the case study research provider, CSIR. These introductory presentations were followed by a panel discussion which focused on the case study 1 *Climate service user requirements*. After a presentation on the socio-economic context, the workshop participants went on to discuss user requirements and the role of climate services in the first break out session. In the afternoon, focus shifted to *Farmer cultivation practices*, with again a panel discussion followed by break out groups with a focus on differences in agricultural practices in South Africa. All the break-out group discussions of the day were reported and further discussed during the final plenary session which concluded day 1.

A similar format was followed for case study 8 on day 2, whereby (four) presentations introduced the case study goals, research, and applications, with further discussions in break out groups. These were again centred around discussions on climate services needs and on the role of climate services in tackling socio-economic challenges. There were no panel sessions for case study 8. This more compressed agenda was due to the fact that the allocated time for this case study was half that of case study 1, with the latter having been given more prominence given the location of the workshop, and, in turn, higher number of stakeholders and participant from South Africa. However, a useful presentation on understanding users' perspectives and socioeconomic context helped better frame the break-out group discussions.

Overall, the programme saw the participation of over ten invited government representatives, climate services experts, international collaborators and scientists to make presentations addressing key issues for climate services provision in South Africa and Mauritius, in the target case study sectors of agriculture and food security and water. See Annex 1 for the detailed workshop agenda.

3.2. Part 1: Focus on South Africa

Welcome Address and Workshop Introduction

To welcome delegates to South Africa and the Workshop, Dr. Bethuel Sehlapelo, head of the Smart Places cluster at the South Africa's Council for Scientific and Industrial Research (CSIR) provided an introductory speech. He reminded the audience that CSIR was founded in 1945 and it therefore has a long tradition of research, also applied to the many societal sectors. CSIR operationalises its mission and strategic objectives to meet societal challenges via nine clusters[1]. More specifically, the Smart Places cluster targets issues in areas of energy, water, sustainability of ecosystems, climate change, functional building infrastructure.

Ms Roberta Boscolo, The FA project leader from World Meteorological Organization (WMO) then kicked off the workshop by providing a brief overview of the FOCUS-Africa project. The project is being implemented in the Southern African Development Community (SADC) region with eight case studies in five countries: Tanzania, South Africa, Malawi, Mauritius and Mozambique. The project research is based on the climate services full value chain, which spans services production, tailoring, supporting user decisions and the measurement of socio-economic benefits, an aspect that is key for sustainability. In line with this, Ms Boscolo explained how the project is subdivided into 8 work packages (WPs), which cover aspects such as climate research, socio-economic value assessments, training and the development of trial climate services. She emphasized the important role of the project in exploring both the research aspects of climate services, as well as, and importantly, of its application through the development of trial climate services for each case study. Crucially, these trial climate services are being co-produced with the users of the case studies, who will be testing them during the project with the view to utilize them beyond the end of the project. Link to Roberta Boscolo's (WMO) Presentation.

[1] https://www.csir.co.za

Presentations

Presentations were given by Mr Nehru Pillay (Land Bank) and Dr Trevor Lumsden (CSIR) to explain the goals, motivations and the research performed in case study 1. Specifically, Mr Nehru Pillay in his presentation *End user perspective on Case Study 1* discussed the motivation and objectives of case study 1.

The Land Bank was established in 1912, it is 100% state owned and receives its funding from private financial institutions and other development financial institutions. The Land Bank has had little focus on climate in the past, whereby crop and livestock losses due to more frequent and intense droughts, floods, pests and diseases were not a major consideration in assessing agricultural loans but with these risks increasing it is imperative for financial institutions to identify and quantify these risks in order to price the risks appropriately but also to assist farmers to adapt their operations to mitigate the risks. Indeed, the Land Bank understands that it needs to develop and adapt internal processes and policies to take climate into consideration. More than that, the Land Bank acknowledges that climate change negatively impacts the financing of agriculture by exacerbating an already risky environment, and introducing greater uncertainty in the ability of farmers to repay loans, and on farm values. This is the reason it decided to focus on the north west of South Africa because of the observed changes in the weather and climate in that region, and its impact of agriculture, and therefore take part in the case study 1 work.

Given the Land Bank mandate is to utilise financial services and products to address critical market failures in the economy for the development and transformation of agriculture, including agricultural land ownership and use, it aims to provide instruments such as affordable finance, facilitation of access to productive agricultural land, facilitation of pre- and post-finance support programmes to minimise the risk of entrepreneurial failures of new entrants in the market. Accordingly, the Land Bank recognises that providing a loan is not the only solution. It is about understanding the challenges of pre-financing as well as providing the support for both financing (pre- and post-financing). This can be done by for instance providing extension services achieved also by partnering with agricultural associations. As changes to yield and weather patterns are now much more important, the Land Bank therefore takes a broader look at how the farmer generates turnover. Thus, the Land Bank ultimately assesses the farmer's ability to pay and therefore evaluates the risk taken with the potential financing given to a farmer. In this context, the Land Bank is also using data to complete a more robust assessment of credit applications, correcting for the risk climate may pose over the next 25 years. Link to Nehru Pillay's (Land Bank) Presentation**.**

Dr Trevor Lumsden (CSIR) continued the case study 1 discussion by presenting the Overview of Case Study 1: *objectives and approach.* As the research partner of case study 1, CSIR is building on the needs of the Land Bank to create trial climate service. To this end, CSIR first assesses the impact of climate change on food security in a key maize production area of South Africa (North West province, see Figure below). This is done in the context of understanding the needs of the Land Bank and the agricultural sector in terms of climate information required to manage financial risks stemming from climate change, and therefore improving credit taking decisions, or other forms of support. Ultimately the goal is to promote and achieve climate resilience amongst farmers.

