



## EUROPEAN CLIMATE, INFRASTRUCTURE AND ENVIRONMENT EXECUTIVE AGENCY (CINEA)

CINEA.C – Green research and innovation  
C.1 – Horizon Europe Climate

### AMENDMENT Reference No AMD-869575-9

#### **Grant Agreement number: 869575 — Full-value chain Optimised Climate User-centric Services for Southern Africa: FOCUS-Africa (FOCUS-Africa)**

The parties agree to amend the Grant Agreement as follows ('**Amendment**')

#### **1 . Removal of a beneficiary whose participation was terminated (for other reasons)**

The participation of the following beneficiary has been terminated:

- JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION (JRC) - on the day after the notification of termination

This implies the **following changes** to the Grant Agreement:

- The 'termination date' is added, for the beneficiary, in the **Preamble**:  
**JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION (JRC)**, established in Rue de la Loi 200, BRUSSELS 1049, Belgium, - until termination date

In accordance with Article 50 of the Grant Agreement, the beneficiary's obligations continue to apply after termination.

#### **2. Change of Annex 1 (description of the action)**

As from 1 March 2022, **Annex 1** is changed and replaced by the Annex 1 attached to this Amendment.

#### **3 . Changes of Annex 2 (estimated budget)**

As from 1 March 2022 , **Annex 2** is changed and replaced by the Annex 2 attached to this Amendment.

All other provisions of the Grant Agreement and its Annexes remain unchanged.

This Amendment **enters into force** on the day of the last signature.

This Amendment **takes effect** on the date on which the amendment enters into force, except where a different date has been agreed by the parties (for one or more changes).

Please inform the other members of the consortium of the Amendment.

## SIGNATURES

For the coordinator

For the Agency

Enclosures:

Annex 1  
Annex 2



**EUROPEAN CLIMATE, INFRASTRUCTURE AND  
ENVIRONMENT EXECUTIVE AGENCY (CINEA)**

CINEA.C – Green research and innovation  
**C.1 – Horizon Europe Climate**

**ANNEX 1 (part A)**

**Research and Innovation action**

**NUMBER — 869575 — FOCUS-Africa**

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## 1.1. The project summary

|                             |        |                              |              |
|-----------------------------|--------|------------------------------|--------------|
| Project Number <sup>1</sup> | 869575 | Project Acronym <sup>2</sup> | FOCUS-Africa |
|-----------------------------|--------|------------------------------|--------------|

### One form per project

#### General information

|                                     |  |
|-------------------------------------|--|
| Project title <sup>3</sup>          | Full-value chain Optimised Climate User-centric Services for Southern Africa: FOCUS-Africa   |
| Starting date <sup>4</sup>          | 01/09/2020   |
| Duration in months <sup>5</sup>     | 48   |
| Call (part) identifier <sup>6</sup> | H2020-LC-CLA-2019-2  |
| Topic                               | LC-CLA-05-2019<br>Human dynamics of climate change   |
| Fixed EC Keywords                   | Climate services for Africa  |
| Free keywords                       | tailored climate information, water-energy-food nexus, climate adaptation strategies for Africa, seasonal forecasts, climate projections, climate resilience, European added-value |

#### Abstract <sup>7</sup>

The central objective of FOCUS-Africa is to develop sustainable tailored climate services in the Southern African Development Community (SADC) region for four sectors: agriculture and food security, water, energy and infrastructure. The proposed co-production amongst end-users, climate scientists and sectoral service providers will ensure that the full value chain for the delivery of the climate services is effectively realised. This will be demonstrated by piloting eight case studies in six countries involving a wide range of end-uses to illustrate how the application of new climate forecasts, projections, resources from Copernicus, GFCS and other relevant products can maximise socio-economic benefits in the Southern Africa region and potentially in the whole of Africa.

An innovative aspect of FOCUS-Africa is to address the recurring sustainability and exploitation challenge of climate services in Africa. To achieve this, it will assess dynamically the socio-economic value of the proposed services during the development of the prototypes to better adapt pilot products to the local situation. End-users and service providers will be fully involved in the definition of the associated exploitation strategies using the innovative Flourishing Business Canvas to design business models that are socially beneficial, gender-sensitive, environmentally regenerative and financially viable. This approach will ensure that each of the co-designed climate product can be operationalised through WMO operational infrastructure (e.g. ECMWF, Regional Climate Centres and National Meteorological and Hydrological Services) in support of sustained country level service delivery on regional and global scales.

Ultimately, FOCUS-Africa climate services are expected to become a fundamental part of sectorial adaptation strategies at different levels (from local to national and regional) and contribute to the implementation of Paris Agreement and the Sustainable Development Goals

## 1.2. List of Beneficiaries

|                             |        |                              |              |
|-----------------------------|--------|------------------------------|--------------|
| Project Number <sup>1</sup> | 869575 | Project Acronym <sup>2</sup> | FOCUS-Africa |
|-----------------------------|--------|------------------------------|--------------|

### List of Beneficiaries

| No | Name  | Short name | Country        | Project entry date <sup>8</sup> | Project exit date                             |
|----|---|------------|----------------|---------------------------------|---|
| 1  | WORLD METEOROLOGICAL ORGANIZATION                                   | WMO        | Switzerland    |                                 |   |
| 2  | BARCELONA SUPERCOMPUTING CENTER-CENTRO NACIONAL DE SUPERCOMPUTACION | BSC        | Spain          |                                 |   |
| 3  | MET OFFICE  | MO         | United Kingdom |                                 |   |
| 4  | WORLD ENERGY & METEOROLOGY COUNCIL                                  | WEMC       | United Kingdom |                                 |   |
| 5  | ELECTRICITE DE FRANCE   | EDF        | France         |                                 |   |
| 6  | AFRICAN CENTRE OF METEOROLOGICAL APPLICATION DEVELOPMENT            | ACMAD      | Niger          |                                 |   |
| 7  | COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH                      | CSIR       | South Africa   |                                 |   |
| 8  | LGI SUSTAINABLE INNOVATION  | LGI        | France         |                                 |   |
| 9  | UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG                        | WITS-GCI   | South Africa   |                                 |   |
| 10 | UNIVERSITY OF CAPE TOWN   | UCT        | South Africa   |                                 |   |
| 11 | AMIGO SRL   | AMIGO      | Italy          |                                 |   |
| 12 | JRC -JOINT RESEARCH CENTRE-EUROPEAN COMMISSION                      | JRC        | Belgium        |                                 | the day after the notification of termination |
| 13 | SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO S ANNA  | SSSA       | Italy          |                                 |   |
| 14 | ASSOCIAZIONE PLAN ITALIA ONLUS                                      | PLAN       | Italy          |                                 |   |
| 15 | INSTITUTO DE INVESTIGACAO AGRARIA DE MOCAMBIQUE                     | IHAM       | Mozambique     | 18/06/2021                      |   |

## 1.3. Workplan Tables - Detailed implementation

### 1.3.1. WT1 List of work packages

| WP Number <sup>9</sup> | WP Title   | Lead beneficiary <sup>10</sup> | Person-months <sup>11</sup> | Start month <sup>12</sup> | End month <sup>13</sup> |
|------------------------|--|--------------------------------|-----------------------------|---------------------------|-------------------------|
| WP1                    | Stakeholder engagement, communication and dissemination                          | 1 - WMO                        | 96.31                       | 1                         | 48                      |
| WP2                    | Assess end-users' challenges and climate services requirements                   | 7 - CSIR                       | 86.60                       | 4                         | 48                      |
| WP3                    | Understand climate processes   | 3 - MO                         | 108.90                      | 1                         | 24                      |
| WP4                    | Develop methods and tools  | 2 - BSC                        | 144.01                      | 1                         | 48                      |
| WP5                    | Develop end-user tailored climate services prototypes                            | 4 - WEMC                       | 149.72                      | 19                        | 48                      |
| WP6                    | Assess the socio-economic value of the prototypes and prepare their exploitation | 8 - LGI                        | 98.05                       | 1                         | 48                      |
| WP7                    | Develop capacities   | 6 - ACMAD                      | 50.00                       | 1                         | 48                      |
| WP8                    | Project coordination and management  | 1 - WMO                        | 37.50                       | 1                         | 48                      |
| WP9                    | Ethics requirements  | 1 - WMO                        | N/A                         | 1                         | 48                      |
| <b>Total</b>           |  |                                | 771.09                      |                           |                         |

### 1.3.2. WT2 list of deliverables

| <b>Deliverable Number<sup>14</sup></b> | <b>Deliverable Title</b>   | <b>WP number<sup>9</sup></b> | <b>Lead beneficiary</b> | <b>Type<sup>15</sup></b>       | <b>Dissemination level<sup>16</sup></b>  | <b>Due Date (in months)<sup>17</sup></b> |
|--|--|------------------------------|-------------------------|--------------------------------|--|--|
| D1.1                                   | Project Website  | WP1                          | 8 - LGI                 | Websites, patents filing, etc. | Public   | 2  |
| D1.2                                   | Communication and Dissemination Plan, style guide document   | WP1                          | 4 - WEMC                | Report                         | Public   | 6  |
| D1.3                                   | Mid-term report on the first series of the events  | WP1                          | 1 - WMO                 | Report                         | Public   | 18                                       |
| D1.4                                   | Update of Communication and Dissemination Plan   | WP1                          | 4 - WEMC                | Report                         | Public   | 28                                       |
| D1.5                                   | Report on the second series of the events  | WP1                          | 1 - WMO                 | Report                         | Public   | 36                                       |
| D1.6                                   | Policy brief   | WP1                          | 2 - BSC                 | Report                         | Public   | 45                                       |
| D1.7                                   | Final Report, wrapping up on the project outputs including cooperation activities, linkage with follow-up projects | WP1                          | 1 - WMO                 | Report                         | Public   | 48                                       |
| D1.8                                   | Report on the introductory session on responsible research and innovation  | WP1                          | 8 - LGI                 | Report                         | Public   | 12                                       |
| D2.1                                   | Report describing setting current risks and vulnerabilities and end-users challenges for each case study           | WP2                          | 7 - CSIR                | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 9  |
| D2.2                                   | Report describing regional climate extremes  | WP2                          | 9 - WITS-GCI            | Report                         | Public   | 24                                       |
| D2.3                                   | Report describing climate risk assessment on food security, water and energy nexus                                 | WP2                          | 7 - CSIR                | Report                         | Public   | 30                                       |
| D2.4                                   | Report on the characterization of climate-ready rice and cowpea varieties  | WP2                          | 13 - SSSA               | Report                         | Public   | 30                                       |
| D3.1                                   | Report on the selection and analysis of high-resolution climate  | WP3                          | 3 - MO                  | Report                         | Public   | 12                                       |



| <b>Deliverable Number<sup>14</sup></b> | <b>Deliverable Title</b>  | <b>WP number<sup>9</sup></b> | <b>Lead beneficiary</b> | <b>Type<sup>15</sup></b>       | <b>Dissemination level<sup>16</sup></b>  | <b>Due Date (in months)<sup>17</sup></b> |
|--|---|------------------------------|-------------------------|--------------------------------|--|--|
|  | projections of the region   |                              |                         |                                |  |  |
| D3.2                                   | Report on the analysis of the predictability of seasonal and decadal forecasts for the region and sectors of interest         | WP3                          | 9 - WITS-GCI            | Report                         | Public   | 18                                       |
| D3.3                                   | Report on the regional extreme events identification and variability  | WP3                          | 11 - AMIGO              | Report                         | Public   | 24                                       |
| D4.1                                   | Report on the verification of seasonal forecasts and the characterization of climate projections and decadal predictions      | WP4                          | 2 - BSC                 | Report                         | Public   | 24                                       |
| D4.2                                   | Report on the multi-model and downscaling for seasonal forecasts, climate projections and decadal predictions                 | WP4                          | 9 - WITS-GCI            | Report                         | Public   | 36                                       |
| D4.3                                   | Report on the verification of ECVs derived indices  | WP4                          | 2 - BSC                 | Report                         | Public   | 42                                       |
| D5.1                                   | Report to document the data required, and a set of guidelines, for all CS prototype development                               | WP5                          | 4 - WEMC                | Report                         | Public   | 30                                       |
| D5.2                                   | Plan for the eight co-designed and co-developed case study prototypes, including description of technical aspects of delivery | WP5                          | 4 - WEMC                | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 36                                       |
| D5.3                                   | WebGIS platform for seasonal/decadal forecast visualization for CSs 2, 4 and 5  | WP5                          | 11 - AMIGO              | Demonstrator                   | Confidential, only for members of the consortium (including the Commission Services) | 38                                       |
| D5.4                                   | Patent Application for the webGIS platform for seasonal/decadal forecast visualization methodology                            | WP5                          | 11 - AMIGO              | Websites, patents filing, etc. | Confidential, only for members of the consortium (including the Commission Services) | 38                                       |
| D5.5                                   | A data catalogue providing the complete   | WP5                          | 13 - SSSA               | Report                         | Public   | 48                                       |

| <b>Deliverable Number<sup>14</sup></b> | <b>Deliverable Title</b>   | <b>WP number<sup>9</sup></b> | <b>Lead beneficiary</b> | <b>Type<sup>15</sup></b>       | <b>Dissemination level<sup>16</sup></b>  | <b>Due Date (in months)<sup>17</sup></b> |
|--|--|------------------------------|-------------------------|--------------------------------|--|--|
|  | genotypic, climatic, and phenotypic characterization of the rice and cowpea accessions used in CS3             |                              |                         |                                |  |  |
| D5.6                                   | Final report to describe the implementation and use of each of the climate service prototype for all of the CS | WP5                          | 4 - WEMC                | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 48                                       |
| D6.1                                   | Methodology to assess socio-economic impacts of climate services   | WP6                          | 8 - LGI                 | Report                         | Public   | 12                                       |
| D6.2                                   | Evaluation of the socio-economic situation in the 8 case studies   | WP6                          | 2 - BSC                 | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 24                                       |
| D6.3                                   | Ex-ante impact assessment of the services prototypes and recommendations                                       | WP6                          | 8 - LGI                 | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 36                                       |
| D6.4                                   | Ex-post impact assessment of the climate services prototypes   | WP6                          | 2 - BSC                 | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 48                                       |
| D6.5                                   | Market analysis and SRA of the climate services  | WP6                          | 11 - AMIGO              | Report                         | Public   | 48                                       |
| D6.6                                   | Exploitation strategies for most promising FOCUS-Africa services   | WP6                          | 8 - LGI                 | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 48                                       |
| D7.1                                   | Capacity Development needs and plan report   | WP7                          | 6 - ACMAD               | Report                         | Public   | 12                                       |
| D7.2                                   | On-line courses and modules  | WP7                          | 6 - ACMAD               | Websites, patents filing, etc. | Public   | 36                                       |
| D7.3                                   | Final report on the project capacity development   | WP7                          | 6 - ACMAD               | Report                         | Public   | 48                                       |

| <b>Deliverable Number<sup>14</sup></b> | <b>Deliverable Title</b>   | <b>WP number<sup>9</sup></b> | <b>Lead beneficiary</b> | <b>Type<sup>15</sup></b>       | <b>Dissemination level<sup>16</sup></b>  | <b>Due Date (in months)<sup>17</sup></b> |
|--|----------------------------|------------------------------|-------------------------|--------------------------------|--|--|
|  | implementation and results |                              |                         |                                |  |  |
| D8.1                                   | Project Quality Plan       | WP8                          | 8 - LGI                 | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 2  |
| D8.2                                   | Detailed Work Plan         | WP8                          | 1 - WMO                 | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 3  |
| D8.3                                   | Data Management Plan       | WP8                          | 8 - LGI                 | ORDP: Open Research Data Pilot | Confidential, only for members of the consortium (including the Commission Services) | 6  |
| D9.1                                   | H - Requirement No. 1      | WP9                          | 1 - WMO                 | Ethics                         | Confidential, only for members of the consortium (including the Commission Services) | 6  |

### 1.3.3. WT3 Work package descriptions

|   |   |                                       |         |
|---|---|---------------------------------------|---------|
| <b>Work package number</b> <sup>9</sup> | WP1   | <b>Lead beneficiary</b> <sup>10</sup> | 1 - WMO |
| <b>Work package title</b>               | Stakeholder engagement, communication and dissemination |                                       |         |
| <b>Start month</b>                      | 1   | <b>End month</b>                      | 48      |

#### Objectives

This workpackage will ensure that the results of FOCUS-Africa are shared with the wider stakeholder community to maximize the impacts in the SADC region and in the African and European continents. Its specific objectives include:

- Develop and execute a dissemination and communication plan to outreach a wider stakeholder community in coordination with other relevant ongoing projects in SADC region
- Plan and execute stakeholders' workshops and consultations, also in collaboration with the EU-Funded Intra-ACP Climate Services Action
- Establish Advisory Board and a project evaluation system
- Develop communication material including a public web portal, awareness campaigns and videos footage
- Engage the stakeholders in a Responsible Research and Innovation approach

#### Description of work and role of partners

**WP1 - Stakeholder engagement, communication and dissemination** [Months: 1-48]  
**WMO, BSC, MO, WEMC, EDF, ACMAD, CSIR, LGI, WITS-GCI, UCT, AMIGO, JRC, SSSA, PLAN, IIAM**  
 Task 1.1: Plan and execution of stakeholders' workshops and consultations (M1-M48)  
 Leader: WMO - Contributors: all project partners

This task will perform the organisation of stakeholders' workshops in order to obtain inputs from internal and external entities that are engaged in the development of the FOCUS-Africa climate services. WEMC and WMO will oversee the preparation of all workshops, in collaboration with the case study representatives. Workshops will be organised every 8 months, approximately at M4, M12, M20, M28, M36 and M44. Each of the 6 countries involved in the case studies (South Africa, Malawi, Mozambique, Tanzania, Zambia and Mauritius) will host one workshop.

The workshop themes topics addressed in the local case studies (food security, infrastructure, energy and water) will also be aligned with the case studies relevant to the host country: this is done to incentivize a wider local participation. The objectives and the programme of each workshop will be defined on a case-by-case basis and in concertation with the WP leaders, so as to consider the latest progresses made in the project. Attendance of the workshop is expected to be between 25 and 35 participants (project partners, local stakeholders, entity from other research projects, etc.). Physical meetings will be complemented with remote communications (teleconferences and emails) in order to achieve an optimal balance of displacement and effectiveness.

The workshops will be along the following lines:

- Situation analysis: gather climate experts and sectoral stakeholders to characterise climate-related challenges, list existing services/initiatives and describe the industry, policy and legal frameworks.
- Exploration of specific climate data and service requirements: meet with prospective users to analyse the climate risks to their work, formulate needs for climate services and expectations in terms of socio-economic impact, and define features and boundary conditions to be considered in designing climate services
- Impact evaluation: co-define (together with stakeholders involved in case studies) a common impact assessment methodology, and coordinate the dynamic evaluation along the project using methods described in WP6

All project partners are expected to contribute to stakeholder engagement via e.g. workshops organizing committee, participation, input to reporting. These events are to be considered the "clock" of the project and thus the activities in all WPs will be aligned to this WP schedule.

This task is cross-sectorial and will help the knowledge sharing across the FOCUS-Africa project and other WMO ongoing projects in the region/continent for identifying gaps, share best practices and report on progress.

Partner: Activity (PM)

- WMO: Support organization of all the stakeholder workshops and engage with the local authorities through the NMHSs (3)
- WEMC: Lead the organization of workshop: logistics, programme, visibility and communication. Produce workshop reports. (15)
- ACMAD: Support the organization of the workshops as co-leader of WP7 (1)

- BSC: Support the organization of the workshops as leader of WP4 and CS2 and CS4 (5.5)
  - CSIR: Support the organization of the workshops as leader of WP2 and CS1 and CS8 (5.5)
  - MO: Support the organization of the workshops as leader of WP3 and CS5 and CS6 (5.5)
  - LGI: Support the organization of the workshops as PMO (WP8) and leader of WP6 (5.5)
  - SSSA: Support the organization of the workshops as leader of CS3 (1.5)
- all other partners: Contribute to organization of and participation to workshops. Feedback to workshop report (0.5 each)

Task 1.2: Establishment of Advisory Board and project evaluation system (M1 – M44)

Leader: WMO - Contributors: LGI, WEMC

This task will build on the identified supporting institutions and individuals (see letters of supports) for establishing an Advisory Board (AB) (link with WP8). This group will meet regularly and will provide a systematic project evaluation from the members' perspective. The AB will have a regular teleconference one month before the stakeholders' workshop to both brief the AB on project progress and to canvass AB's input to refine workshops. AB will be then invited to attend the stakeholders' workshops. The key activities in this WP are:

- a. Establish the AB by leveraging on the project partners' network, the sectors' associations and the large number of linked organisations (noting that the makeup of the board is largely already decided with the individual and organizational supporting letters -see letters in appendices).
- b. Define the Terms of Reference of the AB to include a systematic project evaluation using both formative and summative evaluation in the different project domains, namely project inputs, processes, outputs and outcomes, as well as an overall assessment of the project's achievements.
- c. Organize AB meetings and consolidate in meeting reports the views of the members on the project progress and outputs quality. These reports should also contain the recommendations of the AB on specific activities to be undertaken between workshops.

Partner: Activity (PM)

- WMO : Establish the AB, definition of the Terms of Reference (ToR), establish linkages with the GFCS Partners Advisory Board (PAC) (3)
- LGI: Organize AB meetings and consolidate meetings' report (2)
- WEMC: Assist with the AB establishment, ToRs definition and AB meetings (1,5)

Task 1.3: Develop and execute a dissemination and communication plan to outreach a wider stakeholder community in coordination with other relevant ongoing projects in Africa (M1 – M48)

Leader: WEMC - Contributors: WMO, LGI, ACMAD

This task will plan the communication and dissemination activities to be undertaken as a part of an overall strategy created by WMO (WP1 leader), WEMC, LGI and agreed by all WPs leaders.

LGI, WEMC and WMO will coordinate all communication activities to be carried out for the entire duration of the project. A preliminary dissemination plan, part of a bigger document called Communication and Dissemination Plan (CDP, D1.3), will be delivered at the early stage of the project (M6) after discussing its content during the kick-off meeting, in the dedicated session of WP1. Furthermore, the CDP will briefly present some recommendations on communication activities to be done after the end of the project.

Coordination and exploration of synergies between projects funded under the same or similar calls, as well as with other WMO and GFCS climate services related activities is crucial for resources efficiency and impact maximization. Thus, the CDP will detail the synergies with projects related to climate services in Africa, the EU-funded Intra-ACP project, the Climate Risk and Early Warning System initiative (CREWS) and the regional project funded by the Adaptation Fund (ACREI).

The consortium will also consider interacting with the other relevant EU projects and other initiatives in the field of climate services and develop mutually beneficial synergies (see comprehensive table in Section 1.3.2). This task will also leverage on the sector-specific workshops that WMO, ACMAD will organize as contribution to the Intra-ACP Climate Services Output 1.

Partner: Activity (PM)

- WEMC : Create detailed (CDP). Coordination and preparation of project style guide. Assist with implementation of CDP. Update CDP (4)
- LGI: Support the CDP production (1)

- WMO: Promoting the project implementation with European Commission/Agency and coordinate with project addressing similar sectors/end-users. Ensure that activities are aligned with other initiatives in the Southern Africa region. Provide linkages with SARCOFs and Intra-ACP Climate Services (2)
- ACMAD: Ensure activities are aligned with other initiatives in the African Continent. Provide linkages with African RCOFs and Intra-ACP Climate Services (1)
- ACMAD: Ensure that activities are aligned with other initiatives in the Southern Africa region. Provide linkages with SARCOFs and Intra-ACP Climate Services (1)

Task 1.4: Carry out communication and dissemination actions and develop materials to boost engagement (M1 – M48)  
 Leader: LGI - Contributors: WEMC, BSC, and all the other of the partners

Tailored and effective communication material for FOCUS-Africa will be prepared to serve the communication goals of the project, namely:

- A visual identity comprising a logo and project banner.
- A communication toolkit will be designed including a FOCUS-Africa poster/rollup, flyers, and ‘pitch’ presentation. A project video will also be produced
- A project website will be rolled out in the first month of the project. It will provide a high-level description of the project and its objectives aimed at the general public and users. The website will serve as a mean for the continuous dissemination of information about the project for public awareness as well as internally for the project participants. It will include an ‘Information Observatory’ section providing open access to FOCUS-Africa climate services solutions and related information in a structured way.
- A project intranet, linked to the public website, will be deployed during the first month of the project, to ensure a fluid communication and collaborative work among the project partners
- Social media accounts on Twitter, Facebook and/or LinkedIn will be created at the beginning of the project and managed daily to communicate and disseminate the main results of Focus Africa, as well as build an online community and boost engagement.
- Specific content will be drafted and disseminated through the project’s communication channels:
  - o Blog posts, success stories, testimonials and other forms of articles that set the scene and present the climate services challenges in Africa related to food security, energy and water. In addition, a set of thematic leaflets on the case studies, are also planned.
  - o Infographics, strong visuals and short videos with key project data and results will be designed and disseminated on the various communication channels, in particular social media, to raise awareness of climate services and their benefits
  - o Press releases (at least 3) will be drafted and sent to media when significant milestones have been reached in the project, to inform them on the progress and how Europe is helping the deployment of climate services in Africa
- Communication campaigns with specific messages targeting the various project target audiences will be rolled out during the project based on the objectives and milestones achieved. These campaigns will be based on the various content generated and will be maximised by using the partners’ channels and identified multipliers (clusters, NGO’s, networks...) to relay the campaign and messages. Appealing content will be created in the form of infographics, visuals and/or videos. At least 4 campaigns are planned to be carried out during the course of the project.

Dissemination activities will be clearly defined in the Communication and Dissemination plan drafted in Task 1.3 to share knowledge and results generated in the project and increase their uptake. These include the:

- Coordination of partners’ participation in conferences and events
- Coordination of publications
- Establishment of close collaboration and strengthening ties with networks, clusters, initiatives and similar projects at European and national/regional level
- An annual e-newsletter will be distributed to the project’s stakeholders to inform them on the project’s achievements and progress
- A policy brief aimed at informing policymakers in Europe and Africa about climate services solutions and recommendations will be drafted.

Partner: Activity (PM)

- BSC: Thematic narratives to set the scene of CSs and presenting challenges for climate services in Africa. A policy brief (5)
- LGI: Website development, design and management; Production of the communication toolkit and visual identity; Daily management of social media accounts; Drafting of content to be published monthly for the website and all communication channels: articles, infographics, production of short videos, visuals etc... Drafting and distribution of e-newsletters; Design and implementation of communication campaigns (16)

- WEMC: Contribution to promotional and communication material such webinars, ‘pitch’ presentation. Contribute to dissemination activities (2)
- All the other partners: Contribute to communication as appropriate and relevant: leaflet and/or pitch video, social media communication... (0.5 each)

Task 1.5: Engage stakeholders in a Responsible Research and Innovation approach (M1 – M12)

Leader: LGI – contributors: WMO, all other partners

During the first stakeholders’ workshop, LGI will organise a session to introduce the concepts and tools of Responsible Research and Innovation (RRI). LGI will build on a gender equal and inclusive concept for RRI introduced in the framework of a previous H2020 (FoTRRIS). This concept includes a co-creative dimension of the relationship between science and society (co-RRI), in line with the approach planned in FOCUS-Africa (case studies involving end users and external stakeholders, ex-ante/ex-post socio-economic assessment). Hence, the project partners and the external stakeholders attending the workshop will be trained to this concept and the tools related to it. At the end of the session, a survey will be sent to the project partners to collect a list of tasks and actions of the project in which they plan to adopt the RRI approach (especially for the regional case studies implementation). Based on the results of this survey, the results of implementing the RRI approach will then be tracked along the project, with specific progress reviews during consortium meetings.

Partner: Activity (PM)

- LGI: Organise an introductory session on RRI during the first stakeholders’ workshop; prepare the materials for the session. (3)
- WMO: Assist LGI in the organisation and facilitation of the workshop session; ensure the efficient dissemination of RRI tools and methods in relevant actions of each case study. (2)

#### Participation per Partner

| Partner number and short name | WP1 effort   |
|-------------------------------|--------------|
| 1 - WMO                       | 10.50        |
| MNREM                         | 1.00         |
| 2 - BSC                       | 10.50        |
| 3 - MO                        | 6.00         |
| 4 - WEMC                      | 22.50        |
| 5 - EDF                       | 1.00         |
| 6 - ACMAD                     | 2.50         |
| 7 - CSIR                      | 6.00         |
| 8 - LGI                       | 27.50        |
| 9 - WITS-GCI                  | 2.21         |
| 10 - UCT                      | 1.00         |
| 11 - AMIGO                    | 1.00         |
| 12 - JRC                      | 0.60         |
| 13 - SSSA                     | 2.00         |
| 14 - PLAN                     | 1.00         |
| 15 - IIAM                     | 1.00         |
| <b>Total</b>                  | <b>96.31</b> |

**List of deliverables**

| <b>Deliverable Number<sup>14</sup></b> | <b>Deliverable Title</b>   | <b>Lead beneficiary</b> | <b>Type<sup>15</sup></b>       | <b>Dissemination level<sup>16</sup></b> | <b>Due Date (in months)<sup>17</sup></b> |
|--|--|-------------------------|--------------------------------|---|--|
| D1.1                                   | Project Website  | 8 - LGI                 | Websites, patents filing, etc. | Public                                  | 2  |
| D1.2                                   | Communication and Dissemination Plan, style guide document   | 4 - WEMC                | Report                         | Public                                  | 6  |
| D1.3                                   | Mid-term report on the first series of the events  | 1 - WMO                 | Report                         | Public                                  | 18                                       |
| D1.4                                   | Update of Communication and Dissemination Plan   | 4 - WEMC                | Report                         | Public                                  | 28                                       |
| D1.5                                   | Report on the second series of the events  | 1 - WMO                 | Report                         | Public                                  | 36                                       |
| D1.6                                   | Policy brief   | 2 - BSC                 | Report                         | Public                                  | 45                                       |
| D1.7                                   | Final Report, wrapping up on the project outputs including cooperation activities, linkage with follow-up projects | 1 - WMO                 | Report                         | Public                                  | 48                                       |
| D1.8                                   | Report on the introductory session on responsible research and innovation  | 8 - LGI                 | Report                         | Public                                  | 12                                       |

**Description of deliverables**

D1.1 : Project Website [2]

Project Website

D1.2 : Communication and Dissemination Plan, style guide document [6]

Communication and Dissemination Plan, style guide document

D1.3 : Mid-term report on the first series of the events [18]

Mid-term report on the first series of the events: AB meetings, stakeholders engagement workshop, and Web portal and communication material

D1.4 : Update of Communication and Dissemination Plan [28]

Update of Communication and Dissemination Plan

D1.5 : Report on the second series of the events [36]

Report on the second series of the events: AB meetings, stakeholders' engagement workshops, and Web portal and communication material

D1.6 : Policy brief [45]

Policy brief

D1.7 : Final Report, wrapping up on the project outputs including cooperation activities, linkage with follow-up projects [48]

Final Report, wrapping up on the project outputs including cooperation activities, linkage with follow-up projects



D1.8 : Report on the introductory session on responsible research and innovation [12]

Report on the introductory session on responsible research and innovation (workshop materials and list of targeted actions for RRI implementation)

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>                           | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>   |
|--------------------------------------|--|-------------------------|-----------------------------|--|
| MS1                                  | First Stakeholder Workshop                       | 4 - WEMC                | 4                           | First Stakeholder Workshop<br>Means of verification: Workshop's minutes                    |
| MS2                                  | Second Stakeholder Workshop                      | 4 - WEMC                | 12                          | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes                   |
| MS3                                  | Third Stakeholder Workshop                       | 4 - WEMC                | 20                          | Third Stakeholder Workshop<br>Means of verification: Workshop's minutes                    |
| MS4                                  | Fourth Stakeholder Workshop                      | 4 - WEMC                | 28                          | Fourth Stakeholder Workshop<br>Means of verification: Workshop's minutes                   |
| MS5                                  | Fifth Stakeholder Workshop                       | 4 - WEMC                | 36                          | Fifth Stakeholder Workshop<br>Means of verification: Workshop's minutes                    |
| MS6                                  | Sixth Stakeholder Workshop                       | 4 - WEMC                | 44                          | Sixth Stakeholder Workshop<br>Means of verification: Workshop's minutes                    |
| MS15                                 | roll out of the training courses at 3rd workshop | 6 - ACMAD               | 20                          | roll out of the training courses at 3rd workshop<br>means of verification: Workshop report |
| MS17                                 | Kick Off Meeting                                 | 1 - WMO                 | 1                           | Kick Off Meeting<br>means of verification: minutes   |
| MS18                                 | Project intranet established                     | 8 - LGI                 | 2                           | Project intranet established<br>Means of verification: intranet website                    |
| MS19                                 | Final meeting                                    | 1 - WMO                 | 48                          | Final meeting<br>Means of verification: minutes  |

|   |  |                                       |          |
|---|--|---------------------------------------|----------|
| <b>Work package number</b> <sup>9</sup> | WP2  | <b>Lead beneficiary</b> <sup>10</sup> | 7 - CSIR |
| <b>Work package title</b>               | Assess end-users' challenges and climate services requirements |                                       |          |
| <b>Start month</b>                      | 4  | <b>End month</b>                      | 48       |

### Objectives

This work package will ensure users engagement for prioritising development needs and realistic solutions options through innovative methods developed in the last few years in the context of climate variability and change as well as risk exposure and vulnerability. Exposure and vulnerability will be framed within location specific social, economic, political and cultural realities. A climate risk and vulnerability assessment is thus the prerequisite for the construction of the regional case studies factoring the elements needed for improving resilience. The specific objectives, in support of the other WPs and case studies, include:

- Mapping the landscape of end users' challenges,
- Exploring the state of climate service requirements in the water, food and energy sectors,
- Assessing current and future climate vulnerability and risk through analysis of climate variability and climate change, sensitivity and adaptive capacity of systems in the water, energy, and food security infrastructure nexus.
- Generating and analysing genomic data to be used in combination with climate projections in CS#3

### Description of work and role of partners

#### **WP2 - Assess end-users' challenges and climate services requirements** [Months: 4-48]

**CSIR, BSC, MO, EDF, ACMAD, WITS-GCI, UCT, JRC, SSSA, PLAN, IIAM**

Task 2.1: Climate services requirements, co-production and end user's challenges landscape (M4-24)

Leader: CSIR - Contributors: MO, PLAN, SSSA, BSC, EDF, ACDMAD, IIAM

The mapping of the end-user's challenges landscape and climate service requirements is a steppingstone toward identifying the research gaps, user-driven climate service tools development and capacity building needs. This task will identify the appropriate applications of climate information within the user decision-making process and will support the co-production of user-relevant information [ [ ] ]. The stakeholder workshops (WP1) will provide the primary platform for the users 'engagement. Other available platforms (e.g. surveys, phone interviews) and local forum groups such SARCOFs and Regional User Interface Platforms (Output 1 Intra-ACP) will be used. The task acknowledges the importance of local NMHSs and RCCs partnership as a key factor for successful engagement. The task will have interactions with WPs 1, 3-7. The expected outputs are:

- Better understating of stakeholders' challenges landscape
- Better understanding of stakeholders' decision-making processes with emphasis on gaps and weaknesses in the food, energy and water sectors
- Better understanding of the climate service requirements at various space and time scales
- Enchased participation of stokeholds both at planning and development phases, in the process of the services co-production

Partner: Activity (PM)

- CSIR: Users' requirements and co-production for CS1 and CS8 (7)
- WMO: Engagement with the Mauritius Water Resource Unit (CS8) / Developing the user requirements and co-production for CS1 with CSIR
- IIAM: Conduct FGDs in the Nampula field testing sites (CS3, Mozambique) / Analyse users' requirements in the SADC region for water, food and energy sectors. Data collected from SARCOFs and regional User Interface Platforms (3)
- MO: User's requirements and co-production for two case studies CS5 and CS6 (3)
- PLAN: Conduct surveys and focus group discussions (FGDs) with smallholder farmers in Nampula area (CS3, Mozambique) (4)
- SSSA: Formulate and provide guidance to interviews and analyse the collected information from FDGs and surveys (CS3, Mozambique) (1)
- BSC: Analyse different decision-making contexts and processes for CS2 and CS4 (8)
- EDF: Interaction with EDF South Africa for area of interest, data availability, current practice and perceived/expected climate risks and possible impacts (2)

- ACMAD: Analyse user' requirements in the SADC region for water, food and energy sectors. Data collected from SARCOFs and regional User Interface Platforms (1)

Task 2.2: Climate risk and vulnerability assessment (M9-M48)

Leader: CSIR - Contributors: JRC, WITS-GCI, UCT, SSSA, ACMAD, IIAM

This task will explore the current and future risks arising from climate variability and climate change with special attention to extremes and at different spatio-temporal scales [ ]. The task is cognizant of the methods developed in the field in the last few years and of the emerging debate, among climate service providers, about climate risk management and resilience versus climate change risks and adaptation.

The task will provide:

- Improved understanding on climate risks at various spatio-temporal scales strongly driven by local and regional relevance
- Improved reduction of uncertainty in the climate risk and impact assessment for the water-energy-food nexus systems
- Knowledge on the limits of adaptation

This task will also generate and analyse genomic data to be used in combination with climate projections in C3S. In particular, rice and cowpea landraces will be sourced in local collections and characterized via Next-Generation Sequencing (NGS). Passport data for the accessions, including sampling locations, will be matched with molecular data and climate projections in a landscape genomics and niche modelling approach aiming at the identification of climate-ready varieties featuring genetic factors conferring adaptation to current and projected environmental conditions.

The task will have interactions with WPs 3, 4, 5, 7.

Partner: Activity (PM)

- CSIR: Leading the tasks' activities; scaling up the work done by the CSIR through the GreenBook project; conducting regional extreme value analysis (10)
- WITS-GCI: Assessments of current and future climate risks and impacts (especially linked to extremes and at different spatio-temporal scales) on food security (8.60); and JRC (4.00)
- UCT: Contribute to the development of climate risk assessment building on current work. Explore and trial the innovative use of climate risk narratives as developed in FRACTAL and align these with the evolving use of climate process storylines (10)
- ACMAD Contribute to the development of climate risk assessment by providing regional data and analysis for the water-energy-food system in the SADC region (1)
- SSSA: Based on partners' activities, identifying best climate-ready varieties by genotyping of 250 rice accessions and 250 cowpea accessions. Conducting bioinformatics and statistical approaches using next generation sequencing (NGS) on Illumina technology. Conduct landscape genomics approaches to identify genomic loci and accessions featuring adaptation traits (12)
- IIAM: Support SSSA in selecting and sourcing 500 rice and cowpea accessions. Analyse metadata and passport data. Define the interaction of future climate scenarios in relation to Mozambique current cropping practices, and modelling of future distribution of rice and cowpea on the basis of adaptation data. (12)

#### Participation per Partner

| Partner number and short name | WP2 effort |
|-------------------------------|------------|
| 2 - BSC                       | 8.00       |
| 3 - MO                        | 3.00       |
| 5 - EDF                       | 2.00       |
| 6 - ACMAD                     | 2.00       |
| 7 - CSIR                      | 17.00      |
| 9 - WITS-GCI                  | 8.60       |
| 10 - UCT                      | 10.00      |
| 12 - JRC                      | 4.00       |
| 13 - SSSA                     | 13.00      |

| Partner number and short name | WP2 effort |
|-------------------------------|------------|
| 14 - PLAN                     | 4.00       |
| 15 - IIAM                     | 15.00      |
| <b>Total</b>                  | 86.60      |

#### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title  | Lead beneficiary | Type <sup>15</sup> | Dissemination level <sup>16</sup>  | Due Date (in months) <sup>17</sup> |
|----------------------------------|--|------------------|--------------------|--|------------------------------------|
| D2.1                             | Report describing setting current risks and vulnerabilities and end-users challenges for each case study | 7 - CSIR         | Report             | Confidential, only for members of the consortium (including the Commission Services) | 9                                  |
| D2.2                             | Report describing regional climate extremes  | 9 - WITS-GCI     | Report             | Public   | 24                                 |
| D2.3                             | Report describing climate risk assessment on food security, water and energy nexus                       | 7 - CSIR         | Report             | Public   | 30                                 |
| D2.4                             | Report on the characterization of climate-ready rice and cowpea varieties                                | 13 - SSSA        | Report             | Public   | 30                                 |

#### Description of deliverables

D2.1 : Report describing setting current risks and vulnerabilities and end-users challenges for each case study [9]  
 Report describing setting current risks and vulnerabilities and end-users challenges for each case study

D2.2 : Report describing regional climate extremes [24]  
 Report describing regional climate extremes

D2.3 : Report describing climate risk assessment on food security, water and energy nexus [30]  
 Report describing climate risk assessment on food security, water and energy nexus

D2.4 : Report on the characterization of climate-ready rice and cowpea varieties [30]  
 Report on the characterization of climate-ready rice and cowpea varieties

#### Schedule of relevant Milestones

| Milestone number <sup>18</sup> | Milestone title             | Lead beneficiary | Due Date (in months) | Means of verification  |
|--------------------------------|-----------------------------|------------------|----------------------|--|
| MS1                            | First Stakeholder Workshop  | 4 - WEMC         | 4                    | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes |
| MS2                            | Second Stakeholder Workshop | 4 - WEMC         | 12                   | Second Stakeholder Workshop<br>Means of                                    |

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>   | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>  |
|--------------------------------------|--|-------------------------|-----------------------------|---|
|                                      |  |                         |                             | verification: Workshop's minutes  |
| MS3                                  | Third Stakeholder Workshop   | 4 - WEMC                | 20                          | Third Stakeholder Workshop<br>Means of verification: Workshop's minutes   |
| MS4                                  | Fourth Stakeholder Workshop  | 4 - WEMC                | 28                          | Fourth Stakeholder Workshop<br>Means of verification: Workshop's minutes  |
| MS5                                  | Fifth Stakeholder Workshop   | 4 - WEMC                | 36                          | Fifth Stakeholder Workshop<br>Means of verification: Workshop's minutes   |
| MS6                                  | Sixth Stakeholder Workshop   | 4 - WEMC                | 44                          | Sixth Stakeholder Workshop<br>Means of verification: Workshop's minutes   |
| MS7                                  | All input variables to case study known  | 7 - CSIR                | 7                           | All input variables to case study known<br>Means of verification: location and climate variables identified for crop modelling and first crop model input file complete |
| MS8                                  | 2 users' requirements and challenges identified  | 7 - CSIR                | 12                          | 2 users' requirements and challenges identified<br>Means of verification: consolidated report from stakeholders' workshop and info collated using other methods         |
| MS9                                  | Details on regional extremes arising from climate change and climate variability known | 7 - CSIR                | 24                          | Details on regional extremes arising from climate change and climate variability known<br>Means of verification: report and publication                                 |
| MS10                                 | Online decision support tool on food security, water and energy developed              | 7 - CSIR                | 30                          | Online decision support tool on food security, water and energy developed<br>Means of verification: report/publication describing adaptation tool developed             |
| MS17                                 | Kick Off Meeting   | 1 - WMO                 | 1                           | Kick Off Meeting means of verification: minutes   |
| MS19                                 | Final meeting  | 1 - WMO                 | 48                          | Final meeting Means of verification: minutes  |

|   |                              |                                       |        |
|---|------------------------------|---------------------------------------|--------|
| <b>Work package number</b> <sup>9</sup> | WP3                          | <b>Lead beneficiary</b> <sup>10</sup> | 3 - MO |
| <b>Work package title</b>               | Understand climate processes |                                       |        |
| <b>Start month</b>                      | 1                            | <b>End month</b>                      | 24     |

### Objectives

To advance fundamental understanding of regional climate dynamics across seasonal, decadal and climate change time scales with a particular focus on supporting the construction of valuable and actionable information with the case study activities and engagements. This WP will review and make use of recent high-resolution regional climate model information and observations. Synoptic-scale analyses of model simulations will provide understanding of robustness of climate dynamics, underlying surface responses of various types and generations of RCMs. An improved prediction of extreme events, in relation to local cropping practices surveyed in WP2, will support the identification of sustainable practices that, coupled with crop local adaptation, will result in improved resistance of SADC farming systems. The scientific information and data derived from the selected models will feed, through our case studies and WP4, into the WP5 climate applications and services for designing infrastructure, power forecasting for renewable energy generation or crop models for agriculture planning

### Description of work and role of partners

#### **WP3 - Understand climate processes** [Months: 1-24]

**MO**, WMO, BSC, EDF, ACMAD, CSIR, WITS-GCI, UCT, AMIGO, JRC, SSSA, IIAM

Task 3.1: High-resolution climate projections analysis (M1 – M12)

Leader: MO - Contributors: UCT, WITS, EDF

Analysis of future climatic conditions and associated processes in the region in terms of wind, rainfall, solar and air temperature conditions based on the most recent high-resolution regional climate projections available (i.e. HELIX, PRIMAVERA, IMPALA). This will include the characterization of the future interannual climate variability in the region and the comparison with reanalysis such as ERA5.

Partner: Activity (PM)

- MO: Inventory, review and select existing high-resolution RCM data over the SADC region. (2)
- MO: Analysis of RCM data to better understand key local-scale processes and local-scale climate phenomena. Understand the roles of these phenomena in SADC climate variability and future (7)
- EDF: Comparison of future with present conditions using reanalysis (3)
- WITS: Investigation of the large-scale conditioning modes of variability with centres of action remote from Africa but having a major influence in SADC region (6)
- UCT: Added value of high-resolution RCM downscaling, statistical downscaling, and high resolution GCM projections for constructing climate change storylines. Development of stakeholder specific climate narratives based on climate process storylines to support robust and risk framed decision making. (12)

Task 3.2: Analysis of the predictability of seasonal and decadal forecasts (M1 – M18)

Leader: WITS-GCI - Contributors: ACMAD, SSSA, CSIR, BSC, Amigo, JRC, UCT, WMO, IIAM

Extreme events are triggered by the interaction of processes acting at different spatio-temporal scales from large-scale dynamics of the climate system to mesoscale mechanisms. Large scale changes are predicted by using weather and climate models more skilfully than local extremes, so understanding the link between the two is crucial to understanding and characterizing the impacts of extremes. Understanding climatic situations where concurrent and recurrent extremes events are more likely to happen represents one important facet of disaster risk management. By understanding the teleconnections and their associated hazards, it becomes possible to develop risk management methods optimizing productivity in the energy, agriculture and other sectors of economy and society. El Niño–Southern Oscillation (ENSO), the Indian Ocean and the South west Indian Ocean Dipole (IOD, SIOD) modes and the Southern Annular Mode (SAM) are here considered. In the past, the long-range forecasts of the Southern Africa precipitation had been a challenge for climate modelling. Although its skill is still far from satisfactory, recent progress of climate modelling is making it possible to produce useful predictions up to several months ahead particularly when teleconnections are active. Better understanding of dominant variability modes and processes enables us to understand the predictable variability of precipitation over the region. This requires the investigation of teleconnections and predictability at seasonal and decadal scales useful for the regional case studies i.e. rainfall timing, onset and extent, and accumulated amount as well as wind power. For seasonal forecasts, WP3 will study the observed ENSO, IOD, SIOD, SAM teleconnections and their link

with different variability and extremes of weather in southern Africa. Rainfall deficit, extreme precipitation events, heatwaves, occurring in critical phenological phases, can considerably reduce crop yields, even if annual and seasonal mean climate conditions are at or near normal. Food security implications are particularly serious if there is excessive dependence on a single crop. The role of ocean coupling, monsoon mechanisms and conditional skill associated with teleconnections will be investigated to gain insights into regional predictability limits, leveraging corresponding hindcast data sets.

Partner: Activity (PM)

- CSIR: Investigate driving mechanisms for multi-year droughts during austral mid-summer and the likelihood of a change in intensity and frequency of such events (5)
- WITS: Review the drivers, ENSO, SIOD, Benguela El Niño, other Atlantic and Indian ocean SST patterns, SAM, decadal to multi-decadal oscillation of the southern hemisphere, MJO, Kelvin and Rossby waves of the southern Africa Climate variability and predictability (10)
- ACMAD: Review the predictors used at SARCOF and SWIOCOF. Investigate and identify new predictors. (3)
- WMO: Investigate the role of ocean coupling, monsoon mechanisms, teleconnections, associated conditional skill, and implications for regional predictability limits (3)
- UCT: Improve understanding and disaggregation of sources of at-surface variability in the bottom-up, cross-scale (local-mesoscale-synoptic-global) approach (3)
- WITS-GCI: Explore predictability and large-scale processes linked to the onset of the rainy season as well as the connection to increased risks of extreme events such as droughts (10) and JRC (3.00)
- SSSA, IIAM: Investigation of relationships between large scale processes and crop yield variations/agriculturally-relevant metrics and the physical mechanisms that underpin them (6, 2)
- Amigo: Understanding the role of baroclinic instability in seasonal prediction for the area of interest using specific indexes such as Baroclinic Amplitude Index (4)
- BSC: For seasonal forecasts, investigation of the observed el Niño and NAO teleconnections with different ECV to try to improve system seasonal outcomes with the observed patterns. (6)

Task 3.3: Extreme events identification and variability (M12 – M24)

Leader: Amigo - Contributors: MO, JRC, WITS-GCI, WMO, UCT, SSSA, IIAM

Extreme atmospheric hazards are high impact weather events, typically generating substantial losses and damages and caused by processes occurring in the Earth's atmosphere. The scope of this task is to extend the analysis of Tasks 3.1 and 3.2 by contributing to the understanding of how climate variability can affect the quality of seasonal and decadal forecast in terms of extreme events characterization and change considering both frequency and magnitude. This task will also investigate the future distribution and magnitude of extremes, relevant to all sectors and case studies, in the high-resolution climate projections. This will make use of recently developed methodologies for the identification of extreme events, building up on existing developed specific Extreme Climate Indexes (ECI) and advanced methods for compound, concurrent and recurrent events which combine precipitation data, temperature, and wind for drought/flood, heatwaves and storm detection in Africa. A new methodology to assess the risk of unprecedented extremes will be extended to additional models to gain insights into compound events and outliers in predicted climate indices.

Partner: Activity (PM)

- MO: Assess the representation of the physics and statistics of extreme meteorological events relevant to end-users in the RCM climate simulations. We will focus on both short-duration (less than three days) and long-duration (weeks to months) extreme events to cover the energy, water and infrastructure sectors and their underlying mechanisms (6)
  - UCT: Improve understanding of multi-scale drivers of weather extremes for the various sectors within the framework of process chains and co-behaviour (3)
- WMO: Investigate new methodologies to determine risks of unprecedented extremes, including compound events and outliers in predicted climate indices (3)
- JRC, WITS-GCI, SSSA, IIAM: Characterizing better the dynamics of rainfall extremes in (1) seasonal forecasts and (2) climate projections for the agriculture sector (3, 2.90, 6, 2)
- Amigo: Defining multi hazard indexes for combined extreme events using existing ECI in Africa based on the combination of precipitation, heat waves and wind. Investigate the extreme events time dependant and identification of extreme events which are driven by climate change. (8)

| Partner number and short name | WP3 effort    |
|-------------------------------|---------------|
| 1 - WMO                       | 6.00          |
| 2 - BSC                       | 6.00          |
| 3 - MO                        | 15.00         |
| 5 - EDF                       | 3.00          |
| 6 - ACMAD                     | 3.00          |
| 7 - CSIR                      | 5.00          |
| 9 - WITS-GCI                  | 18.90         |
| 10 - UCT                      | 18.00         |
| 11 - AMIGO                    | 12.00         |
| 12 - JRC                      | 6.00          |
| 13 - SSSA                     | 12.00         |
| 15 - IIAM                     | 4.00          |
| <b>Total</b>                  | <b>108.90</b> |

#### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title   | Lead beneficiary | Type <sup>15</sup> | Dissemination level <sup>16</sup> | Due Date (in months) <sup>17</sup> |
|----------------------------------|---|------------------|--------------------|-----------------------------------|------------------------------------|
| D3.1                             | Report on the selection and analysis of high-resolution climate projections of the region                             | 3 - MO           | Report             | Public                            | 12                                 |
| D3.2                             | Report on the analysis of the predictability of seasonal and decadal forecasts for the region and sectors of interest | 9 - WITS-GCI     | Report             | Public                            | 18                                 |
| D3.3                             | Report on the regional extreme events identification and variability  | 11 - AMIGO       | Report             | Public                            | 24                                 |

#### Description of deliverables

D3.1 : Report on the selection and analysis of high-resolution climate projections of the region [12]

Report on the selection and analysis of high-resolution climate projections of the region

D3.2 : Report on the analysis of the predictability of seasonal and decadal forecasts for the region and sectors of interest [18]

Report on the analysis of the predictability of seasonal and decadal forecasts for the region and sectors of interest

D3.3 : Report on the regional extreme events identification and variability [24]

Report on the regional extreme events identification and variability



**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>      | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>   |
|--------------------------------------|-----------------------------|-------------------------|-----------------------------|--|
| MS1                                  | First Stakeholder Workshop  | 4 - WEMC                | 4                           | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes |
| MS2                                  | Second Stakeholder Workshop | 4 - WEMC                | 12                          | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes   |
| MS3                                  | Third Stakeholder Workshop  | 4 - WEMC                | 20                          | Third Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes |
| MS17                                 | Kick Off Meeting            | 1 - WMO                 | 1                           | Kick Off Meeting means of verification: minutes                            |
| MS19                                 | Final meeting               | 1 - WMO                 | 48                          | Final meeting Means of verification: minutes                               |

|   |                           |                                       |         |
|---|---------------------------|---------------------------------------|---------|
| <b>Work package number</b> <sup>9</sup> | WP4                       | <b>Lead beneficiary</b> <sup>10</sup> | 2 - BSC |
| <b>Work package title</b>               | Develop methods and tools |                                       |         |
| <b>Start month</b>                      | 1                         | <b>End month</b>                      | 48      |

### Objectives

This WP will focus on seasonal forecasts, decadal predictions and climate projections with the aim to:

- Improve the understanding of the seasonal predictability of the Essential Climate Variables (ECV) and indicators needed for the proposed climate services.
- Improve the reliability of the forecasts through the application of bias correction approaches, including novel techniques such as machine learning.
- Coordinate and assess the added value of novel multi-model approaches at seasonal, decadal and climate projection scales from the recent public repositories available.
- Assess the long-term influences of climate in the areas of the case studies.
- Identify the best downscaling methodologies to regionalize the information of Global Climate Models to the studied areas.

### Description of work and role of partners

#### **WP4 - Develop methods and tools** [Months: 1-48]

**BSC, WMO, MO, EDF, ACMAD, CSIR, WITS-GCI, UCT, AMIGO, JRC, SSSA**

Task 4.1: Seasonal forecast quality assessment (M1 – M24)

Leader: BSC- Contributors: AMIGO, ACMAD

The estimation of the seasonal forecast quality based on the past performance of the prediction system is a fundamental step towards the construction of climate services, because it allows quantifying the forecast benefit relative to other prediction approaches. Seasonal predictions must be systematically compared to a reference (reanalysis or observations) to assess their overall quality in a multi-faceted process known as forecast quality assessment. This quality assessment framework seeks to provide the end-users with the tools to understand which approaches could better fit their interests (important for WP5 and WP6). Since climate forecast systems are affected by biases, a range of methods exists and will be here applied to obtain similar statistical properties as found in the observed variables e.g. calibration, quantile-mapping and neural networks. With the objective of providing real-time robust forecast information, seasonal prediction models outputs from the Copernicus Climate Data Store (CCDS) will be used. Uncertainty estimates and reliability will be evaluated using ensemble prediction standard methodologies to contribute to the interpretation of the robustness of the climate information, a key element in any decision-making process. The analysis will be performed globally and at the country-base level, considering that the best bias correction methods may differ depending on the topographical and geographical characteristics of each case study.

Partner: Activity (PM)

- BSC: Verification of raw and bias corrected ECVs from the seasonal forecasting models included in the C3S Data Store. Comparison of different bias correction approaches performance linked to the type of ECVs (9)
- AMIGO: Verification of a specifically tailored bias correction method for extreme ECV values in SADC region. Comparison with other bias correction approaches. (3)
- ACMAD: Review current seasonal forecast methodology at SARCOF and SWIOCOF as part of RCOF sessions reports; and Review of existing applied forecasting methods and sharing in-situ observations on Onset and Cessation of rainfall in Tanzania (4)
- WMO: Assessment of verification methods to be operationalized in the SADC region (2)

Task 4.2: Climate projections and decadal assessment (M1 – M24)

Leader: WITS - Contributors: BSC, JRC, WITS, MO, SSSA

Climate projections offer a unique framework for end-user planning for exploring the possible future evolution of the climate systems. In this task, simulations from the state-of-the-art Coupled Model Intercomparison Project Phase 6 (CMIP6 and available CORDEX data) will be analysed and assessed to establish the potential changes that the FOCUS-Africa areas will experience in the coming decades. These results will be compared with the ones obtained in WP3. In this way the best approach to tackle the bias will be also settled to offer the information with the greatest value in WP5, WP6 and WP7. For the next 5-10 years, as an alternative to climate projections, recently developed decadal climate

prediction systems have attempted to fill the gap that exists between seasonal and climate projection timescales (i.e. from a year up to a decade), where the evolution of the climate is determined by both internally generated variability and externally forced components. Predicting the variations and changes in the climate system at this timescale is considered one of the most challenging problem faced by the climate forecasting community due to the relatively weak constraints that can be applied on the internal variability and the relatively weak anthropogenic external forcing at this timescale. Up to now, very little effort has been put into using these readily available near-term decadal climate forecasts for adaptation and mitigation purposes. This task will address these issues by collecting and analysing state-of-the art decadal climate predictions to be used for the specific user needs in the FOCUS-Africa countries (easing the WP5 developments).

Partner: Activity (PM)

- BSC: Assessment of decadal skill on ECVs and of the impact of different bias correction approaches on decadal predictions. Selection of the best method. (7)
- SSSA: Assessment of projection skills with a special focus on variables related to cereals and legume cropping. Generalize for its use in food security CSs (4)
- MO: Climate projections selection for case studies. Comparison of high-resolution RCM data (i.e. IMPALA) with the GCMs. (6)
- JRC: Statistical analysis of the CMIP6 climate projections with a special focus on extremes (2)
- WITS: Statistical analysis of the CMIP6 climate projections with a special focus on extremes, statistical analysis of the projected climate change futures across the six case-study regions CORDEX-core and Wits-GCI-CSIR ensembles. (8.90)

Task 4.3: Implementation of multi-model and downscaling for seasonal forecasts (M6 – M48)

Leader: BSC- Contributors: AMIGO, UCT, CSIR, MO, SSSA, MRNEM

In this task we will focus on the assessment of statistical downscaling and model combination techniques, with the aim of maximizing the utility of seasonal forecast systems for the ECV prediction. We will try different methodologies to build multi-model outputs from the individual seasonal models present in the C3S Climate Data Store (CCDS). The base-line to compare with will be the multi-model approach from de CCDS, which is simply the unweighted the average of each of the models. We will also study the impact of bias correcting the variables before or after building the multi-model as well as perform a verification analysis of the improvement that we can get from this approach. We will conduct a verification at global scale as well as in a FOCUS-Africa based country level. Besides, in the case studies where regionalization is needed, we will test different approaches to regionalize the information coming from the seasonal forecasting models / multi-model, and compare the performance with the raw seasonal forecasts (e.g. perfect prognosis analogue downscaling). Finally, it is worth noting that with the feedback from the case studies we will keep on improving the applied methodologies applied (WP5 and WP6).

Partner: Activity (PM)

- BSC: Implementation and assessment of several approaches to multi-model and regionalization of seasonal forecasts with a focus on case study ECVs (14)
- AMIGO: Application and verification of specifically tailored downscaling approaches for ECV extremes in multi-model ensemble forecasting (3)
- ACMAD: CS8: downscaling long-term climate forecasts for Mauritius. Validation, increase temporal resolution and development drought indices; and Review of the developed multi-ensemble forecasts with MO, and BSC for the Tanzania case studies 4 and 6
- MRNEM: Provide access to data for downscaling purposes and verification (3.5)
- UCT: Development and implementation of machine learning based statistical downscaling approaches (e.g. SOM based) (4)
- MO: CS6: application and adaptation of the developed multi-model ensemble seasonal forecast for the regions and parameters of interest (2)
- SSSA: CS3: application and adaptation of the developed multi-model ensemble seasonal forecast for the regions and parameters of interest (3)
- CSIR: Support ACMAD in the needed work for CS8 (3)

Task 4.4: Implementation of multi-model and downscaling for climate projections and decadal predictions (M6 – M48)

Leader: AMIGO- Contributors: BSC, CSIR, AMIGO, CSIR, EDF, MO, TMA, MRNEM

There are several centres issuing model projections for CMIP6 and operational decadal predictions. The true potential of this information is unfolded when the projections and predictions of each of these models are combined, because uncertainties can be fully considered. The establishment of an extensive multi-model database of projections and decadal predictions at global and FOCUS-Africa scales is particularly relevant in this case because it will be used in most of

the case studies (WP5 and WP6). Different ways to assemble the multi-models will be compared and assessed. It is important to note that an extensive re-forecast spanning several years is needed to calculate the systematic error, evaluate the forecast quality and perform the calibration and combination of the different predictions, which makes this exercise particularly costly given the complexity of the global models used and the ensemble size employed. The decadal datasets will be kept updated regularly as is required with quasi-operational systems. It is expected that the decadal re-forecasts and forecasts will require substantial resources in terms of disk space and an appropriate organization. Besides, it is important to highlight that the spatial resolution of these models (around 100km) it is too coarse for many applications. It is also our aim to evaluate different ways to regionalize the information of the GCMs to a more user-friendly spatial scale. The methods applied will be refined with the feedback from the case studies.

Partner: Activity (PM)

- BSC: Implementation and assessment of several approaches to multi-model and regionalization of decadal predictions with a focus on case studies ECV. (11)
- AMIGO: Application and verification of specifically tailored multi-model ensemble decadal predictions and downscaling approaches for ECV extremes for future scenarios, analysis of different multi-model strategies for CMIP6 projections and bias-correction/downscaling techniques tailored to agriculture (7.11)
- CSIR: CS1: Downscaling climate change projections for 1961 – 2050 to high-resolution projections; identification of best input data for crop modelling (7)
- MO: CS5 and CS6: application of the multi-model climate projections for the regions and parameters of interest. (2)
- EDF: Implementation and assessment of several approaches to regionalize multi-model decadal predictions and climate projections for CS7 ECVs. (3)
- JRC: Analysis of different multi-model strategies for CMIP6 projections and bias-correction/downscaling techniques tailored to agriculture (1)
- MRNEM: Review developed predictions with BSC. Share local data (3.5)
- ACMAD: Review of the developed predictions with MO, and BSC for the Tanzania case studies 4, 5 and 6

Task 4.5: Derived products using seasonal forecasts, climate projections and / or decadal predictions (M18 – M36)

Leader: BSC - Contributors: CSIR, UCT, AMIGO, ACMAD, MO, SSSA

In this task the results obtained in 4.1, 4.2, 4.3 and 4.4 will be used to compute a coherent and comprehensive range of indexes to feed other models. The scope of that is to provide tailored climatic indexes which can be used in most of the specific case studies connected with WP5 and WP6. These indexes will be provided for historical data (reanalysis and station data when available), scenarios, decadal and seasonal forecasts, depending on the needs of each case study. The outputs will then be used to assess the potential development / improvement of the different climate services. Guidance will be provided on which indices are simulated most accurately by seasonal forecasts and decadal predictions and, also, there will be an assessment on the different scenarios depicted by the climate projections. Locations with high skill in seasonal forecasts will be identified, with an emphasis on FOCUS-Africa study regions

Partner: Activity (PM)

- BSC: Seasonal and decadal computation and verification of SPEI index (multi-model and / or downscaling). (8)
- AMIGO: Contribute on developing specific indexes related to extreme events and climatological variability in the South African area. (5)
- UCT: Verification of regional climate indices and circulation dynamics as a pre-cursor and predictability analysis for i.e. statistical downscaling (4)
- ACMAD: CS8: Develop drought indices from the model outputs. develop threshold for triggering drought or wet conditions alert.
- CSIR: CS8: Support ACMAD to develop drought indices from the model outputs. CS1: crop modelling and livestock stress index evaluation based on downscaled climate modelling data (4)
- MO: CS5: derivation of the design values, from selected climate projections of Task 4.2, required by the Standard Gauge Railway (SGR) Design Standard Manual (6)
- SSSA: CS3: Derivation of climatic indexes relevant for smallholder agriculture on the basis of climatic features identified during surveys and FGDs (4)

#### Participation per Partner

| Partner number and short name | WP4 effort |
|-------------------------------|------------|
| 1 - WMO                       | 2.00       |

| Partner number and short name | WP4 effort    |
|-------------------------------|---------------|
| MNREM                         | 7.00          |
| 2 - BSC                       | 49.00         |
| 3 - MO                        | 16.00         |
| 5 - EDF                       | 3.00          |
| 6 - ACMAD                     | 4.00          |
| 7 - CSIR                      | 14.00         |
| 9 - WITS-GCI                  | 8.90          |
| 10 - UCT                      | 8.00          |
| 11 - AMIGO                    | 18.11         |
| 12 - JRC                      | 3.00          |
| 13 - SSSA                     | 11.00         |
| <b>Total</b>                  | <b>144.01</b> |

#### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title  | Lead beneficiary | Type <sup>15</sup> | Dissemination level <sup>16</sup> | Due Date (in months) <sup>17</sup> |
|----------------------------------|--|------------------|--------------------|-----------------------------------|------------------------------------|
| D4.1                             | Report on the verification of seasonal forecasts and the characterization of climate projections and decadal predictions | 2 - BSC          | Report             | Public                            | 24                                 |
| D4.2                             | Report on the multi-model and downscaling for seasonal forecasts, climate projections and decadal predictions            | 9 - WITS-GCI     | Report             | Public                            | 36                                 |
| D4.3                             | Report on the verification of ECVs derived indices   | 2 - BSC          | Report             | Public                            | 42                                 |

#### Description of deliverables

D4.1 : Report on the verification of seasonal forecasts and the characterization of climate projections and decadal predictions [24]

Report on the verification of seasonal forecasts and the characterization of climate projections and decadal predictions

D4.2 : Report on the multi-model and downscaling for seasonal forecasts, climate projections and decadal predictions [36]

Report on the multi-model and downscaling for seasonal forecasts, climate projections and decadal predictions

D4.3 : Report on the verification of ECVs derived indices [42]

Report on the verification of ECVs derived indices

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>  | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>   |
|--------------------------------------|---|-------------------------|-----------------------------|--|
| MS1                                  | First Stakeholder Workshop  | 4 - WEMC                | 4                           | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes   |
| MS2                                  | Second Stakeholder Workshop   | 4 - WEMC                | 12                          | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes   |
| MS3                                  | Third Stakeholder Workshop  | 4 - WEMC                | 20                          | Third Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes   |
| MS4                                  | Fourth Stakeholder Workshop   | 4 - WEMC                | 28                          | Fourth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS5                                  | Fifth Stakeholder Workshop  | 4 - WEMC                | 36                          | Fifth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes   |
| MS6                                  | Sixth Stakeholder Workshop  | 4 - WEMC                | 44                          | Sixth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes   |
| MS11                                 | Availability of a first working version of seasonal forecasts, decadal predictions and climate projections for the case studies | 2 - BSC                 | 24                          | Availability of a first working version of seasonal forecasts, decadal predictions and climate projections for the case studies<br>Means of verification: report |
| MS17                                 | Kick Off Meeting  | 1 - WMO                 | 1                           | Kick Off Meeting means of verification: minutes  |
| MS19                                 | Final meeting   | 1 - WMO                 | 48                          | Final meeting Means of verification: minutes   |

|   |   |                                       |          |
|---|---|---------------------------------------|----------|
| <b>Work package number</b> <sup>9</sup> | WP5   | <b>Lead beneficiary</b> <sup>10</sup> | 4 - WEMC |
| <b>Work package title</b>               | Develop end-user tailored climate services prototypes |                                       |          |
| <b>Start month</b>                      | 19  | <b>End month</b>                      | 48       |

### Objectives

- To assess how the output designed for each case study can be presented as a prototype that meets users' requirements
- To produce co-designed and co-developed prototypes for each case study, which have the potential to be operated in near real time
- To determine, document and share development and prototypes approaches within the FOCUS Africa consortium and with external stakeholders

### Description of work and role of partners

#### **WP5 - Develop end-user tailored climate services prototypes** [Months: 19-48]

**WEMC, WMO, BSC, MO, EDF, ACMAD, CSIR, AMIGO, SSSA, IIAM**

Task 5.1: Collate output required to develop prototypes (M19 – M30)

Leader: WEMC - Contributors: CSIR, Amigo, BSC, SSSA, MO, EDF, ACMAD

This task will collate the output from relevant WPs (especially WPs 3 and 4) required to develop the case study prototypes. Work will be coordinated amongst all service delivery partners to ensure best practice is adopted, and possible commonalities are exploited. This Task will ensure that each of the climate services in FOCUS-Africa is planned in such a way to be developed with a clear workflow pathway to allow them to eventually be tested in a non-operational environment. For this purpose, a range of requirements and setting, to reflect the climate services foci, spanning sub-seasonal to multi-decadal timescales, and for decision making applications for energy, water, food security and infrastructure sectors will be considered.

Partner: Activity (PM)

- WEMC: Collection of climate projections for the users' needs for CSs 2 and 4; To ensure all data required for WP5 are available, as produced by WP3 and WP4, and that they follow guidelines (specifically the DMP) (8)
- CSIR: Collection of appropriate climate products for water resource managers for South Africa Food Security Study (CS1), in coordination with Land Bank. (2)
- Amigo: Support CSs 2, 4 and 5 in collecting the data for the definition of appropriate climate indexes and the definition of extreme events thresholds. For CSs 2, 4 and 5 collection of data and information for the webGIS application. (6)
- BSC: For CSs 2 and 4, collect assessed and optimized seasonal and decadal climate prediction together with user needs (1)
- SSSA: CS3: development of prototypes (crop genetic resources) on the basis of genomic information and climatic characterization conducted in WP2. (3)
- MO: For CS 5, rationalise temperature and rain design values derived in WP4. For CS 6, collection of appropriate climate products to identify future renewable energy opportunities in Tanzania. TANESCO hydropower production forecast models (6)
- EDF: For CS7, assist in collating the necessary information from other WPs (1)
- ACMAD: For CS7, assist in collating the necessary information from other WPs; and Collection of appropriate climate products for water resource managers for Mauritius Water Security Study (CS 8) (1)

Task 5.2: Plan co-designed and co-developed case study prototypes (M25 – M36)

Lead: WEMC - Contributors: CSIR, Amigo, WMO, SSSA, MO, BSC, EDF, MRNEM, IIAM, ACMAD

This task will produce a plan for the development of the climate service prototypes for each case study. This work will allow to share learning between FOCUS-Africa co-designers, by specifically including intermediate checkpoints. Cross-fertilisation amongst them will likely improve designs and effective delivery of products across all the climate service value chain. Critically, users of the climate service prototypes will be closely consulted to ensure optimal co-design.

Partner: Activity (PM)

- WEMC: Co-design the plan for the food CSs 2 and 4 by harmonising agronomic data to be integrated in the development of the prototype; WEMC will lead the production of a plan for the development of the climate service prototypes: common guidelines and intermediate checkpoints (8)
- CSIR: Co-design CS 1 in coordination with Land Bank. And assist with co-design of CS 8 (2)

- Amigo: In CSs 2 and 4 support the definition and the co-design of the service with a specific focus in the determination of the extreme events In CS 5 co-design the webGIS in terms of data and layers to be visualized (6)
- MRNEM: Co-design CS 2 prototype (2)
- IIAM: CS3: two field trials in which to evaluate crop genetic materials in conjunction with smallholder farmer communities. Approximately 250 rice landraces and 250 cowpea landraces will be grown in two locations, where phenotyping will be carried out with trained agronomists. (12)
- SSSA: CS3: combine the agronomic evaluation of genetic materials with the evaluation provided by farmers over two fields, thus identifying a smaller set of varieties best addressing smallholder farmers needs in relation of gender, location, and local adaptation traits. (8)
- ACMAD (TMA): Contribute to CSs 4, 5 and 6 prototypes co-design; and ACMAD (LB) Contribute to CS 1 prototype co-design (1) (1)
- MO: Co-design of case study prototypes with end-users (COWI, TANESCO, Total) and service provider (WMO) of CSs 5 and 6 (2)
- BSC: Involvement in co-design for food security climate services (CSs 2 and 4). Exchange experience with the case studies CS 1 and CS 3 in food security (2)
- EDF: Co-design CS7 prototype (2)
- ACMAD (MMS) Co-design CS8 prototype (2)

Task 5.3: Development and delivery of prototype climate services (M31 – M48)

Lead: WEMC - Contributors: MRNEM, BSC, Amigo, SSSA, EDF, MO, IIAM, ACMAD

This Task will implement the plans developed in Task 5.2 in close coordination between service producers, developers and users. Each co-developer team will use this as a guide to produce their prototype and to ensure optimal cross-fertilization is optimised. This task will oversee the software development for all prototypes and will also collect feedback about its user-experience, via appropriate methods. These will include usability tests and/or interviews about the proposed solution using techniques such as satisfaction surveys or bipolar laddering. The process of development also includes several stages of co-working to discard or improve the solutions and elements included in the prototype. Documentation and communication aspects including estimates of uncertainty will form an integral component of these prototypes. Regular feedback and effective co-development processes between software developers, communication officers, climate scientists and users will be adopted to ensure that the final demonstrators are fit-for-purpose, easy to use and exploitable beyond the project.

Partner: Activity (PM)

- WEMC: Extend the C3S ECEM demonstrator, currently focussing on Europe, to the SADC region. The extension will be developed by focussing separately on CS 6 (Tanzania, Energy), CS7 (Zambia, Hydro-power) and CS 8 (Mauritius, Water) while ensuring opportunities to scale up to the wider SADC region (31.72). For CS 2 and 4: improve ASAP service provision and visualisation aspects. Develop a specific service to integrate the ASAP information at all time-scales.
- MRNEM: Assist with the co- development and testing prototype for CS2 (1)
- ACMAD (LNB): CS 1 prototype testing; ACMAD (TMA): CS4, 5 and 6 prototypes co-development and testing (4); and ACMAD (MMS): Assist with the co- development and testing of prototype for CS 8 (1)
- IIAM: For CS3: collaborative development of the forecasting service prototype and maintenance of the ICT-based forecasting service to be provided to farmers. Collection and maintenance of climate-ready varieties identified in T5.1 and T5.2 the gene bank for future distribution. (6)
- BSC: For CSs 2 and 4: analyse current visualization strategies and develop conceptual models for new ones. For CS 3: co-develop climate service prototype with one (or a combination) of options (18)
- Amigo: For CS 2 and 4 in collaboration with BSC integrate the services with specific user-oriented analysis of extreme events. For CS 5: work on improvement of webGIS application which, in the future, could be exploited as a commercial service. (9)
- SSSA: For CS3: coordinate the activities and provide technical support in the definition of the methods for best visualizing and distributing seasonal forecasts. Prioritize pre-breeding materials supporting local food security. Catalogue comprising all information provided on the rice and cowpea accessions characterized in CS3, establishing a lasting breeding toolbox (6)
- EDF: CS7 prototype collaborative development. Test & provide feedback (2)
- MO: Assist with prototypes demonstration and delivery for CSs 5 and 6 (2)



| Partner number and short name | WP5 effort    |
|-------------------------------|---------------|
| 1 - WMO                       | 0.00          |
| MNREM                         | 3.00          |
| 2 - BSC                       | 21.00         |
| 3 - MO                        | 10.00         |
| 4 - WEMC                      | 47.72         |
| 5 - EDF                       | 5.00          |
| 6 - ACMAD                     | 3.00          |
| 7 - CSIR                      | 4.00          |
| 11 - AMIGO                    | 21.00         |
| 13 - SSSA                     | 17.00         |
| 15 - IIAM                     | 18.00         |
| <b>Total</b>                  | <b>149.72</b> |

#### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title  | Lead beneficiary | Type <sup>15</sup>             | Dissemination level <sup>16</sup>  | Due Date (in months) <sup>17</sup> |
|----------------------------------|--|------------------|--------------------------------|--|------------------------------------|
| D5.1                             | Report to document the data required, and a set of guidelines, for all CS prototype development  | 4 - WEMC         | Report                         | Public   | 30                                 |
| D5.2                             | Plan for the eight co-designed and co-developed case study prototypes, including description of technical aspects of delivery              | 4 - WEMC         | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 36                                 |
| D5.3                             | WebGIS platform for seasonal/decadal forecast visualization for CSs 2, 4 and 5   | 11 - AMIGO       | Demonstrator                   | Confidential, only for members of the consortium (including the Commission Services) | 38                                 |
| D5.4                             | Patent Application for the webGIS platform for seasonal/decadal forecast visualization methodology   | 11 - AMIGO       | Websites, patents filing, etc. | Confidential, only for members of the consortium (including the Commission Services) | 38                                 |
| D5.5                             | A data catalogue providing the complete genotypic, climatic, and phenotypic characterization of the rice and cowpea accessions used in CS3 | 13 - SSSA        | Report                         | Public   | 48                                 |

### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title  | Lead beneficiary | Type <sup>15</sup> | Dissemination level <sup>16</sup>  | Due Date (in months) <sup>17</sup> |
|----------------------------------|--|------------------|--------------------|--|------------------------------------|
| D5.6                             | Final report to describe the implementation and use of each of the climate service prototype for all of the CS | 4 - WEMC         | Report             | Confidential, only for members of the consortium (including the Commission Services) | 48                                 |

### Description of deliverables

D5.1 : Report to document the data required, and a set of guidelines, for all CS prototype development [30]

Report to document the data required, and a set of guidelines, for all CS prototype development

D5.2 : Plan for the eight co-designed and co-developed case study prototypes, including description of technical aspects of delivery [36]

Plan for the eight co-designed and co-developed case study prototypes, including description of technical aspects of delivery (backend and frontend design)

D5.3 : WebGIS platform for seasonal/decadal forecast visualization for CSs 2, 4 and 5 [38]

WebGIS platform for seasonal/decadal forecast visualization for CSs 2, 4 and 5

D5.4 : Patent Application for the webGIS platform for seasonal/decadal forecast visualization methodology [38]

Patent Application for the webGIS platform for seasonal/decadal forecast visualization methodology

D5.5 : A data catalogue providing the complete genotypic, climatic, and phenotypic characterization of the rice and cowpea accessions used in CS3 [48]

A data catalogue providing the complete genotypic, climatic, and phenotypic characterization of the rice and cowpea accessions used in CS3

D5.6 : Final report to describe the implementation and use of each of the climate service prototype for all of the CS [48]

Final report to describe the implementation and use of each of the climate service prototype for all of the CS

### Schedule of relevant Milestones

| Milestone number <sup>18</sup> | Milestone title             | Lead beneficiary | Due Date (in months) | Means of verification   |
|--------------------------------|-----------------------------|------------------|----------------------|---|
| MS1                            | First Stakeholder Workshop  | 4 - WEMC         | 4                    | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS2                            | Second Stakeholder Workshop | 4 - WEMC         | 12                   | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes    |
| MS3                            | Third Stakeholder Workshop  | 4 - WEMC         | 20                   | Third Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS4                            | Fourth Stakeholder Workshop | 4 - WEMC         | 28                   | Fourth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes |

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>  | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>  |
|--------------------------------------|---|-------------------------|-----------------------------|---|
| MS5                                  | Fifth Stakeholder Workshop  | 4 - WEMC                | 36                          | Fifth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS6                                  | Sixth Stakeholder Workshop  | 4 - WEMC                | 44                          | Sixth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS7                                  | All input variables to case study known   | 7 - CSIR                | 7                           | All input variables to case study known<br>Means of verification: location and climate variables identified for crop modelling and first crop model input file complete |
| MS8                                  | 2 users' requirements and challenges identified   | 7 - CSIR                | 12                          | 2 users' requirements and challenges identified<br>Means of verification: consolidated report from stakeholders' workshop and info collated using other methods         |
| MS9                                  | Details on regional extremes arising from climate change and climate variability known  | 7 - CSIR                | 24                          | Details on regional extremes arising from climate change and climate variability known<br>Means of verification: report and publication                                 |
| MS10                                 | Online decision support tool on food security, water and energy developed   | 7 - CSIR                | 30                          | Online decision support tool on food security, water and energy developed<br>Means of verification: report/publication describing adaptation tool developed             |
| MS11                                 | Availability of a first working version of seasonal forecasts, decadal predictions and climate projections for the case studies | 2 - BSC                 | 24                          | Availability of a first working version of seasonal forecasts, decadal predictions and climate projections for the case studies<br>Means of verification: report        |
| MS12                                 | Availability of plan for the eighth co-designed and co-developed case study prototypes  | 4 - WEMC                | 36                          | Availability of plan for the eighth co-designed and co-developed case study prototypes<br>Means of verification: report (D5.2)  |
| MS13                                 | webGIS platform online  | 11 - AMIGO              | 38                          | webGIS platform online<br>means of verification: The webGIS platform will be online and it can be used by external users  |

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>             | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>   |
|--------------------------------------|------------------------------------|-------------------------|-----------------------------|--|
| MS14                                 | CS prototypes developed and tested | 4 - WEMC                | 48                          | CS prototypes developed and tested Means of verification: CS prototypes made available to relevant users |
| MS17                                 | Kick Off Meeting                   | 1 - WMO                 | 1                           | Kick Off Meeting means of verification: minutes  |
| MS19                                 | Final meeting                      | 1 - WMO                 | 48                          | Final meeting Means of verification: minutes   |

|   |  |                                       |         |
|---|--|---------------------------------------|---------|
| <b>Work package number</b> <sup>9</sup> | WP6  | <b>Lead beneficiary</b> <sup>10</sup> | 8 - LGI |
| <b>Work package title</b>               | Assess the socio-economic value of the prototypes and prepare their exploitation |                                       |         |
| <b>Start month</b>                      | 1  | <b>End month</b>                      | 48      |

### Objectives

The WP6 aims at assessing the socio-economic impacts of the FOCUS-Africa climate services and preparing the exploitation of most promising and impactful services. The following objectives of this WP are to:

- Explore new approaches for socio-economic impact assessment of climate services
- Assess the current socio-economic situation of each case study (baseline for evaluation)
- Evaluate the theoretical socio-economic impacts of climate services
- Propose improvements to prototypes to increase their impacts
- Measure and validate socio-economic impacts (ex-post)
- Define exploitation strategies for the provision of climate services
- Study the replicability of climate services to other geographic areas and other socio-economic contexts.