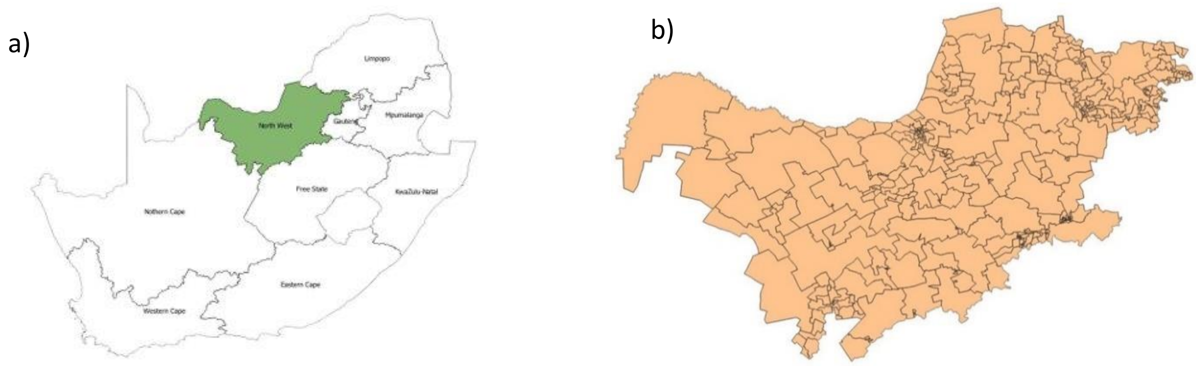

Figure 7: a) Map of South Africa, with the Northwest province highlighted. b) Voting districts in the Northwest province

An ongoing process for CSIR is assessing user challenges and climate services requirements, through its interaction with the Land Bank. CSIR is already combining climate, crop and livestock models to produce long term projections of key variables indicating climate risk which can then feed into the Land Bank credit model. Results will also inform the risk disclosure the Land Bank has to make, also for farmer preparedness to climate change.

In terms of modelling, CSIR is using a combination of CORDEX projections and local downscaling efforts for numerous climate variables. The crop modelling is then performed using the Decision Support System for Agrotechnology Transfer (DSSAT) model applied to maize and configured over the province at an appropriate scale (e.g., voting districts). Various management scenarios are being considered (e.g. optimum scenario when farmer has all the resources available, such as fertilizers). As a next step, livestock modelling will also be performed adopting a stress index approach. Credit model developed by the Land Bank which models the probability of a farmer defaulting on the loan, and considers both present and future risks, with climate change as just one of the risks. The credit model runs at farm level as this is the scale at which lending decisions are made. The trial climate service will be composed of the adapted credit model, which will draw information from a database of climate, crop, livestock model outputs, and with maps of key model output for use by the Land Bank or farmers. Main discussions centred around possible contradictions in model outputs for the North-west Province. Link to Trevor Lumsden's (CSIR) Presentation.

Figure 8: Presentations by CSIR and Land Bank on Case study 1 (Food security in South Africa)

Panel Discussion: Climate Service User and Provider Perspectives

The panel session was moderated by Elliot Moyo (CSIR). The focus of the session was around *the users' challenges and coping strategies, including exploring what climate services are currently available, and what are the barriers to using existing services and what improvements are needed to climate services.* The panel was comprised of Todani Nemadzhilili (Land Bank), Refilwe Mokgajane (DARD), Willem Landman (University of Pretoria), Michael Mengistu (South African Weather Service) and Bruce Hewitson (University of Cape Town).

Figure 9: Panel Discussion on climate service user and provider perspectives

Issues such as spatial and temporal scales, how services are presented, how uncertainty is communicated and interpreted, and accessibility and dissemination of the service were considered. Existing available climate services, the barriers and challenges to their application, and what improvements may be needed were also explored. Moreover, the discussion sought to better understand who the actual users are, and how widely existing climate services are used. The main highlights of the panel session included, the need to integrate climate risk (particularly long term projections) into credit risk models given that climate hazards constitute a considerable risk for profitability of farming and hence loan repayments. On uncertainties in climate information, it was noted that this can emanate naturally due to the unpredictability of climate systems or structurally from the models but is also an issue related to how climate information is communicated, with engagement between scientists and users being key to aid understanding of uncertainty and how this impacts on decision making. South African Weather Services (SAWS) noted that they have a range of products that assist farmer decision making, including soil moisture, onset and cessation of rainfall seasons and use of crop models. It was noted that although forecast skill varies by location, generally the forecasts are improving. Blending data and using different models could improve the results and builds trust in farming communities. It was also noted that some farmers have data and it would be useful if they could be encouraged to share this to improve prediction models, get them more involved in the processes and ultimately build trust.

Understanding the scocio-economic Context

Presentations were given on *the importance of agriculture in the Northwest province and climate change adaptation initiatives* by Diketso Mache (DALRRD), before a discussion with Hangwani Muedi (DARD) who connected virtually. Agriculture contributes only about 2% to the Growth Domestic Product (GDP) of South Africa but it is considered an important engine for the growth of the rest of the economy because of its backward and forward linkages to the economy. Agriculture has been identified as one of the key sectors that could contribute towards the greening of the South African economy. The realization of this potential is, however, threatened by changing climatic conditions caused by the global climate. The Northwest is predominantly rural, with around 60% of the population living in rural areas who mainly depend on agriculture for livelihoods.

Northwest (NW) district occupies 8% of the land area in South Africa, with 1.3 million living below the poverty line and a majority of these being found in Bojanala district. Bojanala has the lowest contribution to agriculture in the region, due to more of a mining focus. There has been a decrease in salaries in NW but an increase in grants. Out of 1.2 million households in the NW, 10.4% are involved in agriculture. This is a small increase on the previous year and could be a result of the stimulus package provided by the agricultural department. Data shows that 35.7% of households have severely inadequate or inadequate food access. In western district, underground water is an issue. There are 2.3 million farmers with limited skill and resources. The region is overstocked with livestock, with a risk of exceeding grazing capacity. Livestock production districts are predicted to experience greatest increase in temperature by 2050 (+3-3.5C).

Generally, South Africa continues to meet food requirements at a national level, with a combination of domestic food production and imports. However, RSA households are battling with several challenges that are exacerbated factors such as the impact of COVID 19, unemployment, food prices, unstable household food production, loss of income etc. The country has ample maize supply to meet the demand and will be able to export into neighbouring countries. This has been underpinned by favourable weather conditions and is beneficial as maize is one of the staple foods consumed in the country. In terms of Agriculture and Agro-processing Master Plan for South Africa, one of the visions, in relation to FOCUS-Africa, is to build a growing, equitable, inclusive, competitive, job-creating, low-carbon and sustainable agriculture and agro-processing sector. Objectives of the Master Plan: to increase in food security in South Africa; to create an effective farmer support system and agro-processing incentives; to enhance resilience to the effects of climate change and promote sustainable management of natural resources. The Master Plan indicates that there are four categories of farmers: subsidence, smallholder, medium-scale and large-medium commercial. The medium-scale farmers are probably the most appropriate users for FOCUS-Africa. There are around 40k medium-scale farmers, with a turnover between 1 and 10 million SA Rand, and with potential commercial viability but lacking market, technical and debt resolution support.