### Description of work and role of partners

**WP6 - Assess the socio-economic value of the prototypes and prepare their exploitation** [Months: 1-48]

LGI, WMO, BSC, MO, WEMC, EDF, ACMAD, CSIR, UCT, AMIGO, SSSA, PLAN

Task 6.1: Definition of a socio-economic impact assessment approach tailored to the FOCUS-Africa context (M1 – M12)

Leader: LGI - Contributors: BSC, WMO, PLAN, EDF, MNREM, ACMAD

This task aims at defining processes, methods and tools to be used all along the project to evaluate the socio-economic impact of the developed climate services. It will be co-developed by the Impact Assessment Team (IAT, composed by LGI and BSC) together with local representatives of the case studies to ensure the consideration of local specificities while keeping a common baseline to allow cross-analyses and identify most impactful climate services.

A literature review of the latest publications on socio-economic assessments will be performed and shared on the bibliographic database ZOTERO, as well as an analysis of approaches used in other projects (e.g. Climandes and Sustainable CIS). This work will be used to define a FOCUS-Africa approach based on state-of-the-art methods and tailored to the project's specificities (Africa, climate services, water-food-energy nexus, gender biases, etc.). The IAT will prepare a first impact assessment grid based on the global indicator framework (IAEG-SDGs, 2016). Indicators relating to SDG2 (zero hunger), SDG6 (clean water & sanitation), SDG7 (affordable & clean energy) and SDG9 (industry, innovation and infrastructure) will be used to evaluate the direct impacts of the climate services. A second set of indicators (e.g. SDG5, SDG10 and SDG13) will be used to measure the indirect impact of the services.

Local representatives of the case studies will update the assessment grid to better adapt it to their respective local contexts. Indicators will be reviewed according to data available on the studied areas, locally or in international databases (World Bank, UN, etc.). In addition, indicators will also be added or modified to monitor issues that are specific to the case studies. Once updated, the impact assessment grid will be composed of common indicators to all case studies (baseline) and specific indicators for each case study.

The IAT will then identify which social indicators shall be monetised to be included in a quantitative evaluation and determine discount rates to consider various time horizons (seasonal, decadal, etc.). Common guidelines to conduct the assessment will be created by the IAT to ensure a harmonised approach between all case studies.

Partner: Activity (PM)

- LGI: literature review and approach identification (assessment grid and guidelines); Coordinate the task and the deliverable writing (2)
- WMO: Contribute to the literature review and to the design the approach for the evaluation; Contribute to the deliverable writing (1)
- BSC: Contribute to the literature review and review and update the impact assessment grid (0.5)
- ACMAD: Review and update the impact assessment grid to ensure consistency with the local situation, suggest local sources of socio-economic data (1)
- PLAN, EDF: Review and update the impact assessment grid to ensure consistency with the local situation, suggest local sources of socio-economic data (0.5 each)
- MRNEM : Facilitate the involvement of end users that are not project partners (0.25 each)

Task 6.2: Ex-ante analysis

An ex-ante impact assessment is a fundamental tool used by policy-makers to estimate the likely effects of a policy programme ahead of its deployment. A similar approach will be used within the FOCUS-Africa project to evaluate potential socio-economic impacts of the climate services.

Subtask 6.2.1: Evaluation of the socio-economic situation (M6 – M24)

Leader: LGI – Contributors: BSC, WMO, PLAN, EDF, MNREM, ACMAD

The ex-ante analysis will start with an assessment of the current socio-economic situation of each case study. The Impact Assessment Team (IAT) will first conduct a series of interview with the local representatives of the eight case studies using the guidelines defined in Task 6.1. Interviews will be used to fill in the impact assessment grid as well as establish a stakeholder mapping for each case study. Local actors of the ecosystems that are expected to be the most affected by the climate services (e.g. NGOs, climate service providers, policy-makers, citizens) will be involved in the series of interviews to complete the situation evaluation. Gender balance will be a priority within each panel of interviewees. Special attention will be paid to two specific aspects:

- Gender biases in relevant social or economic criteria (ex: unequal access to resources/services, lower participation rate in decision-making processes and labour markets, etc.).
- Interdependencies between criteria due to the Water-Food-Energy nexus

The IAT will finalise the evaluation thanks to data collected in the databases identified in Task 6.1.

Finally, the assessment will include a benchmark of climate services provided in the region (used or not used by local communities). This task will be performed in close collaboration with WP2 to mutualise events and efforts in the data collection campaign and take advantage of stakeholder workshops performed within the scope of WP1.

Partner: Activity (PM)

- LGI :Evaluation of the socio-economic situation of 5 case studies (CS2, CS3, CS4, CS5 and CS6). Support evaluation in CS1, CS7 and CS8 and ensure standard approach; Coordinate the task and the deliverable writing (9)
- BSC: Manage the evaluation of the socio-economic situation of 3 case studies (CS1, CS7 and CS8); - Contribute to the deliverable writing (5.25)
- WMO, PLAN, EDF: Provide socio-economic data and trends, facilitate the identification of relevant local stakeholders and conduct interviews (CS1, CS3, CS7) (1 each)
- MRNEM: Organise interviews with end-users in the country, facilitate the identification/involvement of local stakeholders (CS2, CS4, CS6, CS8)
- ACMAD: Organise interviews with end-users in the country, facilitate the identification/involvement of local stakeholders (CS2, CS4, CS6, CS8) (1)
- WMO: Facilitate the involvement of local representatives of the case studies (0.25)

Subtask 6.2.2: Assessment of expected impacts and recommendations for improvement (M25 – M36)

Leader: LGI - Contributors: BSC, CSIR, SSSA, MO, WEMC, CSIR, UCT

The second phase of the ex-ante analysis will assess the likely impacts of the FOCUS-Africa climate services before the demonstration period. At this stage, they are considered as “climate service prototypes”. Results of WP3 and WP4 (climate information, forecast characteristics, etc.) together with the climate service prototype development plan produced in Task 5.2 (service design, delivery processes, etc.) will be used as inputs. The likely impact of each prototype of all socio-economic indicators defined in Task 6.1 will then be assessed by the IAT together with the service developers. It will provide an outlook of benefits for the local actors (end users, stakeholders of the case study, local population, etc.) as well as potential side effects the service provision may induce. Climate services already use by the local community and highlighted in Task 6.2.1 will be considered to identify the added-value of FOCUS-Africa prototypes.

The task will serve as a continuous improvement process to increase the socio-economic impacts of prototypes before the development phase. Each impact assessment will result in recommendations to improve the development climate service prototypes running in WP5.

Partner: Activity (PM)

- LGI: Ex-ante impact assessment of the service prototypes developed within the scope of 5 case studies (CS2, CS3, CS4, CS5 and CS6); Coordinate the task and the deliverable writing (9)
- BSC: Ex-ante impact assessment of the service prototypes developed within the scope of 3 case studies (CS1, CS7 and CS8); Contribute to the deliverable writing (5.25)
- CSIR SSSA, WEMC, MO, UCT: Provide technical and economic information on climate service prototypes, contribute to estimate the potential impact of the services (0.5 per case study)

Task 6.3: Ex-post analysis (M31 – M48)

Leader: BSC - Contributors: LGI, Land Bank, PLAN, EDF, CSIR, BSC, SSSA, WEMC, MO, UCT, ACMAD

The ex-post assessment will evaluate the actual socio-economic impacts of the climate services prototypes. Similarly, to the approach used for the ex-ante analysis (Task 6.2.1), the IAT will conduct the evaluation through interviews with local actors and use the same impact assessment grid. The general socio-economic impact of each climate service prototype will be assessed, and their main beneficiaries will be identified. Weaknesses of the climate service prototypes will also be highlighted to service providers to drive potential further improvements, during or after the project. This information will be used to validate the impact of the climate service prototypes and to support the definition of sustainable business models for the exploitation of the services (Task 6.5).

In addition, a gap analysis between the results of the ex-ante and ex-post assessment will be performed. A further study will be undertaken on indicators whose actual impact is significantly lower than the expected impact to identify shortages in the FOCUS-Africa assessment approach and propose improvements. The updated approach will be formalised and proposed to local policy makers as a new tool to evaluate the impact of climate services. This task will be conducted in close collaboration with partners involved in Task 5.3 (Development and delivery of prototype climate services).

Partner: Activity (PM)

- BSC: Ex-post impact assessment of the service prototypes of 3 case studies (CS1, CS7 and CS8); Coordinate the task and the deliverable writing (5.5)
- LGI: Ex-post impact assessment of the service prototypes of 5 case studies (CS2, CS3, CS4, CS5 and CS6); support to BSC for the ex-post impact assessment of CS1, CS7 and CS8, ensure application of standard approach; Contribute to the deliverable writing (8)
- PLAN: Distribution of climate services developed in CS3 (forecasting tool and climate-ready varieties) to smallholder farmer communities in a crowd sourcing approach. Conduction of innovation workshops and monitoring activities during cropping season to collect data about the performance of climate services. Empowering women farmers (8)
- ACMAD, EDF: Qualitative and quantitative feedback (user's perspective) on the climate services, organise interviews with stakeholders (CS1, CS7) (1 each)
- CSIR, BSC, SSSA, WEMC, MO, UCT: Qualitative and quantitative information (provider's perspective) to evaluate the socio-economic impacts of the climate services (0.5 per case study)
- MRNEM: Interviews with end-users that are not project partners, facilitate the reinvolvement of local stakeholders of T6.2.1 (CS2, CS4, CS6, CS8) (0.25)
- WMO: Facilitate the involvement of local representatives of all case studies (0.25)

Task 6.4: Market analysis and Scalability and Replicability Analysis (SRA) (M31 – M48)

Leader: AMIGO - Contributors: LGI

The results of the ex-post analysis are subject to the specific context of the case studies. This task aims at defining how the developed climate services can be scaled up, replicated and transferred to other environments. A market analysis will be conducted to identify potential markets for the developed climate services. A specific focus will be put on Africa as WP3 will have studied climate processes that impact climate variability in African regions. The study will look for geographic and socio-economic areas that encounter similar sectorial challenges and vulnerabilities as the ones identified in WP2. Areas where stakeholders have expressed their interest for the climate services throughout the project will also be considered. Key factors that lead to the successful implementation of a climate service in the context of its case study will be identified. The PESTEL framework will be used to give an overview of the different macro-environmental factors (political, economic, social, technological, environmental and legal). Key success factors will be integrated into an SRA grid that will be used to evaluate the potential of the given climate service in other locations. Results of this task will be primarily used to define exploitation strategies (Task 6.5). In addition, stakeholders and policy-makers of locations with a high potential for a climate service will be informed.

Partner: Activity (PM)

- AMIGO: Define the methodology (market analysis and SRA), identify and analyse new promising markets, conduct the SRA, inform local stakeholders and policy-makers about interesting services (8)
- LGI: Support the definition of the methodology, provide key success factors, identify and analyse new promising markets (3.5)

Task 6.5: Definition of exploitation strategies (M31 – M48)

Leader: LGI - Contributors: AMIGO, CSIR, PLAN, WEMC, EDF, ACMAD, MNREM

This task aims at defining future strategy for market approach and designing appropriate business models for the most promising climate services developed during the project. Results of the ex-post analysis (Task 6.3) and the replicability analysis (Task 6.4) will be used to identify most promising services.

Partners identified as services providers in the project will be assisted in the definition of their business models using innovative tools (e.g. the Flourishing Business Canvas) to design business models that are socially beneficial,

environmentally regenerative and financially viable. In particular, a cost analysis of the operationalisation of the prototypes will be conducted and service delivery processes will be designed to improve access for women to the climate services. End-users from the project as well as potential customers will be involved in the definition of exploitation strategies.

Partner: Activity (PM)

- LGI: Identify most promising services, propose customised approaches to service providers to define their strategies, co-design business models and market uptake strategies with them (7.5)
- AMIGO: Perform the cost analysis, provide inputs for the design of business model and market uptake strategies; Contribute to the deliverable (4)
- PLAN: CS3: Identify most promising climate-ready varieties from stakeholder feedbacks, coordination of the distribution of such varieties. Definition of exploitation strategies to upscale the project innovation in Mozambique and in other SADC regions (4)
- BSC: Strengthen the end-user engagement (1.6)
- CSIR, WEMC, MNREM: Provide information on the services, contribute to the design of business models and exploitation strategies of their services, involved end-users that are not project partners to provide feedback on business models and exploitation strategies (0.5 each)
- ACMAD, EDF: Provide feedback on the relevance of business models and exploitation strategies (0.25 each)

#### Participation per Partner

| Partner number and short name | WP6 effort   |
|-------------------------------|--------------|
| 1 - WMO                       | 1.50         |
| MNREM                         | 1.50         |
| 2 - BSC                       | 18.10        |
| 3 - MO                        | 1.00         |
| 4 - WEMC                      | 1.50         |
| 5 - EDF                       | 2.75         |
| 6 - ACMAD                     | 3.20         |
| 7 - CSIR                      | 2.00         |
| 8 - LGI                       | 39.00        |
| 10 - UCT                      | 1.00         |
| 11 - AMIGO                    | 12.00        |
| 13 - SSSA                     | 1.00         |
| 14 - PLAN                     | 13.50        |
| <b>Total</b>                  | <b>98.05</b> |

#### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title  | Lead beneficiary | Type <sup>15</sup> | Dissemination level <sup>16</sup> | Due Date (in months) <sup>17</sup> |
|----------------------------------|--|------------------|--------------------|-----------------------------------|------------------------------------|
| D6.1                             | Methodology to assess socio-economic impacts of climate services | 8 - LGI          | Report             | Public                            | 12                                 |



### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title  | Lead beneficiary | Type <sup>15</sup> | Dissemination level <sup>16</sup>  | Due Date (in months) <sup>17</sup> |
|----------------------------------|--|------------------|--------------------|--|------------------------------------|
| D6.2                             | Evaluation of the socio-economic situation in the 8 case studies         | 2 - BSC          | Report             | Confidential, only for members of the consortium (including the Commission Services) | 24                                 |
| D6.3                             | Ex-ante impact assessment of the services prototypes and recommendations | 8 - LGI          | Report             | Confidential, only for members of the consortium (including the Commission Services) | 36                                 |
| D6.4                             | Ex-post impact assessment of the climate services prototypes             | 2 - BSC          | Report             | Confidential, only for members of the consortium (including the Commission Services) | 48                                 |
| D6.5                             | Market analysis and SRA of the climate services                          | 11 - AMIGO       | Report             | Public   | 48                                 |
| D6.6                             | Exploitation strategies for most promising FOCUS-Africa services         | 8 - LGI          | Report             | Confidential, only for members of the consortium (including the Commission Services) | 48                                 |

### Description of deliverables

D6.1 : Methodology to assess socio-economic impacts of climate services [12]

Methodology to assess socio-economic impacts of climate services

D6.2 : Evaluation of the socio-economic situation in the 8 case studies [24]

Evaluation of the socio-economic situation in the 8 case studies

D6.3 : Ex-ante impact assessment of the services prototypes and recommendations [36]

Ex-ante impact assessment of the services prototypes and recommendations

D6.4 : Ex-post impact assessment of the climate services prototypes [48]

Ex-post impact assessment of the climate services prototypes

D6.5 : Market analysis and SRA of the climate services [48]

Market analysis and SRA of the climate services

D6.6 : Exploitation strategies for most promising FOCUS-Africa services [48]

Exploitation strategies for most promising FOCUS-Africa services

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>      | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>  |
|--------------------------------------|-----------------------------|-------------------------|-----------------------------|---|
| MS1                                  | First Stakeholder Workshop  | 4 - WEMC                | 4                           | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS2                                  | Second Stakeholder Workshop | 4 - WEMC                | 12                          | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes    |
| MS3                                  | Third Stakeholder Workshop  | 4 - WEMC                | 20                          | Third Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS4                                  | Fourth Stakeholder Workshop | 4 - WEMC                | 28                          | Fourth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes |
| MS5                                  | Fifth Stakeholder Workshop  | 4 - WEMC                | 36                          | Fifth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS6                                  | Sixth Stakeholder Workshop  | 4 - WEMC                | 44                          | Sixth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS17                                 | Kick Off Meeting            | 1 - WMO                 | 1                           | Kick Off Meeting means of verification: minutes                             |
| MS19                                 | Final meeting               | 1 - WMO                 | 48                          | Final meeting Means of verification: minutes                                |

|   |                    |                                       |           |
|---|--------------------|---------------------------------------|-----------|
| <b>Work package number</b> <sup>9</sup> | WP7                | <b>Lead beneficiary</b> <sup>10</sup> | 6 - ACMAD |
| <b>Work package title</b>               | Develop capacities |                                       |           |
| <b>Start month</b>                      | 1                  | <b>End month</b>                      | 48        |

### Objectives

This work package will contribute to develop the capacity of the regional NMHSs research institutes and other identified climate service providers to generate tailored, science-based, innovative and technology driven climate products, information and services, in operational mode .

The specific objectives include to:

- Assess the training needs of the regional climate services providers
- Review and upgrade the training curricula on climate monitoring and forecasting, climate change detection and scenario development for impact studies
- Develop and test training materials in collaboration with intra ACP GFCS programme, RCOFs other relevant ongoing activities and initiatives in Africa
- Develop online resources for their inclusion in the existing platforms/portals

### Description of work and role of partners

#### **WP7 - Develop capacities** [Months: 1-48]

ACMAD, WMO, BSC, MO, WEMC, UCT, SSSA, IIAM

Task 7.1: Assess capacity development needs and review and upgrade training curricula (M1 – M12)

Leader: ACMAD - Contributors: BSC, UCT, WMO, MO

Based on the capacity needs of the regional climate services providers, a new comprehensive training curriculum will be generated by upgrading the current curricula and including the recent advances and the outputs of FOCUS-Africa. WMO Resolution 5 (EC-68) on the Competencies for provision of Climate Services will be used as a reference to understand the capacity development needs. The competency framework for climate services is designed to help NMHSs and other institutions to deliver high-quality climate services in compliance with WMO standards and regulations, specifically those defined by the WMO Commission for Climatology and the Global Framework for Climate Services. Its implementation can follow the WMO Competencies Framework which is structured in 5 top-level competencies, as described in the WMO Guide on Competency Framework (WMO-No. 1205).

This task will support the development of novel training material to prepare competent staff to deliver innovative climate services. Sessions during the stakeholder's workshops (WP1) and other regional events (RCOFs) will be dedicated to curriculum and training material consolidation for climate services for food security, energy and water sectors.

Partner: Activity (PM)

- WMO: Assess the capacity development needs in the regional NMHSs and facilitate involvement of WMO technical commission experts' panel for the review (3)
- ACMAD: Collect training curricula from SARCOF, analyse and provide information on improvements needed based of feedbacks from SARCOF participants; and Collect training curricula from African RCOFs and workshops. Review relevant research findings and new climate services developments (2)
- UCT: Provide inputs on curricula based on extensive experience in NMS capacity development and other climate science/change capacity development (2)
- BSC: Liaise with partners and associates in Europe to review WP4 relevant research findings and material available from seasonal forecasting programmes. (0.5)
- MO: Identify and collate existing training materials and platforms in use in other African RCCs (I.e. ICPAC) (0.5)

Task 7.2: Develop and test training materials (M12 – M35)

Leader: ACMAD - Contributors: BSC, UCT, WEMC, WMO, MO, SSSA, IIAM

Task description:

Recent research findings and expected results from FOCUS-Africa research and innovative approaches will provide new material for upgrading the training courses. ACMAD and WMO will liaise with partners of the relevant WPs (especially WP 3 and 4) and with other initiatives (C3S, intra-ACP GFCS) to consolidate the training materials and test them in the stakeholder's workshops (WP1). The design and delivery of training material will take into account the unequal access of women to international capacity development activities. The training initiatives will ensure a balanced gender and

age representation reflective of different perspectives and experiences. In addition, training content design will consider economic and social issues, human rights, gender equality, and the rights of indigenous peoples and local communities. In the case study 3, Mozambique food security, modules will be tailored to enhance people-centred multi-hazard and multi-sectoral climate forecasting and adaptation through participatory processes.

Partner: Activity (PM)

- ACMAD: Prepare a report describing the upgrades proposed on the new training material. Lead development of new materials (6)
- ACMAD: Contribute to upgrade report preparation. Lead testing of new training (4)
- WMO: Provide guidance and experts networks and facilitate cooperation with existing on-going activities. Organize relevant testing with ACMAD (2)
- IIAM: Development of training materials to upscale the good practices developed in CS3 to other crops and other regions in Mozambique. (4)
- BSC: Provide input for new training material relative to WP4 findings on Seasonal forecasting. (2.5)
- WEMC: Provide input for new training material and support testing (2)
- SSSA: Input for new training material relative to the use of genetic data and seasonal and projected climate data for local adaptation in local germplasm collections (4)
- MO: Support review of training material and support testing (0.5)
- UCT: Provide input for new training material and support testing (2)

Task 7.3: Develop online resources (M24 – M48)

Leader: ACMAD - Contributors: BSC, UCT, WEMC, WMO, MO

Given the enormous need for effective capacity building in most African NMHSs, this task will ensure legacy and sustainability of the capacity development effort by preparing online resources and facilitating their inclusion in existing or under development platforms/portals under the supervision of ACMAD, WMO.

Partner: Activity (PM)

- WMO: Review the on-line training and facilitate the sharing in existing or under development dedicated portal/platform (1)
- ACMAD: Facilitate uptake of on-line training in relevant existing web portals; and Define content of online material. Liaise with other WPs to run one to two online trainings. Ensure upscaling for training using online material (10)
- WEMC: Support the development of on-line training material (1)
- BSC: Support the development of content for on-line training material relative to WP4 findings on Seasonal forecasting. (1)
- MO: Support and provide technical input on content developed for on-line training (1)
- UCT: Support the development of on-line training material (1)

#### Participation per Partner

| Partner number and short name | WP7 effort   |
|-------------------------------|--------------|
| 1 - WMO                       | 6.00         |
| 2 - BSC                       | 4.00         |
| 3 - MO                        | 2.00         |
| 4 - WEMC                      | 3.00         |
| 6 - ACMAD                     | 22.00        |
| 10 - UCT                      | 5.00         |
| 13 - SSSA                     | 4.00         |
| 15 - IIAM                     | 4.00         |
| <b>Total</b>                  | <b>50.00</b> |

### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title   | Lead beneficiary | Type <sup>15</sup>             | Dissemination level <sup>16</sup> | Due Date (in months) <sup>17</sup> |
|----------------------------------|---|------------------|--------------------------------|-----------------------------------|------------------------------------|
| D7.1                             | Capacity Development needs and plan report                                  | 6 - ACMAD        | Report                         | Public                            | 12                                 |
| D7.2                             | On-line courses and modules   | 6 - ACMAD        | Websites, patents filing, etc. | Public                            | 36                                 |
| D7.3                             | Final report on the project capacity development implementation and results | 6 - ACMAD        | Report                         | Public                            | 48                                 |

### Description of deliverables

D7.1 : Capacity Development needs and plan report [12]  
Capacity Development needs and plan report

D7.2 : On-line courses and modules [36]  
On-line courses and modules

D7.3 : Final report on the project capacity development implementation and results [48]  
Final report on the project capacity development implementation and results

### Schedule of relevant Milestones

| Milestone number <sup>18</sup> | Milestone title             | Lead beneficiary | Due Date (in months) | Means of verification   |
|--------------------------------|-----------------------------|------------------|----------------------|---|
| MS1                            | First Stakeholder Workshop  | 4 - WEMC         | 4                    | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS2                            | Second Stakeholder Workshop | 4 - WEMC         | 12                   | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes    |
| MS3                            | Third Stakeholder Workshop  | 4 - WEMC         | 20                   | Third Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS4                            | Fourth Stakeholder Workshop | 4 - WEMC         | 28                   | Fourth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes |
| MS5                            | Fifth Stakeholder Workshop  | 4 - WEMC         | 36                   | Fifth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS6                            | Sixth Stakeholder Workshop  | 4 - WEMC         | 44                   | Sixth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>                           | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>   |
|--------------------------------------|--|-------------------------|-----------------------------|--|
| MS15                                 | roll out of the training courses at 3rd workshop | 6 - ACMAD               | 20                          | roll out of the training courses at 3rd workshop means of verification: Workshop report          |
| MS16                                 | roll out of the on-line training courses         | 6 - ACMAD               | 38                          | roll out of the on-line training courses means of verification: Number of access to the platform |
| MS17                                 | Kick Off Meeting                                 | 1 - WMO                 | 1                           | Kick Off Meeting means of verification: minutes  |
| MS19                                 | Final meeting                                    | 1 - WMO                 | 48                          | Final meeting Means of verification: minutes   |

|   |                                     |                                       |         |
|---|-------------------------------------|---------------------------------------|---------|
| <b>Work package number</b> <sup>9</sup> | WP8                                 | <b>Lead beneficiary</b> <sup>10</sup> | 1 - WMO |
| <b>Work package title</b>               | Project coordination and management |                                       |         |
| <b>Start month</b>                      | 1                                   | <b>End month</b>                      | 48      |

### Objectives

This WP ensures the achievement of the project's objectives, in terms of scientific quality, timely delivery, and contribution to the expected impact of the project. WP8 aims at achieving: efficient progress monitoring; timely and detailed reporting to the EC; constitution and organisation of the WP management teams; proper scientific quality of the deliverables.

In terms of consortium management, WP8 objectives are to guarantee sound management of contractual and financial issues, setting-up and maintaining project management tools, good communication in the consortium, proper quality assurance in the delivered reports, financial and contractual management, reporting to the EC. Consortium management and scientific coordination are placed under the responsibility of the coordinator. While being fully responsible towards the EC, WMO will be assisted by LGI, which has longstanding experience as Project Management Office in EU collaborative projects. This will allow the Coordinator to focus on strategic coordination while being supported for the operational and administrative project management.

### Description of work and role of partners

#### **WP8 - Project coordination and management** [Months: 1-48]

**WMO**, BSC, MO, WEMC, ACMAD, CSIR, LGI

Task 8.1: Project coordination (M1 – M48)

Leader: WMO - Contributors: LGI, CSIR, MO, BSC, WEMC, ACMAD

This task groups the coordinator's activity of organization and monitoring of the work progress:

- Elaboration of the detailed work plan, established at the beginning of the project, defining with precision the activities of each Partner within each task and identifying the involved persons.
- Supervision of project deliverables, progress milestones, and planning;
- Risk analysis and management plan throughout the project;
- Key performance indicators follow up;
- Continuous monitoring of Partners' scientific achievements;
- Scientific review of the work and deliverables performed by the Partners;

Partner: Activity (PM)

- WMO: Scientific coordination of the project and technical review (6)
- LGI: Project management office (3)
- CSIR, MO, BSC, WEMC, ACMAD: WP coordination (1.5 Each )

Task 8.2: Quality management (M1 – M48)

Leader: LGI - Contributors: WMO

- Elaboration and application of a Project Quality Plan, internal guideline detailing project procedures (quality assurance, document management, document templates, etc.), in accordance with the project management and organisation defined in the Contract;
- Set-up and maintenance of a web-based document management tool for publishing and exchanging documents within the consortium;
- Monitoring of workflow and information management, ensuring good communication within the consortium.
- Implementation of adequate internal structures safeguarding effective knowledge, IP and innovation management to create, capture and manage research results
- Maintenance of Partners' contact information (GDPR compliant), including emailing lists;

Partner: Activity (PM)

- LGI: Set-up, monitoring and maintenance of the procedures and management tools (4)
- WMO: Responsible for the overall project quality and internal communication (2)

Task 8.3: Project secretariat and internal project meetings organization (M1 – M48)

Leader: LGI - Contributors: WMO

- Preparation, organization and minutes of the kick-off meeting /final project meeting with all Partners at the beginning and at the end of the project
- Preparation, organization and minutes of Executive Committee meetings
- Preparation, organization and minutes of the plenary meetings (jointly with the workshops meetings);
- Handling of the project correspondence;
- Acting as entry point for the project for external bodies;
- Support to project Partners upon request;
- More generally, ensuring that all Partners share the same level of information on general issues concerning the project, i.e. contract and project management, work progress, dissemination, etc.

Partner: Activity (PM)

- LGI: Pre- and post-processing of the meetings, correspondence, partner support (4)
- WMO: Preparation, chairing the meetings; correspondence validation; entry point (2)

Task 8.4: Contractual & Financial Management (M1 – M48)

Leader: WMO - Contributors: LGI

This task comprises the management of the administrative and financial issues:

- Maintenance of the Grant and Consortium Agreements;
- Management of funds and maintenance of budget files;
- Coordination of the periodic (M18, M36 and M48) and final (M48) reports to the EC;
- Advice on contractual / financial matters to project Partners upon request.

Partner: Activity (PM)

- LGI: Finance, contract maintenance, periodic report coordination, partner support , including the management of amendments following the inclusion of new partners (upon open calls) (5)
- WMO: Contribution and validation of the periodic report and contract maintenance (2)

Task 8.5: Data Management (M1 – M48)

Leader: LGI - Contributors: ALL

A good knowledge and data management is a key conduit leading to knowledge discovery and innovation, and to subsequent knowledge integration and reuse. As data gets collected, processed and generated by the project, this task will support the consortium throughout the entire life cycle of the project. A template will be circulated to assess the data/information/knowledge that is already owned, to be collected, processed, or generated by the partners. This standardized process should make the coordination of the data collection more efficient, ensuring its quality and optimising consolidation efforts. Once data is collected and/or generated, it must be stored in a standardized and efficient way, in order to allow for easy use and reuse. For this purpose, for every document, the task will provide a methodology including naming conventions and the necessary information to be detailed (resource name, resource type, media type, language, license, distribution medium, usage, size, description, ownership.). This uses a collaborative storage platform to make the exchanges of documents within the consortium easier. As part of making research data findable, accessible, interoperable and re-usable (FAIR), this entire process will be described in the Data Management Plan (DMP) and updated over the course of the project. The DMP will include information on the data life cycle:

1. The handling of research data during and after the project
2. The type of data to be collected, processed or generated
3. The methodology and standards to be applied
4. Whether data will be shared/made open and how?
5. How data will be curated and preserved?
6. Ensure exploitation strategies do not infringe on IP (patent) rights

All partners will be involved in the identification of data

Partner: Activity (PM)

- LGI: Preparation of the data management plan (2)



| Partner number and short name | WP8 effort   |
|-------------------------------|--------------|
| 1 - WMO                       | 12.00        |
| 2 - BSC                       | 1.50         |
| 3 - MO                        | 1.50         |
| 4 - WEMC                      | 1.50         |
| 6 - ACMAD                     | 1.50         |
| 7 - CSIR                      | 1.50         |
| 8 - LGI                       | 18.00        |
| <b>Total</b>                  | <b>37.50</b> |

#### List of deliverables

| Deliverable Number <sup>14</sup> | Deliverable Title    | Lead beneficiary | Type <sup>15</sup>             | Dissemination level <sup>16</sup>  | Due Date (in months) <sup>17</sup> |
|----------------------------------|----------------------|------------------|--------------------------------|--|------------------------------------|
| D8.1                             | Project Quality Plan | 8 - LGI          | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 2                                  |
| D8.2                             | Detailed Work Plan   | 1 - WMO          | Report                         | Confidential, only for members of the consortium (including the Commission Services) | 3                                  |
| D8.3                             | Data Management Plan | 8 - LGI          | ORDP: Open Research Data Pilot | Confidential, only for members of the consortium (including the Commission Services) | 6                                  |

#### Description of deliverables

D8.1 : Project Quality Plan [2]

Project Quality Plan

D8.2 : Detailed Work Plan [3]

Detailed Work Plan

D8.3 : Data Management Plan [6]

Data Management Plan

**Schedule of relevant Milestones**

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>       | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b>  |
|--------------------------------------|------------------------------|-------------------------|-----------------------------|---|
| MS1                                  | First Stakeholder Workshop   | 4 - WEMC                | 4                           | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS2                                  | Second Stakeholder Workshop  | 4 - WEMC                | 12                          | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes    |
| MS3                                  | Third Stakeholder Workshop   | 4 - WEMC                | 20                          | Third Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS4                                  | Fourth Stakeholder Workshop  | 4 - WEMC                | 28                          | Fourth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes |
| MS5                                  | Fifth Stakeholder Workshop   | 4 - WEMC                | 36                          | Fifth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS6                                  | Sixth Stakeholder Workshop   | 4 - WEMC                | 44                          | Sixth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes  |
| MS17                                 | Kick Off Meeting             | 1 - WMO                 | 1                           | Kick Off Meeting means of verification: minutes                             |
| MS18                                 | Project intranet established | 8 - LGI                 | 2                           | Project intranet established<br>Means of verification: intranet website     |
| MS19                                 | Final meeting                | 1 - WMO                 | 48                          | Final meeting Means of verification: minutes                                |

|   |                     |                                       |         |
|---|---------------------|---------------------------------------|---------|
| <b>Work package number</b> <sup>9</sup> | WP9                 | <b>Lead beneficiary</b> <sup>10</sup> | 1 - WMO |
| <b>Work package title</b>               | Ethics requirements |                                       |         |
| <b>Start month</b>                      | 1                   | <b>End month</b>                      | 48      |

### Objectives

The objective is to ensure compliance with the 'ethics requirements' set out in this work package.

### Description of work and role of partners

**WP9 - Ethics requirements** [Months: 1-48]

**WMO**

This work package sets out the 'ethics requirements' that the project must comply with.

### List of deliverables

| <b>Deliverable Number</b> <sup>14</sup> | <b>Deliverable Title</b> | <b>Lead beneficiary</b> | <b>Type</b> <sup>15</sup> | <b>Dissemination level</b> <sup>16</sup>   | <b>Due Date (in months)</b> <sup>17</sup> |
|---|--------------------------|-------------------------|---------------------------|--|---|
| D9.1                                    | H - Requirement No. 1    | 1 - WMO                 | Ethics                    | Confidential, only for members of the consortium (including the Commission Services) | 6   |

### Description of deliverables

The 'ethics requirements' that the project must comply with are included as deliverables in this work package.

D9.1 : H - Requirement No. 1 [6]

2.1. The procedures and criteria that will be used to identify/recruit research participants must be kept on file. 2.2. The informed consent procedures that will be implemented for the participation of humans must be kept on file. 2.3. Templates of the informed consent/assent forms and information sheets (in language and terms intelligible to the participants must be kept on file. 2.9. Copies of opinions/approvals by ethics committees and/or competent authorities for the research with humans must be kept on file.

### Schedule of relevant Milestones

| <b>Milestone number</b> <sup>18</sup> | <b>Milestone title</b> | <b>Lead beneficiary</b> | <b>Due Date (in months)</b> | <b>Means of verification</b> |
|---------------------------------------|------------------------|-------------------------|-----------------------------|------------------------------|
|---------------------------------------|------------------------|-------------------------|-----------------------------|------------------------------|

### 1.3.4. WT4 List of milestones

| Milestone number <sup>18</sup> | Milestone title                         | WP number <sup>9</sup>                                      | Lead beneficiary | Due Date (in months) <sup>17</sup> | Means of verification   |
|--------------------------------|---|---|------------------|------------------------------------|---|
| MS1                            | First Stakeholder Workshop              | WP1,<br>WP2,<br>WP3,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8 | 4 - WEMC         | 4                                  | First Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes                                  |
| MS2                            | Second Stakeholder Workshop             | WP1,<br>WP2,<br>WP3,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8 | 4 - WEMC         | 12                                 | Second Stakeholder Workshop<br>Means of verification: Workshop's minutes                                    |
| MS3                            | Third Stakeholder Workshop              | WP1,<br>WP2,<br>WP3,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8 | 4 - WEMC         | 20                                 | Third Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes                                  |
| MS4                            | Fourth Stakeholder Workshop             | WP1,<br>WP2,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8         | 4 - WEMC         | 28                                 | Fourth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes                                 |
| MS5                            | Fifth Stakeholder Workshop              | WP1,<br>WP2,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8         | 4 - WEMC         | 36                                 | Fifth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes                                  |
| MS6                            | Sixth Stakeholder Workshop              | WP1,<br>WP2,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8         | 4 - WEMC         | 44                                 | Sixth Stakeholder Workshop<br>Means of verification:<br>Workshop's minutes                                  |
| MS7                            | All input variables to case study known | WP2,<br>WP5   | 7 - CSIR         | 7                                  | All input variables to case study known<br>Means of verification: location and climate variables identified |

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>  | <b>WP number<sup>9</sup></b> | <b>Lead beneficiary</b> | <b>Due Date (in months)<sup>17</sup></b> | <b>Means of verification</b>  |
|--------------------------------------|---|------------------------------|-------------------------|--|---|
|                                      |   |                              |                         |  | for crop modelling and first crop model input file complete   |
| MS8                                  | 2 users' requirements and challenges identified   | WP2, WP5                     | 7 - CSIR                | 12                                       | 2 users' requirements and challenges identified Means of verification: consolidated report from stakeholders' workshop and info collated using other methods  |
| MS9                                  | Details on regional extremes arising from climate change and climate variability known  | WP2, WP5                     | 7 - CSIR                | 24                                       | Details on regional extremes arising from climate change and climate variability known Means of verification: report and publication                          |
| MS10                                 | Online decision support tool on food security, water and energy developed   | WP2, WP5                     | 7 - CSIR                | 30                                       | Online decision support tool on food security, water and energy developed Means of verification: report/publication describing adaptation tool developed      |
| MS11                                 | Availability of a first working version of seasonal forecasts, decadal predictions and climate projections for the case studies | WP4, WP5                     | 2 - BSC                 | 24                                       | Availability of a first working version of seasonal forecasts, decadal predictions and climate projections for the case studies Means of verification: report |
| MS12                                 | Availability of plan for the eighth co-designed and co-developed case study prototypes  | WP5                          | 4 - WEMC                | 36                                       | Availability of plan for the eighth co-designed and co-developed case study prototypes Means of verification: report (D5.2)                                   |
| MS13                                 | webGIS platform online  | WP5                          | 11 - AMIGO              | 38                                       | webGIS platform online means of verification: The webGIS platform will be online and it can be used by external users   |
| MS14                                 | CS prototypes developed and tested  | WP5                          | 4 - WEMC                | 48                                       | CS prototypes developed and tested Means of verification: CS prototypes made available to relevant users  |
| MS15                                 | roll out of the training courses at 3rd workshop  | WP1, WP7                     | 6 - ACMAD               | 20                                       | roll out of the training courses at 3rd workshop means of verification: Workshop report   |
| MS16                                 | roll out of the on-line training courses  | WP7                          | 6 - ACMAD               | 38                                       | roll out of the on-line training courses means of verification: Number of access to the platform  |
| MS17                                 | Kick Off Meeting  | WP1, WP2,                    | 1 - WMO                 | 1  | Kick Off Meeting means of verification: minutes   |

| <b>Milestone number<sup>18</sup></b> | <b>Milestone title</b>       | <b>WP number<sup>9</sup></b>                                | <b>Lead beneficiary</b> | <b>Due Date (in months)<sup>17</sup></b> | <b>Means of verification</b>   |
|--------------------------------------|------------------------------|---|-------------------------|--|--|
|                                      |                              | WP3,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8                 |                         |  |  |
| MS18                                 | Project intranet established | WP1,<br>WP8   | 8 - LGI                 | 2  | Project intranet established<br>Means of verification:<br>intranet website |
| MS19                                 | Final meeting                | WP1,<br>WP2,<br>WP3,<br>WP4,<br>WP5,<br>WP6,<br>WP7,<br>WP8 | 1 - WMO                 | 48                                       | Final meeting Means of<br>verification: minutes                            |

### 1.3.5. WT5 Critical Implementation risks and mitigation actions

| Risk number | Description of risk   | WP Number          | Proposed risk-mitigation measures   |
|-------------|---|--------------------|---|
| 1           | Restriction in data access may result in insufficient data for model validation   | WP1, WP2, WP3, WP4 | Wide range of industrial partners has already committed to provide relevant data. Research participants hold also extensive databases of experimental data that can supplement the validation where gaps are identified.  |
| 2           | Failure in storage “blades” may result in data loss   | WP1, WP2, WP3, WP4 | Provision to back up important data sets to tape is factored in. A software repository will provide an external backup of the important code. Input data sets can be re-extracted from source. Data generated by the project could be regenerated.                          |
| 3           | Low skill/large uncertainty in the seasonal forecasts / decadal predictions and climate projections may impact the amount of time estimated for climate information production and validation | WP4                | Use a wide spread of climate data from different forecasts systems. Verification assessment in the early stages of the project. Specific calendars where all the partners in their corresponding tasks will do periodic estimations of the workload left to finish the task |
| 4           | Low number of adaptation traits (rice and cowpea) may jeopardize the proposed experiments   | WP2                | Other plant genetic resources may be sourced by the IIAM genebank (e.g. sorghum, maize), to broaden the scope for search for adaptation with redesigned experiments to fit the allocated budget.  |
| 5           | The molecular diversity in the plant genetic resources is not sufficient for the identification of most adapted genetic materials   | WP2                | Additional accessions will be characterized to incorporate more genetic diversity   |
| 6           | Diverse conventions for data storage may lead to incompatibility for direct use in prototypes   | WP5                | Regular communication with WP3 and WP4 to ensure data produced follow project agreed DMP  |
| 7           | Data may be insufficient for testing the CS prototypes  | WP5                | Ensure a minimal common dataset is available (e.g. ERA5 data) to develop CS prototypes  |
| 8           | Poor translation of users requirements may limit the relevance of the application and ultimately lead to users’ disappointment  | WP5                | Ensure regular interaction with users takes place to avoid divergence in prototype application development.   |
| 9           | Incompatibility of prototypes application across platforms (e.g. Windows, Mac, iOS, Android etc) may limit the uptake of the service  | WP5                | Programming language, visual design etc. are cross-compatible and functional on all major platforms. Regular testing will confirm the compatibility.  |
| 10          | Lack of feedback from end-users may limit the ability to develop a useful climate service   | WP1, WP2, WP3, WP4 | In addition to the end-users already identified and the Advisory Board members, online survey tools such as Questmark will be used to optimize the time of the industry partners involved in shaping the format of the end-products.  |

| <b>Risk number</b> | <b>Description of risk</b>  | <b>WP Number</b>                            | <b>Proposed risk-mitigation measures</b>   |
|--------------------|---|---|--|
| 11                 | Limited interest in the FOCUS-Africa climate solutions by end users may lead to low ability to analyse the socio-economic benefits.       | WP3, WP4, WP5                               | During the project, all stakeholders will be identified to be included in the audience of the project's activities. Serious games approach will be used to give to end users a 'hands on' experience on the FOCUS-Africa solutions and maximize user acceptance. |
| 12                 | Low participation in workshops / Lack of inputs from stakeholders may slow or hinder the implementation                                   | WP2, WP4                                    | Organize the workshops jointly with other ongoing events, prepare a well-structured campaign and promote the events well in advance  |
| 13                 | Lack of inputs from partners for communication material leading to low visibility for the project   | WP1   | Put in place a well-structured mechanism for collecting news items   |
| 14                 | Low security situation in countries where the stakeholder workshops are scheduled may lead to cancellation of the stakeholder workshops   | WP1   | Monitor the political and environmental situation in the host countries. Make sure the rescheduling and relocation is anticipated  |
| 15                 | Lack of structured archive of curricula and training materials / Inability to capitalize on huge investments made in the past on training | WP7   | WMO to mobilize expert teams to structure existing records and collect missing elements  |
| 16                 | Delays in the partner's responses has an impact on the release of the agreed results and documents  | WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9 | Close coordination of partner activities with regular follow-up meetings (i.e Skype calls or direct phone calls).  |



### 1.3.6. WT6 Summary of project effort in person-months

|                            | WP1   | WP2   | WP3    | WP4    | WP5    | WP6   | WP7 | WP8   | WP9 | Total Person/Months per Participant |
|----------------------------|-------|-------|--------|--------|--------|-------|-----|-------|-----|-------------------------------------|
| 1 - WMO                    | 10.50 | 0     | 6      | 2      | 0      | 1.50  | 6   | 12    | ✓   | 38                                  |
| · MNREM                    | 1     | 0     | 0      | 7      | 3      | 1.50  | 0   | 0     |     | 12.50                               |
| 2 - BSC                    | 10.50 | 8     | 6      | 49     | 21     | 18.10 | 4   | 1.50  |     | 118.10                              |
| 3 - MO                     | 6     | 3     | 15     | 16     | 10     | 1     | 2   | 1.50  |     | 54.50                               |
| 4 - WEMC                   | 22.50 | 0     | 0      | 0      | 47.72  | 1.50  | 3   | 1.50  |     | 76.22                               |
| 5 - EDF                    | 1     | 2     | 3      | 3      | 5      | 2.75  | 0   | 0     |     | 16.75                               |
| 6 - ACMAD                  | 2.50  | 2     | 3      | 4      | 3      | 3.20  | 22  | 1.50  |     | 41.20                               |
| 7 - CSIR                   | 6     | 17    | 5      | 14     | 4      | 2     | 0   | 1.50  |     | 49.50                               |
| 8 - LGI                    | 27.50 | 0     | 0      | 0      | 0      | 39    | 0   | 18    |     | 84.50                               |
| 9 - WITS-GCI               | 2.21  | 8.60  | 18.90  | 8.90   | 0      | 0     | 0   | 0     |     | 38.61                               |
| 10 - UCT                   | 1     | 10    | 18     | 8      | 0      | 1     | 5   | 0     |     | 43                                  |
| 11 - AMIGO                 | 1     | 0     | 12     | 18.11  | 21     | 12    | 0   | 0     |     | 64.11                               |
| 12 - JRC                   | 0.60  | 4     | 6      | 3      | 0      | 0     | 0   | 0     |     | 13.60                               |
| 13 - SSSA                  | 2     | 13    | 12     | 11     | 17     | 1     | 4   | 0     |     | 60                                  |
| 14 - PLAN                  | 1     | 4     | 0      | 0      | 0      | 13.50 | 0   | 0     |     | 18.50                               |
| 15 - IIAM                  | 1     | 15    | 4      | 0      | 18     | 0     | 4   | 0     |     | 42                                  |
| <b>Total Person/Months</b> | 96.31 | 86.60 | 108.90 | 144.01 | 149.72 | 98.05 | 50  | 37.50 |     | 771.09                              |

*1.3.7. WT7 Tentative schedule of project reviews*

| <b>Review number <sup>19</sup></b> | <b>Tentative timing</b> | <b>Planned venue of review</b> | <b>Comments, if any</b> |
|------------------------------------|-------------------------|--------------------------------|-------------------------|
| RV1                                | 21                      |                                |                         |
| RV2                                | 33                      |                                |                         |
| RV3                                | 48                      |                                |                         |

### **1. Project number**

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

### **2. Project acronym**

Use the project acronym as given in the submitted proposal. It can generally not be changed. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

### **3. Project title**

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

### **4. Starting date**

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry into force of the Grant Agreement (NB : entry into force = signature by the Agency). Please note that if a fixed starting date is used, you will be required to provide a written justification.

### **5. Duration**

Insert the duration of the project in full months.

### **6. Call (part) identifier**

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

### **7. Abstract**

### **8. Project Entry Month**

The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

### **9. Work Package number**

Work package number: WP1, WP2, WP3, ..., WPn

### **10. Lead beneficiary**

This must be one of the beneficiaries in the grant (not a third party) - Number of the beneficiary leading the work in this work package

### **11. Person-months per work package**

The total number of person-months allocated to each work package.

### **12. Start month**

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

### **13. End month**

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

### **14. Deliverable number**

Deliverable numbers: D1 - Dn

### **15. Type**

Please indicate the type of the deliverable using one of the following codes:

|        |  |
|--------|--|
| R      | Document, report                       |
| DEM    | Demonstrator, pilot, prototype         |
| DEC    | Websites, patent filings, videos, etc. |
| OTHER  |  |
| ETHICS | Ethics requirement                     |
| ORDP   | Open Research Data Pilot               |
| DATA   | data sets, microdata, etc.             |

## 16. Dissemination level

Please indicate the dissemination level using one of the following codes:

- PU Public
- CO Confidential, only for members of the consortium (including the Commission Services)
- EU-RES Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)
- EU-CON Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)
- EU-SEC Classified Information: SECRET UE (Commission Decision 2005/444/EC)

## 17. Delivery date for Deliverable

Month in which the deliverables will be available, month 1 marking the start date of the project, and all delivery dates being relative to this start date.

## 18. Milestone number

Milestone number: MS1, MS2, ..., MSn

## 19. Review number

Review number: RV1, RV2, ..., RVn

## 20. Installation Number

Number progressively the installations of a same infrastructure. An installation is a part of an infrastructure that could be used independently from the rest.

## 21. Installation country

Code of the country where the installation is located or IO if the access provider (the beneficiary or linked third party) is an international organization, an ERIC or a similar legal entity.

## 22. Type of access

- TA-uc if trans-national access with access costs declared on the basis of unit cost,
- TA-ac if trans-national access with access costs declared as actual costs, and
- TA-cb if trans-national access with access costs declared as a combination of actual costs and costs on the basis of unit cost,
- VA-uc if virtual access with access costs declared on the basis of unit cost,
- VA-ac if virtual access with access costs declared as actual costs, and
- VA-cb if virtual access with access costs declared as a combination of actual costs and costs on the basis of unit cost.

## 23. Access costs

Cost of the access provided under the project. For virtual access fill only the second column. For trans-national access fill one of the two columns or both according to the way access costs are declared. Trans-national access costs on the basis of unit cost will result from the unit cost by the quantity of access to be provided.

## Amendment

### History of changes

| <b>PART A</b>     |  |  |
|-------------------|--|--|
| <b>DATE OF GA</b> | <b>ITEM</b>  | <b>CHANGES</b>   |
| GA 20220421       | Beneficiaries, Work Packages and Deliverables sections | <ul style="list-style-type: none"> <li>• JRC has been removed from the Beneficiaries and the consortium               <ul style="list-style-type: none"> <li>○ JRC has been removed from WP1                   <ul style="list-style-type: none"> <li>▪ JRC's action has been reallocated to WITS-GCI that now have an effort of 2.21 PM</li> </ul> </li> <li>○ JRC has been removed from WP2                   <ul style="list-style-type: none"> <li>▪ JRC has been replaced by WITS-GCI to lead the D2.2 (WP2)</li> <li>▪ WITS-GCI has been added in T2.2 to take over JRC's action</li> <li>▪ JRC's action has been reallocated to WITS-GCI that now have an effort of 8.60 PM</li> </ul> </li> <li>○ JRC has been removed from WP3                   <ul style="list-style-type: none"> <li>▪ WITS-GCI has been added in T3.2 and T3.3 to take over JRC's action</li> <li>▪ JRC's action has been reallocated to WITS-GCI that now have an effort of 18.90 PM</li> </ul> </li> <li>○ JRC has been removed from WP4                   <ul style="list-style-type: none"> <li>▪ JRC has been replaced by WITS-GCI to lead the D4.2 (WP4)</li> <li>▪ WITS-GCI has been added in T4.2 to take over JRC's action. Now WITS-GCI has an effort of 8.90 PM</li> <li>▪ JRC has been replaced by AMIGO in T4.4. Now AMIGO has an effort of 18.11 PM</li> </ul> </li> <li>○ JRC has been removed from WP5                   <ul style="list-style-type: none"> <li>▪ WEMC replaces JRC in T5.1, T5.2, T5.3. Now WEMC has an effort of 47.72 PM</li> </ul> </li> <li>○ JRC has been removed from WP6                   <ul style="list-style-type: none"> <li>▪ JRC has been replaced by BSC in T6.3. Now BSC has an effort of 18.10 PM.</li> </ul> </li> <li>○ 1 PM from JRC's effort has been reallocated to LGI in WP8</li> </ul> </li> <li>• Changes in ACMAD's effort:               <ul style="list-style-type: none"> <li>○ WP1: 2.50 PM</li> <li>○ WP2: 2 PM</li> <li>○ WP4: 4 PM</li> <li>○ WP5: 3 PM</li> <li>○ WP6: 3.20 PM</li> <li>○ WP7: 22 PM</li> </ul> </li> </ul> |
|                   | Financial Information                                  | <ul style="list-style-type: none"> <li>• JRC:               <ul style="list-style-type: none"> <li>○ PERSONNEL COSTS: Withdrawal of JRC: 93,492 euros spent in the first reporting period, JRC frees up: 192,588 euros for the consortium. Decrease of PM in all WPs (from 40 to 13.60 PM)</li> </ul> </li> </ul>  |

|             |                                       |  |
|-------------|---------------------------------------|--|
|             |                                       | <ul style="list-style-type: none"> <li>○ SUBCONTRACTING: Withdrawal of JRC: spent 20,000 euros in the first reporting period, freeing up: 40,000 euros for the consortium. The remaining budget (40,000 euros) will be 'shifted' into personnel costs.</li> <li>○ OTHER DIRECT COSTS: Withdrawal of JRC: spent 0 euros in the first reporting period, freeing up: 27,000 euros for the consortium</li> <li>○ INDIRECT COSTS: Withdrawal of JRC: spent 23,373 euros in the first reporting period, freeing up: 54,897 euros for the consortium.</li> <li>• BSC: <ul style="list-style-type: none"> <li>○ PERSONNEL COSTS: Additional 7191 euros (=1.6 PM in WP6)</li> </ul> </li> <li>• WEMC: <ul style="list-style-type: none"> <li>○ PERSONNEL COSTS: Additional 11,7863 euros (=15.72 in WP5)</li> </ul> </li> <li>• LGI: <ul style="list-style-type: none"> <li>○ PERSONNEL COSTS: Additional 6,500 euros (=1 PM in WP8)</li> <li>○ OTHER DIRECT COSTS: Additional 20500 euros to support the travel of experts</li> </ul> </li> <li>• WITS-GCI: <ul style="list-style-type: none"> <li>○ PERSONNEL COSTS: Additional 78,039 euros (= 15.61 PM in WP1-4)</li> </ul> </li> <li>• AMIGO: <ul style="list-style-type: none"> <li>○ PERSONNEL COSTS: Additional 21,495 euros (=4.1 PM in WP4)</li> </ul> </li> <li>• ACMAD: <ul style="list-style-type: none"> <li>○ SUBCONTRACTING COSTS: Reallocation from personnel costs to subcontracting 163925 euros</li> <li>○ PERSONNEL COSTS: Reallocation from the 'freed up' indirect costs to personnel costs of 32785 euros (=8.2 PM in WP2-WP5)</li> </ul> </li> </ul> |
| GA 20200312 | Beneficiaries, Work Packages sections | <ul style="list-style-type: none"> <li>• Removal of non-validated partners (SADC, MMS, DCCMS, TMA, Landbank (LB), IIAM) in WP 1, 2, 3, 4, 5, 6 and 7. PM and task were given to WMO . PM number and task description was not change.</li> <li>• Removal of non-validated partners (SADC p55, MMS p68/69, DCCMS p74, TMA p69/70, Landbank p75, IIAM) from Annex 2. Their respective budget was given to WMO without changing the maximum grant amount.</li> </ul>   |
| GA 20200127 | Financial Information                 | <ul style="list-style-type: none"> <li>• Partner EDF, the direct personnel costs were declared as actual costs while they should have been declared as unit costs. Modification implemented.</li> </ul>  |
| GA 20191230 |                                       | <ul style="list-style-type: none"> <li>• Initial GA</li> </ul>   |

| DATE OF GA  | ITEM        | CHANGES   |
|-------------|-------------|---|
| GA 20220726 | Section 3.4 | In the text: Travel costs of the entire consortium are now 583000 euros to account for new travel costs of ACMAD (and no equipment). Additional other direct costs are now 4000 euros (only MNREM, without ACMAD). ACMAD table with direct costs changed (equipment removed, travel costs increased). |

|             |                |  |
|-------------|----------------|--|
|             | Section 4.2    | ACMAD table was modified - the exact tasks for each consultant in the subcontracting costs were added.   |
| GA 20220421 | Acronyms table | APHLIS has been removed<br>LB for Land Bank has been added   |
|             | Section 1.3.1  | JRC has been removed<br>APHLIS has been removed  |
|             | Section 1.3.2  | APHLIS has been removed<br>JRC has been removed  |
|             | Section 1.4.2  | APHLIS has been removed  |
|             | Section 2.2.1  | JRC has been removed<br>APHLIS has been removed  |
|             | Section 3.3    | The number of partners has been replaced: “The <i>FOCUS-Africa</i> brings together 15 strong partners across Europe (9) and Africa (6).”<br>JRC has been removed   |
|             | Section 3.4    | Ressources to be committed were changed (totals in the budget)<br>JRC has been removed<br>ACMAD table was inserted (justifying the direct costs)   |
|             | Section 4.1    | JRC has been removed   |
|             | Section 4.2    | The subcontracting costs for ACMAD were added as well as the description of tasks of the local consultants.  |
| GA 20200312 | Section 1.3.2  | <ul style="list-style-type: none"> <li>• Removal of DCCMS as service provider (p17)</li> <li>• Removal of IIAM as service provider (p18)</li> <li>• Removal of TMA as service provider (p19, p20)</li> </ul>   |
|             | Section 2.2.1  | <ul style="list-style-type: none"> <li>• Removal of DCCMS, IIAM, TMA as service provider (p29) WMO added</li> <li>• Removal of TMA as service provider (p30) WMO added</li> <li>• Removal of DCCMS, IIAM, TMA, Landbank, SADC, MMS in Table 4 (p32)</li> </ul> |
|             | Section 3.3    | <ul style="list-style-type: none"> <li>• Update on the number of partner in the project and removal of DCCMS, IIAM, TMA, Landbank, SADC, MMS (p 41)</li> <li>• Addition of MMS and Landbank as key stakeholders</li> </ul>                                     |
|             | Section 3.2    | <ul style="list-style-type: none"> <li>• Update of "additional other direct cost" addition of WMO and removal of IIAM, MMS, TMA, DCCMS (p42)</li> </ul>  |
|             | Section 3.4    | <ul style="list-style-type: none"> <li>• Removal of Landbank in kind reference (p42)</li> <li>• Removal of use of resources table of MMS, TMA, DCCMS and IIAM. Effort given to WMO (p43-44)</li> </ul>   |
|             | Section 4      | Members of the consortium: Removal of participants MMS, SADC, DCCMS, IIAM, Landbank and TMA  |
| GA 20200127 | Section 2.1.1  | <ul style="list-style-type: none"> <li>• Addition of WMO/GFCS in Impact #2</li> </ul>  |

|             |             |   |
|-------------|-------------|---|
|             | Section 3.4 | <ul style="list-style-type: none"> <li>• Correction of costs detail for PLAN and IIAM (EC request)</li> <li>• Addition of the beneficiaries numbering in the respective order</li> <li>• Added a sentence to address the conditions emerged from the Ethic Screening</li> </ul> |
|             | Section 5.1 |   |
| GA 20191230 |             | <ul style="list-style-type: none"> <li>• Initial GA</li> </ul>  |



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*FOCUS-Africa*'s proposal was inspired by the environmental commitment of world leader Nelson Mandela, who in 2013 said:

**“Our people are bound up with the future of our land. Our national renewal depends upon the way we treat our land, our water, our sources of energy, and the air we breathe. ... Let us restore our country in a way that satisfies our descendants as well as ourselves.”**

| Acronyms         | Definition   |
|------------------|--|
| <b>AB</b>        | Advisory Board   |
| <b>C3S</b>       | Copernicus Climate Change Service                                    |
| <b>CCDS</b>      | Copernicus Climate Data Store  |
| <b>CDP</b>       | Communication and Dissemination Plan                                 |
| <b>CS</b>        | Case Study   |
| <b>DFID</b>      | Department for International Development                             |
| <b>DSSAT</b>     | Decision-Support System for Agro-technology Transfer                 |
| <b>ECCA</b>      | European Climate Change Adaptation Conference                        |
| <b>ECI</b>       | Extreme Climate Indexes  |
| <b>ECV</b>       | Essential Climate Variable   |
| <b>ENSO</b>      | El Niño–Southern Oscillation   |
| <b>EVA</b>       | Extreme Value Analysis   |
| <b>ExCom</b>     | Executive Committee  |
| <b>FAO</b>       | Food and Agriculture Organisation                                    |
| <b>FCFA</b>      | Future Climate for Africa  |
| <b>GB</b>        | Governing Board  |
| <b>GCM</b>       | Global Climate Model   |
| <b>GDPR</b>      | General Data Protection Regulation                                   |
| <b>GFCS</b>      | Global Framework for Climate Services                                |
| <b>IAEG SDG</b>  | Inter-agency and Expert Group on SDG Indicators                      |
| <b>IAT</b>       | Impact Assessment Team   |
| <b>ICCS</b>      | International Conference on Climate Services                         |
| <b>IOD</b>       | Indian Ocean Dipole  |
| <b>IP</b>        | Intellectual Property  |
| <b>IPCC</b>      | Intergovernmental Panel on Climate Change                            |
| <b>LB</b>        | Land Bank  |
| <b>MHEWS</b>     | Multi-Hazard Early Warning Systems                                   |
| <b>NAP</b>       | National Adaptation Plan   |
| <b>NDC</b>       | Nationally Determined Contribution                                   |
| <b>NGS</b>       | Next-Generation Sequencing   |
| <b>NMHS</b>      | National Meteorological and Hydrological Service                     |
| <b>PMO</b>       | Project Management Office  |
| <b>PRESAC</b>    | Prévision Climatique Saisonniere En Afrique Centrale                 |
| <b>PRESAGG</b>   | Prévisions Climatiques Saisonnières pour les pays du Golfe de Guinée |
| <b>PRESANORD</b> | Prévisions Climatiques Saisonnières en Afrique du NORD               |
| <b>RCC</b>       | Regional Climate Center  |
| <b>RCM</b>       | Regional Climate Model   |
| <b>RCOF</b>      | Regional Climate Outlook Forum                                       |
| <b>RRI</b>       | Responsible Research and Innovation                                  |

|                |   |
|----------------|---|
| <b>RVAA</b>    | Regional Vulnerability Assessment and Analysis  |
| <b>SADC</b>    | Southern African Development Community          |
| <b>SAM</b>     | Southern Annular Mode                           |
| <b>SARCOF</b>  | Southern African Regional Climate Outlook Forum |
| <b>SDG</b>     | Sustainable Development Goal                    |
| <b>SEB</b>     | Socio Economic Benefit                          |
| <b>SGR</b>     | Standard Gauge Railway                          |
| <b>SIOD</b>    | South west Indian Ocean Dipole                  |
| <b>SME</b>     | Small & Medium Enterprise                       |
| <b>SPATSIM</b> | Spatial and Time Series Information Modelling   |
| <b>SRA</b>     | Scalability and Replicability Analysis          |
| <b>SRIA</b>    | Strategic Research and Innovation Agenda        |
| <b>SWIOCOF</b> | South West Indian Ocean Climate Outlook Forum   |
| <b>TRL</b>     | Technology Readiness Level                      |
| <b>UN</b>      | United Nations                                  |
| <b>WCRP</b>    | World Climate Research Programme                |
| <b>WOFOST</b>  | World FOod STudies                              |

| <b>Project acronyms</b> | <b>Project full name</b>   |
|-------------------------|--|
| <b>APA</b>              | Adaptation Programme in Africa   |
| <b>ASAP</b>             | Anomaly Hot Spots of Agricultural Production   |
| <b>ASPIRE</b>           | Adaptive Social Protection Information for Enhanced Resilience   |
| <b>CIREG</b>            | Construction Insurance Risk Engineers Group  |
| <b>CLARA</b>            | Climate forecast enabled knowledge services  |
| <b>CLIM2POWER</b>       | Climate to Power   |
| <b>CREWS</b>            | Climate Risk and Early Warning System initiative   |
| <b>DFID's CAROT</b>     | Department for International Development – Climate Adaptation to Risks and Opportunities in Tanzania         |
| <b>ECEM</b>             | European Climatic Energy Mixes   |
| <b>ERA4CS</b>           | European research area for climate services  |
| <b>EUCP</b>             | European Climate Prediction system   |
| <b>FRACTAL</b>          | Future Resilience for African Cities and Lands   |
| <b>HIGHWAY</b>          | HIGH impact Weather Lake sYstem  |
| <b>ICPAC</b>            | IGAD Climate Prediction and Application Centre   |
| <b>IGAD</b>             | Intergovernmental Authority on Development   |
| <b>IMPALA</b>           | Improving Model Processes for African Climate  |
| <b>JPI</b>              | Joint programming Initiative   |
| <b>MED-GOLD</b>         | Mediterranean Grape, Olive and Durum wheat food system   |
| <b>METAGRI</b>          | agrometeorological services for farmers in west africa   |
| <b>PRIMAVERA</b>        | Process-based climate simulation: advances in high resolution modelling and European climate risk assessment |
| <b>S2S4E</b>            | Subseasonal to Seasonal climate services for Energy  |
| <b>SAWIDRA</b>          | Satellite and Weather Information for Disaster Resilience in Africa  |
| <b>SECLI-FIRM</b>       | The added value of Seasonal Climate forecasting for Integrated Risk Management                               |
| <b>SOCCEM</b>           | Southern Ocean Carbon and Climate Observatory  |
| <b>SWIFT</b>            | Science for Weather Information and Forecasting Techniques   |
| <b>UMFULA</b>           | Uncertainty Reduction in Models for Understanding Development Applications                                   |
| <b>WISER</b>            | Weather and Climate Information Services for Africa  |

# 1 Excellence

***FOCUS-Africa* will develop tailored 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 six countries involving a wide range of end-uses and users. The case studies will illustrate how the use of climate science, forecasts and projections can maximize socio-economic benefits in the Southern Africa region and potentially in the whole of Africa.**

The landmark Paris Agreement at COP21, which called for enhancement to adaptive capacity, strengthening of resilience and reduction of vulnerability to climate change, with a view to contributing to the Sustainable Development Goals (SDGs), has reinvigorated the global response to climate change. Climate-related hazards, especially for people living in poverty, exacerbate stressors resulting in negative impacts on livelihoods, crop yields and essential infrastructure. To act on these adaptation priorities, as identified in Nationally Determined Contributions (NDCs), climate-sensitive sectors require science-based and user-specific climate information connecting natural and socio-economic research with practice. “Climate services”, as defined by the Global Framework for Climate Services<sup>1</sup> (GFCS), involve the timely production, translation, provision and use of climate data, information and knowledge for informed societal decision-making. Enabling access to climate information and providing userfriendly climate services will help decision makers at all levels and in a wide range of sectors including food security, water, health and energy. A full climate services value chain encompasses both hydrometeorological data and processes as well as user actions, outcomes and their value in terms of economical and societal benefits. Addressing the full value chain, the central aim of *FOCUS-Africa*, is required in order to ensure the exploitation and sustainability of climate services. While the use of climate information is growing rapidly worldwide, the majority of the countries in Africa still lack the infrastructural, technical, human and institutional capacities to provide high quality climate services.

Southern Africa, the target of *FOCUS-Africa*, is marked by economic regional imbalances with small and little diversified economies, pronounced inequalities and poverty. According to the SADC<sup>2</sup> Regional Indicative Strategic Development Plan (2010), the region is among the poorest in the world, with nearly 45% of the total population in the region living on less than one US dollar per day<sup>3</sup>. The SADC region has a combined area of 986,246,000 ha, of which only 6.11% is cultivated. Agriculture is mainly rainfed, sustaining the livelihoods of over 60% of the population. The region is endowed with vast but unexploited energy resources. The resource rich 15 transboundary river basins of the region present opportunities for regional integration and coordinated and sustained growth through the water-energy-food nexus.

The SADC countries are particularly vulnerable to climate variability, change and extremes: particularly water resources, agriculture, hydropower generation, ecosystems and basic infrastructures are especially under stress as a result of increased frequency and intensity of floods, droughts and landslides. Disaster management amounted to USD 10 billion in damages between 1980 and 2015, based on data from EM-DAT<sup>4</sup>. The recent hot summers and sporadic rainfall in South Africa in 2015, 2016 and 2018 are already posing a threat to sustainability of agricultural activities that result in compounding losses to farmers and bankruptcy. For instance, the 2015/16 drought contributed to over 40 million people to be food insecure, and dam water levels to be reduced, leading to intermittent power outages in most countries in the region. SADC is also vulnerable to future climate change, with a low adaptive capacity (FCFA, 2017<sup>5</sup>). The Regional Vulnerability Assessment and Analysis (RVAA), released in July 2019, indicated that food security remains a challenge with a staggering increase of 28% compared to data collected in 11 SADC members states in 2018. Southern Africa is projected to become generally drier under low mitigation climate change futures<sup>6</sup> posing a severe threat to the economic development of the region unless strategic adaptation measures are swiftly implemented.

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<sup>1</sup> <http://www.wmo.int/gfcs/implementation-plan>

<sup>2</sup> SADC is a regional organisation consisting of 16 member countries: Angola, Botswana, Comoros, D.R. Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe.

<sup>3</sup> Davis-Reddy CL and Vincent K (2017) Climate Risk and Vulnerability: A Handbook for Southern Africa (2<sup>nd</sup> Ed), CSIR.

<sup>4</sup> International Disaster Database <https://www.emdat.be/>

<sup>5</sup> Future climate for Africa (FCFA) (2017): <http://www.futureclimateafrica.org/map-of-projects/> <sup>6</sup> Archer E. et al (2018) [doi:10.7809/b-e.00296](https://doi.org/10.7809/b-e.00296)

The development of improved climate information and forecasts of decision-relevant parameters is essential to address these challenges. Tailored forecasts, for example of rainfall onset and cessation, are regularly requested by users, along with the associated skill information. Development and delivery of such products and services, and evaluation of socio-economic benefits is central to *FOCUS-Africa*. Such long-range climate forecasts will allow *FOCUS-Africa*'s end users like farmers, asset and power plant managers, to better manage potential risks and improve efficiency in their operations.

The World Meteorological Organization (WMO) and partners, through collaboration platforms such as Regional Climate Outlook Forums (RCOF), have greatly helped promote and advance the development of climate services in Africa. However, in a recent WMO Global Review of RCOFs conducted in 2017, the assessment of Southern African RCOF (SARCOF) revealed that: i) climate services are a new area for some countries and there is lack of general awareness about the role of such services; ii) there is lack of adequate funding from governments, in spite of the support from Ministers responsible for Meteorology in SADC member countries; iii) there is limited infrastructure, tools and expertise in some SADC countries relevant to the development of climate services, and; iv) there is lack of coordination with users at all levels.



**Figure 1:** Map of the SADC region and the SADC countries

*FOCUS-Africa* presents a carefully conceived plan of research and innovation to advance the underpinning science required to provide robust climate services and development of climate-integrated applications for the energy, water, infrastructure and food security sectors. Critically, both the science and the applications are targeted at specific requirements, captured through close and effective engagement with end-users, via on-going projects and consultations. Such a dialogue provides a strong basis for successful project implementation. Specifically, these endusers are either based, or have operations, in Africa and will therefore provide strong guidance to the implementation and value assessment of the case studies, and the ensuing delivery of the *FOCUS-Africa* climate services. Moreover, through co-production with end-users, climate scientists and sectoral service providers will ensure a full value chain for the delivery of climate services is effectively realized. As a result, not only will the climate services developed by *FOCUS-Africa* benefit SADC-based research organisations and users, from businesses to policy makers, but also the European consortium partners will also greatly enhance their knowledge in both the science and the climate services provision.

## 1.1 Objectives

The overarching objectives of *FOCUS-Africa* are

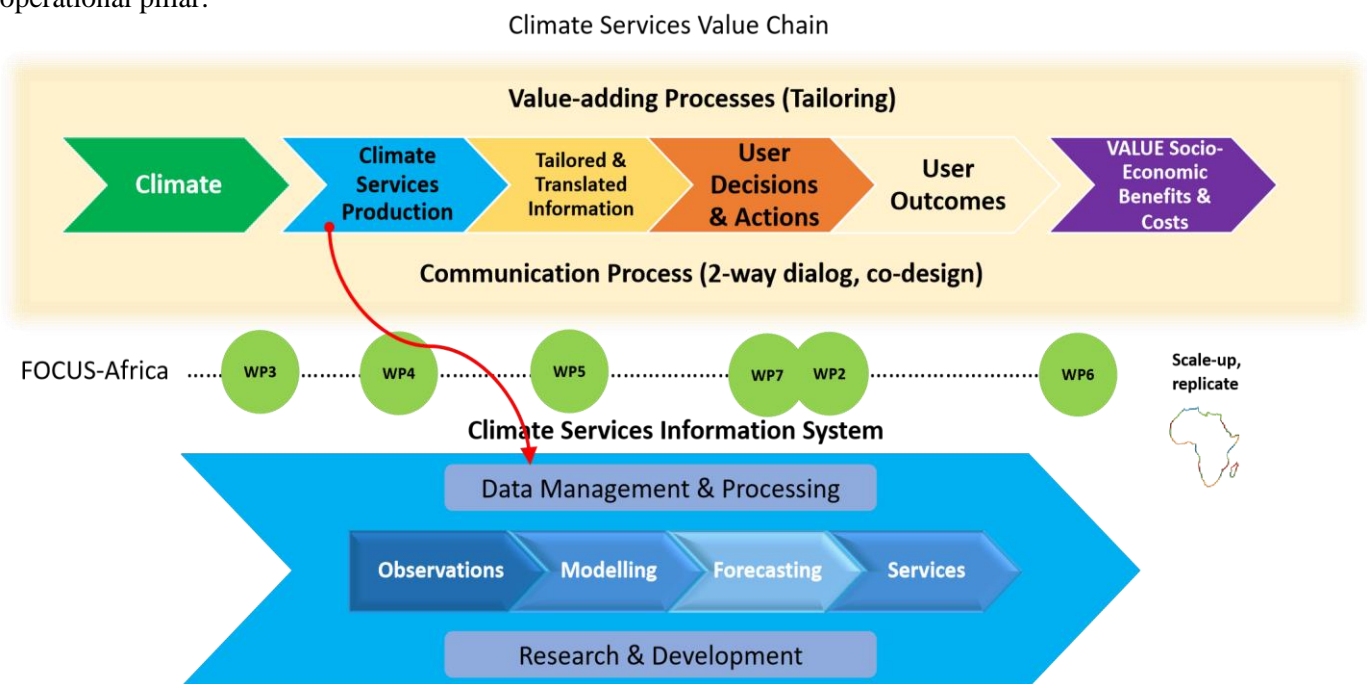
1. To advance the way in which climate information (from historical records to seasonal forecasts and projections, also exploring decadal forecasts) is processed and used in decision making, including policy making for its direct uptake by the regional and national climate services providers;
2. To characterize end-use requirements through regular engagement with stakeholders and active players in the sectors, and ensure that lessons learned are upscaled to other countries in Africa, but also Europe, and other regions of the world, measured via standard analytics;

- To contribute to the advancement of the scientific knowledge via publications and reports such as those relevant for the IPCC, through the innovative science developed by *FOCUS-Africa* in support of improved ways to use climate information such as better identification and characterisation of extremes for the historical period and calibrated multi-variable approaches to climate predictions and projection;

*FOCUS-Africa*'s climate services will be developed by ensuring the full value chain is implemented, starting from close involvement of end-users, to the tailoring of climate information by service providers, to the best use of observations and model data by research organisations. Having all relevant actors involved in the creation and use of climate services will ensure they are credible, relevant, robust, effective and long-lasting (**Figure 2**). More specifically *FOCUS-Africa* will:

- decisively strengthen the link between the climate scientific community and stakeholders in the SADC region, by leveraging the advanced scientific knowledge and strong networks of our team, and by establishing dedicated channels of communications, so as to target the full value chain of our users, since the start of the project,
- advance our understanding of how climate science can be tailored and applied to events critical for different socio-economic sectors in SADC, also contributing to the IPCC knowledge and communications, by the mature phase of the project (M30),
- demonstrate the effectiveness of climate information in strengthening the adaptive capacity of end-users by delivering tailored, actionable and exploitable climate services and by estimating their socio-economic benefits across the full value chain.

The findings will be upscaled to the wider SADC region, and possibly to other parts of Africa, and operationalized through WMO's involvement in the EU-funded Intra-ACP climate services project<sup>6</sup>, as well as other projects implemented by WMO and partners, and through WMO's GFCS and its Climate Services Information System operational pillar.



**Figure 2** – Concept of the *FOCUS-Africa* climate service value chain and the mapped project line of actions in terms of Work Packages. The lower arrow shows the elements of the services production, while the upper arrow represents the full value chain which includes the service production.

## 1.2 Relation to the work programme

*FOCUS-Africa* responds to the call *Human Dynamics of Climate Change* (LC-CLA-05-2019), sub-topic ‘Climate Services for Africa’, and it addresses the specific challenges and scope of the call as shown in Table 1:

<sup>6</sup> <http://intra-ACP-map.acp.int/projects/418/>

| Challenge/Scope  | <i>FOCUS-Africa</i> approach  |
|--|---|
| Exploit new, relevant climate data made available by Copernicus and other relevant sources (such as GEOSS) | The <i>FOCUS-Africa</i> team has strong experience working with the full range of Copernicus Climate Change Service (C3S) products. These data, including climate projections will form the backbone of <i>FOCUS-Africa</i> . We will also use recent and higher resolution climate data over Africa from projects <i>FOCUS-Africa</i> partners contribute to or lead such as H2020 PRIMAVERA <sup>7</sup> , HELIX, FCFA IMPALA <sup>8</sup> , and explore use of bias adjustment approaches. Indeed, this is essential to address the large biases of the climate data in the SADC region where observations are sparse, including comparison with station data, and satellite data based on available products from Sentinel satellites and Copernicus EO program.  |
| Demonstrate clear end-user engagement, consultation and participation                                      | Close stakeholder engagement is an integral part of <i>FOCUS-Africa</i> . In addition to productive consultations with end-users as already performed in previous projects (e.g. WMO's MHEWS, DFID's CAROT), <i>FOCUS-Africa</i> will have a strong programme of stakeholder engagement using a variety of methods which will be tailored to the sectors considered, level of knowledge of the end-users, gender and cultural context, among other things. These would include surveys, focus groups, e-participation, citizens' juries, deliberative conferences, world cafés, and town hall meetings. Stakeholder engagement will continue from the first stage (assessing climate risks) to the final stage (producing a blueprint) of the project and coproduction will form part of the climate service design process.  |
| Create dedicated climate services for Africa for at least two identified sectors                           | <i>FOCUS-Africa</i> has identified eight case studies in the energy, food security, water and infrastructure sectors of the SADC region, in order to provide a range of examples where climate service delivery can be successfully implemented. The case studies, formulated based on end-user requirements, aim to improve adaptation and resilience. The resulting tailored, bespoke climate services encompass the full value-chain, whereby each case study is contributed by a research partner, a service provider partner and an end-user. This approach  |
|  | will ensure an easier exploitation of these delivered climate services, through suitable market channels. Lessons learnt, including service design and implementation, can be upscaled through <i>FOCUS-Africa</i> 's wide-ranging stakeholder engagement programme within the SADC region.   |
| Enhance planning and implementation of climate adaptation strategies in Africa                             | <i>FOCUS-Africa</i> will make use of historical data and seasonal forecasting systems, particularly the C3S products, and high-resolution climate projections at the global level, but also downscaled using e.g. existing partner's methodologies over the SADC region. These will thus provide a refined assessment of (i) the future climate conditions expected in the region relevant for all sectors of activities, including updated and operational long-range predictions (from season to 5-10 years) and (ii) national energy and climate policies, such as outlined in NDCs. Use of new seasonal forecast products will allow development and adoption of soft adaptation measures through better resource and asset management decisions. In each specific sector, <i>FOCUS-Africa</i> climate services are expected to become a fundamental part of sectorial adaptation strategies at different levels (from local to national and regional). For instance, in the food security sector, <i>FOCUS-Africa</i> will contribute to the enhancement of warning systems for production hot-spots as well as medium-to-long term agro-management planning and risk reduction strategies through dedicated modelling. In energy, the new climate data will be used for example to aid expansion of renewable energy's power production and for long-term plans development of infrastructures for both national energy and private companies (e.g. TANESCO, Total, EDF, COWI). |

<sup>7</sup> Haarsma et al. (2016) CMIP6 High Resolution Model Intercomparison Project, <https://doi.org/10.5194/gmd-9-4185-2016>.