Amongst the programmes to support Climate Change Adaptation initiatives, the DALRRD provides: Land Care Animal and Veld Management, Research and development, and Extension and Advisory services. Within the latter programme, more than 200 extension workers serve the North West province, and there are more than 100 advisory personnel, who are being trained to communicate climate change information. Discussion following the presentation centred around limited integration of forecast information into decision making at the local government level; and the need to better package climate information to be more useful to local government decision making. Link to Diketso Mache's (DALRRD) Presentation.

Break-out Groups: User requirements and challenges

Figure 10: Introduction to Break-out Groups with presential and virtual participants

To introduce the break-out group discussions, Ilaria Vigo (BSC) gave a brief presentation where she emphasised the importance of sharing knowledge through co-production. This is a fundamental process to achieve meaningful climate services and is a win-win approach. She explained that FOCUS-Africa implements a developed socio-economic impact assessment methodology to better understand the system and evaluate future changes, as well as improve the design of the case studies and foster legacy. Link to Ilaria Vigo's (BSC) Presentation**.**

Attendees were then split into three groups for break-out sessions and were tasked with considering *perspectives from other food security case studies on end user requirements and the role of climate services in tackling socio-economic challenges*. Key issues that emerged from the breakout groups included: the need for integration of indigenous climate knowledge; better understanding of the various communication methods for different target groups (e.g., WhatsApp for extension; face-to-face communication for farmers); the need to train users on use of the information; and the need for different types of climate information at different timescales, for example, soil moisture, for land preparation and planning.

Figure 11: Break-out groups on end user requirements from Food Security case studies and the role of climate services in tackling socio-economic challenges

Panel discussion: farmer cultivation practices

This panel discussion was moderated by Trevor Lumsden (CSIR) and welcomed speakers Lebogang Mabe, a local farmer, Thatayaone Bolokang of DARD and Johan Malherbe of ARC to discuss *access to fertilizer, irrigation & improved varieties; planting regime/timing, drought mitigation strategies, disease & pest management and livestock challenges.* The purpose of the session is to improve our understanding of how farmers are practising on their farms, to understand the cultivation practises they are using in order to make sure that when we run the crop models in the project, they reflect as closely as possible what actually happens on the farms. From the discussions it was noted that the climate in the Northwest province is characterised by 350 to 700 mm rainfall gradient (from east to west) and an aridity gradient (with the west hotter), with long winter and dry periods, making wildfires common. Long dry seasons have an effect on agricultural activities and affect the quality of food. Low temperatures cause plantation to be prone to fires. Late winters have windy condition with problems of wind erosion. Severe conditions are often observed in the south of the province: these are strongly associated with El Niño-Southern Oscillation (ENSO), with some years having very little rain and some a lot of rainfall; so there is a strong interannual variability, and often with below normal rainfall. Maize is grown widely, while Sunflower is grown as a cash crop. Groundnuts, cotton, and sorghum are other dominant cultivated crops in the province. Regarding the insurance, it is very expensive to take out a policy in dry years. In addition, insurance companies set a lot of conditions such as a farmer needs to plant within a certain period of time, otherwise farmers would not be covered. Also, there are some areas, mainly affected by drought, that are not insurable at all. Linking with presentations made earlier, the need to ensure climate risk is integrated into insurance and credit for agriculture in the province was noted.

Break-out Groups: Farmer practices

Participants were again split into groups for break-out sessions to consider *perspectives from other food security* *case studies, differences to South Africa practices and what drought mitigation strategies are used elsewhere.* During the discussions it emerged that variety selection is an important factor in areas that are affected by drought. This can be informed by farmer knowledge and science (e.g. crop modelling). The most critical phases in the crop cycle affected by drought and dry spells was noted as emergence, flowering, and grain filling stages. In addition to variety selection, crop diversification (e.g. to drought resistant crops like sorghum) was highlighted. Most farmers do not have irrigation and understanding of the forecast is often limited.

Part 1 Recordings:

- Plenary Recording 1
- Plenary Recording 2
- Plenary Recording 3

3.3. Part 2: Focus on Mauritius

On Day 2, the workshop focus shifted to the motivations, user requirements, and climate service development of case study 8, therefore looking at the water and agriculture sector in Mauritius. Mohau Mateyisi (CSIR) introduced the session by emphasising that climate services should be a shared endeavour, and silos should be removed, with a smooth flow of information from research to service providers to users. In case study 8 the efforts by the Mauritius Meteorological Services (MMS) to enhance resilience to climate change are already yielding lessons lon the approach to tailoring of climate services, whereby we need to pay attention to the specificity of the users' requirements.

Presentations

Sebastian Grey (WMO) chaired this session, which comprised of four presentations followed by questions and answers. The first presentation was given virtually by Renganaden Virasami (MMS) and focused on setting the scene on climate, climate hazards and climate services in Mauritius. Initially the MMS started as a weather forecast based service notably for the general public, aviation and maritime industry. This remains the core duty to this day. Specific products delivered by the MMS are monthly weather summary and monthly rainfall statistics; produces one day forecast to 7-day forecasts; it also started to develop seasonal forecasts in the 1990s: one for summer and one for winter. In the pipeline there is a new website with more climate products (partly tailored to certain needs of some sectors).