<sup>8</sup> Kendon et al. (2019) Enhanced future changes in wet and dry extremes over Africa at convection-permitting scale, *Nature Communications*, 10, 1794

|  |  |
|--|--|
| <p>Provide added value to activities addressed by other initiatives (GFCS, Copernicus, etc.)</p>           | <p><b>FOCUS-Africa</b> will advance beyond completed and on-going GFCS, C3S and also World Bank, UK DFID, Global Challenges Research Fund and Newton Fund and WMO projects such as APA (Adaptation Programme in Africa), C3S Clim4energy, ECEM and Energy, DFID’s CAROT, WISER (HIGHWAY, ASPIRE, W2-SIP), AFRICAP and SWIFT, FCFA’s (IMPALA, FRACTAL and UMFULA), WCSSP. Since <b>FOCUS-Africa</b> partners have been involved in all these projects, the consortium will be able to capitalize on them and build on their outcomes. This will allow the testing and assessment of climate services, which are fit-for-purpose for integration within the decision-making processes and tools of <b>FOCUS-Africa</b>’s end-users. Some recent climate data analysis tools and post-processing methods have also been developed by consortium members working together on other EU projects such as H2020 SECLI-FIRM, S2S4E, Plan4Res, MedGOLD, and C3S Energy. <b>FOCUS-Africa</b> will allow extending and adapting this output to the SADC region, including through, but not limited to, the C3S ECEM and EU-funded Intra-ACP projects.</p> |
| <p>Relate to the EUAfrica Research and Innovation Partnership on Climate Change and Sustainable Energy</p> | <p><b>FOCUS-Africa</b> strongly contributes to the EU-Africa partnership on Climate Change and Sustainable Energy, and SDG 7 on Energy, in the area of both climate adaptation and renewable energy (RE) uptake. The proposed climate services in the two SADC countries, Malawi and Tanzania, will provide prime examples:</p> <ul style="list-style-type: none"> <li>• to <i>increase the renewable energy share</i> by using reanalyses and climate projections to improve estimation of RE resources in Tanzania,</li> <li>• to <i>enhance adaptation strategies</i>, both through ‘hard’ measures (use of reanalysis and climate projections for improved hydropower planning in Malawi), and ‘soft’ measures (use of seasonal forecasts for management of RE production and electricity demand, from one to several months ahead in Tanzania).</li> </ul>  |

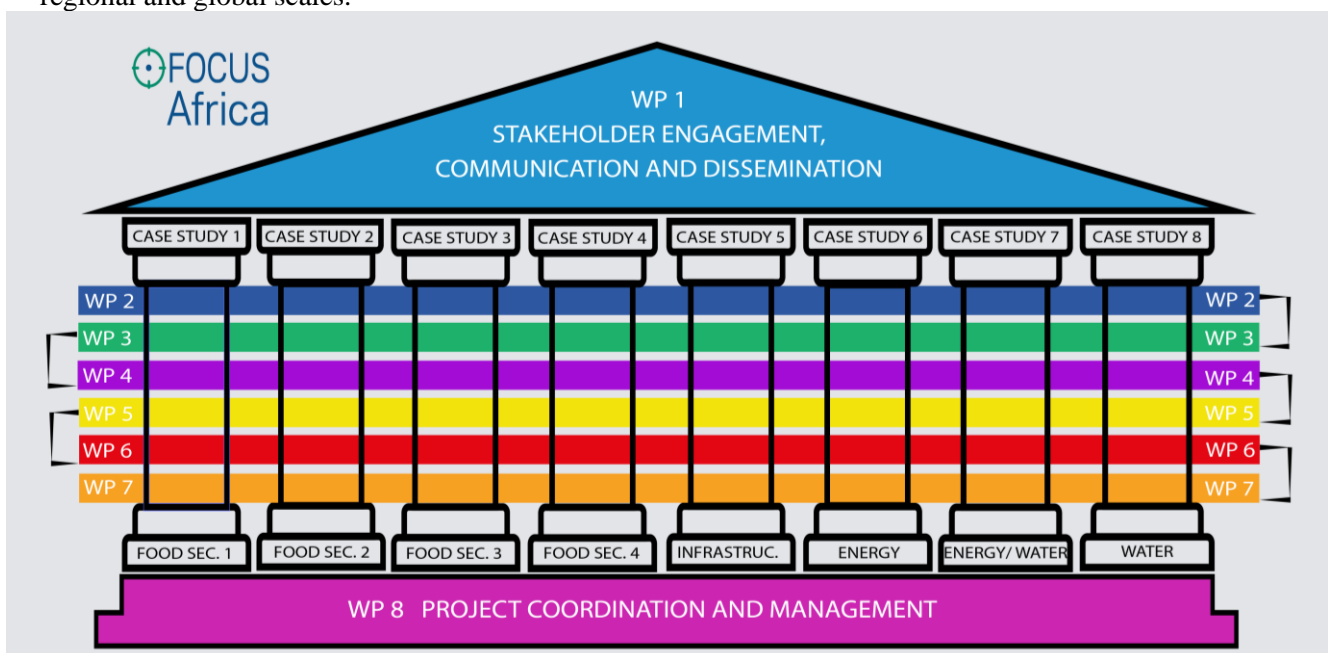
**Table 1 – FOCUS-Africa Relation to Work Programme**

### 1.3 Concept and methodology

#### 1.3.1 Concept

**FOCUS-Africa** is built around end-user formulated case studies, or pillars (see **Figure 3**), conceived so that:

- 1) Each case study will encompass end-to-end articulation of the climate services value chain from climate information system operations to co-development of products with end-users, application, communication and dissemination of those products, user feedback, and evaluation of associated costs and benefits.
- 2) Each case study will include an assessment of how such value chains can be operationalized through WMO operational infrastructure (e.g. ECMWF and other GPCLRFs, Regional Climate Centres and National Meteorological and Hydrological Services [NMHSs]) in support of sustained country level service delivery on regional and global scales.





**Figure 3** – Schematic of the *FOCUS-Africa* structure. The eight case studies constitute its pillars. Each of them is supported by each WP. The workpackages are generally executed in a sequential way (see connectors). Crucially, WP1 encompasses all WPs and case studies to ensure regular and effective communication across WPs, case studies, and external stakeholders.

The co-design, development, delivery and communication of these case studies will be served by eight Work Packages (WPs) which focus on assessing the users' climate-related challenges and risks (WP2), understanding regional climate processes (WP3), developing methods and tools (WP4), creating prototypes of end-user tailored climate services (WP5), assessing their economic value and exploiting results (WP6) and capacity building (WP7). These six WPs are strongly complemented by a cross-cutting and critical WP on stakeholder engagement, communication and dissemination (WP1) and one on project management (WP8). In *FOCUS-Africa* each WP is contributed to by multiple partners spanning the full climate service value chain in order to guarantee that feedback is considered as early as possible in the development stage.

One key aspect in the design of concept and implementation of *FOCUS-Africa* is the formation of small coproduction teams for each case study to reflect the value chain of climate services. In each case study there will be at least three partners, a scientific one who provides credible climate information, a service delivery one who is effective at 'translating' the climate information into usable and actionable applications or tools, and naturally, the end-user. The last one will provide regular feedback, advices, and ultimately make use of the climate services. Additional cross-cutting partners, mainly with social science expertise, will assist in the stakeholder engagement, a dynamic socio-economic assessment, and communication, dissemination and exploitation activities.

The climate services developed by *FOCUS-Africa* will exploit as many of the latest climate products and output from recent or current European projects, such as EU H2020 projects SECLI-FIRM, S2S4E, PRIMAVERA, MEDGOLD, JPI ERA4CS's projects CLIM2POWER and CIREG, and C3S Energy and Water operational services. The underlying data will cover a wide spectrum of products from seasonal predictions (typically from C3S and other Global Producing Centres [GPCs]) to climate projections (typically from CMIP5 and 6, CORDEX-Africa<sup>9</sup>, EU HELIX, H2020 PRIMAVERA and FCFA IMPALA), as well as historical climate reanalyses (e.g. ERA5) and an emerging capability for near-term climate predictions out to a few years ahead<sup>10</sup>. Each of these streams will have a different purpose in the climate services developed. Seasonal forecasts will be used for operational and maintenance purposes, as in the food security case study for Malawi, and climate projections will support planning and investment decisions such as for the hydro-power case study in Malawi. Climate reanalyses will provide an important reference for both streams. In all, *FOCUS-Africa* will demonstrate the power of the latest and best climate information in different case study contexts, therefore providing an array of situations from which more general lessons learnt can be drawn. Importantly, *FOCUS-Africa*'s case studies will be complemented by socio-economic evaluations of the delivered climate services using approaches being refined by EU projects such as CLARA, SECLI-FIRM and S2S4E, including objective assessments of the effectiveness and usability of the climate services based on the experience of the end-users. WMO and ACMAD will play a central role in developing the capacity of the regional NMHSs, RCCs, research organizations and other services providers on the use of the outputs developed in the *FOCUS-Africa*. Capacity development in climate services competency is part of the RCOFs and other training activities organized by the African Regional Climate Centers (RCCs) with WMO support. The project will align the capacity development efforts with those promoted by WMO for enhancing the capabilities of the NMHSs to deliver climate services to users and will make sure that the project innovative processes and tools will be part of the WMO training curricula and Global Campus<sup>11</sup>.

### ***Positioning of the project***

Climate services in most SADC countries are in their infancy. However, there are several recent and on-going related projects (see table below) with *FOCUS-Africa* partners involving stakeholder engagement, climate data, analytical methods, climate applications and capacity building material on which the project will build<sup>12</sup>. These form significant building blocks for the climate services to be developed in *FOCUS-Africa*. Therefore, our tools and applications are currently mainly classified at Technology Readiness Level (TRL) level three (*experimental proof of concept*), although in some instances level four (*technology validated in lab*), with few already at level five (*technology*

<sup>9</sup> Lennard et al. (2018) On the need for regional climate information over Africa under varying levels of global warming, *Env. Res. Lett.* 13 060401

<sup>10</sup> Kushnir et al. (2019) Towards operational predictions of the near-term climate. *Nature Climate Change* vol. 9, 94–101; Walker et al. (2019) Skill of GloSea5 dynamical and GHACOF consensus seasonal forecasts of East African rainfall, *Climate Dynamics*, <https://doi.org/10.1007/s00382-019-04835-9>

<sup>11</sup> <https://public.wmo.int/en/resources/training/wmolearn>

<sup>12</sup> Roberts et al. (2019) Description of the resolution hierarchy of the global coupled HadGEM3-GC3.1 model as used in CMIP6 HighResMIP experiments, *Geosci. Model Dev. Discuss.*, <https://doi.org/10.5194/gmd-2019-148>; Razgour et al (2019) <https://www.pnas.org/content/116/21/10418>

validated in relevant environment). The latter have been developed by project partners with a legacy of strong engagement and projects in the region such as WMO, Met Office, CSIR and AMIGO<sup>13</sup>.

These on-going projects will thus provide an effective way to build on existing relationships in countries to adapt and tailor TRL4-type scientific products into useful TRL6-type information for end-users. In this regard, the project will be closer to the ‘market’ than most traditional development projects. The objective is indeed to reach TRL 7 (*system prototype demonstration in operational environment*) by the end of the project through the following stages:

- **Now - TRL 4:** some climate data and applications, tools, tutorial have already been developed and analysed in Africa or region by our partners
- **TRL 5:** Tailoring, optimization and verification of existing products to end-users’ needs through WP 2, 3 and 4
- **TRL 6:** Proofs of concept climate services through the case studies via WP 5
- **TRL 7:** Assessment of the added-value of the climate products and information through WP 6.

### Related research and innovation initiatives

Through the cumulative wealth of knowledge and expertise brought to bear by the **FOCUS-Africa** partners, the project will leverage a wide range of other relevant projects and activities. Several of the *FOCUS-Africa* partners have been and/or are already involved in climate service projects. This will be a tremendous asset for *FOCUS-Africa* as it will ensure that lessons learnt in other geographic domains, industries and climate contexts will inform the work of *FOCUS-Africa*. The following table provide a list of projects and the linkages with *FOCUS-Africa*

| Initiative   | Short description   | Interest for the project   | Relationship Status  |
|--|---|--|--|
| Intra-ACP Climate Services                                     | Aims at making available improved climate services in Africa, Caribbean and Pacific with funding from the European Commission | Running in parallel with <i>FOCUS-Africa</i> , it will complement activities such as WPs 2, 3 and 7 of <i>FOCUS-Africa</i> | WMO and ACMAD are implementing partners. Starting in October 2019                    |
| GFCS Adaptation Programme in Africa (Phase I and II)           | Enhance capacity of NMHS to better anticipate and respond to extreme weather events and climate change                        | Targeting Tanzania and Malawi countries and the food security sector. Own User Interface Platform for capacity building.   | GFCS Office in WMO is coordinating the project. Phase II terminates in December 2019 |
| Agricultural Climate Resilience Enhancement Initiative (ACREI) | Develop and implement adaptation strategies to strengthen the resilience of smallholder farmers                               | Sharing best practices and tool for climate services for food security in Eastern Africa                                   | Implemented by WMO in partnership with FAO. First year of implementation             |
| Sustainable Climate  | Assessment of the effectiveness of Climate Services in Africa   | Lesson Learned for Socioeconomic benefits analysis of climate services   | WMO and GFCS are partners.   |

|                     |  |   |  |
|---------------------|--|---|--|
| Information Systems |  |   |  |
| CREWS Initiative    | Supporting LDCs and SIDS to significantly increase the capacity to generate and communicate multi-hazard early warnings. | Several Projects in Africa involving the European and African NMHSs | WMO Implementing Partner together with World Bank and UNDRR. |

<sup>13</sup> Rembold et al. (2019) ASAP: A new global early warning system to detect anomaly hot spots of agricultural production for food security analysis. *Agricultural Systems*, Vol. 168, 247-257.

|                      |  |   |  |
|----------------------|--|---|--|
| SAWIDRA/<br>SARCISDR | The Project is being implemented in the 16 SADC Member States, to increase the capability to respond to climate induced disasters and reduce loss of lives and property damage                                     | Sharing networks for capacity development in Southern Africa for the use of regional climate models (RCMs) for seasonal climate prediction  | The Project is implemented by SADCCSC and ends in January 2020, providing technical assistance to SADC's National Meteorological and Hydrological Services (NMHSs) |
| SOCCEM               | The project explores the role of the Southern Ocean in influencing climate variability in Africa   | FOCUS can cross-pollenate with the SOCCEM project in terms of informing on predictability of African climate variability  | WITS is leading the coordination of the project  |
| HIGHWAY              | Strengthening the Regional Meteorological Early Warning System in the Lake Victoria Basin  | Apply lessons learnt from endusers and regional Met Agencies to develop fit-for-purpose climate tools/services  | WMO is the lead coordinator, Met Office is implementing partners   |
| ICPAC                | Improve the development, uptake and use of subseasonal, seasonal and longterm timescale products and services for regional application including in Tanzania. This project is linked to SCIPEA and ENACTS projects | Apply knowledge and tools developed with TMA in Tanzania  | Met Office is implementing partners  |
| CAROT                | CAROT is part of the AIM4Resilience (Assisting Institutions and Markets for Resilience) programme in Tanzania  | Enabling TMA to support the citizens of Tanzania to make climate-smart decisions based on relevant, reliable and accessible weather and climate information, and to enable TMA to support the private sector with relevant and effective weather and climate services | Met Office is lead the project   |
| WCSSP South Africa   | Collaboration between Met Office and South Africa Weather Service to develop capacity for using the UK Met Office Unified Model for disaster risk reduction through impact-based weather forecasting               | Apply operational forecasting knowledge acquired in South Africa across the region  | TMA leads the implementation with Met Office and SAWS  |
| IMPALA               | Pan-African very highresolution model to better capture key processes and local-scale weather phenomena.   | Use the IMPALA high-resolution regional climate model data for the local climate data analysis and case studies   | Met Office is a partner  |

|                               |  |   |  |
|-------------------------------|--|---|--|
| C3S Energy C3S Contract       | Climate services for the energy sector on historical, seasonal to projections timescales, including evaluation and Quality Control of C3S data | Use of C3S Energy outputs and extension to areas outside of Europe. Leverage operational expertise  | WEMC is the leader coordinator and EDF is a partner with Met Office. BSC is involved with insurance industry |
| SECLI-FIRM H2020 RIA project  | Climate services for the energy and water industries, on sub-seasonal to seasonal timescale  | Transfer of expertise in terms of stakeholder engagement, branding, design, prototype development   | WEMC is the leader coordinator and Met Office one of the partners  |
| CLIM2POWER                    | Climate services for energy sector on seasonal and projection timescales   | Use of some of the tools developed for Europe   | EDF is a partner and WEMC is in the Advisory Board   |
| ASAP                          | Online information system for food security and agriculture early warning system   | Project outputs will be used for improving agricultural early warning and in particular the forecasting capacity of the system                |  |
| MED-GOLD                      | Turning climate-related information into added value for traditional MEDiterranean Grape, Olive and Durum wheat food systems                   | Lessons learnt and knowledge sharing for food-security case studies and technical development in seasonal predictions and climate projections | Met Office is a partner in the consortium  |
| S2S4E                         | Operational Climate service for the renewable energy industry, on sub-seasonal to seasonal time scales   | Project outputs can be used for southern Africa, as well as benefit from their experience in developing their Decision Support Tool           | BSC is the lead coordinator and EDF is a partner   |
| ClimateEurope                 | Coordination of European climate modelling, observations and climate services infrastructure   | Building on the existing network of climate services users and providers  | Met Office is the leader and BSC is a partner of the consortium  |
| EUCP                          | European Climate Prediction System, on timescales between 1 to 40 years  | Explore results obtained from decadal climate prediction development for the FOCUS Africa context   | BSC and Met Office are partners  |
| PRIMAVERA                     | H2020 project developing high resolution climate models and analysis tools   | The application of both highresolution global climate data and analysis methods   | BSC and Met Office are partners  |
| XCF, eXtreme Climate Facility | United Nations project for evaluating a new insurance system for agriculture production in Africa  | Providing connection with XCF community and methodology for extreme event analysis  | AMIGO is the main scientific partner.  |

**Table 2 – FOCUS-Africa** related research and innovation initiatives

### 1.3.2 Methodology

With the overarching aim to deliver full value-chain, effective and impactful climate services, *FOCUS-Africa* is built around eight case studies in the SADC region. These case studies have been formulated in close consultation with key sectoral end-users. An extensive feasibility study has already been carried out by some *FOCUS-Africa* partners in 2018-19 for the energy sector in Tanzania, including a stakeholder workshop. To demonstrate their commitment, these stakeholders are, in many cases, also full partners in the *FOCUS-Africa* proposal, engaging their time and effort to ensure the effectiveness of the developed climate services. In some other cases, as with the food security in Malawi,

while the specific end-user will be identified during the project, the ASAP<sup>14</sup> climate service prototype has already received wide support by diverse stakeholders. Also, *FOCUS-Africa* will take full advantage of the multiple sectors being considered by all case studies and will ensure cross-fertilisation, exploiting common features in terms of climate data analysis and methods development. *FOCUS-Africa* will then facilitate the transfer of the learnings to both other sectors/users and countries within the SADC region.

While keeping the case studies as the ultimate target, *FOCUS-Africa* will also produce:

- i. Credible, reliable and robust climate data analysis and methods to feed the climate services;
- ii. Dynamic socio-economic benefit (SEB) analyses to demonstrate their value, including plans for transferring lessons to other countries and sectors.

The environmental and socio-economic risks posed by climate variability and change are dependent on the interaction of climate-related hazards with the exposure and vulnerability of end-users' sectors as well as their ability to adapt<sup>14</sup> and the limits of realistic adaptation. Current exposure and vulnerability of a sector to an existing climate hazard may not necessarily remain the same under future climate conditions. **WP 2** will therefore ensure user engagement to prioritise development needs and realistic adaptation options. The proposed framework is based on an extensive number of partners' projects in the region and recent research in developing and applying vulnerability and risk assessments in the context of climate change<sup>15</sup>. This WP will exploit online adaptation tool recently developed<sup>16</sup> for Southern Africa to quantify the sectoral impact of climate variability and change with a special attention to the exposure of various hazards such as drought, wildfires, floods and heatwaves. The vulnerability assessment framework will use the indicators conceptualised from science-based disaster risk reduction and climate change adaptation, grounded in the conceptual framework and definitions of the Fifth Assessment Report of the IPCC Working Group 2<sup>17</sup>. **WP 3** will extract valuable and 'actionable' signals from predictions and projections on the seasonal time scale and beyond. It is important to note that 'actionable' is strongly conditioned by the risk framing at play in the case studies. It should not be assumed that narrow uncertainty ranges are the most actionable as this depends on the appreciation and risk appetite of the decision context. Likewise, what signal or information is valuable needs to be based on the structured analysis of the end-users' requirements coming from WP 2. WP 3 will thus advance fundamental understanding of regional climate dynamics across seasonal, decadal and climate change time scales, with a particular focus on supporting the construction of valuable and actionable information for the case study activities and engagements. To undertake this, we will make use of recent high-resolution climate model data and methods already developed within the H2020 PRIMAVERA and DFID/NERC FRACTAL projects such as story lines and climate process chains<sup>18</sup>. The underlying premise is to move away from classical climate predictions framed as probabilities or uncertainty ranges, and rather focus on plausible physical process storylines and how they might unfold. With such improved understanding of climate dynamics from the seasonal to the decadal scale and beyond, it will be possible, for instance, to identify adaptive traits making crop varieties most suited to cultivation in given climatic niches<sup>19</sup> thus informing future dynamics of habitat and agrobiodiversity losses. Together with the identification of suitable cropping practices<sup>20</sup>, improved local adaptation will result in enhanced resilience of SADC farming systems. In the next stage, **WP 4** will develop and apply different approaches for supporting the use of climate forecast and projection data in delivering *FOCUS-Africa* objectives. These methods include predictability skill assessment, downscaling, calibration and bias adjustment of the seasonal forecasts, decadal predictions and

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<sup>14</sup> Field et al. (2014), "Climate change 2014: impacts, adaptation, and vulnerability", Working Group II Contribution to the IPCC 5th Assessment Report - Technical Summary, pp. 1-76

<sup>15</sup> Cavan G., and R. Kingston. (2012): Development of a climate change risk and vulnerability assessment tool for urban areas. I. J. of Disaster Resilience in the Built Environment, Vol. 3 Issue: 3, pp.253-269, <https://doi.org/10.1108/17595901211263648>;

Espada R., A. et al., (2017) Vulnerability assessment of urban community and critical infrastructures for integrated flood risk management and climate adaptation strategies", Int. J. of Disaster Resilience in the Built Environment, Vol. 8 Issue: 4, pp.375411, <https://doi.org/10.1108/IJDRBE-03-2015-0010>;

Connelly, A.; et al (2018): Enhancing the Practical Utility of Risk Assessments in Climate Change Adaptation. Sustainability, 10, 1399

<sup>16</sup> CSIR. (2019). Green Book: Adapting South African settlements to climate change. Available at: [www.greenbook.co.za](http://www.greenbook.co.za)

<sup>17</sup> Niang I, et al. (2014) Climate change 2014: Impacts, adaptation, and vulnerability. Part B: Regional aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press; 2014. p. 1199–1265.

<sup>18</sup> Quagraine, et al.. (2019) A Methodological Approach to Assess the Co-Behavior of Climate Processes over Southern Africa. Journal of Climate. DOI: 10.1175/JCLI-D-18-0689.1. ; Daron, et al.. (2019) Climate process chains: examples from Southern Africa. International Journal of Climatology. doi:10.1002/joc.6106 ; Shepherd T.G. (2019) Storyline approach to the construction of regional climate change information, *Proceedings of the Royal Society A*, 475, 2225, <https://doi.org/10.1098/rspa.2019.0013>; van den Brink, H. W. and de Goederen, S. (2017) Recurrence intervals for the closure of the dutch maeslant surge barrier. *Ocean Science*, 13, 691–701

<sup>19</sup> Dell'Acqua et al (2014) <https://bmcbgenomics.biomedcentral.com/articles/10.1186/1471-2164-15-801>;

Brunazzi et al (2018) <https://onlinelibrary.wiley.com/doi/full/10.1111/tpj.13888>

<sup>20</sup> Altieri and Nicholls (2017) <https://link.springer.com/article/10.1007/s10584-013-0909-y>

climate projections as well as regionally optimized multi-model combinations<sup>21</sup>. WP4 will evaluate the existing methods (e.g. debiasing, recalibration by ensemble spread inflation or by quantile-to-quantile mapping) and explore the possibility of using multi-model strategies and downscaling to extract valuable information from large-scale patterns to case study level, either via statistical techniques or machine learning modelling. All these analyses will be conducted at global scale and *FOCUS-Africa* country-level to provide each case study with the best suited data and skill metrics.

**WP 5** will then determine and optimize delivery and processing schedules stemming from WPs 1, 2, 3 and 4, so as to aid the exploitation strategy developed in WP 6. End-user tailored climate services prototypes will be developed by considering a range of requirements and setting, to reflect the CS foci, therefore spanning seasonal to multidecadal timescales, and for decision making applications for energy, water, food security and infrastructure sectors. The climate services will include pilot products using a combination of visual web platforms, data delivery, and routine reporting, as done for instance by our partners with the C3S ECEM (European Climatic Energy Mixes) demonstrator<sup>22</sup>, the S2S4E Decision Support Tool<sup>23</sup>, the ASAP (Anomaly Hot Spots of Agricultural Production<sup>24</sup>), the IDA platform<sup>25</sup>. Climate service prototypes considered in this WP also include crop genetic resources and prebreeding materials with adaptive traits in local agriculture. In terms of technical development of the prototypes, the project will adopt an Agile-type approach. A key aspect of the development of the prototypes will be the regular interaction between the technical developers, the providers of the climate service content and the users, following co-design and co-development practices developed through other climate services projects in H2020 (e.g. CLARA, SECLI-FIRM, S2S4E, Med-GOLD), in ERA4CS (e.g. CLIM2POWER, CIREG, CLISWELN), in C3S (e.g. ECEM, CLIM4ENERGY, SWICCA, EDGE) and UN funded project XCF.

To ensure that the climate services meet the users' requirements and result in tangible benefits, **WP 6** will assess their socio-economic value. In addition, it will prepare the exploitation of the most promising and impactful services. This will follow a nexus approach to achieve a global improvement of water, energy and food security. An ex-ante analysis will be conducted during the development of the prototypes to better adapt pilot products to the local situation and increase socio-economic impacts. An ex-post analysis conducted after the adoption of the services will evaluate their actual benefits, with a special focus on women. End-users and service providers will then be involved in the definition of exploitation strategies using innovative tools (e.g. the Flourishing Business Canvas) to design business models that are socially beneficial, gender-sensitive, environmentally regenerative and financially viable. Finally, **WP 7** will focus on the direct beneficiaries of these activities in the region: the service delivery entities. WP7 will upgrade the current training curricula and create new modules based on the science-based and innovative tools developed within the project. This initiative will be aligned with the activities of the Intra-ACP Climate Services project with the aim to maximize the complementarities and create synergies. The involvement of ACMAD and WMO in both projects will ensure that the capacity building plan is in line with WMO Competency Framework for Climate Services and that lessons learnt and best practices gained in the SADC region will be shared with the other African regions. According to the GFCS proposed pillars of climate services, capacity development encompasses all elements of the climate services value-chain from climate monitoring and prediction, climate change detection and scenario development, to services delivery and end-user engagement, in compliance with the highest quality management standards. Climate services delivery requires an increase of multi-disciplinary skills to enable the African institutions (especially NMHSs), who are in charge of timely and routinely services provision, to build stronger national ownership and enhance sustainability, while also addressing inclusiveness and access to climate education and information. Capacity development in climate services competency has been part of the RCOFs and other training initiatives organized by ACMAD and SADC-CSC in Africa. Supporting the African NMHSs needs for capacity development is one of the WMO's core expertise and the mandate of the African RCCs. On-going capacity development initiatives include the Online Course for Trainers (since 2014) and face-to-face courses for trainers (for over 20 years).

**Case Studies** – The eight *FOCUS-Africa* case studies are all in the SADC region (see tables below), with an initial target in: South Africa, Tanzania, Malawi, Mozambique and Mauritius. This choice is based on expressed user requirements and their high-priority targets. This starting point will allow the project to produce some relatively

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<sup>21</sup> Penabaz, E. *et al.* (2019) 'Bias adjustment and ensemble recalibration methods for seasonal forecasting: a comprehensive intercomparison using the C3S dataset', *Climate Dynamics*, pp. 1–27; Doblas-Reyes, F. J. *et al.* (2013) 'Seasonal climate predictability and forecasting: Status and prospects', *Wiley Interdisciplinary Reviews: Climate Change*, 4(4), pp. 245–268.


<sup>22</sup> <http://ecem.wemcouncil.org>


<sup>23</sup> <https://s2s4e-dst.bsc.es/#/>

<https://mars.jrc.ec.europa.eu/asap/>

<sup>25</sup> [https://amigo.shinyapps.io/IDA\\_prototype/](https://amigo.shinyapps.io/IDA_prototype/)

short-term wins, particularly amongst the case studies which prove to advance the faster, and this will help the *FOCUS-Africa* project team and, especially the end-users, to gain higher confidence in climate services. However, and critically, the choice of case studies and countries is also based on established and effective relationships with the organisations involved in *FOCUS-Africa*, which are responsible for developing climate services in the selected countries.

| 1   |  | South Africa  | Food security | Projections |
|---|---|---|---------------|-------------|
| <b>The Problem</b>  |   |   |               |             |
| <p>Climate variability in the region exposes agricultural activities to periodic occurrence of multi-year droughts that leads to severe losses to farmers and bankruptcy of investors. In the recent years (e.g. 2015, 2016 and 2018) very hot conditions during summer and sporadic rainfall resulted in significant negative impacts to crop production. The summer of 2015/16 was the hottest summer on record in many areas, including parts of the maize production region. According to the latest climate projections, the region will continue to experience relatively large impacts through the 21<sup>st</sup> century under both high and low mitigation scenarios.</p> <p>The Land Bank is a Development Finance Institution providing financial services to the commercial farming sector and agribusiness in South Africa. To a large degree, anticipating climate variability and extremes are key to the success of long-term investments in farming operations of the Bank. Current key performance indicators of the bank include the number of employees that will be retained as a consequence of mitigating climate change impacts as well as the number of new employees absorbed for mitigating climate change impacts. For these reasons, the Land Bank is interested in a climate product that provides information on investments exposures to climate-related risks in order to adjust the credit model to compensate for potential climate change impacts.</p> |   |   |               |             |
| <b>The Methodology</b>  |   |   |               |             |
| <p>Landbank will select the specific area of interest (a district) in the North West of the country and will provide historical production data, historical information on pests and diseases, agro-management practices and soil information. Crop model simulations (Decision-Support System for Agro-technology Transfer DSSAT<sup>26</sup>) will be generated using:</p> <ul style="list-style-type: none"> <li>• Stochastic weather simulator</li> <li>• Coarse climate model simulation</li> <li>• High-resolution climate simulation</li> <li>• Blending a stochastic model with coarse and high-resolution climate simulations</li> </ul> <p>The results combined with simulated stress indices will support decision not only on potential options for crops, but also for livestock. The team will identify adaptation measures and investigate underlying opportunities. This will feed the co-development of an adaptation strategy for the LandBank's credit model.</p>  |   |   |               |             |
| <b>The Climate Service</b>  |   |   |               |             |
| <b>Present</b>  |   | <b><i>FOCUS-Africa</i> development</b>  |               |             |
| CORDEX-Africa   |   | Improved high-resolution climate projections  |               |             |
| Statistical model to predict maize yields based on historical production figures  |   | Maize yields simulated using the DSSAT crop model, using both historical observed and simulated climate datasets. Best method of simulated data inclusion identified and applied for forecasting future yield trends using improved projections |               |             |
| No inclusion of projected climate change impacts in the Land Bank credit model  |   | The Land Bank credit model compensates for projected climate change impacts and uncertainties   |               |             |
| <b>The Team</b>   |   |   |               |             |
| <b>Research: WITS – Service Provider: CSIR – End-User: Land Bank</b>  |   |   |               |             |

| 2  |  | Malawi | Food security | Seasonal |
|--|---|--------|---------------|----------|
| <b>The Problem</b>   |   |        |               |          |
| <p>With much of the agricultural production coming from smallholder rain-fed systems, climatic shocks such as floods and droughts have a significant impact on population livelihood and on the country's economy. Projected increase in temperature will have strong implications for agricultural planning. For example, planting crops that are heat sensitive and already near the limit of range-tolerance for growth is likely to be unsustainable in the long term. The drying trend in some areas means that future agricultural decisions should consider the risks of crop failure due to delay in the start of the rainy season. In addition, increasing temperature and more irregular rainfall are expected to have a negative impact on postharvest losses by making grains and tubers more vulnerable to mycotoxins and by increasing storage losses. Finally, the food scarcity and quality may deteriorate with climate change and further affect malnutrition rates.</p> |   |        |               |          |

<sup>26</sup> Zinyengere et al. (2015) Crop model usefulness in drylands of southern Africa: an application of DSSAT, *South African Journal of Plant and Soil*, 32 (2), 95-104

Based on the stakeholder engagement of the 2015 WMO service delivery, and GFCS APA Malawi projects, the main challenges in this sector are related to:

- Seeding time and crop yield
- Crop diversification planning
- Postharvest management to deliver recommendations for harvest time, storage period and grain conservation treatments.

These issues require (1) better accuracy of seasonal forecasts than currently provided by GHACOF or SARCOF, (2) earlier delivery timing and (3) better characterization of the future weather patterns and extremes in the region for better crop selection and harvest planning. This improved climate information will then be integrated within existing agricultural tools focusing on drought warning system, crop yield forecasting, and postharvest cereal management.

#### The Methodology

The team will develop the following methodology for the climate services production and delivery:

- Analysis of the state-of-the-art climate projections and decadal forecasts
- Verification and optimization (calibration, downscaling, multi model) of seasonal forecasts
- Detection and assessment of drought: upgrade ASAP warning system using the optimized seasonal forecasts and decadal forecasts
- Seasonal climate information integration within the APHLIS postharvest management information system
- Application of the WOFOST-based crop modelling tool with end-user's local data (when available) and using new climate projections to identify risks, vulnerabilities as well as adaptation pathways.

#### The Climate Service

| Present                        | <i>FOCUS-Africa</i> development                           |
|--------------------------------|---|
| CMIP5 Data                     | Bias-adjusted new RCM and high-resolution GCM             |
| Uncalibrated seasonal forecast | Bias adjusted, calibrated seasonal and decadal forecasts  |
| ASAP warning system            | Tailored ASAP using new climate/seasonal data             |
| WOFOST crop modelling tool     | Upgraded WOFOST using new agro-climate data and processes |

#### The Team

**Research:** BSC – **Service Provider:** MNREM, Amigo – **End-User:** Local farmers' association

|          |   |                   |                      |                             |
|----------|---|-------------------|----------------------|-----------------------------|
| <b>3</b> |  | <b>Mozambique</b> | <b>Food security</b> | <b>Seasonal/Projections</b> |
|----------|---|-------------------|----------------------|-----------------------------|

#### The Problem

Mozambique ranks third among African countries most exposed to weather-related hazards, suffering from periodic cyclones, droughts, and floods (GFDDR 2017 report on Mozambique). Such occurrences especially affect rural and marginal areas, exacerbating food security issues in smallholder farming communities. Most of the 3.2 million smallholder farmers of Mozambique (accounting for 95% of the agricultural production of the country) grow a combination cereals and legumes in low-input and rain fed settings, making their crop yields vulnerable to rising temperatures and erratic rainfalls. The coastal parts of Nampula province, where this case study will be implemented, have received lower average precipitation, recently experiencing more consecutive dry days (2000–2014 compared to 1981–1999). This province is classified by FAO one of the riskiest food security areas in the country (FAO – Mozambique Humanitarian Response Plan, March 2019).

The current issues can be summarized in: i) poor access to crop varieties with adaptation traits (“climate-ready” varieties) and ii) scarce preparation and resilience. These issues can be tackled with a combination of climate and agronomic research aiming to provide smallholder farmers with the capacity to match desirable climate-ready varieties with improved seasonal forecasting. The case study employs a multidisciplinary approach encompassing climate science, genomics, agronomy, and social sciences to provide climate services to the end-users along two paths: i) the development of ICT-based tools delivering improved seasonal forecasting, and ii) the identification, characterization and testing of climate-ready varieties of rice and cowpea.

#### The Methodology

This case study will distribute improved seasonal forecasts and climate-ready crop varieties. Improved seasonal forecast products suitable for on-site applications will be developed taking into account users' needs, and with multi-model ensemble seasonal forecasts and reforecasts from C3S. Ensemble-based seasonal forecasts will be calibrated using bias-correction and/or more sophisticated methods, developed and tested using reforecasts and validation from observations (when available) and reanalyses. Climate-ready crop variety products will be developed through the genomic and phenotypic characterization of Mozambique rice and cowpea genetic resources, identifying their adaptive potential in relation to seasonal and projected climate data with landscape genomics approaches and niche modelling. The interaction with the users will be fundamental to identify which variables and/or indices convey in the most effective way actionable forecasts and to identify varieties addressing the specificities of local agriculture. The methodological steps are the following:



- Engagement of smallholder farmer communities through surveys and focus group discussions;
- Production of climate forecasts and projections on the basis of farmer needs, and integration of seasonal forecasts in an ICT-based platform (e.g. mobile app or messaging service);
- Characterization of the molecular diversity of Mozambique rice and cowpea landraces through next-generation sequencing (NGS) to be used in *landscape genomics* approaches using climate projections to model their adaptability in different scenarios;
- Participatory variety selection of rice and cowpea landraces in experimental fields to identify climate-ready varieties matching specific seasonal climate conditions and farmer requirements;
- Provision of best adapted varieties in combination with ICT-based tools to farmer communities in a crowd-sourcing approach.

#### The Climate Service

##### Present

No-use or use of uncalibrated seasonal climate forecasts

No use of climate projections in crop breeding and varieties distribution.

##### FOCUS-Africa development

Proof-of-concept use of bias adjusted, calibrated seasonal forecast for smallholder farming systems

Identification of climate-ready crop varieties supporting resilience of smallholder agriculture using climate projections

#### The Team

**Research:** SSSA – **Service Provider:** PLAN-International, IIAM, BSC – **End-User:** Smallholder farmers

4



**Tanzania**

**Food security**

**Seasonal/Projections**

#### The Problem

Over the last few decades, shifts in rainfall seasonality and prolonged dry spells, accompanied by outbreaks of pests and diseases, have caused significant impacts on agricultural productivity. Increasing frequency and severity of droughts have been affecting socio-economic development activities including crop production and electricity generation. For instance, a study<sup>27</sup> reported that in Dodoma there was a decrease in harvest by 80% attributed to low rainfall. In 2005, most parts of Tanzania, particularly coastal regions and North-Eastern highland regions, experienced below normal rainfall and severe droughts, which led to a decrease in agricultural production, starvation and electricity rationing. Similarly, this year rainfall deficits were recorded in the northern Manyara region and in north-eastern Arusha, Tanga and Kilimanjaro regions, with cumulative precipitation in March and April 2019 even 50-75% below average (FAO, 2019). The projected strong warming and the changes in rainfall conditions – which will be accurately addressed in the project –, will pose a threat to agriculture. Impacts on productivity and postharvest processes (e.g. grains and tubers more vulnerable to mycotoxins and increased storage losses<sup>28</sup>) are for instance expected. The food scarcity and quality may further deteriorate with climate change, seriously affecting malnutrition rate. Based on the stakeholder engagement conducted in the recent DFID Tanzania CAROT and GFCS APA Tanzania projects (CGIAR, 2017), farmers are looking for similar information as the Malawi case Study.

#### The Methodology

- Analysis of the state-of-the-art climate projections
- Verification and optimization (calibration, downscaling, multi model) of seasonal and decadal forecasts
- Detection and assessment of droughts: upgrade of the ASAP warning system, using the optimized seasonal forecasts and decadal predictions
- Integration of seasonal climate information within the APLIS postharvest management information system
- Application of upgraded WOFOST-based crop modelling tool with local data (when available) and using new climate projections to identify risks, vulnerabilities and adaptation pathways.

#### The Climate Service

##### Present

CMIP5 data

Uncalibrated seasonal and decadal forecasts

ASAP warning system

WOFOST crop modelling tool

##### FOCUS-Africa development

Bias-adjusted new RCM and high-resolution GCM

Bias adjusted, calibrated seasonal and decadal forecasts


ASAP upgrade using new climate/seasonal data


WOFOST upgrade using new agro-climate data and processes

#### The Team

<sup>27</sup> Shemsanga, et al. (2010) The Cost of Climate Change in Tanzania: Impacts and Adaptations. Journal of American Science, 6, 182-196.

<sup>28</sup> Stathers, T. et al. (2013) Postharvest Agriculture in Changing Climates: Its importance to African Smallholders Farmers. Food Security 5(3): 361-392

| 5   |  | Tanzania                                   | Infrastructure | Projections |
|---|---|--|----------------|-------------|
| <b>The Problem</b>  |   |  |                |             |
| <p>The infrastructure sector is extremely vulnerable to extreme event such as heavy rainfall and heatwaves. For railway lines, high air temperatures can trigger: heat damage and deterioration of structures, thermal expansion of bridge joints, fire risk, overheating of electrical equipment, increased corrosion risks in coastal areas, health and safety of users and staff, and changes in pattern of usage, e.g. tourism patterns change. In addition, prolonged and/or heavy precipitation and storms lead to:</p> <ul style="list-style-type: none"> <li>• damages in tunnels, culverts, drainage and structures from flooding</li> <li>• increased runoff from adjacent land contributing to surface flooding</li> <li>• reduced safety as a result of standing water</li> <li>• increased scouring of bridges and support structures</li> <li>• increased slope instability and landslips, debris, rock or mud flows</li> <li>• damage to earthworks and structures</li> <li>• overloading of drainage systems</li> <li>• inaccessible assets and sections of network</li> <li>• long-term deterioration of structures due to increase in soil moisture levels</li> <li>• health and safety risk to users and staff</li> <li>• changes to groundwater pressure and subsidence</li> </ul> <p>Recently, the government of Tanzania has allocated US\$ 700 million of its 2018-19 budget for the construction of the Standard Gauge Railway (SGR) from Dar es Salaam to Makutupora (722km). COWI, our end-user, is responsible for the design of the section running from Dar es Salaam to Morogoro and will benefit from a better characterization of future weather patterns and extremes to:</p> <ul style="list-style-type: none"> <li>• Derive future design values (i.e. 100-year rainfall/flood, 100-year air temperature) and operational thresholds for the asset</li> <li>• Review the SGR Design Standard Manual to ensure appropriate protection against extreme events</li> <li>• Review the ISO14090 - on climate change adaptation published in June 2019</li> <li>• Design engineering solutions for natural shoreline protection and drainage system</li> <li>• Address emergency management plans and actions that could be integrated into normal maintenance;</li> </ul> |   |  |                |             |
| <b>The Methodology</b>  |   |  |                |             |
| <p>A close engagement with COWI will ensure that the existing decision-making processes will integrate climate risk, both strategically and operationally. The climate services products will be based on:</p> <ul style="list-style-type: none"> <li>• Analysis of latest high-resolution GCM and RCM projections (2030-60) in terms of potential changes in weather regimes and extremes for rainfall and air temperatures;</li> <li>• Derivation of the design values, from RCM data, required by the SGR Design Standard Manual using an in house advanced non-stationary Extreme Value Analysis (EVA).</li> </ul>  |   |  |                |             |
| <b>The Climate Service</b>  |   |  |                |             |
| <b>Present</b>  |   | <b>FOCUS-Africa development</b>            |                |             |
| Uncalibrated climate projections  |   | Bias-corrected RCM and high resolution GCM |                |             |
| EVA standard approach   |   | Tailored non-stationary EVA method         |                |             |
| Standard design values for Rail Structure   |   | Optimized rail structure’s design values   |                |             |
| <b>The Team</b>   |   |  |                |             |
| <b>Research: UCT, MO – Service Provider: TMA, Amigo – End-User: COWI</b>  |   |  |                |             |

| 6   |  | Tanzania | Energy | Seasonal/Projections |
|---|---|----------|--------|----------------------|
| <b>The Problem</b>  |   |          |        |                      |
| <p>While hydropower is currently the largest source of renewable electricity, solar and wind power are projected to provide significant generation capacity to support the country economic development. There are significant climate challenges, however, with developing additional renewable energy capacity:</p> <ul style="list-style-type: none"> <li>• Annual and inter-annual variability of the climate can lead to energy shortages, and limitation in generation capacity. The current energy mix has a significant dependency on reservoir fed hydropower. Droughts, such as those experienced in 2006 and 2011, both reduce the availability of water in reservoirs and increase the pressure on using available water for agriculture and sanitation.</li> </ul> |   |          |        |                      |

- Climate change may both increase the frequency of climate conditions that impact power generation, livelihoods, health and wellbeing. Average annual temperatures are expected to increase between 1 and 3°C by the 2050s, impacts to wind, solar radiation and rainfall extent, timing and amounts are far less certain and thus need to be investigated.

Two main energy companies in the country, TANESCO and Total, seek to characterize how climate variability and change will affect current renewable power generation and future development plans.

#### The Methodology

- Co-production, with end-user TANESCO and Total and climate services provider - TMA, for development planning, assets' operation and associated power production forecast tools
- Climate services for renewables development planning to:
  - Identify and analyse historical datasets to produce reliable climatology maps and long-term statistics
  - Analyse most recent future climate projections and evaluate the potential impact on renewable energy production
- Climate services for support of renewables' assets operations to:
  - Develop site- and area-specific seasonal predictions of rainfall, wind solar radiation, including onset, cessation and duration of rainfall
  - Incorporate seasonal forecast data into:
    - TANESCO statistical/physical models to estimate impacts on reservoir-fed and run-of-river hydropower stations
    - TANESCO hydropower production forecast models

#### The Climate Service

##### Present

CMIP5 and CORDEX climate projections for TANESCO and Total planning  
GHACOF seasonal forecast  
TANESCO hydrological models  
TANESCO hydropower production forecast

##### FOCUS-Africa development

Bias-adjusted RCM and high-resolution GCM  
Optimized seasonal forecast based on SECLI-FIRM methodologies and tailored power generation models using calibrated climate data

#### The Team

**Research:** MO – **Service Provider:** TMA, WEMC – **End-User:** TANESCO and Total

|   |   |        |              |             |
|---|---|--------|--------------|-------------|
| 7 |  | Malawi | Energy/Water | Projections |
|---|---|--------|--------------|-------------|

#### The Problem

The country heavily relies on hydropower, which is projected to be increasingly exposed to large climate fluctuations. Électricité de France (EDF), our end-user seeks to better characterise the impacts of climate variability and future change on hydropower generation in the **Mpatamanga** river basin by addressing the following questions:

- Can past data help understand and attribute events which have a significant impact on river flow & water availability (like the recent years droughts)?
- Will future hydrological cycle of the **Mpatamanga** river be changed due to climate change, and how?
- Can seasonal forecasts help anticipate such events a season ahead to better inform hydro-power plants and water resource management?


These issues related to the **Mpatamanga** river catchment are shared by other river catchments in Southern Africa, and thus are relevant to the private energy sector but also to climate policy development in Southern Africa. This service is relevant to better assess the impacts of climate variability and change on energy production, on country-specific energy mix strategy (mainly hydropower, but an outlook extended for wind and solar will also be included) and on the design of renewable energy infrastructures.

#### The Methodology

The main focus is on the assessment of hydropower for the **Mpatamanga** river catchment. Specifically, the team will make use of a range of newly available climate datasets, including C3S products (ERA5 reanalysis, multi-model seasonal forecast) and high-resolution climate projections. The approach involves:

- An assessment of recent interannual/decadal climate variability on hydropower generation on the **Mpatamanga** river basin, using observations and reanalysis data
- An estimate of future impacts of climate change on water resources availability and hydropower generation (changes in mean annual water incomes, changes in seasonal cycle, increased/decreased extremes) using climate projections
- The development of simple statistical downscaling methods to reproduce climate for Ngonye hydropower plant
- The design of an improved operations and maintenance schedule based on the timely RE energy generation forecast at seasonal timescales (hydro + wind and solar)

| <b>The Climate Service</b>  |  |
|---|--|
| <b>Present</b>  | <b><i>FOCUS-Africa development</i></b>                           |
| Uncalibrated climate projections  | Calibrated and bias-adjusted RCM and high-resolution GCM         |
| Standard statistical downscaling  | Tailored statistical downscaling for the Ngonye hydropower plant |
| <b>The Team</b>   |  |
| <b>Research:</b> UCT, WITS – <b>Service Provider:</b> WEMC – <b>End-User:</b> EDF |  |

| 8  |  | <b>Mauritius</b>   | <b>Water</b>   | <b>Seasonal</b> |
|--|---|--|--|-----------------|
| <b>The Problem</b>   |   |  |  |                 |
| <p>The Water Resource Unit (WRU) in Mauritius is the central water authority responsible for monitoring the water collected in different reservoirs at different times of the year and for allocating the commodity for different competing social and economic activities. Over the past decades, observed rainfall suggests that the pattern of rainfall has changed over Mauritius. Extreme rainfall events as well as intra-seasonal variability have been increasing thus providing additional complexity to the water resource management.</p> <p>The WRU currently uses the 6-month seasonal rainfall forecast to plan for water distribution. This product is delivered by the Mauritius Meteorological Services (MMS) and is based on the regional outlook forum SARCOF and SWIOCOF. Lately the MMS has started issuing a running 3-month seasonal forecast based on statistical model output with a low spatial resolution. Improvements on the spatial and temporal resolutions of the long-term forecast would provide a better insight for near-future changes in rainfall and temperature thus supporting the WRU in the challenge of managing of water resources for all domestic, industrial and agricultural use.</p> |   |  |  |                 |
| <b>The Methodology</b>   |   |  |  |                 |
| <p>Through an established framework of ongoing collaboration between WRU and MMS, the team will investigate the use of seasonal forecasts at sub-seasonal timescales, and develop drought. The approach will involve:</p> <ul style="list-style-type: none"> <li>• Gathering historical data of rainfall, river gauge flow, reservoir level and agricultural production</li> <li>• Verify the skill for different lead times of current seasonal forecast models and any model predicting climate extremes (drought /wet conditions)</li> <li>• Downscale (statistically) long-term climate forecasts for Mauritius from global models using appropriate techniques.</li> <li>• Generate current and expected rainfall and SPI maps for all watersheds over the island, with full probability distribution; validate these forecasts with already available observed rainfall data.</li> <li>• Developing thresholds for triggering drought or wet conditions alerts as a decision support tool.</li> <li>• Developing appropriate climate products for irrigation frequency to be calculated for specific areas / agricultural community.</li> </ul>  |   |  |  |                 |
| <b>The Climate Service</b>   |   |  |  |                 |
| <b>Present</b>   |   | <b><i>FOCUS-Africa development</i></b>                                   |  |                 |
| 3 and 6-month seasonal forecast with a simple downscaling analogue model   |   | High-resolution, statistical downscaled rainfall forecast                | High-resolution seasonal forecast verified and optimized for different watersheds. |                 |
|  |   | Drought forecasting and monitoring using indices specific for watersheds | Irrigation model   |                 |
| <b>The Team</b>  |   |  |  |                 |
| <b>Research:</b> CSIR – <b>Service Provider:</b> Mauritius Meteorological Services, WEMC – <b>End-User:</b> Water Resource Unit  |   |  |  |                 |

### ***1.3.3 Capacity development and Gender Equality***

***FOCUS-Africa*** will develop and test training material under WP 7. Capacity development for climate services encompasses all elements of the services value chain from climate monitoring and prediction, climate change detection and scenario development, to service delivery and end-user engagement, in compliance with the highest quality management standards and gender inclusiveness. Capacity development in climate services competency has been part of the RCOFs and other training initiatives organized by ACMAD and SADC-CSC with WMO support. The WMO's core expertise is to support capacity development needs in Africa through online Course for Trainers (Trainer Resources Portal) and face-to-face courses for trainers. This collection of resources is based on the WMO Competency Requirements for Education and Training Providers. ***FOCUS-Africa*** will capitalize, through WP 7, on the new research and innovative approaches developed in the identified tasks and activities to upgrade the current curricula and create new modules to be added in the existing ongoing training. Implementation of the NextGeneration RCOF processes, as advocated by the WMO Global RCOF review, will be an overarching focus for the capacity development effort. Pilot capacity building effort targeting the countries hosting cases studies will be

organized to test prototypes and training materials. ACMAD as the RCC with continental mandate will be responsible for upscaling by including the material in the planned training of trainer’s events for all RCCs in Africa.

**FOCUS-Africa** will carry out stakeholders’ consultations in a gender responsive and gender equal way. This will be achieved by gender-informed participatory methods enabling to tackle the key challenges of underrepresentation of either women or men in consultation throughout the project cycle. Where possible gender-responsive tools will be developed by considering key gender desirable outcomes thus improving gender equality and empowering women and men. For example, activities will be designed to differentiate the gender specific needs, like training for girls and women will be organised in addition to the standard engagement activities to allow women to be visible actors and decision-makers. Such training will be designed by specialist women as “trainer-of-trainers”. We will also ensure that women within the project, but also amongst external stakeholders, are fully involved in the design and development of case study prototypes so that there can eventually be a wider uptake by women. The consortium partners fully support the threefold relationship between women and research, as described by the EC. For example, WMO has demonstrated commitment to equality and diversity issues through its successful performance in the UN System-Wide Plan on Gender Equality and Empowerment of Women program and the UK Met Office has a bronze award under the Equality Challenge Unit’s Athena Swan Charter. WMO, as project coordinator, will lead the implementation of the actions under the guidance of its Policy on Gender Equality. The WMO Policy on Gender Equality promotes, encourage and facilitate gender equality and establish mechanism by which progress can be measured. This project is committed to mainstreaming gender in its tasks and activities and is determined to attract more women in the fields of science and climate services.

## 1.4 Ambition

The ambition of **FOCUS-Africa** is to establish communication mechanisms, advance the science of climate services, and produce effective climate service delivery in such a way to be considered not only a key reference for all future climate service projects in the SADC, but also a source of knowledge and tools for the development of practical and useful climate services to better tackle the risks of climate change. While **FOCUS-Africa** builds on past and ongoing related projects, this four-year project will provide a step change in the way climate services are developed and used throughout the supply chain of end-users. To achieve this, **FOCUS-Africa** can rely on a very strong existing partnership between European and SADC organisations, and the project team. Such a network will also be broadened to a wider user-community through an extensive stakeholder engagement programme. The scientific findings in the project will produce critical new knowledge to open questions of practical significance to users, such as rain season onset or frequency of projected heat waves. The project will also produce and provide innovative service delivery tools to users, based on advanced user-friendly services developed through recent and ongoing projects, which are being widely used by the European community. This will further cement the connections and collaborations between European and SADC organisations. Finally, the project will provide innovative ways to assess the value of full value chain of climate services that will assist with their acceptability, uptake, and exploitation.

### 1.4.1 Beyond the state of the Art

With **FOCUS-Africa**, food security, water resources, energy and infrastructure stakeholders including farmers, reservoir managers and hydropower operators as well as the associated governmental agencies/decision makers will be better equipped to manage risks associated with climate variability, change and extremes based on science-based, operationalized and actionable climate prediction and projection products, and to implement optimal realistic strategies for adaptation to climate change. Table 3 lists the main types of practices addressed by **FOCUS-Africa**, their current state-of-the-art and the targeted advancement.

| PRACTICE AREA                   | State-of-the-Art   | HOW WILL <b>FOCUS-AFRICA</b> ADVANCE CURRENT TRL?   |
|---------------------------------|--|---|
| Climate model data and analysis | CMIP5, CORDEX using a range of statistical analysis – <b>TRL 4</b> | New sets of higher resolution climate model data will be compared and evaluated using new analysis methods. These will be used to better characterize uncertainties in climate and sectoral variables for <b>FOCUS-Africa</b> end-users, and will be used to design climate change adaptation policies in the region – <b>TRL 6</b> |
| Seasonal forecasts              | Basic products from GPCs and RCOFs – <b>TRL 3</b>                  | <b>FOCUS-Africa</b> will downscale, calibrate, verify and use recent multi-model forecasts from C3S over the case studies regions – <b>TRL 5</b>  |

|  |  |  |
|--|--|--|
| Detection and assessment of drought/ risks of agriculture losses   | ASAP <sup>14</sup> system using 10-day ahead global forecast data – <b>TRL 5</b>                                   | <b>FOCUS-Africa</b> will develop and upgrade the system to integrate the new seasonal and decadal forecasts.   |
| Crop yield forecast, agro-management and climate change adaptation | WOFOST system using seasonal forecast over Europe – <b>TRL 5</b>   | <b>FOCUS-Africa</b> will develop and apply an upgraded WOFOST-based system <sup>29</sup> over SADC integrating new seasonal forecast and climate projections together with users' knowledge and experience to improve the available modelling tools – <b>TRL 7</b> |
| Energy demand and production                                       | TANESCO forecasting and planning tool – <b>TRL 3</b>   | <b>FOCUS-Africa</b> will develop, test and upgrade the system to integrate new seasonal forecast – <b>TRL 5</b>  |
| Reservoir level forecast   | SPATSIM <sup>30</sup> tool with no forecast data – <b>TRL 3</b>  | <b>FOCUS-Africa</b> will develop, test and upgrade the system to integrate new seasonal forecast – <b>TRL 5</b>  |
| Infrastructures' future design values                              | Generalized Extreme Value methods using GCM/RCM data– <b>TRL 4</b>   | Optimization and application of a new advanced method to reduce conservatism and uncertainties in 2050 100-year design values– <b>TRL 7</b>  |
| Climate projections communication                                  | Probabilities or uncertainty ranges – <b>TRL 5</b>   | Plausible climate process storylines with contextually relevant climate risk narratives co-developed with end-users <sup>19</sup> - <b>TRL 7</b>   |
| Forecasts of species vulnerability risk under future climate       | Ecological niche modelling disregarding local intraspecific local climatic adaptation <sup>31</sup> - <b>TRL 4</b> | Application of new method <sup>13</sup> taking into account adaptive genetic variation and evolutionary potential to assess the impacts of climate change on agro-biodiversity– <b>TRL 6</b>   |
| Capacity Building Training Material                                | WMO Trainer Resources Portal – <b>TRL 4</b>  | <b>FOCUS-Africa</b> will upgrade the WMO training system modules using the tools of WP 5 in synergy with optimizations conducted through Output 4 of the Intra-ACP Climate Services project – <b>TRL 6</b>   |
| Business Models Design for exploitation strategy                   | Standard Business Model canvas <sup>32</sup> – <b>TRL 5</b>  | Application of an innovative tool, the Flourishing Business Canvas, to design business models that are socially beneficial, environmentally regenerative and financially viable <sup>33</sup> – <b>TRL 6</b>   |

**Table 3 – FOCUS-Africa targeted advancements**

### 1.4.2 Innovation Potential

Climate services are still a niche activity in Africa and thus the associated innovations, sometimes already implemented in Europe, struggle to take off. In addition, in Africa, there is still little evidence of the actual value of climate services and the challenges that hamper current efforts to evaluate the impact of climate services and innovative solutions for the end-users as shown in a recent WMO study<sup>34</sup>. This highlighted the importance of experimentally designing climate service programs for evaluation based on an impact pathway, rather than leaving evaluation as an after-thought. To strengthen the evidence based on the actual value of climate information services, complementary evaluation efforts need to draw on a combination of qualitative and quantitative approaches, be sensitive to the heterogeneity of end-users, and go beyond the focus on energy or agriculture production to include other dimensions of the water and infrastructure sectors. In addition, there is still a lot of experimentation with user practices, business models, products, regulatory structures, infrastructure, and technology, which makes it hard for innovative climate products to compete on the market against established methods or datasets. In SADC, the specific market itself is not yet fully developed and thus it is difficult for newcomers to establish themselves in their

<sup>29</sup> de Wit, et al. (2019). 25 years of the WOFOST cropping systems model. *Agricultural Systems*, 168, 154-167 **Error! Hyperlink reference not valid.**

<sup>30</sup> Sawunyama and Hughes (2010) Using satellite-based rainfall data to support the implementation of environmental water requirements in South Africa. *Water SA*, vol.36, n.4

<sup>31</sup> Pacifici M, et al. (2015) Assessing species vulnerability to climate change. *Nat Clim Chang* 5 :215-225.

<sup>32</sup> Osterwalder, A., Pigneur, Y., Clark, T. (2010) *Business model generation: a handbook for visionaries, game changers, and challengers*. Wiley, Hoboken, NJ

<sup>33</sup> Upward, A., Jones, P. (2016) An Ontology for Strongly Sustainable Business Models: Defining an Enterprise Framework Compatible With Natural and Social Science. *Organization & Environment* 29, 97–123. doi: 10.1177/1086026615592933

<sup>34</sup> Tall et al. (2018) Do climate services make a difference? A review of evaluation methodologies and practices to assess the value of climate information services for farmers: Implications for Africa. *Climate Services*, 11, 1-12

niche. There is thus a need to prepare, from the beginning of the project, the exploitation of the most innovative and impactful services by first identifying them and then defining as early as possible their exploitation strategies.

The most innovative aspect of *FOCUS-Africa* is thus to address this recurring sustainability and exploitation challenge. The proposed co-production amongst end-users, agro-climate scientists and sectoral service providers will ensure a full value chain for the delivery of services. WP 6 is fully dedicated to ensure that the climate services, including the innovations, developed in the case studies meet the users' requirements but also find their way on the "climate market" in a sustainable manner. To achieve this, WP 6 will (1) assess dynamically the socio-economic value of the proposed services and (2) design their exploitation strategies if deemed valuable and sustainable. The analysis will be thus conducted during the development of the prototypes to better adapt pilot products to the local situation and increase socio-economic impacts. End-users and service providers will then also be fully involved in the definition of the exploitation strategies using the innovative Flourishing Business Canvas<sup>35</sup> to design business models that are socially beneficial, environmentally regenerative and financially viable.

As illustrated in the previous section 1.4.1, we have already identified some potential promising innovative climate services:

- Analysis of the recent high-resolution IMPALA climate data over the region
- Upgrade of the ASAP and WOFOST systems with the latest seasonal, decadal and future-decades climate data
- Application of a novel advanced EVA method to use adequately climate projections for designing infrastructures
- Application of climate process storylines to communicate better climate information
- Application of a novel method to forecast crop varieties vulnerability under future climate
- Extension of the WMO Trainer Resources Portal for capacity building in synergy with the Intra-ACP project

These will enable a better deployment of our innovations in Africa by overcoming known barriers for climate services market building, as also illustrated for example in the H2020 MARCO project<sup>35</sup>, such as:

- **Multi-sector:** on top of our sectoral case studies, it is relevant to identify cross-sectoral, sub-sectoral, transsectoral or even non-sectoral phenomena that might already have or will have impact on climate services markets in the future.
- **Organisations and Institutions:** Existing ways in which business or public organisations work, as users of climate services, need to be taken into account, such as formal barriers to using climate services and informal ways of collaborating even across departmental boundaries. The same is true for institutional enablers and barriers, like rules, procedures, standing practices, and instruments policy-making and management.
- **Labelling:** Whatever 'climate services' could be, may in its the actual context of use not be called 'climate services'. What at the end of the day counts as 'climate services' may in practice figure in many different terms and practices (e.g. linked to 'resilience', 'climate adaptation', 'risk assessment', to name a few), depending on what justifies paying attention to climate issues in a given context. It even may in some way or another be connected to other kinds of services, advice, or intelligence, only making sense in combination with other bodies of knowledge.
- **Sustainability:** Providers and users of our climate services need to develop plans to become independent of subsidised projects, while public procurement might remain an important segment of the market.
- **Non-use and resistance:** User-related service innovation will have to analyse carefully what leads actors not to use climate services or to even reject them. Resistance is a common feature of change and innovation processes, which cannot be reduced to deficiency or an involuntary act, but rather could, at closer inspection, turn out to be perfectly rational, voluntary, and capable. In sensitive areas, for instance, every link to "climate" or other environmental issues may be avoided in order not to raise further leading questions.

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<sup>35</sup> Damm et al. (2019) The market for climate services in the tourism sector – An analysis of Austrian stakeholders' perceptions. *Climate Services*, 11, 1-12



## 2 Impact

### 2.1 Expected impacts

#### 2.1.1 FOCUS-Africa impact statement in response to the call for proposals

*FOCUS-Africa* aims at closing existing gaps and strengthening weak links in the value chain of operational climate prediction and projection in support of risk management and adaptation decision-making in Africa. *FOCUS-Africa* responds to the three expected impact goals of the call as follows:

#### **Impact #1 - Better policy making for climate adaptation in project and other countries, including Europe**

Climate adaptation policy and private decision-making in the SADC region<sup>36</sup> exist but are generally based on historical data and/or *ad hoc* simplified local climate data analysis. They do not take advantage of recent proposed approaches and methodologies and they are not based on a systematic sectorial evaluation integrating all different socio-economic, environmental, climatic and biophysical factors. Furthermore, they do not use recent and forthcoming high-resolution climate predictions and projections for the development of sector-specific tools and services<sup>37</sup>. By filling these gaps and addressing these issues, *FOCUS-Africa*'s co-designed, tailored and evaluated climate services will ensure an effective integration of climate, socio-economic and biophysical information into climate change adaptation policies for Mauritius, Mozambique, Malawi, Tanzania and South Africa. *FOCUS-Africa* will provide key contributions to achieve the challenging objectives of the Joint Africa-EU strategy as refined in the latest 2017 action plan, in particular on investing in people, strengthening resilience and security, and mobilising investments. Moreover, it is also expected to have indirect effects on migration in the long-term when extended to additional countries and regions and operationally implemented. *FOCUS-Africa* will represent a showcase for services that can be developed and applied in other regions of the world as well as in other sectors. Therefore, it is expected to contribute to the EU climate adaptation strategy and to the open issues identified in its 2017-18 evaluation as well as to the mitigation of greenhouse gas emissions and to the implementation of the COP21 Paris Agreement as well as to the UN-SDGs such as: SDG 7 'Affordable and Clean Energy', SDG 13 'Take urgent action to combat climate change and its impacts', and SDG2 'zero hunger'. *FOCUS-Africa* will thus support the **EU Strategy on adaptation to climate** in promoting better informed decision-making with **Action 4** (bridge the knowledge gap) and **Action 7** (ensuring more resilient infrastructure).

#### **Impact #2 – Increased scientific capacity in the region and strengthened support for international scientific assessments**

*FOCUS-Africa* will support science development in Africa through advances in: climate system understanding (WP3), use of predictions and projections, innovative tools, methods and approaches for multi-hazard comprehensive sectorial impacts, and risk assessments and design of optimal adaptation strategies and services (WPs 4, 5, 6). Therefore, *FOCUS-Africa* is expected to contribute significantly to the AR6<sup>40</sup> and the following IPCC assessments (WP3 to WGI; WPs 2 and 6 to WGII) but also to the annual FAO-SOFI State of Food Security and Nutrition in the world and the WMO/GFCS "State of Climate Services"<sup>38</sup>. The project's achievements are also expected to be exported and used in other regions of Africa, thus contributing, at a later stage, to initiatives such as the MedECC

'Mediterranean experts on climate and environmental change'.

*FOCUS-Africa* will encourage active participation in key important regular events involving end-users, e.g. the European Climate Change Adaptation conference, the ClimDev-Africa Climate Change and Development in Africa Conference, the International Conference on Climate Services, the World Bank One Planet Summit etc.... Finally, *FOCUS-Africa* will involve the African partners in all these activities, especially those linked to African conferences and international initiatives such as the IPCC.

<sup>36</sup> NCCAS (2017) National Climate Change Adaptation Strategy for South Africa

<sup>37</sup> Filho et al. (2018) Strengthening climate change adaptation capacity in Africa. *Environmental Science and Policy* 86, 29–37

<sup>40</sup> <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>

<sup>38</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=10089](https://library.wmo.int/doc_num.php?explnum_id=10089)

### Impact #3 - Stronger adaptive capacity and climate resilience in project countries

*FOCUS-Africa* will promote the integration and systematic use of advanced tools and methods (WP 4) in key management decisions through effective demonstrations of eight tailored verified climate services, strategically targeting industry and other end-users across a range of four sectors and six countries. This will also include assessment of the socio-economic benefits (SEBs) to allow scaling up to the other countries and major players in the region such as national energy and water managers who generally still use decision-making models based on climatology (WP 1, 7).

**Food security** and livelihoods in the SADC region are threatened by climate change, variability and extreme events. Farming communities practicing marginal agriculture with low inputs and no irrigation have very limited resilience and adaptive capacity. *FOCUS-Africa* will directly address these systems, developing climate services integrating climate information with advanced agro-climatic approaches designed to support key agro-management decisions at all time scales (within growing season and for 5-10 years and beyond planning). At the same time, *FOCUS-Africa* will support local, regional and national authorities as well as international initiatives working on the areas targeted with sectorial information and alert systems.

Africa has initiated an ambitious Program for Infrastructure Development in Africa (PIDA), to sustain the current economic growth through investment in infrastructure. These investments will support the construction of long-lived infrastructure (e.g., dams, power stations, transport systems and irrigation canals). *FOCUS-Africa* will thus ensure that high-quality climate service (i.e. case study in Tanzania) is thus integrated and used in the implementation of the PIDA to ensure (i) the resilience of existing infrastructures by developing adequate design standards, operating procedures, (ii) better planning decisions about how to invest in new assets to reduce vulnerability and (iii) that these assets deliver increased climate resilience for communities.

For the energy and water sectors, *FOCUS-Africa* will enhance provision and utilization of climate information, hence supporting the development and operationalization of renewable energy and water management. Climate services for the hydropower (case study in Malawi), wind and solar sectors (case study in Tanzania) typically focus on two main aspects of the power plant lifecycle: planning and site selection, and operations and maintenance. For example, in Tanzania, Malawi and Mauritius, *FOCUS-Africa* will characterize the sensitivity and vulnerability of national current hydropowers and water reservoirs plans<sup>39</sup> to climate variability and projected climate change (2030-50). The results will thus contribute to these countries, but also SADC region, energy and climate policy development.

#### 2.1.2 Substantial impacts beyond those explicitly mentioned in the call

In addition to the impact mentioned in the call, *FOCUS-Africa* is expected to have additional economic, social and environmental impacts detailed here below:

### Impact #4 - Better informed and connected end-user communities

To maximise the benefits for end-user communities, *FOCUS-Africa* will use the principles of GFCS's User Interface Platform (UIP)<sup>43</sup>. By connecting groups of scientists, researchers, climate service providers, and service users in multi-directional dialogue and feedback loops, the UIP ensures that climate service development is driven by user demand and is supported by the most advanced scientific discoveries and technological innovation. This active platform ensure that climate products and services are continually evaluated by their users, practical possibilities of science are explored and better understood, and users and providers work together to improve the products. Examples of such platforms are: the RCOFs, liaison working groups on disaster management, farmer field schools, water learning centres, and national health working groups. This approach has demonstrated (WMO's Climate and Health Working Groups across Africa, Indonesia Climate Field Schools) the effective provision of information that is relevant, understandable, well communicated, accessible and trusted. To fully tap the benefits of climate services, the *FOCUS-Africa*'s UIP will incorporate sectoral expertise and include user guidance through co-development. This should be eased by the fact that *FOCUS-Africa* is based on a close interaction between scientists from different disciplines (e.g. agronomy, climate science and statistics), tool-developers and engaged national, regional and local stakeholders.

<sup>39</sup> <https://www.infoafrica.it/wp-content/uploads/2017/02/Power-System-Master-Plan-PSMP-2016-Update.pdf>

<sup>43</sup> <https://gfcs.wmo.int/UIP>

## Impact #5 - Improved women's access to climate services

Unequal access to climate services is a threat to women's role as key socio-economic players and at the same time reduces the ability to mitigate climate risks<sup>40</sup> and adapt to climate change. *FOCUS-Africa* will cut across all the value chain with an emphasis on activities where women are most involved such as processing and marketing in the agriculture sector. To achieve this, *FOCUS-Africa* will build upon WMO projects in Africa focusing on gender equality such as GPOWER<sup>41</sup> and METAGRI in which, for example, specialized temperature and relative humidity information for cassava processors were provided in order to aid the choice of drying processing time. Women's associations and interest groups constituted a powerful lever for the integration of a large overlooked section of the population - women - while also ensuring more widespread use of meteorological and climatological services to increase the resilience of communities. During project implementation, *FOCUS-Africa* will ensure that the team responsible for conducting the socio-economic assessment (WP6) is gender balanced. In addition, gender-balance will also be targeted in the interview panels consulted for the need collection (WP2) and the impact assessment (T6.2 and T6.3). Furthermore, a special focus will be put on existing gender biases during the evaluation of the socioeconomic situation (T6.2.1). The design of climate services (WP5) as well as exploitations strategies (T6.5) will consider gender-specific needs, particularly by identifying dissemination channels that address the women-specific constraints. For example, the activities within case study 3 will be conducted with a gender-aware design, and men and women smallholder farmers will be involved in equal numbers to address different needs and expectations towards *FOCUS-Africa* innovation. The FDGs planned in Mozambique with Nampula farmers will take into consideration the needs and interests of girls and boy/women and men in all their diversity. The innovation workshops will ensure that activities are implemented to empower women, especially in access to services and work agriculture, and strength their role in the decision mechanism and process.

This impact is strongly linked to SDG 5.1.1 (monitor equality and non-discrimination on the basis of sex) and SDG 5.B (enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women).

## Impact #6 – Increase uptake and sustainability of the developed climate services

One of our partners recently showed<sup>42</sup> that to increase uptake of climate services their design has to readily fit the specific decision contexts of the African continent where climate change risk perceptions are different. *FOCUSAfrica* will build upon developed methods, such as the UNDP knowledge, integration web-interface, to integrate existing knowledge and connect amongst existing networks in order to foster knowledge production through coordination.

To make the best use of these connections and promote uptake, *FOCUS-Africa* will rely on WMO mechanisms for aligning the diverse efforts being made across SADC.

Concerning sustainability, *FOCUS-Africa* will address this challenge by ensuring, through WP6, that the climate services, including the innovations, meet the users' requirements and find their way on the "climate market" in a sustainable manner. To achieve this, WP 6 will assess dynamically the socio-economic value of the proposed services and design their exploitation strategies. One innovative aspect of *FOCUS-Africa* is to conduct this analysis during the development of the prototypes to better adapt pilot products to the local situation and increase socioeconomic impacts. End-users and service providers will then also be fully involved in the definition of the exploitation strategies using the innovative Flourishing Business Canvas<sup>41 35</sup> to design business models that are socially beneficial, environmentally regenerative and financially viable as described in section 1.4.2.

Moreover, *FOCUS-Africa* has been structured to increase the replicability potential of (1) the project results e.g. methodology to extract climate signal for applications such as intensity of rainy season and (2) the end-to-end methodology used to produce them. The project will describe in detail the conditions applicable to the analysis, such as climate processes (WP3), global socio-economic indicators (WP6) and specific needs and challenges (WP2). The ex-ante data collection (WP6) will foster understanding of the factors contributing to the successful implementation of the services and ease the replicability under various geographic, demographic and climate conditions. e.g. methodology to extract climate signal for applications such as intensity of rainy season. In addition, to foster the replicability and scalability of our results, *FOCUS-Africa* will apply a PESTEL framework to identify the key macroenvironmental factors (political, economic, social, technological, environmental and legal) to evaluate better the potential uptake of the climate services in other locations.

<sup>40</sup> Chanana-Nag and Aggarwal (2018) <https://doi.org/10.1007/s10584-018-2233-z>

<sup>41</sup> <https://public.wmo.int/en/resources/gender-equality/making-weather-and-climate-services-more-gender-sensitive>

<sup>42</sup> Steynor and Pasquini (2019) Informing climate services in Africa through climate change risk perceptions, *Climate Services*

Building on the experience of the SCIP EA project (involving the UK Met Office and the Tanzania Meteorological Agency), market opportunities will be aided by the *FOCUS-Africa* capacity building programmes (WP7), which will encompass all relevant project results to transfer knowledge to local stakeholders (policy-makers, industry, innovators, research communities, etc.), also fostering replicability.

### 2.1.3 Barriers and obstacles

The potential barriers that may limit the expected impacts of the project and the foreseen measures to mitigate the risks are listed here:

#### Unsustainable climate services or vague sustainability performance of the new climate services

*FOCUS-Africa* will develop a plan in WP 6 to illustrate how the proposed climate services could be maintained and further extended after the project. An exploitation strategy will be developed using an innovative approach described in section 1.4.2. In addition, we will build up on our learnings on climate services sustainability from recent projects<sup>4344</sup>

#### Limited replicability / scalability

*FOCUS-Africa*, in WPs 1 and 2 through WMO and the RCCs/RCOFs, will facilitate co-operation and co-ordination among multiple actors around a geographical or sectoral focus. WP 6 will undergo a “Terminal Evaluation” including information on the project’s replicability/scalability and lessons learned as well as recommendations on way forward.

In addition to the significant cost reduction achieved, the outcomes of the project, such as awareness creation about relevant technologies, learning, knowledge sharing, and replicability will also be evaluated.

#### Poor user engagement

*FOCUS-Africa* will use a range of tools to engage efficiently with end-user such as Questmark, an online tool for harnessing user feedback and virtual consultations and surveys.

#### Perceived poor skill of seasonal forecasts

The tailoring of seasonal forecasts carried out in WP 5 and in close collaboration with end-users will ensure the exploitation of the maximum prediction performance, as a way to re-assure end-users about the skill of the forecasts. In cases where skill remains poor, even after careful tailoring, this will be properly documented to provide stronger factual evidence of the limitations of seasonal forecasts on the one hand and to inform model developers on the other.

#### Reluctance of end-users to incorporate new data and information into their management strategies

End-user engagement from the start of the project will be of utmost importance, and will be essential part of the Communication Plan.

Lack of simplicity and usability of the services developed to be adopted by large players and small end-users The services will be user-friendly, since they will be co-designed together with a range of diverse end-users, and the added-value will be subsequently tested on the field.

#### Difficulties in implementing the adaptation strategies resulting from the policy framework at local, national or international level

A dedicated risk analysis considering both economic and non-economic risks for market uptake (undertaken in WP 6), coupled with a continuous involvement of main end-users, will avoid a mismatch between regulatory framework and solutions/ strategies developed during the project.

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<sup>43</sup> Soares and Buontempo (2019) Challenges to the sustainability of climate services in Europe. *WIREs Clim Change*; 10:e587. <https://doi.org/10.1002/wcc.587>

<sup>44</sup> Vogel et al. (2019) Climate services in Africa: Re-imagining an inclusive, robust and sustainable service, *Climate Services*.

## 2.2 Measures to maximise impact

### 2.2.1 Dissemination and exploitation of results

To guarantee that *FOCUS-Africa* will reach the expected impacts previously identified, all project partners commit to actively contribute to the definition, planning and execution of dissemination and exploitation measures throughout the course of the project.

A characterisation of expected project results will be conducted at the beginning of the project to both protect the project partners' interests and ensure an efficient dissemination. **Exploitable results** and **non-exploitable results** will be clearly identified and handled in distinct plans to ensure that no communication/dissemination measure harms the legitimate interests of the project partners.

#### *Dissemination of project results*

The *FOCUS-Africa* Communication and Dissemination plan will be delivered at early stage of the project (D1.3, M6). The plan will be updated halfway of the project (D1.6, M24) in order to capture the changes in the landscape of ongoing and emerging initiatives. The plan will pursue two main objectives:

- Ensure that the project outputs and results reach the relevant target groups, especially end-users, in and beyond the participating countries
- Ensure transparency and visibility of the project activities and to acquire the needed support for crucial stakeholders

*FOCUS-Africa* will use its **official website** as the main and general dissemination channel to reach all types of actors that may be interested in reusing the project results. It will include an Observatory to transform project results into knowledge. For example, end-user requirements, case studies, publications, new validated products inventory and samples, and main technical and workshop reports that are relevant for external stakeholders and other relevant EU and African projects will be made available here. In addition, *FOCUS-Africa* will use other dissemination channels dedicated to specific target audiences:

- **Research communities** will be specifically addressed through the release of **scientific publications** in climaterelated journals such as Nature Communication, Climate Dynamics, Regional Environmental Change, Climatic Change, Climate Services, Bulletin of the American Meteorological Society. The publications are expected to deal with the regional climate change in Southern Africa, climate services for food security, water and energy management, adaptation to extreme events, transdisciplinary development of new climate knowledge for more resilient society, among other climate-related topics. These publications can be used to support international scientific assessments.
- *FOCUS-Africa* will use the results of the project to draw up a **policy brief that can help policy-makers** to take climate-adaptation related decision. Policy briefs will cover, among others, recommendations for evaluating the impact of climate services, highlights of the socio-economic value of climate services and lessons learnt from the development of climate services.
- Relevant project results will be encompassed in **FOCUS-Africa trainings** to develop the capacity of the regional NMHSs, SADC/CSC, research institutes and other identified climate service providers. Trainees will increase skills in generating tailored, science-based, innovative and technology driven climate products, information and services. Training materials will be made available in existing or under development platforms/portals. This knowledge transfer will strengthen the adaptive capacity of trainees and foster the replicability of the methodological frameworks at the same time.
- *FOCUS-Africa* will organise a **workshop** in each of the partner African countries. These stakeholder workshops will gather every 8 months relevant stakeholders of the addressed sector. These workshops will be the occasion to allow **industrial stakeholders** to get familiar with service prototypes. When relevant, these meetings can also be used to reach citizens that may have an interest in using the project results.
- **Practitioners and decision-makers** will also be approached during dedicated events on climate services for food security, energy and water that will be attended by the *FOCUS-Africa* consortium.
- In particular, partners will participate in National Climate Services Fora (where established), RCOFs, Intra-ACP sector-specific regional stakeholder consultations and conferences. The following list of RCOFs in Africa is given on an indicative basis:
- Greater Horn of Africa Climate Outlook Forum (GHACOF)
- PRÉvisions climatiques Saisonnières en Afrique Soudano-Sahélienne (PRESASS)

- Prévisions Climatiques Saisonnières pour les pays du Golfe de Guinée (PRESAGG)
- Prévision Climatique Saisonnière En Afrique Centrale (PRESAC)
- Prévisions Climatiques Saisonnières en Afrique du Nord (PRESANORD)
- Southern African Regional Climate Outlook Forum (SARCOF)

In addition to these standard dissemination activities, **FOCUS-Africa** will use innovative approaches and leverage on the WMO, GFCS and EU networks and mechanisms for an effective dissemination of results, including:

- Organising local meetings with National Hydrological and Meteorological Services in the region to implement pathways towards operationalisation of the **FOCUS-Africa** climate services in their countries
- Including **FOCUS-Africa** tools and products in the WMO Climate Services Toolkit
- Providing updates on a regular basis at the GFCS Partners Advisory Committee meetings
- Leveraging on ongoing EU, WMO and GFCS projects and activities in Africa to synergise the project dissemination.