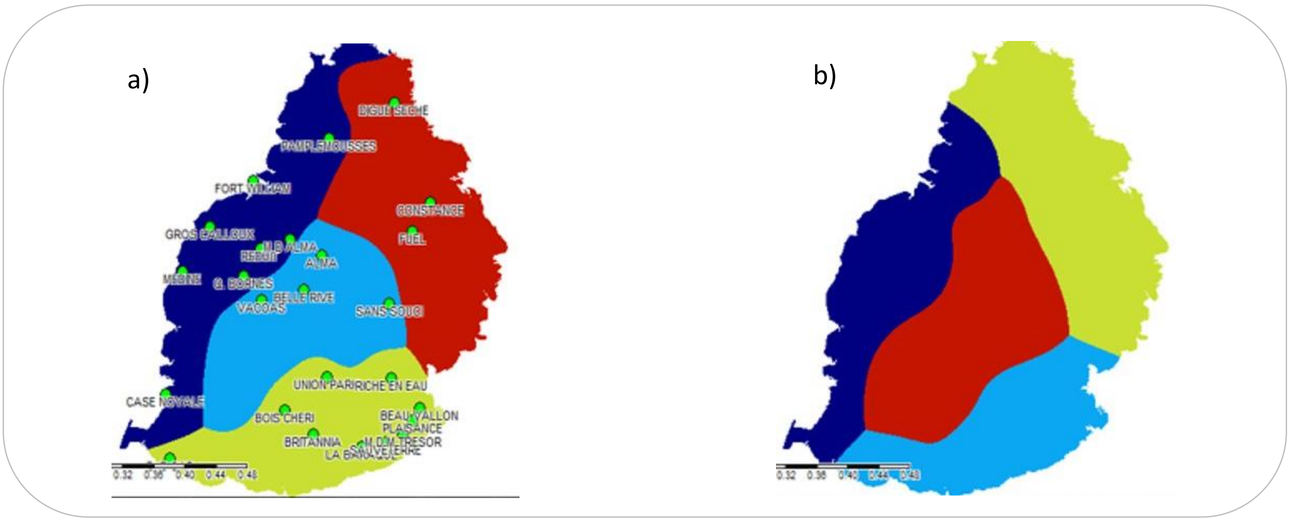

Figure 12: Climate zones of Mauritius. a) Austral Summer. b) Austral Winter

As part of the development of seasonal forecasts for the water and agricultural sectors, specific indices are being explored. For instance, for the water sector, indices being explored are the standardized precipitation index (SPI) for different stations, with focus on reservoir management at monthly and 3-monthly timescales. While the project is already achieving some of these goals, MMS aims to improve diversity of output, temporal and spatial resolution, tailoring of products in consultation with users, improve access and userbase of forecasts for target applications (currently products are produced mostly in isolation from users leading to subjective anticipation of user needs); undertake post-event evaluation and analysis of forecasts. Link to Renganaden Virasami's (MMS) Presentation.

Following was Mahendra Kumar Bissessur of WRU who presented on water resources management in Mauritius and the implications and opportunities for climate services. As a result of its volcanic origin and the high permeability of underlying rocks, most of the rivers and rivulets on the island originate from the central plateau. The climate is a tropical one with only two seasons, winter prevailing from May to October and summer from November to April. The wettest month is February and driest month is November. In Mauritius, the replenishment of water resource systems occurs during the summer season, when two thirds of the mean annual rainfall is received. Despite receiving over 2,000mm of rainfall annually, the country often faces water supply shortages, in the dry months from September to December. Rainfall patterns have a great effect on the availability of both surface and groundwater. Access to potable water reaches 99.8% of population with a daily per capita consumption of around 180 litres).

The Water Resources Unit (WRU) created in 1992 in the then Ministry of Public Utilities is the nodal organisation for the coordination of all activities concerning water resources management with the major water users organisations such as Central Water Authority (CWA), Irrigation Authority (IA), Central Electricity Board (CEB) and Wastewater Management Authority (WMA). The WRU's vision is to ensure an adequate and sustainable supply of water for the country's present and future needs, and its mission is to assess, mobilise, control, develop, manage and conserve water resources and to supply such resources to stake holders as well as to advise the Central Water Authority in the enforcement and administration of the Ground Water Act and the Rivers and Canals Act. Currently WRU makes use of the seasonal forecasts from the MMS to plan for operations of dam release and allocation of water to different stakeholders. It also uses climate services more generally to manage the dam inflows during normal and extreme seasons, and the inter basin catchments to allocate water in rainfall deficient areas. WRU produces trend analyses of actual rainfall with level and production of boreholes.

Some of the challenges in the water sector in Mauritius are: i) changes in rainfall pattern and spatial characteristics, ii) high intensity rainfall in short periods, iii) dry spell over longer period, iv) real time forecasting and planning, v) long term planning for food security and allocation of water. Accordingly, there are a number of implications and opportunities for climate services such as assessment of climate change patterns, further ground observations, modernization of existing climate data archive infrastructures, new technology with advanced satellite data acquisition, and better long-term forecasting to improve resilience to climate change. All this requires enhanced collaboration and sharing of experience between MMS and WRU in terms of data and research, as well as with other countries in the SADC regions. Link to Mahendra Kumar Bissessur's (WRU) Presentation.

Figure 13: Presentations by MMS, WRU, CSIR and FAREI on Case study 8 (Water in Mauritius)

From the Food and Agriculture Research and Extension Institute (FAREI), Prathima Poonpoon presented on crop and livestock management in a changing climate. FAREI mission is to support and implement priority research, development and technology programmes, projects and appropriate technologies for food security and to enhance competitiveness, sustainability and stakeholder equity across the agri-food value chains. Amongst FAREI's responsibilities, and of relevance to the project, the Crop Research department (one of six) has the responsibility to support and oversee development in the non-sugar crop sector and ensure that the needs of the sector are addressed through research and adoption of new technologies. Its mission is to conduct applied and adaptive cost-effective research for the introduction and development of novel technologies, to increase crop production and improve crop quality to enhance food security in a sustainable manner. The Livestock Research department comprises the Animal Production and Animal Health Divisions. It has the mandate to conduct strategic research in the livestock and poultry sectors and adapts relevant knowledge and techniques to local conditions. The Extension and Training department ensures technology transfer to the farming community and agro-entrepreneurs in the horticultural and livestock sectors. Its mission is to provide a cost-effective technical advisory and training service to the farming community for sustainable development of the agricultural sector (vegetables, fruits, ornamentals and livestock). The role of the Resource Management department is to optimise use of agricultural resources (land, water, nutrients, seed, waste), improve climate resilience, farm productivity and maintain long term sustainability of production systems.

As a Small Island Developing States (SIDS), Mauritius is ranked as the country with the 16th highest disaster risk and the 10th most exposed to natural hazards. Hotter summers, flash floods and damage to agricultural fields, crops and livestock after cyclones are more frequent in the island. Alarmed by the vulnerability of the agricultural sector in Mauritius to this global phenomenon, suitable adaptation and mitigation solutions are required. Amongst the current climate change impacts in Mauritius are rising average temperatures (1.15^0C per decade), decreasing trend in annual rainfall (about 8% compared to 1950s), lengthening of the intermediate dry season and decreasing number of rainy days.

In terms of agricultural sector, this represents 2.78% of GDP: Mauritius imports close to 77% of its food requirements. The main items imported include wheat, rice, oil, fresh fruits, meat and milk. Around 8 200 ha of land are devoted to food-crop production that annually aggregate to 110 000 tonnes. Some 8 000 small farmers cultivate a range of food crops and a small number of farmers grow fruit for the export markets. As temperature rises, there is a shift in agricultural zones for some crops grown under rainfed conditions to higher altitudes. The production of some crops, like Onion & Potato, which require cool temperatures can be affected. Higher temperatures in summer and lower temperatures in winter favour the incidence of pests and diseases. Crop production is affected by more frequent and severe agricultural droughts, cyclones and torrential rains. Crops cultivated along the coastal belts are affected by more frequent tidal waves which exacerbate soil quality and reduce productivity. Regarding livestock, climate change is manifesting in a reduced milk production and decreased productivity in chicken farms and increased mortality rate. Moreover, a lower pasture production in rainfed areas, and a higher incidence of pests and diseases have been observed.

To counter the impacts of climate change, actions are being taken to better manage crop production. This is achieved for instance via water and energy saving irrigation technologies (e.g., gravity drip, nanopore sprayer, sheltered farming, solar power-driven drip irrigation/fertigation systems), as well as harvesting rainwater for use in shelter farming. Ten new automatic weather stations have recently been installed to monitor these management approaches. FAREI has also developed a range of climate smart rain harvesting techniques. Adaptation measures include breeding new varieties to enhance resilience, something that could also be enhanced by climate projections and crop modeling. Other soft measures include training famers on better strategies and promoting sustainable practices. Link to Prathima Poonpoon's (FAREI) Presentation.

Finally, Mohau Mateyisi (CSIR) concluded with the objectives, approach and timeline of case study 8. The objectives of this case study are: i) to improve spatiotemporal resolution of seasonal forecast for the benefit of decision-making processes around water use (e.g., in Mauritius water resources improved forecast could inform domestic, industrial and agriculture water allocation and use), ii) to tailor seasonal information to meet the needs of key users such as MMS, iii) to develop a trial climate service that better informs the water and agricultural users on climate-related risks, iv) to understand the socio-economic benefits of the developed products. Co-production is essential to achieve these objectives. The methodology involves developing algorithms for dynamically downscaling seasonal climate forecasts. The output of the downscaled model is at 400 meter grid resolution (a grid with 190 X 190 points over Mauritius). Relevant indicators are being discussed and tailored with the MMS and the users of the case study, such as WRU, and FAREI. The way of communicating the information is also being explored, including through the use of the Teal tool, a web GIS visualization tool that can be used for food security and water sectors. Communications via cell phones are also being considered. Link to Mohau Mateyisi's (CSIR) Presentation.

Figure 14: Open discussion on the presentations about Case study 8 (Water in Mauritius)

Discussion on the presentations included the following:

- Understanding the role of the meteorological services in agricultural insurance with it being noted that meteorological data is crucial for verification of the occurrence of extreme events.
- Elaboration on how MMS engages with users, which included surveys among stakeholders and providing reports on regular verification of forecasts.
- Communication methods for extreme events, for which MMS has a dedicated automatic messaging system that sends information to key people and institutions (for example, prime ministers, all hotels). Also, media, national TV, radio, the internet are used, while there are also WhatsApp groups for different stakeholder. There are also plans to launch EWASH and Emergency Water Sanitation and Hygiene Group through which stakeholder will receive warnings on mobile phones.

Break-out Groups: Understanding users' perspectives and socioeconomic context

Ilaria Vigo (BSC) gave an introductory presentation on understanding socio-economic benefits of climate services in the water and food security sectors ahead of a break-out groups session. The topics of the day two break-out group sessions were twofold; 1) to discuss climate services needs and 2) to identify the role of climate services in tackling socio-economic challenges. The key issues raised from the breakout groups included:

- *The need to understand the socio-economic status of users in order to better tailor climate information to them.*
- *The need to support capacity building of extension agents to be able to communicate climate information and advisories to users.*
- *Enhancing the network of observation equipment, including automatic weather stations, for better data for tailored* products.
- *Request for more discussions on the nexus between water, energy and food in the context of a changing climate, particularly understanding of trade-offs, and exploring linkages between sectors in the event of hazards like drought.*
- Working with stakeholders in media, like radio stations and presenters, to have broad and accurate dissemination of forecasts.

Final remarks

Ms Roberta Boscolo concluded the workshop with some final remarks and acknowledgements, stating that the project has exceeded our expectations. We now understand the problems, current situations and what is expected as an output. "I have heard the voice of everyone in this room. That everyone is willing to work together". The talks have been inclusive in the plenary and break out groups. We are building something important and will truly make an impact. She thanked the participants in the room and virtually, and CSIR for hosting the workshop in Pretoria.

Figure 15: Final remarks on Parts 1 and 2 by the Project Coordinator, Ms Roberta Boscolo (WMO)

Part 2 Recordings:

- Link to Plenary Recording 1
- Link to Plenary Recording 2

3.4. Part 3: NMHS Capacity Building Session

The afternoon of day 2 of the stakeholder workshop, 2nd June 2022, was dedicated to a capacity building session on seasonal climate forecasts for National Meteorological and Hydrological Services, with focus on objective seasonal forecasting. This began with a round table and the results of a survey on the use of seasonal forecasts by NMHSs. This was followed by an introduction to the practical application of objective seasonal forecasting (OSF) by John Faragher of the UK Met Office, who used the example of the Greater Horn of Africa Climate Outlook Forum (GARCOF). This was followed by a presentation from Andre Kamga of ACMAD on the 9-step method for objective seasonal forecasting, based on methodologies used at ACMAD. Aside from providing training on seasonal climate forecasting, the session sought input from NMHS around:

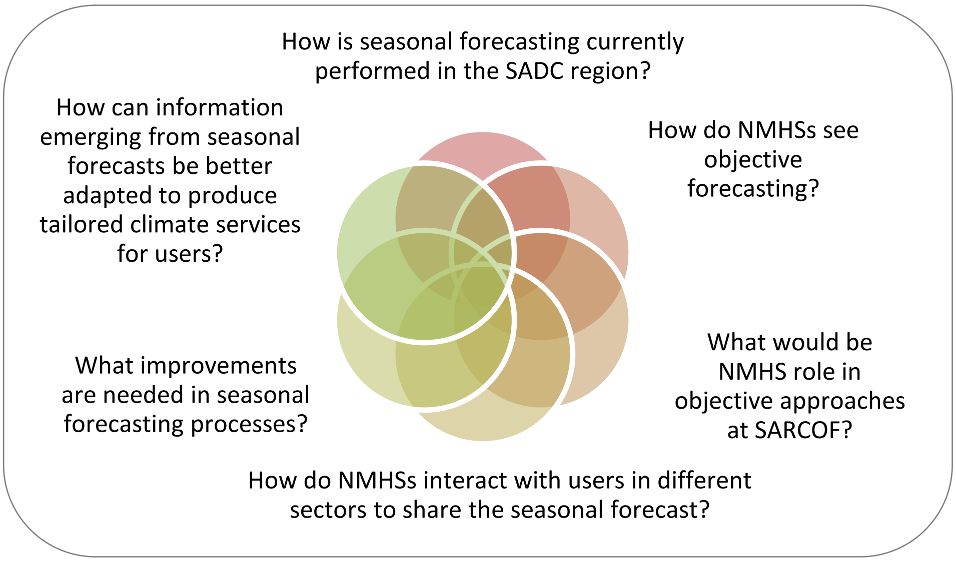

Figure 16: Discussed points during the Capacity development session on Objective Seasonal Forecasting

Round table: discussion on capacity building of SADC NMHS

The floor was given to the NMHS representatives to introduce themselves, but before that the moderator acknowledged presence of two Permanent Representatives (PR's) from Malawi and Comoro. Introductions were then made from everyone present during the session, and there were also virtual participants.

Malawi PR: Mentioned that seasonal forecasting is very important in the region since the region is highly dependent on rainfed agriculture. She brought out that climate experts still face a lot of challenges with issuing these forecasts since users require a lot from them, such as onsets of rainfall, and currently with what is provided through seasonal forecasting, we still can't reach the level the level to which users expect from us. She hopes that this session will bring out something that can be used to improve on the way seasonal forecast is issued to users, and also thanked FA for giving this capacity building for improving on climate services in the region.

Comoros PR: In Comoros they are involved in both South-West Indian Ocean Climate Outlook Forum (SWIOCOF) and Southern African Regional Climate Outlook Forum (SARCOF) processes and have two teams with different experts from different fields like agronomists, hydrologists etc all participate during these forums to come up with the forecasts.

Climate Experts present were from 11 SADC Countries, namely Angola, Botswana, Comoros, Lesotho, Madagascar, Malawi, Mozambique, Seychelles, Tanzania and Zimbabwe. There was also an expert present online from Zambia.

Figure 17: Discussion on capacity building of SADC NMHS

Overview of Survey Results-NMHS Seasonal Forecasting

Sebastian Grey presented on the results of the survey from the experts from the NMHS to have an idea on their level of involvement in seasonal forecasting. Link to the NMHS Survey Results Presentation. The results showed that:

1. Tools being used for seasonal forecasting are CPT, CFT-SADC tool, GEOCOF and SEAFORD-MMS, Python, and global models used NCEP, ECMWF.
2. Most seasonal forecasts produced are for rainfall, and are probabilistic. Not all countries issue temperature forecasts, while some do 10 day and monthly forecasts in addition to the seasonal forecasts.
3. *Capacity gaps identified were:* generation and communication of tailored products, downscaling, use of statistical models and need support in dynamical models, lack of verification, lack of long-term data observations and limited sub-seasonal forecasting.
4. Needs identified included: Strengthen capacity for dynamical forecasting including computing and IT issues, address data gaps, verification support, training and secondments to countries with expertise.
5. Engagement with stakeholders is not very regular, and a lot needs to be done here, and also identifying more platforms of engagement apart from NCOF's.

Objective seasonal forecasting – lessons from GHACOF/ICPAC

John Faragher's presentation was based on the workdone through the regional climate centre for the Horn of Africa, the IGAD Climate Prediction and Applications Centre (ICPAC). He explained the background and principles of objective forecasting, linking to work done to support Eastern African NMHSs and ICPAC through the UK-funded WISER project.

As background to OSF, in 2017 WMO recognised that use of dynamical forecasts from its network of producers was largely subjective and that subjectivity of the widely-used consensus approach limited the usability of forecasts and also the verifiability. So, in 2018-19 a WMO expert team produced a technical document where ten principles to using an objective approach was described “Guidance on Operational Practices for Objective Seasonal Forecasting”. Objective forecasting uses dynamical climate models as the primary basis. In essence the guidance document encourages use of objective forecasting as it follows a procedure that is traceable, reproducible, well-documented, with forecasts amenable to verification. More accurate tercile percentages could be produced using OSF.

Three cases were presented to demonstrate the point. C*ase* 1: was done for October-November-December 2019, and it was the only time the 55% probability was used. This was to say that it was going to be wetter than normal, which actually happened. *Case 2****,*** was for March-April-May 2021, which produced a 33% probability across the different catergories, highlighting that the season could be any case from dry to wet, and not normal like most people would interpret. *Case 3:* Here examples of new and more user relevant products, were highlighted, based on improved forecast probabilities. In summary the benefits of objective forecasting is that it is capable of bolder probabilities/sharpness and confronting uncertainty. Link to John Faragher’s (Met Office) presentation

Seasonal forecasting methodologies at ACMAD

The presentation focused more on principles of objectives seasonal forecasting and how a 9-step method could be used in the SADC region to improve objectiveness and enable better replicability and verification. The 9 steps were noted as follows:

First is to try and understand the climate, and then look at the intra variability and trends. You can generate the forecast just by considering the trends. Take the last three months, a month (30 days) and then 7 days. **Second** step is to do composite analysis, by trying to understand how this year's climate drivers are relating to other years climate drivers. Use historical records and analyse the dry and wet years, for both rainfall and the SST's to see which SST's correspond with the wet and dry years. That way you will understand how your region relates to the different drivers. You can also derive an estimation of the amount of precipitation that can be received, for your season of forecast. **Third** is to identify analogue years. This is done by understanding the historical years and how the drivers are similar. First you analyse the ENSO and identify past years that have similar behaviour as to what is currently happening. From analogues analysis, you come up with the precipitation analysis from the different analogue years. These analogue years can also be used for monitoring purposes of the start of the agriculture season. This is done by determining whether the onsets will be early, normal or late. Cumulative time series graphs are also plotted to determine the onsets and dry spells. The **fourth** step is statistical forecasting, using linear regression, PCA and CCA. Only improvement is to mask the output with your skill map. Major message to convey here, is to always mask your forecast with the skill map. Neural network outlook also shown but not much was mentioned on it.