### **Exploitation of project results**

The **FOCUS-Africa** exploitation plan will be drafted as a complement to the Communication and Dissemination plan. It will be continuously updated along the course of the project and delivered at the end (D6.6, M48) and will ensure that the results identified as exploitable are correctly handled to maximise the impact of the project. The exploitation plan will achieve the following objectives:

- Identify and manage all project results
- Ensure internal & external freedom to operate (IP)
- Consider project partners' exploitation claims
- Protect innovative project results
- Transfer IP ownership to other consortium partners
- Define most adequate business strategies

The exploitation plan will first deal with the **FOCUS-Africa** climate services. A detailed market uptake strategy and business model will be proposed to ensure their sustainable exploitation (WP 6). The preliminary strategic information provided by the **FOCUS-Africa** services providers is presented hereunder. These draft exploitation strategies will be used as a basis for the continuous update of the exploitation plan during the project.

| <b>CLIMATE SERVICE #1</b>          |   |
|------------------------------------|---|
| <b>Value proposition</b>           | Include potential climate-change impacts in credit model and general agricultural sector support, identifying for a specific geographic location the potential impacts of climate variability and climate change on the production of maize, taking into account management practices in the specific area, combining observations, climate models and crop models to analyse potential outcomes. |
| <b>Service provider</b>            | CSIR  |
| <b>Targeted end-users</b>          | Providers of financial support to farmers   |
| <b>Targeted geographic area(s)</b> | The study will focus on a specific area in the North West Province of South Africa, an important maize-production area vulnerable to extreme climate variability.   |
| <b>Information delivery mode</b>   | The delivery mode will be in the form of an adapted credit model used in the focus area.  |
| <b>Partnerships</b>                | Potential partners will be farmers and farmers associations in the region of interest.  |

### **CLIMATE SERVICE #2**

|                          |   |
|--------------------------|---|
| <b>Value proposition</b> | Increase and stabilise crop yields by adopting optimal measures to adapt to future climate conditions (e.g. seeding time, crop diversification, harvest and storage period, grain conservation treatments). |
| <b>Service provider</b>  | MRNEM, AMIGO  |

|                                    |  |
|------------------------------------|--|
|                                    |  |
|                                    |  |
| <b>Targeted end-user(s)</b>        | Decision-makers of the agri-food industry working in all phases of the crop production, from sowing time to post-harvest activities. Agronomists, agricultural scientists and crop scientists as most promising end-users. |
| <b>Targeted geographic area(s)</b> | First proposed in Malawi. Possible replicability options to be investigated.   |
| <b>Information delivery mode</b>   | To be integrated in the existing ASAP decision support tool and in APHILS  |
| <b>Partnerships</b>                | Partnership with the Farmers Union of Malawi (FUM) (service promotion to its members).   |

### CLIMATE SERVICE #3

|                                    |  |
|------------------------------------|--|
| <b>Value proposition</b>           | Increase resilience of marginal cropping systems by developing climate-ready varieties and pre-breeding materials and providing recommendations on their use in combination with forecasting tools   |
| <b>Service providers</b>           | IIAM, SSSA   |
| <b>Targeted end-users</b>          | Smallholder farmer communities in Nampula, Mozambique  |
| <b>Targeted geographic area(s)</b> | First proposed in Nampula, Mozambique. Then first geographic extension in the SADC region if the first exploitation appears to be successful.  |
| <b>Information delivery mode</b>   | Combination of an ICT-based forecasting tool and climate-ready varieties characterized for their adaptation potential.   |
| <b>Partnerships</b>                | Partnership with smallholder farmer communities in the Nampula area through PLAN. Then possible partnership with national climate offices and breeding efforts in the region to reach new potential users across the country and beyond. Additional possible partnership with CGIAR centers such as CIMMYT and ICARDA to further exploit the breeding potential of the services. |

### CLIMATE SERVICE #4

|                                    |   |
|------------------------------------|---|
| <b>Value proposition</b>           | Increase and stabilise crop yields by adopting optimal measures to adapt to future climate conditions (e.g. seeding time, crop diversification, harvest and storage period, grain conservation treatments).   |
| <b>Service provider</b>            | TMA , AMIGO   |
| <b>Targeted enduser(s)</b>         | The service is intended for decision-makers of the agri-food industry working in all phases of the crop production, from sowing time to post-harvest activities. Agronomists, agricultural scientists and crop scientists are identified as most promising end-users. |
| <b>Targeted geographic area(s)</b> | The service will be initially developed for Tanzania but can be applied to any large infrastructure development in the region.  |
| <b>Information delivery mode</b>   | - The service will be integrated in the ASAP (Anomaly Hot Spots of Agricultural Production)   |
| <b>Partnerships</b>                |   |

### CLIMATE SERVICE #5

|                          |  |
|--------------------------|--|
| <b>Value proposition</b> | Build more climate resilience rail infrastructures by mainstreaming climate and climate change information taking into consideration risks related to extreme events from the design and implementation phase. |
| <b>Service provider</b>  | AMIGO  |

|                                    |  |
|------------------------------------|--|
| <b>Targeted enduser(s)</b>         | The service is intended for engineering companies involved in the design of large infrastructures. COWI is expected to be the first customer of the service for a railway system. The service is generic and can be applied to any large infrastructure (Dam, power plant ...) |
| <b>Targeted geographic area(s)</b> | The service will be initially developed for Tanzania but can be applied to any large infrastructure development in the region.   |
| <b>Information delivery mode</b>   | The service will be delivered either through a simple tabular format or via a webGIS platform depending on customers' requirements.  |
| <b>Partnerships</b>                | UCT and MO partnership to deliver and exploit the service  |

#### CLIMATE SERVICE #6

|                                    |   |
|------------------------------------|---|
| <b>Value proposition</b>           | Improve the planning of new renewable energy plants and the management of the energy generation in existing plants by integrating multi-timescale climate information in decision-making process.                   |
| <b>Service provider</b>            | WEMC  |
| <b>Targeted enduser(s)</b>         | Investors of the renewable energy sector as well as companies generating renewable energy are the most promising end-users of the service. TANESCO is expected to be the first customer of the service in Tanzania. |
| <b>Targeted geographic area(s)</b> | The service will be initially developed for Tanzania but can be proposed across the region to other grid operators.   |
| <b>Information delivery mode</b>   | The service will be delivered through a web-based graphical user interface (similar to the C3S ECEM demonstrator)   |
| <b>Partnerships</b>                | MO and WEMC partnership to deliver and exploit the service  |

#### CLIMATE SERVICE #7

|                                    |   |
|------------------------------------|---|
| <b>Value proposition</b>           | Optimise the management of hydro powerplants by providing historical data and projections for key indicators (precipitation, temperature, water inflow, etc.).        |
| <b>Service provider</b>            | WEMC  |
| <b>Targeted enduser(s)</b>         | Companies in the energy sector managing hydro powerplants as the most promising endusers of the service. EDF as first user of the service.                            |
| <b>Targeted geographic area(s)</b> | First provided for the Mpatamangariver basin. Expansion to be envisaged to other basins in <b>Malawi</b> and in the SADC region (Tanzania and Mauritius as priority). |
| <b>Information delivery mode</b>   | The service will be delivered through a mix of direct reporting and a web-based graphical user interface (similar to the C3S ECEM demonstrator)                       |
| <b>Partnerships</b>                | WITS ,WEMC, EDF   |

#### CLIMATE SERVICE #8

|                                    |  |
|------------------------------------|--|
| <b>Value proposition</b>           | Improve water management in areas under water scarcity pressure by providing insight for long term changes in key water-related indicators (rainfall, temperature, water supply, etc.)   |
| <b>Service provider</b>            | WMO , WEMC   |
| <b>Targeted enduser(s)</b>         | Water management companies are identified as the main end-users of the service. The Water Resources Unit (WRU) of the Republic of Mauritius is expected to be the first customer of the service.<br>Farming communities and actors of the agriculture industry are two other customer segments that will be addressed. |
| <b>Targeted geographic area(s)</b> | The service will be initially developed for Mauritius, and then Rodrigues.   |



|                                  |   |
|----------------------------------|---|
| <b>Information delivery mode</b> | The service will be delivered through a web-based graphical user interface (similar to the C3S ECEM demonstrator) |
| <b>Partnerships</b>              | The Water Resources Unit, CSIR, WEMC  |

Beside the climate services, the partners of *FOCUS-Africa* will generate a significant number of IP foreground. All project results identified as potentially exploitable will be classified in one of the three categories:

1. Commercially exploitable by a *FOCUS-Africa* partner (product, service, spin-off/start-up, etc.)
2. Exploitable in a non-commercial manner by a partner (further research, policy change, etc.)
3. Exploitable by external stakeholders.

The exploitation plan will address all exploitable project results and be used as a document to support project partners in the definition of exploitation strategies for their IP foreground. While categories (2) and (3) require less effort, it is important to identify potential beneficiaries and define a light exploitation strategy to reach them. As shown in Table 4 the project partners have already identified their expected foreground IP. Their respective intended exploitation strategy is reported in Section 4. During the project, Task 6.5 will facilitate the detailed developments of these strategies.

| Main type of IP foreground | WMO |     |    |     | MNREM |  | AMIGO |   | SSSA | PLAN | IIAM | WEMC | ACMAD | LGI | CSIR | WITS |
|----------------------------|-----|-----|----|-----|-------|--|-------|---|------|------|------|------|-------|-----|------|------|
|                            |     | BSC | MO | UCT |       |  | EDF   |   |      |      |      |      |       |     |      |      |
| Research roadmap           |     |     |    | x   |       |  |       |   |      |      |      |      |       |     | x    |      |
| Policy recommendation      | x   |     | x  |     |       |  |       |   |      | x    |      |      |       |     |      |      |
| Collaborative platform     | x   |     | x  |     |       |  |       |   |      |      |      |      |       |     |      |      |
| Skill, knowledge           | x   | x   | x  | x   | x     |  |       | x | x    | x    | x    | x    |       | x   | x    | x    |
| Education material         | x   |     |    | x   |       |  |       |   |      | x    |      |      | x     |     |      |      |
| Prototype                  |     |     |    |     |       |  | x     |   |      |      | x    | x    |       |     |      |      |
| Software                   | x   |     |    |     |       |  |       | x |      |      |      |      |       |     |      |      |
| Publication                |     | x   | x  | x   |       |  |       |   | x    |      |      |      |       | x   | x    |      |
| Data                       |     |     |    | x   |       |  |       | x | x    |      |      |      |       |     |      |      |
| Standards                  | x   |     | x  |     |       |  |       |   |      |      |      |      |       |     |      |      |

**Table 4** – Expected types of IP Foreground

### *Data management*

The data collected and produced for the correct development of the research activities within *FOCUS-Africa* can be classified in two types: scientific and personal data. Both types will be respectively managed according to the open data policy recommended by the European Commission and the General Protection data Regulation (GDPR). Data will be curated by individual partners overseen by the Coordinator (WP 8). The Data Management Plan (DMP) will specifically address the issue of the methods of generation, collection, storage and access of data associated with the project. Subject to the provisions set out in the Intellectual Property Management plan, project data will be made available in a timely and efficient manner which allows effective preservation, discovery, retrieval and analysis of the data created. Data management activities will be adequately resourced and implemented by all partners. All partners will adhere to the FAIR principle, aiming to make the projects research data Findable, Accessible, Interoperable and Re-usable.

During the project, the main source of climate data used will be a collection of model outputs, reanalysis and observations downloaded mainly from the C3S. These files will be downloaded individually by the different partners from the original data sources and stored in their individual data storages in their native format (grib for ECMWF). Climate data will be obtained through ssh connections to the remote data servers and retrievals through ftp or the web api from the ECMWF.

Regarding climate data standards, a guideline during the project is to comply to the data standards established in the geospatial data community (like CF conventions). Once downloaded the data will be formatted in NetCDF

following the INSPIRE Directive standards. As the project aims at using data from existing platforms (e.g. Copernicus) the original data standards will be kept for these data and adapted to the project needs. The second data category is personal data. Professional information, pictures, videos and audio recordings will be gathered always with the informed consent of the people involved. To collect the data mentioned different technical solutions will be used. For the user's feedback and personal data, the information will be gathered through participatory activities held along the project (e.g. surveys, on-line forms, interviews, workshops and/or face-to-face meetings).

### ***Knowledge management***

The use of knowledge generated in the project and Intellectual Property (IP) will be governed by the terms of the Grant Agreement and the terms of the Consortium Agreement, which will be based on the DESCA 2020 Model.

#### **Access Rights to Background and Results**

In order to ensure a good execution of the project, the project partners will agree to grant each other royalty-free Access Rights to their Background and Results for the execution of the project. The Consortium Agreement will define further details concerning the Access Rights after the duration of the project to Background and Results.

#### **IP Ownership**

Results shall be owned by the project partner carrying out the work generating such Results. If any Result is created jointly by at least two project partners and it is not possible to distinguish between the individual contributions, such work will be jointly owned by the contributing project partners. The same shall apply if, in the course of carrying out work on the project, an invention is made having two or more parties contributing to it, and it is not possible to separate the individual contributions. Such joint applications and patents shall be jointly owned by the contributing parties. Details concerning jointly owned Results, joint inventions and joint patent applications will be addressed in the Consortium Agreement.

#### **Open Access**

**FOCUS-Africa** will fully embrace the open access policy of Horizon 2020 by providing online access to scientific information that is free of charge to end-users and that is re-usable. **Open access** will be maintained for deliverables (when public), interim and final reports. These will be online published on a dedicated public library, directly accessible through the public website of the project. The green model will be the default way of granting access to the peer-reviewed scientific research articles. The Open Access Infrastructure for Research in Europe (OpenAIRE) will be the entry point for the partners to determine the repository for their publications.

During the preparation phase of the project, another background and foreground IP screening will be conducted to ensure an exhaustive list of IP to be handled. Specific limitations and/or conditions for implementation and exploitation for these IP will be defined in details and integrated in the Consortium Agreement.

During the project, IP strategies will be drafted together with IP owners and exploiting partners (Task 6.5). Fair conditions for the exploitation of IP (including joint owned IP) will be defined. An IP ownership structure will be established for all exploitable results that combine IP from several owners. IP issues will be carefully considered during the design of exploitation strategies.

### ***2.2.2 Communication activities***

We propose a comprehensive set of modern communication tools for online facilitation, and the most efficient channels for communication, dissemination and exploitation including:

- **FOCUS-AFRICA Website:** The official website, delivered in the second month of the project, will provide a high-level description of the project and its objectives aimed at the project's stakeholders and the general public. The website will also contain more detailed outputs, such as links to scientific publications, public reports, general information, news and dissemination material. It will be built and run by LGI and regularly updated with the support and contributions of the project partners.
- **Communication campaigns:** At least 4 campaigns using the various communication channels, in particular on social media (Twitter, LinkedIn, Facebook) will be rolled out. Specific messages targeting the project's

audiences will be developed based on the objectives and milestones achieved. These campaigns will be based on the various content generated and will be maximised by using the partners' channels and identified multipliers (clusters, NGO's, networks...) to relay the campaign and messages. Appealing content will be created in the form of infographics, visuals and/or videos.

- **Visual identity materials:** *FOCUS-Africa* logo, letterhead, report template, meeting template, and power point templates will provide consistent branding for the project.
- **Dissemination materials:** These will be created to present the project's activities and results. They will be made mainly available online (although some printed material will be disseminated at key events) and will include leaflets, videos, infographics, visuals, factsheets, posts, policy brief etc.
  - Thematic leaflets: A set of leaflets will present the case studies, define the challenges for each and describe how the project will address the challenges, and explain how *FOCUS-AFRICA* will provide climate services tools to overcome them.
  - *Policy brief:* a policy brief analysing climate services in the countries and sectors will be drafted and disseminated to target policymakers in Europe and Africa.
- **Press releases:** In addition to engaging with various users, *FOCUS-Africa* proposes targeted media outreach actions involving national newspapers, media outlets specialising in climate services (e.g. CDKN.org, climateservices.org), and EU and Africa policy and media (AllAfrica, Carbonbrief.org). At least three press releases will be distributed and include both information material and visual materials i.e. graphs, photos etc., and will be sent when significant milestones have been reached.
- **Project reports:** The project deliverables that are in report format and defined as public will be made openly accessible on the *FOCUS-Africa* website to widely share useful results and conclusions. The most relevant deliverables for the audiences will be turned into a more appealing format to maximise their reach.
- **Papers for peer-reviewed literature:** Scientific papers created within *FOCUS-Africa* will be published in open access peer-reviewed literature to reach the scientific community and advertised through the website.
- **Promotion and dissemination of results in international fora of relevance:** To strengthen the role of the project as a base of cutting-edge research, the project will leverage the consortium's industrial and scientific networks, to present the *FOCUS-Africa* innovations to conferences and other external event opportunities. Already identified conferences in Europe and Africa are: European Climate Change Adaptation Conference (ECCA), Conference on Climate Change and development in Africa, International Conference on Climate Services (ICCS).
- **Official EU Communication Channels:** Whenever an important milestone in the project is reached, the subsequent press release will be forwarded to the relevant EU dissemination portals. The press releases will be directly transmitted via Cordis Wire (<http://cordis.europa.eu/wire/>).

The Consortium will also submit articles to <http://cordis.europa.eu/news> and [http://www.ec.europa.eu/research/infocentre/all\\_headlines\\_en.cfm](http://www.ec.europa.eu/research/infocentre/all_headlines_en.cfm). The Project Office will be contacted with regards to other dissemination steps supported by the EU.

Key messages will be tailored according to the type of stakeholder. The key messages will be integrated in all communication materials and activities and reviewed with the project results during the implementation. The key messages will be conveyed through multiple media options addressing a wider stakeholder audience outside the consortium to ensure maximum effectiveness. Awareness raising of *FOCUS-Africa* achievements and effects will be also targeted to the policy makers involved in the National Adaptation Plans (NAPs) process as well as in national development and sector-specific plans.

A summary of communication measures and targeted audience is presented in Tables 5 and 6:

| Objective                                  | Target audience                | Material/content (and responsibility)  | Method/communication measures   | Frequency          |
|--|--------------------------------|--|---------------------------------|--------------------|
| Ensure an effective and integrated project | <i>FOCUS-Africa</i> consortium | <ul style="list-style-type: none"> <li>• Progress and results (WP8)</li> <li>• Risks/benefits/issues (WP8)</li> <li>• Queries/questions (WP8)</li> </ul> | Project intranet                | Continuous updates |
|  |                                |  | Partners' Forums                | Annual             |
|  |                                |  | Email, Web and teleconferencing | Frequent           |
|  |                                | <ul style="list-style-type: none"> <li>• Overall project progress</li> </ul>   | One-page progress reports       | Quarterly          |

|   |  |   |   |                               |
|---|--|---|---|-------------------------------|
| Ensure EC is fully informed of project progress   | EC Project Officer                       | (WP8)<br>• Issues (WP8)<br>• Deliverable progress (WP8)   | Deliverable and periodic reports                                      | As per deliverable dates      |
|   |  |   | <i>FOCUS-Africa</i> website   | As per reporting periods      |
| Awareness of capabilities and discussion of needs | Intermediate users (and end users)       | • Presentations (WP1)<br>• Workshop discussions (WP1)<br>• Advisory Board meetings (WP1)  | International conferences, GFCS PAC meetings, RCOFs                   | As they occur and as required |
| Advertise progress and obtain expert advice       | Wider scientific and technical community | • Deliverables and other reports (WPLeaders)<br>• Presentations at conferences including case studies (WPLs)<br>• Papers (WPLs)   | Project website   | As per timetable              |
|   |  |   | Project & task team meetings  | Monthly                       |
|   |  |   | Conferences, GFCS PAC meetings, RCOFs                                 | As opportunities arise        |
|   |  |   | Publication in open literature  | When ready                    |
| Mutual awareness                                  | Other EU bodies                          | • Discussion of needs (WP1)<br>• Plans and results (WPLs)   | Project website   | Monthly                       |
|   |  |   | EC or project meetings  | As required                   |
| Exploitation of new capabilities                  | Policy and decision makers               | Presentations (WP1)   | Meetings organised by EC and AU                                       | As they occur                 |
|   |  | Summary information (WP1)   | <i>FOCUS-Africa</i> website   | Quarterly                     |
| Project visibility & raise public awareness       | Wider public                             | Relevant results and their implications including case studies (WP1)<br>Communication campaigns<br>Content creation (infographics, factsheets, posts, success stories, testimonials...) | <i>FOCUS-Africa</i> website, social media and African relevant events | Monthly                       |

**Table 5 – *FOCUS-Africa* communication measures and responsibilities**

| Target Audience         | Food security, Water and Energy users/sectors  | National, Regional and International Organizations   | Climate services providers  |
|-------------------------|--|--|---|
| Method of Communication | <ul style="list-style-type: none"> <li>Website</li> <li>Dissemination material</li> <li>Specialized workshops &amp; training sessions</li> <li>Webinars</li> <li>Focus groups</li> <li>Interviews and surveys</li> <li>Conference presentations</li> <li>National and regional GFCS UIPs</li> <li>Social Media</li> <li>Direct contact and 1:1 meetings</li> </ul> | <ul style="list-style-type: none"> <li>Website</li> <li>Dissemination material</li> <li>Scientific publications</li> <li>GFCS PAC meetings</li> <li>RCOFs and NCOFs</li> <li>Specialized workshops &amp; training sessions</li> <li>Webinars</li> <li>Focus groups &amp; questionnaires</li> <li>Conference presentations</li> <li>Social Media</li> </ul> | <ul style="list-style-type: none"> <li>Website</li> <li>Dissemination material</li> <li>Scientific publications</li> <li>Focus groups &amp; questionnaires</li> <li>Conference presentations (e.g., ICCS, EGU, EMS/ECAC)</li> <li>Questionnaires</li> </ul> |
| Information Type        | <ul style="list-style-type: none"> <li>Outcomes</li> <li>Best practices</li> <li>Lessons Learned</li> <li>Summary of case studies</li> <li>Training on the tools</li> </ul>  | <ul style="list-style-type: none"> <li>Best practices</li> <li>Summary of case studies</li> <li>Lessons Learned</li> </ul>   | <ul style="list-style-type: none"> <li>Information on the compete technology and its application</li> </ul>   |

|     |  |  |  |
|-----|--|--|--|
| Aim | <ul style="list-style-type: none"> <li>• Ensure tools developed are directly relevant</li> <li>• Share knowledge</li> <li>• Share experience</li> <li>• Motivate adoption</li> </ul> | <ul style="list-style-type: none"> <li>• Share experience</li> <li>• Ensure replicability and sustainability</li> <li>• To promote project results as potential guidance to policy making</li> </ul> | <ul style="list-style-type: none"> <li>• Raise awareness and mobilize sector interest in compete solutions</li> <li>• Ensure operationalization of services</li> </ul> |
|-----|--|--|--|

**Table 6** – FOCUS-Africa communication actions per targeted audience

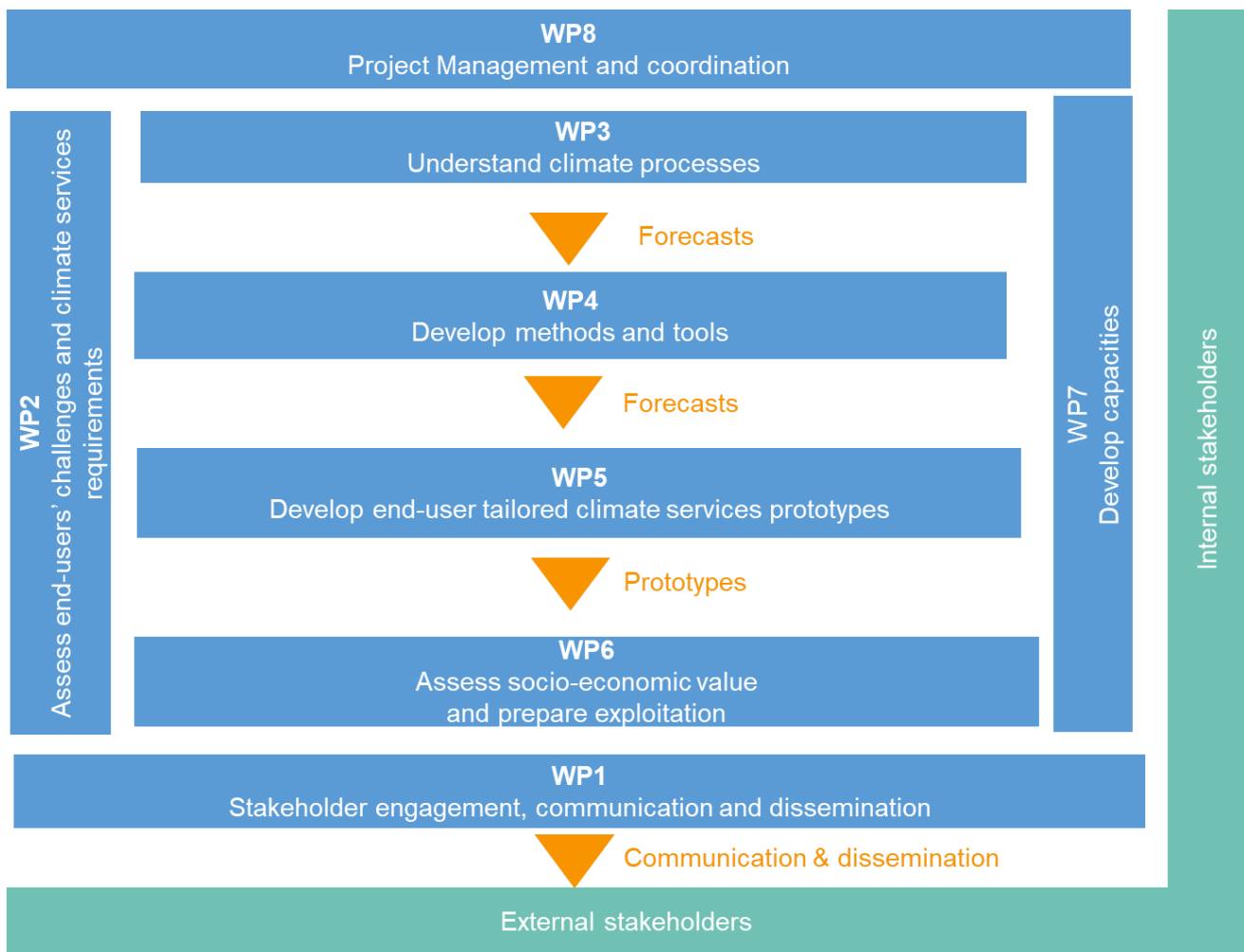
### 3 Implementation

#### 3.1 Work plan — Work packages, deliverables

##### Overall structure of the work plan

The project work plan is composed of eight inter-linked WPs (see Figure 4). **WP1** is a cross-cutting WP covering the stakeholder engagement, communication and dissemination activities. **WP2** will focus on assessing the user’ climate-related challenges and needs as well as on the quantifying the impact of climate variability and climate change on the different sectors with special attention to hazards such as drought, wildfires, floods and heatwaves. The project will contribute to better understanding of the regional climate processes within **WP3**, which will use regional climate model information and observation to analyse climate dynamics. WP3 will identify valuable and ‘actionable’ signals from predictions and projections on the seasonal time scale and beyond to frame the risks at play in the case studies. The derived data will be used by **WP4** to develop and apply state-of-the-art methods for supporting the use of climate forecast and projection data in delivering *FOCUS-Africa* objectives in each case study. These methods include predictability skill assessment, downscaling, calibration and bias adjustment of the seasonal forecasts, decadal predictions and climate projections as well as regionally optimized multi-model combinations. **WP5** will collect and rationalise the climate information produced in order to optimize delivery and processing schedules for each case study, so as to clearly demonstrate how the *FOCUS-Africa*’s end-users will benefit from the project’s innovations. To close the full-value chain, **WP6** will assess the climate services socioeconomic value and prepare the exploitation of the most promising and impactful services. This will be framed in a water-energy-food-climate nexus approach to achieve a global enhancement in climate risk management and adaptation. With **WP7**, the project will contribute to a strong capacity building programme in Africa as per the cross-cutting pillar of the climate services delivery, taking in consideration the needs for regional capacity and women empowerment. The overall project management and coordination will be taking place in **WP8**.

##### Pert Diagram



**Figure 4:** PERT chart

## GANTT Chart





## 3.2 Management structure, milestones and procedures

### 3.2.1 Management structure

The project governance structure is presented in the Figure 5

**Governing Board (GB):** The GB is the highest authority of the project, comprising of one representative per partner. The Chairperson will be elected at the first meeting for the entire project period. GB meetings will be organised once per year by default, but the ExCom can call for ad hoc GB meetings. The GB's decisions may include: Request amendments to the Grant Agreement; Initiate and agree on changes to the Consortium Agreement (CA); Define strategic reorientations of the work plan or budget; Termination of a partner's participation, following procedures set out in the CA. Decisions of the GB shall require a vote by simple majority, except for changes affecting the Grant Agreement, which shall require a 2/3 majority. The quorum is of 2/3 of GB members.

**Executive Committee (ExCom):** The members of the ExCom are the Coordinator (chair) and the WP leaders, supported by the Project Management Office (PMO, which does not vote). The ExCom is the executive body in charge of the management of the project. Its responsibilities are the following: Day-to-day decision-making; harmonisation, follow-up and adaptation of detailed work plans; Assessment of the results obtained and possible minor adaptations of the future work; deciding on technical reviews; Preparation of the periodic scientific and management reports; Proposals for GB decision on major work plan or funding issues; Risk management.

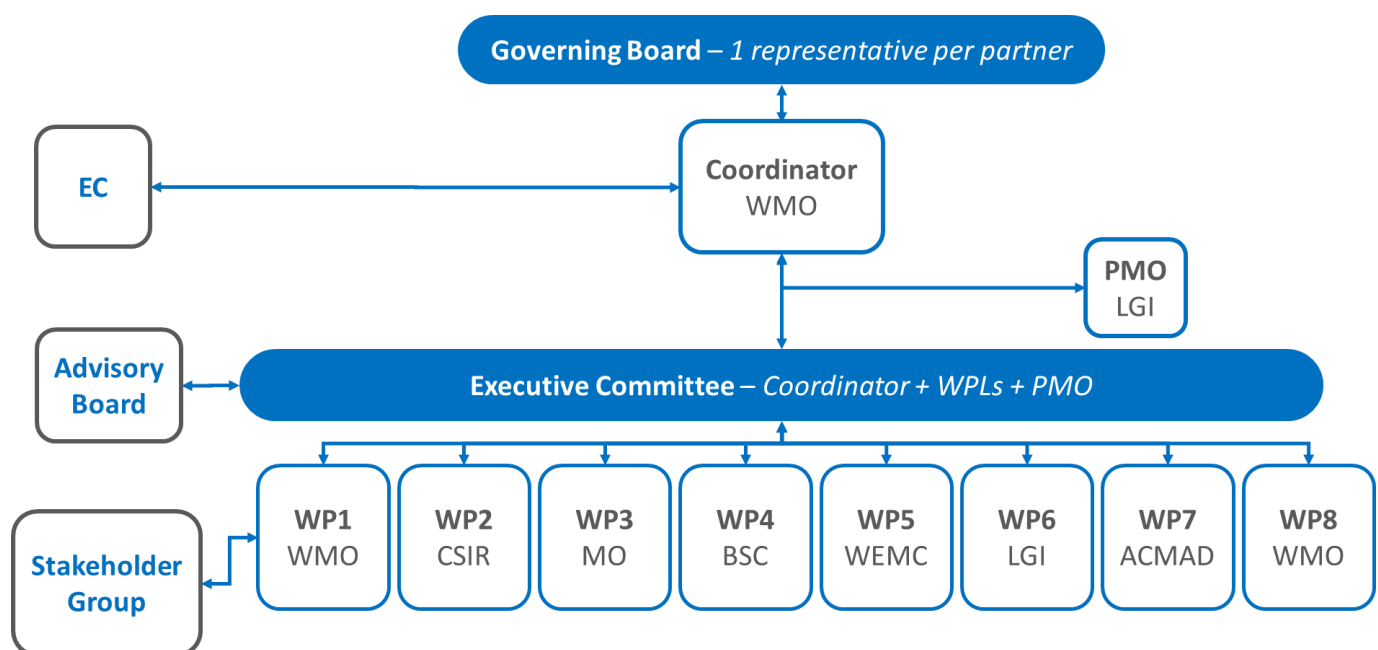


Figure 5 – FOCUS-Africa Governance Structure

**Coordinator:** The Coordinator is formally entitled to manage the relationship between the consortium and the European Commission. Her responsibilities are the following: Ensure the scientific and technical coordination of the project; Chair the ExCom, report to the GB; Organise plenary meetings; Undertake all necessary legal and ethical responsibilities and obligations; Ensure sound financial management; Validate and submit reports and deliverables to the EC, in particular periodic reports; Consolidate the detailed project work plans; Organise external interactions; Facilitate information flow within the consortium.

**WP Leaders:** FOCUS-Africa is divided into 8 Work Packages led by WP leaders (WPLs). Each WP covers a distinct subset of project activities and is divided into tasks. The WPLs are in charge of: Coordinating, monitoring and reporting the WP work; Implementing decisions taken by the GB and ExCom; Reporting to the ExCom on progress, use of resources and potential issues; Organising WP progress meetings as necessary; Contributing to the

periodic scientific and management reports; Organising the quality control of the results obtained in their WP; Participating in the ExCom meetings; Approving and releasing the WP deliverables.

**Project Management Office (PMO):** In order to strengthen the management team of the consortium, the Coordinator has decided to enlist an external Project Management Office having extensive experience in international collaborative projects and excellent knowledge of applicable EC rules and regulations. The PMO shall be in charge of support tasks described below on behalf of the Coordinator: Support to the GB and ExCom; Monitoring work progress; Supporting the preparation and submission of deliverables; Quality & workflow management; Amendment preparations; Consolidating financial reporting and compiling periodic reports; General project assistance tasks such as preparation of meetings, minutes, etc. The PMO will be operated by LGI, an SME which has been supporting collaborative project management since 2005. This organisation relies on a fruitful long-lasting cooperation between LGI and the coordinator organisation, in particular with the management support of H2020 projects.

**Advisory Board (AB):** It consists of representatives from non-partners that can guide the partnership with reference to the needs and viewpoints of key stakeholders. It is intended to be representative of various stakeholder communities.

The mandate of the AB (which is operated under WP1) is to review selected project outputs and provide feedback to increase their quality, appeal, and ultimately to ensure that the needs of key stakeholders are met and they support the solutions proposed by the consortium.

The participation of AB members has been identified among the institution that confirmed their interest in the project. (see letters in Section 4 of the proposal):

| Organisation                            | Participant in AB | Added value in AB   |
|---|-------------------|---|
| ECMWF – Copernicus Climate Change       | Florence Rabier   | Main provider of climate information at European and global level |
| World Climate Research Programme (WCRP) | Detlef Stammer    | Network of global experts in climate research                     |
| Global Water Partnership                | Alex Simalabwi    | Network of main advisers in water resource management             |
| FAO                                     | Lev Neretin       | Global expertise in Agriculture and Food Security                 |
| University of Cape Town                 | Bruce Hewitson    | Linkages with CR4D (Climate Research for Development in Africa)   |
| University of Pretoria                  | Willem Landman    | Seasonal Forecast world expert                                    |

**Table 9 – FOCUS-Africa potential AB members**

In addition, intention to contribute and support *FOCUS-Africa* has been received from key stakeholders who could not formally commit at the stage of the proposal:

| Organisation  | Synergies   |
|---|---|
| South Africa Weather Services (SAWS)                    | Capacity development, sustainability and replicability                    |
| COWI  | Co-development of climate services for Standard Gauge Railway in Tanzania |
| Total   | Co-development of climate services for renewable energy in Tanzania       |
| Instituto Nacional de Meteorologia (INAM) in Mozambique | Capacity development, sustainability and replicability                    |
| Ministry of Agriculture, Tanzania                       | Co-development of climate services for food security                      |
| Chitedze Agricultural Research Station, Malawi          | Co-development of climate services for food security                      |
| Mauritius Meteorological Services (MMS)                 | Co-development of climate services for food security in Mauritius         |
| Landbank  | Co-development of climate services for food security                      |

**Table 10 – List of institutions that will contribute to FOCUS-Africa implementation**

**Stakeholder network (SN):** Stakeholder engagement is key aspect of the project. For this reason, one WP is notably dedicated to that. It is thus important to have a Stakeholder Network to share and exchange knowledge, raise awareness and allow FOCUS Africa beneficiaries to get connected with key sectoral end-users (stakeholder). Also, the stakeholder network will facilitate knowledge transfer to users and ensure that lessons learned can be upscale to other African countries. The work on establishing the SN has begun in the proposal phase (see letters in Section 4). At the project start, an information and invitation will be sent out towards all stakeholders possibly interested to grow the network. Stakeholders will be informed of project progress and will be invited to participate in workshops for implementing the stakeholder consultation (WP1). A provision to cover travel and accommodation costs of participants is foreseen in the WP1 budget. More than 12 organisations have expressed their intent to participate in the consultation or to generally support the project.

### *Management procedures*

**Quality Management:** A Project Quality Plan (PQP: D8.1) will describe the applicable guidelines on project documentation, reporting, approval and submission of deliverables. To assure the quality control of the project, the coordinator will be responsible of the quality and delivering at due time of all deliverables and milestones.

**Project meetings:** Project plenary meetings will be organised during the workshops, every 8 months and starting with the kick-off. Efforts are taken to reduce the project's ecological footprint while implementing the project. Project events and meetings take place back-to-back to optimise travel. Whenever possible, virtual meetings or conference calls will be preferred. The ExCom and WPs will hold additional web meetings as required.

**Management Tools:** An online collaborative workspace will be used to support efficient collaboration between the partners, acting as an internal document repository and internal communication centre. Key project information, such as contractual documents, planning, meeting minutes, templates for producing project deliverables and presentations, etc. will be available on the workspace.

The workspace will also provide a document validation workflow for efficient quality control before the submission of deliverables. Deliverables uploaded by the main author will be reviewed by the WP leader, the coordinator and a quality check by the PMO before finalisation. If areas of improvement are identified at any step in the process, the document is rejected and needs to be approved anew. A dashboard providing deliverables and milestones status ensure a precise monitoring and management. Finally, a user directory is also part of this workspace, allowing efficient internal communication.

The collaborative workspace is GDPR compliant (collect only useful data; used only for the purpose of the project; explicit opt-in; and cybersecurity). This tool will be created and maintained by the PMO (LGI).

**Consortium Agreement (CA):** Before the project starts, the consortium partners will sign a CA (based on the DESCA model), defining roles, responsibilities, mutual rights and obligations. These in particular include the management of IP rights, as well as project organisation and financial management procedures. The CA will implement the orientations defined in the exploitation section (2.2.1), and in particular the transfer of ownership to the future platform. The CA will also cover the internal organisation of the consortium, governance and decisionmaking processes, arrangements for the distribution of EU funding among Partners, rules for partners joining or leaving the Consortium, and provisions for the settlement of disputes within the Consortium.

**Conflict Resolution:** The decision-making process is based on consensus whenever possible. If a consensus cannot be reached, decisions will be made with the voting rights defined above. In the event that disputes or differences arise that cannot be resolved in this manner, the following process shall be applied: disputes within a WP that cannot be resolved internally by the WPL shall be referred to the Coordinator who will attempt to reconcile differences. If this does not resolve the dispute, the Coordinator will raise the issue for discussion with the ExCom. In case this also fails to reach a compromise, the conflict will be presented to the GB, and consultation with the EC Project Officer may be sought. If all other options have been exhausted and no compromise could be reached, disputes will be settled through arbitration in Brussels under the rules of arbitration of the International Chamber of Commerce by an arbitration panel appointed under those rules. The decision of the arbitration panel will be final and binding upon the Partners concerned. Where the dispute concerns IP, the dispute can be taken up with the Coordinator who

can request the assistance of the EC IPR Helpdesk or require the creation of an IPR External Advisory Panel to provide counsel and advice.

**Interaction with other European projects or international initiatives:** Cooperation with other projects and initiatives is welcome and foreseen. After decision of the GB, the Coordinator or another partner will establish a formal contact; a permanent correspondent for each peer-project will be appointed. All information circulation between projects shall respect the provisions of the GA and CA. The initial list of initiatives can be found in section 1.

### ***Innovation Management***

***FOCUS-Africa***, through WPs 6 and 8, will implement adequate internal structures safeguarding effective knowledge, IP and innovation management helping create, capture and manage research results. From the very beginning of the project planning, ***FOCUS-Africa*** will raise awareness among all partners of good research practice and the importance of IP management (incl. confidentiality, ownership, access rights, responsibilities). We will establish procedures to recognise, capture and characterise project outputs (e.g. notification of partners of any publication or disclosure). We will also assess, balance and moderate the possibly varying exploitation interests of project partners (e.g. through exploitation or innovation questionnaires) and come up with a jointly agreed strategy that responds to the overall reason for the project: to jointly address specific challenges and expected impacts – and not partners individual interests. We will systematically plan, prepare and implement appropriate activities to identify, assess and prioritize key exploitable results (e.g. exploitation workshops). We will also establish proper arrangements to ensure freedom-to-operate with project results; i.e. pre-publications reviews, checking potential third-party infringements. This will ensure that our exploitation strategies do not infringe on IP (patent) rights of other and that we cover well the wide range of paths to bring research results to the marketplace such as:

- Improving existing or developing new products and services to be more competitive in existing markets,
- Creating new businesses for further exploitation, i.e. Spin-offs or Joint Ventures among project partners or involving third parties outside of the project,
- Taking advantage of licensing opportunities by negotiating the right type of licence to be granted, e.g. exclusive, non-exclusive or sole licence, and whether it should be limited by the field of use and/or territory.
- Using project outcomes for further research and teaching activities.