The **fifth** is a looking at the teleconnections analysis of the ENSO, AMO, IOD etc. This step has to identify all the teleconnections of the region and to derive the seasonal climate of your region based on that. e. g. SWIO, SIOD, WTIO etc. The **sixth** is determining interactions analysis between regions for the same target season. Forecast is taken from other colleagues from other regions and use for our forecast so that we have confidence with what we do. Looking at the interactions between the African monsoon and tropical cyclones. Also looking at upper-level divergence and convergence. **Seven** is considering the global single model ensemble. This only involves that the interpretations of the global models, and also to mask the forecast with the skill map to derive information where it can actually be useful. The same is done also for the global multi model ensemble which is the **eighth** step. The **ninth** and last step is the consolidations of all the outputs form all the eight steps used and produce an analysis and forecast.

ACMAD indicated that such methodologies have been used in work with the disaster management office to tailor forecast to their needs. Lastly, they highlighted the need to make tailored products for the specific needs of the different sectors. Link to Andra Kamga’s (ACMAD) presentation.

A rich discussion followed the presentations. Key issues discussed included what the role of the NMHSs would be in OSF, what would happen to the use of the forecasters experience, which is currently a key factor in seasonal forecasting, and finally the need to understand the specific capacity building needed to shift to OSF. A key issue was around the meaning of a 33% probability in a forecast. While in most cases people believe this means there is a 33% chance of 1 of the 3 outcomes, this actually means that there is no clear signal from the models. It was also noted that OSF methods could aid in automation of various processes.

Figure 18: Discussion on presented material during NMHS capacity development session

Following the initial discussions, the NMHSs were then asked their views on OSF. The main responses centred around the following points:

Objective seasonal forecasting seems to leave everything to the models yet in many cases the forecaster or human perspective could be crucial to interpreting the model outputs.

The NMHSs are generally keen to learn more about any processes that could improve service delivery to their users, including OSF and downscaling. However, they still requested clarity on how they would be supported with relevant capacity building and tools should the need to shift to OSF materialise.

National efforts on forecasting should be contributed to regional forecast using the capacity of SARCOF.

Final remarks of the training session

It was noted that that the use of consensus forecasts came as a rule of engagement, but are not necessarily the best forecast. The idea behind it is that you can't come up with the forecast for a specific country without that country being involved. Objective forecasting on the other hand does not have human interference. Scientists let the model do their work, look at their output and evaluate it so the bias coming from the forecaster is removed. Traditionally, the forecaster was more important than the model – the dynamical models were there for us to interpret not for them to forecast for us. The dilemma is to have a smooth transition between subjective and objective forecasts, or even a merging of subjective and objective forecasts but to identify principles and methods that can be objectively used and verified. It should also be noted that objective forecasts require sufficiently accurate and long historical data. Overall, the idea would be for the regional centres to produce the objective forecasts, share it with the NMHSs, which can then take these forecasts, add their own local information and interpretation to come up with the best localised forecasts.

John Faragher thanked everyone for the contribution. He noted that this is the start of the process. He then handed over to Andre Kamga, who thanked everyone and said that despite the challenges ahead with the coproduction of the best seasonal forecasts ACMAD, the NMHSs and partners would together keep on working on enhancing the processes and outputs.

Part 3 Recording:

- Link to NMHS Capacity Building Recording.

4. Conclusion

Overall, the workshop objectives were met and being the first in-person stakeholder workshop since the start of the project this was a huge milestone. The in-person engagements enabled partners to engage more closely, while also serving as a team building experience. Better understanding was gained on the context for climate services delivery, the major needs and challenges for each case study and the opportunities that lie ahead in the development of the case studies and support to their sustainability.

A list of the most important points raised during both the stakeholder workshop and the capacity building session are provided in the following:

- Urgent need for better ways to predict the onset, duration, and cessation of rainy season
- Ensure accuracy, uncertainty, and limitations of using seasonal forecast and projection model output are properly communicated to users and are well documented. This includes clarifying role of natural uncertainty (due to limits of predictability of the climate system) and structural uncertainty (tool, models, choices we make in the processing).
- Enhance capacity building including via direct engagement between scientists and users, also as a way to understand how we use language differently and to learn from each other better.
- Increasing need for training on the interpretation of use of seasonal forecasts, with different approaches (dynamical, statistical, as well as objective vs subjective).
- Improve ways to convey seasonal forecasts and projections and their level of uncertainty in a descriptive and visual way.
- Encourage farmers and other users to share their data as a way to both improve prediction models and to get them involved in the process. This can help build trust.
- Importance to consider and include indigenous knowledge in seasonal forecasting.
- Need to better investigate best method of communication (WhatsApp, visualisation portals).
- Seek opportunities to demonstrate use of climate services to support cross-sectoral (nexus) activities.
- Maintain links with stakeholders who contributed to the workshop and demonstrated an interest to use FOCUS-Africa output (e.g., Northwest province farmers and Mauritius
- Harness opportunities to work with Government Departments (e.g., the Department of Agriculture, Rural Development), to integrate climate information in their planning.

Annex 1: Workshop Agenda

Wednesday, 1 June –
Focus on Case Study 1: Food Security, South Africa

Time (SAST/ UTC+2)	Activity	Responsible
9h00 – 9h20	**Opening remarks- introduction & overview of project**	Roberta Boscolo (WMO), Dr. Bethuel Sehlapelo (CSIR)
  9h20 – 9h35 9h35 – 9h50 9h50 – 10h05	**Presentations** Land Bank: End user perspective on Case Study 1 CSIR: Overview of Case Study 1 objectives and approach **Questions**	Chair: Francois Engelbrecht (WITS) Speakers: Nehru Pillay (Land Bank) Trevor Lumsden (CSIR)
10h05 – 10h50	**Climate service user requirements** Panel Discussion What are users' challenges and coping strategies, what climate services are currently available, what are the barriers to using existing services, what improvements are needed to climate services	Moderator: Elliot Moyo (CSIR) Panel: Todani Nemadzhilili (Land Bank) Refilwe Mokgajane (DARD) Willem Landman (Uni of Pretoria) Michael Mengistu (SA Weather Service) Bruce Hewitson (UCT)
10h50 – 11h15	**Coffee Break**	
  11h15 – 11h35 11h35 – 11h50	**Socio-economic context** **Presentation** The importance of agriculture in the North West province and climate change adaptation initiatives **Questions**	Chair: Ilaria Vigo (BSC) Speaker: Diketso Mache (DALRRD) Hangwani Muedi (Online)
11h50 – 12h45	**Break-out Groups** Consider perspectives from other food security case studies on end user requirements and the role of climate services in tackling socio-economic challenges	BoG#1 (Plenary room): Moderator Dragana Bojovic (BSC) Facilitator: Kristian Nielsen (WEMC) Note taker: Elliot Moyo (CSIR) BoG#2 (Room 30pp): Moderator: : Trevor Lumsden (CSIR) Facilitator: Hamid Bastani (WMO) Note taker: Ilaria Vigo (BSC) BoG#3 (Room 20pp): Moderator: Sara Octenjak (BSC) Facilitator: Sebastian Grey (WMO) Note taker: Adéola Jaiyeloa (LGI)
12h45 – 14h15	**Lunch and group photo**	

14h15 – 15h00	**Farmer cultivation practices** **Panel Discussion** Access to fertilizer, irrigation & improved varieties; planting regime/timing, drought mitigation strategies, disease & pest management, livestock challenges	Moderator: Trevor Lumsden (CSIR) Panel: Lebogang Mabe (farmer) Thatayaone Bolokang (DARD) Johan Malherbe (ARC)
15h00 – 15h15	**Coffee break**	
15h15 – 16h00	**Break-out Groups** Consider perspectives from other food security case studies – differences to South Africa practices, what drought mitigation strategies are used elsewhere	BoG#1 (Plenary room): Moderator: Jonathan Padavata (WITS) Facilitator: Kristian Nielsen (WEMC) Note taker: Ilaria Vigo (BSC) BoG#2 (Room 30pp): Moderator: Mercy Macharia (Sant'Anna) Facilitator: Hamid Bastani (WMO) Note taker: Elliot Moyo (CSIR) BoG#3 (Room 20pp): Moderator: Sara Octenjak (BSC) Facilitator: Sebastian Grey (WMO) Note taker: Vaileth Jonas (TMA)
16h00 – 17h00	**Report back from the day's break-out sessions**	Moderator: Trevor Lumsden (CSIR) Nominated rapporteurs

Thursday, 2 June Morning –
Focus on Case Study 8: Water, Mauritius

Time (SAST/ UTC+2)	Activity	Responsible
9h00 – 9h15	**Recap of the previous day and introduction to the next sessions on CS8**	Roberta Boscolo (WMO), Mohau Mateyisi (CSIR)
9h15 – 9h30 9h30 – 9h45 9h45 – 10h00 10h00 – 10h15 10h15 – 10h30	**Presentations** Mauritius Meteorological Services (MMS) – setting the scene on climate, climate hazards and climate services in Mauritius WRU – Water resources management in Mauritius: Implications and opportunities for climate services Food and Agriculture Research and Extension Institute (FAREI) - Crop and livestock management in a changing climate CSIR – bringing it all together: Case Study 8 objectives, approach and timelines **Questions**	Chair: Sebastian Grey (WMO) Speakers: Renganaden Virasami (MMS) (Presenting virtually) Mahendra Kumar Bissessur (WRU) Prathima Poonpoon (FAREI) Mohau Mateyisi (CSIR)
10h30 – 10h45	**Coffee break**	
10h45 – 11h00	**Understanding users' perspectives and socioeconomic context** Introductory presentation on understanding socioeconomic benefits of climate services in the water and food security sectors	Ilaria Vigo (BSC)
11h00 – 12h00	**Break-out Groups** Topics: 1. Climate services needs 2. The role of climate services in tackling socio-economic challenges (benefits & risks)	BoG#1 (Plenary room): Moderator: Sebastian Grey (WMO) Facilitator: Kristian Nielsen (WEMC) Note taker: Vaileth Jonas (TMA) BoG#2 (Room 30pp): Moderator: Ilaria Vigo (BSC) Facilitator: Hamid Bastani (WMO) Note taker: Sara Octenjak (BSC) BoG#3 (Room 20pp): Moderator: Elliot Moyo (CSIR) Facilitator: (LGI) Note taker: Mecklina Merchades (TMA)
12h00 – 12h30	**Report back from the day's break-out sessions**	Moderator: Mohau Mateyisi (CSIR)
12h30 – 13h00	**Workshop wrap-up, way forward and farewell**	Trevor Lumsden (CSIR) Mohau Mateyisi (CSIR) Roberta Boscolo (WMO)
13h00 – 14h00	**Lunch**	

Thursday, 2 June Afternoon –
National Meteorological and Hydrological Services (NMHSs) Capacity Building Session

<table>
<tr><td>14h00 – 15h00</td><td>NMHS capacity building session – Seasonal forecasting methodologies
Introduction to the session
Objective seasonal forecasting – lessons from GHACOF/ICPAC
Seasonal forecasting methodologies at ACMAD</td><td>Moderators:
Sunshine Gamedze (ACMAD)
John Faragher (Met Office)
Andre Kamga (ACMAD) (remotely)</td></tr>
<tr><td>15h00 – 15h30</td><td colspan="2">Coffee break</td></tr>
<tr><td>15h30 – 16h30</td><td>NMHS capacity building session (continued)
Seasonal forecasting in SADC region
Facilitated discussion
How do NMHSs see objective forecasting?
What would be NMHS role in objective approaches at SARCOF?
How do NMHSs interact with users in different sectors to share the seasonal forecast?
What improvements are needed in seasonal forecasting processes?
How can information emerging from seasonal forecasts be better adapted to produce tailored climate services for users?</td><td>Moderators:
Esther Jansen (ACMAD)
Sunshine Gamedze (ACMAD),
Scott Burgan (Met Office)</td></tr>
</table>

Annex 2: Poster of the project