### ***3.3 Consortium as a whole***

The ***FOCUS-Africa*** brings together 15 strong partners across Europe (9) and Africa (6). The project consortium unites an excellent mix of research institutions (BSC, CSIR, WITS-GCI, UCT, SSSA, and IIAM), national/regional/international organisations involved in implementing the Climate Services Information System pillar of GFCS (WMO and ACMAD), service providers (MNREM, including Amigo as SME), extension services/NGO (PLAN), industry/sectorial end-users (EDF) and social scientists/experts (LGI and BSC) to address the full-value chain of climate services delivery. In putting together the consortium, the coordinator (WMO), was guided by the lesson learned of many successful GFCS related projects implemented in Africa and elsewhere, as well as those funded through European Union programmes (ERA4CS, C3S). The majority of these projects have been/are implemented by at least one of the partners of the ***FOCUS-Africa*** consortium (see Table 2 in Section 1.3). More importantly, the consortium has the factual combination of expertise to fulfil the project objectives as outlined in the ***FOCUS-Africa*** approach in response to the funding call:

- Advanced scientific knowledge in climate processes affecting the SADC region, including modes of variability and trends (WITS-GCI, UCT, CSIR, SSSA)
- World leading capabilities in processing climate predictions from seasonal to decadal and in regionalizing climate projections (BSC and MO, UCT and SSSA)
- Proven ability of end-user's engagement and solid channels of communication with a wide range of stakeholder networks (WMO, ACMAD, MNREM and PLAN)
- Highly specialized know-how in tailoring climate information for a wide range of users' needs, especially in food security, water, energy and infrastructure sectors (WEMC, MO, BSC, CSIR, SSSA, IIAM and Amigo)
- A pool of experts in social sciences to facilitate the integration of humanitarian and gender aspects, as well as the approach to Responsible Research and Innovation (LGI, PLAN and BSC)

- An innovative approach to Capacity development, Communication, Dissemination and Exploitation (LGI, WMO, WEMC and ACMAD)

### ***Other countries and international organisations***

In coordinating the project, WMO will be drawing on the capabilities of its network of NMHSs and regional, global and specialized centres worldwide, as well as its hundreds of experts who serve in WMO technical commissions. WMO will coordinate the implementation of this project guided by its technical regulations and standards, which led the establishment of the GFCS a decade ago and which continues to underpin the GFCS implementation. In particular WMO involvement in ***FOCUS-Africa*** project as coordinator is essential for:

- Ensuring the project aligns with and contributes to the Climate Services Information System, which is one of the GFCS pillars and a main WMO contribution to GFCS
- Aligning ***FOCUS-Africa*** with the European Commission-funded Intra-ACP project, of which WMO is an implementing partner, as well as with other such projects in the region (ACREI, HIGHWAY, CREWS)
- Ensuring that the most robust methods and products developed within ***FOCUS-Africa*** and the Intra-ACP project are operationalized through WMO systems for sustaining routine delivery of the climate services developed through the project, including strengthening WMO cooperation with C3S in this region
- Facilitating access to the NMHSs data for model validation and calibration under the WMO policy for international exchange of climate data and products to support the implementation of GFCS (Resolution 60, 17th WMO Congress)

### ***3.4 Resources to be committed***

To achieve the goals of ***FOCUS-Africa***, the partners have prepared a detailed work and resource plan for the full project duration. To finance the planned work, the 16 partners are requesting 6 973 017.50 € of funding over 48 months. Direct personnel cost has the largest share (4 334 624 €, 62%), other direct costs represent 16% (1 109 650 €), subcontracting (183 925€).

Finally, overheads (indirect costs) account for 1 357 818 €, following financial rules of H2020.

The 16 partners (including 1 linked third party) of FOCUS Africa mobilise 771.09 persons/months (pm) as detailed in Table 12.

The amount requested is justified by the ambitious plan that the consortium put together for the implementation of ***FOCUS-Africa***. Such plan is feasible thanks to the highly-skilful and truly complementary efforts of the consortium members. The carefully designed intervention will provide a broad range of climate services for multisector users in Africa. Overall, considering the four sectors and the six African countries, the level of complexity in the project had to be accounted in the funding requested. **Travel costs** of the partners represent 583 k€. Budget provisions of 325 k€ have been set aside (in coordinator budget) to cover the workshop travel costs of the stakeholder and advisory board members, and in LGI to cover the travel of local experts in Africa. ***FOCUS-Africa*** budget follows agreed internal budget rules:

- Travel rate defined (average travel costs according to the UN travel agency through WMO) o 2000€ per travel per participant for intercontinental travels (within Europe or Africa)
  - 2500€ per travel per participant for transcontinental travels (from Europe to Africa and vice versa)
- For each meeting and workshop, number of people travelling per institution type
  - 3 persons from the coordinating institution, WMO, which leads 2 work packages
  - 2 persons from workpackage and cases study leading institutions
  - 1 person from the PMO
  - 1 person from the other partners

#### **Additional other direct costs:**

- Communication material, printing: 5k€ (LGI)
- Dissemination costs (participation in conferences, publication costs): 33k€ (SSSA, IIAM)
- Consumables, field studies and survey additional travel costs (WP5, WP6): 117k€ (LGI, BSC, PLAN, IIAM)
- Equipment (IT, computer & software upgrade, depreciation costs): 4k€ (MNREM)

- Audit cost estimated at 3k€ for those institutions that will require a CFS (direct costs exceeding 325k€): WMO, BSC, MO, WEMC, LGI, Amigo.

In addition, SSSA (partner n°16) will offer in-kind a four-year scholarship for a PhD student to work on the agronomic and climatic aspects of the case study in Mozambique

For several partners, the sum of the costs for ‘travel’, ‘equipment’ and ‘goods and services’ exceeds 15% of the personnel costs. For 6 partners (WMO, ACMAD, SSSA, PLAN, NMREM , IIAM) the explanation of their costs is as follows:

| 1.WMO and linked third parties           | Cost (€)         | Justification   |
|--|------------------|---|
| <b>Travel WMO</b>                        | 387 000€         | 3 persons attending 6 workshops in Africa (2500€ per travel);<br>Provisions for 5 Advisory Board Members and 20 Stakeholder members to be invited to attend the 6 workshops in Africa (2200€ per travel)<br>3 persons at WMO attending the KoM and Final Meeting in Europe (2000€ per travel) |
| <i>Travel MRNEM (linked third party)</i> | 17 000€          | 1 person attending 6 workshops in Africa (2000€ each)<br>1 person attending the KoM and Final Meeting in Europe (2500€ each)  |
| <i>Equipment MRNEM</i>                   | 4 000€           | Hardware and software upgrade in support of climate data management for climate output verifications (following the H2020 and internal depreciation rules)  |
| <b>Other goods and services</b>          | 3 000€           | Audit cost  |
| <b>Total</b>                             | <b>411 000 €</b> |   |

| 6. ACMAD                        | Cost (€)       | Justification   |
|---------------------------------|----------------|---|
| <b>Travel</b>                   | 29 500€        | 1 person attending 6 stakeholder workshops in Africa (2000€ per travel) - 6 x 2000 = 12000<br>1 person attending the Final Meeting in Europe (2500€ per travel) – 1 x 2500 = 2500<br>5 people travelling on missions to support the synergies with SADC and CLIMSA (2000€ per travel) - 5 people x 2000 = 10000<br>2 people attending internal review meeting at WMO (2500€ per travel) - 2 x 2500 = 5000 |
| <b>Other goods and services</b> | 4 500€         | Audit cost: 4500€   |
| <b>Total</b>                    | <b>34 000€</b> |   |

| 8. LGI                          | Cost (€)  | Justification   |
|---------------------------------|-----------|---|
| <b>Travel</b>                   | 73 000 €  | 3 persons attending 6 workshops in Africa (2500€ per travel);<br>2 trips of 2 people to Tanzania/Malawi for the ex-ante and ex-post analysis:<br>2*2*(2500+1500)<br>3 persons attending the KoM and Final Meeting in Europe (2000€ per travel)  |
| <b>Travel costs for experts</b> | 104 000 € | Travel costs for experts to attend workshops stakeholder meeting and costs for organisation of conference with projects funded under the same call (Down2Earth and CONFER) 76 000<br>Travel costs will go to cover African experts’ travel costs in meetings 20 500<br>Audit cost 3000<br>Costs for communication and dissemination materials: 5000 |

|              |                 |  |
|--------------|-----------------|--|
| <b>Total</b> | <b>177 500€</b> |  |
|--------------|-----------------|--|

| 13. SSSA                        | Cost (€)        | Justification  |
|---------------------------------|-----------------|--|
| <b>Travel</b>                   | 48 000€         | 2 persons attending 6 workshops in Africa (2500€ each)<br>2 persons attending the KoM and Final Meeting in Europe (2000€ each)<br>1 person attending 4 conferences (two agronomic and two climate) that will require intercontinental flights (2500€ each)   |
| <b>Other goods and services</b> | 8 000€          | Two publications in open access journals, including high impact ones (eg Nature Plants). It is estimated 4K per publication  |
| <b>Other goods and services</b> | 45 000€         | Genotyping 250 accessions of rice ( <i>Oryza sativa</i> ) and 250 accessions of cowpea ( <i>Vigna unguiculata</i> ) in order to match climate data developed in WP2 and WP4. These accessions will be sourced from the IIAM genebank.. DNA extraction will be conducted in Mozambique using a commercial kit such as the GenElute™ Plant Genomic DNA Miniprep Kit. Consumables for DNA extraction include vials, pipette and pipette tips, EtOH, plasticware. These materials should be secured in excess in case something goes wrong during the DNA extraction. The cost is estimated in 10 EUR per sample, totalling 5,000 EUR. The cost of sequencing is projected at 80 EUR per sample, including library preparation and quality and quantity check for input DNA. The genotyping cost is therefore quantified in 40,000 EUR.. |
| <b>Total</b>                    | <b>101 000€</b> |  |

| 14. PLAN                        | Cost (€)       | Justification  |
|---------------------------------|----------------|--|
| <b>Travel</b>                   | 19 000€        | 1 person attending 6 workshop in Africa (2500€ each)<br>1 person attending the KoM and Final Meeting in Europe (2000€ each)  |
| <b>Travel</b>                   | 4 394€         | Field activities to be conducted in Mozambique, Nampula smallholder farmer communities. The community baseline activities will be conducted through Focus Group Discussions (FGDGs) and surveys. The cost includes: field trips for 3 people x 8 days per month = 24 days in total, including material, fuel for vehicle, <i>per diem</i> and accommodation. The cost is estimated in 183,08 EUR per day, totalling 4,394 EUR.   |
| <b>Travel</b>                   | 4 437€         | Monitoring activities required to measure the functionality of prototypes in their operational environment (i.e. smallholder farmers' fields who have received them) as developed in WP5. This activity entails recurrent visits to farmer households. The cost includes 21 trips from Nampula Office (12 trips in the 2° year and 9 in the 3° year) for 2 people for 2 days (per motorcycle) including fuel, accommodation and per diem. The cost is estimated in 211,3 EUR per day, totalling 4,437 EUR. |
| <b>Other goods and services</b> | 8 169 €        | 4 innovation workshops will be organized from the second year of the project onwards targeting the local farmers. The workshops objective is to showcase and field test the project's innovations, namely the weather forecast tool and the climate-ready varieties. The cost includes: 1-day x 45 people for 4 workshops, including venue, lunch and refreshment, facilitator, and materials. The cost is estimated in 2,042 EUR per workshop, totaling 8,169 EUR.  |
| <b>Total</b>                    | <b>36 000€</b> |  |


| 15. IIAM      | Cost (€) | Justification  |
|---------------|----------|--|
| <b>Travel</b> | 23 000€  | 1 person attending 6 workshops in Africa (2000€ each)<br>1 person attending KoM and Final Meeting in Europe (2500€ each)<br>1 person attending 2 to 4 conferences (agronomic and climate) that will require intercontinental flights (6000€) |

|                                 |                |  |
|---------------------------------|----------------|--|
| <b>Other goods and services</b> | 37 150€        | <p>Field work will be performed by IIAM in two location in the Nampula area. The prototype test will be conducted with the same smallholder farmers contributing to the project via WP2, by performing a participatory variety selection. In characterization fields, the 500 accessions will be grown in replica for a total of 1000 small plots per field, with planned measured of 0.5m x 1.5m. The field costs are calculated as follows. Land occupation, tilling, and field operations including weeding and irrigation when needed are estimated in 6,72 EUR per plot (500 in the amplification field and 1000 in each of two characterizations fields), for a total of 16,800 EUR. This figure includes fuel for daily transportation at field sites location and operation of field machines. The cost of casual labours in Mozambique is estimated in 350 EUR per cropping season per person. 5 persons are needed for each season, for a total of 5,250 EUR. For each field, it is estimated a cost of 2,500 EUR (total of 7,500 EUR) to acquire field supplies including paper bags for sowing and harvesting, sickles and picks, and safety supplies for field work. For each of the three experimental fields we plan to employ nitrogen and phosphorus as fertilizers to secure crops' growth, for an estimated cost of 1,200 EUR per field (total of 3,600 EUR). Finally, 4,000 EUR are requested to cover for costs linked to monitoring travels from the IIAM headquarters in Maputo to the Nampula area (about 2,000 Km to the North). This estimate derives from the cost of four flights (estimated 500 EUR each) and 20 days of residence of Maputo staff in the Nampula area (with a daily allowance of 100 EUR).</p> |
| <b>Total</b>                    | <b>60 150€</b> |  |



## 4 Members of the consortium

### 4.1 Participants

|   |   |                     |                    |  |
|---|---|---------------------|--------------------|--|
| 1   | <b>Organisation<br/>Météorologique<br/>Mondiale</b> | <b>OMM-<br/>WMO</b> | <b>Switzerland</b> | <br><b>WORLD<br/>METEOROLOGICAL<br/>ORGANIZATION</b> |
| Brief description   |   |                     |                    |  |
| <p>WMO is a specialized agency of the United Nations (UN) with 193 Member States and Territories. It is the UN system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the land and oceans, the weather and climate it produces and the resulting distribution of water resources. WMO provides world leadership and expertise in international cooperation in the delivery and use of highquality, authoritative weather, climate, hydrological and related environmental services by its Members, for the improvement of the well-being of societies of all nations.</p> <p>Through its Technical Commission, Programmes and Regional Offices as well as by synergistic partnerships, WMO facilitates the maintenance and expansion of its Members' atmospheric, oceanographic and land-based observational networks; the free unrestricted exchange of the resulting data and information; and related capacity development and research in order to optimize the production of weather, climate and water-related services worldwide. Current WMO programmes relevant to this project are:</p> <ul style="list-style-type: none"> <li>• Agricultural Meteorology - Assisting National Meteorological and Hydrological Services in providing weather and climate services to farmers, herders and fishermen in order to promote sustainable agricultural development, increase productivity and contribute to food security</li> <li>• Capacity Development - Assisting in the capacity development of National Meteorological and Hydrological Services (NMHSs) by improving human, technical and institutional capacities and infrastructure, particularly in developing, least developed and small island developing states and territories in order to enable them to deliver weather, climate and water-related services</li> <li>• World Climate Programme – Improving the understanding of the climate system for the benefit of societies coping with climate variability and change</li> <li>• World Climate Services Programme – Improving the availability of, and access to, reliable climate data, monitoring and forecasts</li> </ul> <p>WMO is co-sponsoring the following programmes that are relevant to this project:</p> <ul style="list-style-type: none"> <li>• Global Climate Observing System (GCOS) - contributing to solving challenges in climate research and also underpin climate services and adaptation measures.</li> <li>• Integrated Drought Management Programme (IDMP) - Building drought resilience to reduce poverty</li> <li>• World Climate Research Programme (WCRP) – coordinating and guiding international climate research to develop, share and apply the climate knowledge that contributes to societal well-being</li> </ul> <p>WMO is leading the Global Framework for Climate Services (GFCS) implementation and is the founder of the Intergovernmental Panel on Climate Change (IPCC). Both GFCS and IPCC secretariats are part of WMO structure.</p> <p><b><u>Foreseen exploitation strategy in FOCUS Africa</u></b></p> <p>Improve the WMO <b>service</b> framework that supports the operationalisation of climate services thus to sustain the demonstrated value chains and promote knowledge transfer. The elements of the operational climate services delivery are: Global data processing and Forecasting System (including C3S), Regional climate centres RCCs, National Meteorological and Hydrological Services, Regional Training Centers RTCs, Regional Climate Outlook For a, Climate Services Toolkit and National Frameworks for Climate Services.</p> <p>Improve the WMO existing Training material</p> <p>Targeted beneficiaries: Policy-makers, Research communities, Industry, innovators</p> <p>Website address: <a href="https://public.wmo.int/en">https://public.wmo.int/en</a></p> |   |                     |                    |  |

### Role in project

Project Coordinator, Leader of WP1 “ Stakeholders Engagement, communication and dissemination” and WP8 “Project Coordination and Management”

### Key staff


| Name             | Gender   | Short CV  |
|------------------|--|---|
| Maxx Dilley      | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Director of Climate Prediction and Adaptation Branch, of the Climate and Water Department. He is in charge of coordinating climate activities overall within the WMO. Previous to join WMO, he was research scientist at the International Research Institute for Climate and Society (IRI) |
| Roberta Boscolo  | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Science Officer for Climate and Energy, in charge of the implementation of Climate Services for Energy as contribution to the GFCS. Before joining WMO, she was scientific officer in WCRP secretariat  |
| Filipe Lucio     | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Director of the GFCS Office. Previous to join WMO he was Director of the National Institute of Meteorology of Mozambique  |
| Wilfran Okia     | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Head of the World Climate Application and Services Division. Previous to join WMO, he was the Head of Science at the Technical Support Unit of IPCC WG 1  |
| Mark Majodina    | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | WMO Representative for Eastern and Southern Africa based in Nairobi, Kenya. Before joining WMO, he was senior manager of international relations at SAWS  |
| Robert Stefanski | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Head of the Agricultural Meteorology Division and of the Technical Support Unit of the IDMP   |
| Michel Rixen     | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Senior Scientist at the WCRP in charge of overall coordination of climate observations, data and modelling related initiatives. He is in charge of coordination of CMIPs and CORDEX   |
| Ilaria Gallo     | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Associate Scientific Officer leading the design of capacity building activities for integration of climate information in the National Adaptation Plans (NAPs)  |
| Dominique Berod  | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Head of Basic Systems in Hydrology Division. He is responsible for coordinating WMO’s water-related data and information systems activities.  |
| Clare Nullis     | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Media Officer   |

### Publications

- WMO Statement on the state of the Global Climate (annual publication)
- Energy Exemplar to the User Interface Platform of the GFCS
- The Global Climate in 2011-2015
- El Nino/Southern Oscillations
- Guide to Climatological Practices

### References

1. GFCS Adaptation Programme in Africa (GFCS APA) ([https://gfcs.wmo.int/GFCS\\_APA\\_II](https://gfcs.wmo.int/GFCS_APA_II))
2. Agricultural Climate Resilience Enhancement Initiative (ACREI) (<http://www.wmo.int/pages/prog/wcp/agm/meetings/mg2017/documents/ACREIbrochure.pdf>)
3. Climate Risk and Early Warning Systems (CREWS) <https://www.crews-initiative.org/en>
4. Intra-ACP Climate Services project (<http://intra-acp-map.acp.int/projects/418/>)
5. Sustainable CIS ([https://gfcs.wmo.int/Sustainable\\_CIS](https://gfcs.wmo.int/Sustainable_CIS))

|  |  |     |       |   |
|--|--|-----|-------|---|
| 2  | <b>Barcelona Supercomputing Center-Centro nacional de Supercomputación</b> | BSC | Spain |  |
| Brief description  |  |     |       |   |
| <p>The Barcelona Supercomputing Center-Centro Nacional de Supercomputación (BSC, <a href="https://www.bsc.es">https://www.bsc.es</a>) combines unique high performance computing facilities and in-house top research departments on Computer, Engineering, Life, and Earth sciences. It is the main provider of public supercomputing services in Spain, coordinating the Red Española de Supercomputación and representing Spain in international initiatives such as PRACE (<a href="http://www.prace-ri.eu/">http://www.prace-ri.eu/</a>). The Earth Sciences (ES) Department focuses on developing and implementing global and regional models and data solutions for air quality and climate forecasting and their applications. The ES Department is structured around four groups with more than 90 researchers and support staff. It is a highly productive scientific entity that has published more than 160 research peer-reviewed articles over the last 5 years, many in high-impact journals.</p> <p>Within the ES Department, the Earth System Services group (ESS) aims at demonstrating the ongoing value of climate prediction services, atmospheric composition and weather forecasting to society and the economy. The group actively works in identifying user needs that will partly guide research in the ES Department and aims to quantify the impact of weather, climate, aerosols and gaseous pollutants upon socioeconomic sectors through the development of user-oriented services that ensure the transfer of the technology developed and the adaptation to a rapidly changing environment, especially of those highly vulnerable. This group is coordinating the H2020 project S2S4E-776787 “Subseasonal to seasonal climate predictions for energy” and has a key role in other European and national projects on climate services such as ClimatEurope-689029, MEDGOLD-776467, VISCA-730253 and EUCP-776613. The ESS has an interdisciplinary approach, closely collaborating with research groups and general support groups at BSC (technology transfer, communications, visualisation, education and outreach). The Computer Applications in Science and Engineering department (BSC-CASE) is devoted to finding new computational strategies to simulate and solve complex problems in industry and academia. Within BSC-CASE, the Scientific visualisation group has ample experience in designing and implementing data-heavy user interfaces in the projects PELE-GUI, S2S4E (ongoing), CYBELE (ongoing), and projects for private companies in the energy and utilities sectors. The team also has strong experience in science dissemination and communication to general and specialized audiences with interactive data visualisations.</p> <p>This BSC’s interdisciplinary expertise will be used for technical – such as climate tools, methods, and services development –, as well as stakeholder-oriented aspects of FOCUS Africa, including stakeholder engagement, communication, visualization, and value assessment.</p> <p><b><u>Foreseen exploitation strategy in FOCUS Africa</u></b><br/> Conduct <b>further research</b> to improve climate change adaptation and resilience.<br/> Targeted beneficiaries: Policy-makers, Research communities, Industry, innovators</p> <p>Website address: <a href="http://www.bsc.es">www.bsc.es</a></p> |  |     |       |   |
| Role in project  |  |     |       |   |
| Leader of WP4 “Development of methods and tools”. Leader of two case studies for food security in Malawi and Tanzania.   |  |     |       |   |

| Key staff |        |          |
|-----------|--------|----------|
| Name      | Gender | Short CV |

|                          |  |   |
|--------------------------|--|---|
| Isadora Christel Jiménez | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Dr. Jiménez holds a PhD and a Master’s degree in science communication. She has seven years of research background followed by more than eight years of experience in the field of science communication. She has demonstrated effective applied practice, facilitating user engagement and tailoring climate information to the needs of relevant sectors of society. She has management experience as Work Package leader in EU-funded projects such as EUPORIAS, APPLICATE, PRIMAVERA and currently in CCiCC, she is communication manager of a COST action (inDust), and she is part of the coordination team of the S2S4E project. She leads the Knowledge Transfer team of the Earth System Services Group (ESS). The team is formed by three science communication experts, two social scientists, a research engineer specialised in user engagement, a User eXperience designer and a front-end developer. |
| Dragana Bojovic          | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Dragana has 15 years of experience in working on <b>decision support for global environmental change</b> . She has been collaborating with scientists, policy-makers and communities from different parts of the world, supporting knowledge transfer to enhance resilience to climate and other socio-ecological changes. Since 2016, Dragana has been working as a social scientist involved in <b>climate services coproduction</b> at BSC’s Earth Sciences Department. She holds a PhD in Science and Management of Climate Change (Ca’Foscari University of Venice) and a MSc in Environmental Change and Management (Oxford University).  |
| Ilaria Vigo              | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Ilaria is environmental economist at the Earth Sciences Department. She is responsible of the economic evaluation of climate services for different sectors: energy, agriculture and finance. Ilaria also works in policy assessments. She gained experience in the field during her previous job as policy adviser for a consultancy company based in Brussels. She holds a MSc in Economics, specialized in public policy (Barcelona Graduate School of Economics). She graduated in Economics (the University of Pavia). Ilaria is fluent in English, Italian and Spanish. She is intermediate Portuguese speaker.   |
| Raül Marcos              | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Raül has 7 years of experience in working on the study of <b>seasonal forecasting and its applications</b> in a range of fields: renewable energy, forest fires, water resources and agriculture. He also has experience in the development of climate services in these areas. He holds a PhD in Physics (University of Barcelona) and a MSc in Meteorology (University of Barcelona).   |

|                         |  |   |
|-------------------------|--|---|
| Marta Terrado           | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Marta has an experience of more than 10 years in <b>agriculture, water management and ecosystem services</b> research. She is Science Communication Specialist at BSC's Earth Science Department, supporting activities on communication, dissemination and user engagement. Working in the co-production of climate services, Marta facilitates <b>knowledge transfer for climate change adaptation at the science-stakeholders interface</b> . She has a PhD in Earth Sciences (University of Barcelona) and  |
|                         |  | a Master's degree in Geographical Information Systems (Polytechnic University of Catalonia).  |
| Nube González-Reviriego | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Dr. Gonzalez-Reviriego holds a PhD in Research and Development of Geotechnologies by USAL. She has six years of experience in the field of climate services where she has focused in the development of services for the energy sector and has carried out applied research to understand the forecast quality and the predictability sources of the most comprehensive set of sub-seasonal and seasonal probabilistic predictions of wind speed and temperature. She has contributed to various national and European projects as RESILIENCE, EUPORIAS or currently MED-GOLD and S2S4E among others. |

#### Publications

- Terrado, M., Lledó, L., Bojovic, D, St Clair, A.L., Soret, A., Doblas-Reyes, F.J. Manzanas, R., San-Martín, D. and Christel, I. (2019) The Weather Roulette: a game to communicate the usefulness of probabilistic climate predictions. Bulletin of the American Meteorological Society, forthcoming.
- Bojovic, D. & Giupponi, C. (2019). Understanding the dissemination and adoption of innovations through social network analysis: geospatial solutions for disaster management in Nepal and Kenya. Journal of Environmental Planning and Management. <https://doi.org/10.1080/09640568.2019.1614435>
- Marcos R.; Llasat M.C.; Quintana-Seguí P.; Turco M. (2018) Use of bias correction techniques to improve seasonal forecasts for reservoirs — A case-study in northwestern Mediterranean. Science of The Total Environment, 610, pp.64–74. DOI: <https://doi.org/10.1016/j.scitotenv.2017.08.010>
- Marcos R.; González-Riviriego N.; Torralba V.; Soret A.; Doblas-Reyes F.J. (2018) Characterization of the near surface wind speed distribution at global scale: ERA- Interim reanalysis and ECMWF seasonal forecasting System 4. Climate Dynamics, 52 (5-6), 3307. DOI: <https://doi.org/10.1007/s00382-018-43385>
- Marcos R.; Llasat M.C.; Quintana-Seguí P.; Turco M. (2017) Seasonal predictability of water resources in a Mediterranean freshwater reservoir and assessment of its utility for end-users. Science of The Total Environment, 575, pp.681–691. DOI: <https://doi.org/10.1016/j.scitotenv.2016.09.080>


#### References

- H2020 project S2S4E-776787: it will offer an innovative service to improve RE variability management by developing new research methods exploring the frontiers of weather conditions for future weeks and months. The main output of S2S4E will be a user co-designed Decision Support Tool (DST) that for the first time integrates sub-seasonal to seasonal (S2S) climate predictions with RE production and electricity demand.
- H2020 project PRIMAVERA-641727: The goal of PRIMAVERA is to deliver novel, advanced and well-evaluated high-resolution global climate models (GCMs), capable of simulating and predicting regional climate with unprecedented fidelity, out to 2050.
- H2020 project MED-GOLD-776467: this project will demonstrate the proof-of-concept for climate services in the agriculture sector by developing case studies for three hallmarks of the Mediterranean food system: grapes, olives and durum wheat.
- H2020 project VISCA- 730253: the main objective of VISCA is making South-European wine industries resilient to climate changes, while minimizing costs and risks through an improvement of the production management (quality and quantity of final product). This objective will be achieved with the integration of climatic data, phenological , irrigation models, and end-users' requirements into a Decision Support System (DSS) co-designed with wine producers from Spain, Italy and Portugal.
- H2020 project EUCP-77661: The overarching objective of the European Climate Prediction (EUCP) system is to develop an innovative European regional ensemble climate prediction system based on a new generation of improved and typically higher-resolution climate models, covering timescales from seasons to decades initialised with observations, and designed to support practical and strategic climate adaptation and mitigation decision-taking on local, national and global scales.

**Significant infrastructure and/or any major items of technical equipment**

BSC-CNS is the National Supercomputing Facility of Spain and hosts a range of HPC systems including MareNostrum IV the new supercomputer, will be 12.4 times more powerful than the current MareNostrum 3 that will have a performance capacity of 13, 7 Petaflop/s. The general purpose element will have 48 racks with more than 3,400 nodes with next generation Intel Xeon processors and a central memory of 390 Terabytes. The second element of MareNostrum 4 will be formed of clusters of three different technologies that will be added and updated as they become available. These are technologies currently being developed in the US and Japan to accelerate the arrival of the new generation of pre-exascale supercomputers.

The BSC-CNS is a key element of and coordinates the Spanish Supercomputing Network, which is the main framework for granting competitive HPC time to Spanish research institutions. Furthermore, BSC-CNS is one of six hosting nodes in France, Germany, Italy and Spain that form the core of the PRACE network. PRACE provides competitive computing time on world-class supercomputers to researchers in the 25 European member countries.

|                   |            |            |    |   |
|-------------------|------------|------------|----|---|
| 3                 | Met Office | Met Office | UK |  |
| Brief description |            |            |    |   |

The Met Office, founded in 1854, is the National Meteorological Service (NMS) for the United Kingdom. It employs around 1,800 staff including meteorologists, hydrologists, oceanographers, climate scientists, IT and support staff. A world renowned centre of excellence for research and operational services in meteorology, oceanography, forecasting and climate prediction, the Met Office supports a large number of customers globally, including governments, civil aviation, defence, commerce and industry. The Met Office is a Trading Fund within the UK Government's Department for Business, Energy and Industrial Strategy (BEIS) and this status engenders a business approach in addition to the R&D activities, resulting in successful products and service delivery. There are over 500 people actively involved in strong research and development programmes in the areas of ocean and atmospheric modelling, observational research, data assimilation and reanalysis, ensemble forecasting and forecast verification on all timescales from days to centuries, as well as climate impacts and consultancy services. This global reputation in these areas requires an infrastructure that not only includes a high performance computing environment, but also the processes and the people and software to manage those processes.

As a science-led organisation our success in weather forecasting and climate prediction depends, critically, on having a world-class research programme. Seamless modelling, whereby a single model family can be used for prediction across a range of timescale (from weather forecasting to climate change), has been at the heart of the Met Office strategy for weather and climate prediction. The Met Office Unified Model (UM) is a numerical model of the atmosphere used for both weather and climate applications. The UM is in continuous development by the Met Office and its partners, adding state of the art understanding of atmospheric processes to new releases. The UM applies a "seamless" modelling approach, which means that the same dynamical core and, where possible, the same parameterization schemes are used across a broad range of spatial and temporal scales on a traceable frame work. The model is suitable for numerical weather prediction (NWP), seasonal forecasting and climate modelling with forecast times ranging from a few days to hundreds of years. Furthermore, the UM can be used both as a global and a regional model.

**Foreseen exploitation strategy in FOCUS Africa**

- Improve **understanding** of climate processes in the region, to publish scientific papers and optimise climate services
- Apply new scientific results to optimise and develop renewable energy operations
- Apply new methodologies to design adequately large infrastructure and amend existing ISO engineering standards
- Develop further **existing relationships** with NMHs in the SADC region to exploit and deliver new climate services
- Apply FOCUS-Africa **new business models** to optimize exploitation strategies and showcase adding value of new climate products
- Provide continuity and extension to past and on-going projects in the region such as WISER, FCFA, ICPAC.
- Targeted beneficiaries: Policy-makers, Research communities, Industry, innovators

Website address: <http://www.metoffice.gov.uk/>

**Role in project**

Leader of WP3 “Understand Climate Processes”. Leader of two case studies in Tanzania on renewable energy and infrastructure

**Key staff**

| Key staff                        |  |  |
|----------------------------------|--|--|
| Name                             | Gender   | Short CV   |
| Nicolas Fournier Science Manager | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Nicolas is a climate scientist by background. His main expertise is on climate change adaptation working with industry or governments, especially in the energy sector. At the Met Office, he leads the Copernicus Clim4energy, H2020 SEDNA and WISER ASPIRE projects. He was based in Ghana from September 2018 to June 2019. |

|   |  |   |
|---|--|---|
| Kathrin Hall<br>Capacity Development Programme<br>Manager | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Kathrin is a Capacity Development Programmes Manager, leading a team of International Development Managers to deliver projects to improve national capacity to provide user driven weather and climate services. She has recently been involved in a number of projects across Eastern and Southern Africa. |
| Galia Guentchev Senior<br>Scientist                       | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Galia is a climate scientist. Her main expertise includes regional climate variability and change; downscaling climate information; relationships between atmospheric circulation and extreme events. She has recently been involved in the Clim4energy and C3S energy projects.                            |
| Justin Krijnen Scientist                                  | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Justin is a climate scientist and expert in seasonal and demand forecasting for the water and energy sectors. He has been recently involved in the EU projects: EUPORIAS and Clim4energy.   |
| Laura Dawkins<br>Senior Scientist                         | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Laura is an applied statistician who develops advanced statistical models to solve weather and climate related issues in the Energy and Infrastructure sectors.   |

### Publications

- Fournier et al (2018) A Case Study to Demonstrate the Development of Climate Services to Tackle the Challenges of Climate Variability and Long-term Changes. Modern Environmental Science and Engineering, 1, 1-12
- Kendon et al. (2019) Enhanced future changes in wet and dry extremes over Africa at convection-permitting scale, Nature Communications, 10, 1794.
- Stratton et al. (2018) A Pan-African Convection-Permitting Regional Climate Simulation with the Met Office Unified Model: CP4-Africa. J. Climate, 31, 3485–3508
- Roberts, M. J. et al. (2019) Description of the resolution hierarchy of the global coupled HadGEM3GC3.1 model as used in CMIP6 HighResMIP experiments, Geosci. Model Dev. Discuss.
- Dawkins and Stephenson (2018) Quantification of extremal dependence in spatial natural hazard footprints: independence of windstorm gust speeds and its impact on aggregate losses, Natural Hazards and Earth System Sciences, 18, 11.

### References

- H2020 SECLI-FIRM: an on-going project aiming to demonstrate how the use of improved climate forecasts, out to several months ahead, can add practical and economic value to decision-making processes and outcomes in both the energy and water sectors. Meteorological variables have a significant impact upon many segments of industry, including the power price through renewable productions (solar, wind and hydro) and power demand, and on gas demand.
- Copernicus Clim4energy: An EU coordinated project that has brought together complementary expertise of 7 climate research and service centres and 10 energy practitioners to demonstrate, from case studies, the value chain from ECVs to actionable information in the energy sector. It will deliver 9 energy-relevant pan-European indicators of climate trends and variability with a cross-sectoral consistency, appropriate documentation and guidance, estimation of uncertainties, and a demonstration of use
- FCFA IMPALA: The IMPALA project developed, for the first time, a pan-African very high resolution model of 4km to better capture key processes and local-scale weather phenomena including extremes, providing new understanding of the roles played by these processes in African climate variability and change. The improved knowledge and new simulations will be used by scientists in four regional research projects (AMMA-2050, FRACTAL, HyCRISTAL and UMFULA).



- H2020 PRIMAVERA: an EU project coordinated by the Met Office to look at process-based assessment of high resolution modelling and European climate. As part of the project improved process-representation and focussed metrics for ocean models will be developed
- H2020 ECEM: An EU coordinated project that developed an online demonstrator to assess how well different energy supply mixes in Europe will meet demand, over different time horizons (from seasonal to long-term decadal planning), focusing on the role climate has on the mixes.
- AFRICAP: Met Office have been working with UK partners and organisations and governments in Malawi, South Africa, and Tanzania to ensure climate research is linked to local needs, with a particular focus on the Agriculture sector. We are creating an evidence base to underpin new country-specific policies in agriculture and food production. The aim is to support climate-smart, sustainable agricultural development.
- Climate Adaptation to Risks and for Opportunities (CAROT): The Met Office has developed the capacity of the Tanzania Met Agency (TMA) through the DFID Tanzania CAROT project. As a priority sector for Tanzania, the project focused on developing enhanced seasonal forecasts for the Agriculture sector. Met Office provided capacity development and mentoring to the TMA. The project successfully co-developed a more user friendly seasonal forecast service and related distribution processes, with a focus on the agriculture sector.

|  |   |             |           |  |
|--|---|-------------|-----------|--|
| 4  | <b>World Energy &amp; Meteorology Council</b> | <b>WEMC</b> | <b>UK</b> |  |
| Brief description  |   |             |           |  |
| <p>The World Energy &amp; Meteorology Council (WEMC) is a company limited by guarantee, headquartered at the University of East Anglia (UEA) and incorporated in November 2015. As a boundary organisation, WEMC’s mission is to promote sustainable energy for a low-carbon economy, enhance resilience of energy infrastructure and improve efficiency of energy systems. To achieve this, WEMC is acting as a crucial link and broker between the research community and the energy sector, facilitating the two-way sharing of information and data and promoting the development and adoption of state-of-the-art meteorological services. WEMC organises the series of International Conferences Energy &amp; Meteorology (six so far, with the latest in Denmark in June 2019), numerous very well received stakeholder workshops and training events. WEMC leads and contributes to several projects, including Copernicus Climate Change Service (C3S) and EU H2020, in collaboration with organisations such as Met Office, EDF, ENEL, Météo-France, CEA. WEMC is also growing a consistent membership with members from both the meteorological community and the energy sector. One of the main activities offered to members is the participation in Special Interest Groups (SIGs).</p> <p><b>Foreseen exploitation strategy in FOCUS Africa</b></p> <ul style="list-style-type: none"> <li>• Exploit the <b>climate service</b> prototypes developed as part of the FOCUS-Africa case studies, possibly as an extension to the C3S ECEM demonstrator.</li> <li>• Exploit the additional expertise developed during FOCUS-Africa with innovative <b>stakeholder engagement</b> approaches, and refined branding and design, for the climate service community. <u>Targeted beneficiaries:</u> Policy-makers, Industry, innovators, Research communities</li> </ul> <p>Website address: <a href="http://www.wemcouncil.org">http://www.wemcouncil.org</a></p> |   |             |           |  |
| Role in project  |   |             |           |  |
| Leader of WP5 ‘Develop end-user tailored climate services prototypes’. Leader of case study in <b>Malawi</b> on hydropower and water management  |   |             |           |  |
| Key staff  |   |             |           |  |
| Name   | Gender  | Short CV    |           |  |


|                  |  |   |
|------------------|--|---|
| Alberto Troccoli | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Prof. Alberto Troccoli has over 20 years of experience in several aspects of meteorology and climate and their application to the energy sector. He has worked at several leading institutions such as NASA, ECMWF (UK), the University of Reading (UK) and CSIRO (Australia). Alberto is the editor of four books, including ‘Weather Matters for Energy’, and convener of the International Conferences Energy & Meteorology. Alberto holds a PhD in Physical Oceanography from the University of Edinburgh (UK). |
| Luke Sanger      | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Luke holds an MSc (first class honours) in Computer Science, where he specialised in data development and sentiment analysis. Luke applies his development experience to integrate climate data and energy data in maintaining and developing public-facing tools, such as the ECEM demonstrator.   |
| Janice Ogonji    | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | With a Bachelor of Laws (LLB) and an MA in International Development, Janice has over 10 years’ experience in human rights research. Janice assists with the management of several projects that WEMC is involved in, particularly the C3S Energy, including stakeholder engagement.  |
| Elena Bertocco   | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Elena studied and worked in the fashion design industry in Italy for over 10 years before graduating in History of Art and Architecture (University of Reading, UK). Elena has been successfully designing ICEM and WEMC branding items since 2008. She uses text, images and graphics to craft messages and create effective branding.   |

### Publications

- Troccoli A, Goodess C, Jones P, Penny L, Dorling S, Harpham C, Dubus L, Parey S, Claudel S, Khong D-H, Bett PE, Thornton H, Ranchin T, Wald L, Saint-Drenan Y-M, De Felice M, Brayshaw D, Suckling E, Percy B and Blower J (2018) Creating a proof-of-concept climate service to assess future renewable energy mixes in Europe: An overview of the C3S ECEM project. *Adv. Sci. Res.*, 15, 191–205, doi.org/10.5194/asr-15-191-2018
- [Book] Troccoli A, ed (2018) *Weather and Climate Services for the Energy Industry*. Palgrave Macmillan, 197 pp. <https://doi.org/10.1007/978-3-319-68418-5>
- [Book] Troccoli A, Dubus L and Haupt SE, eds (2014) *Weather Matters for Energy*. Springer Academic Publisher, 528 pp.
- [Book] Troccoli A, ed (2010) *Management of Weather and Climate Risk in the Energy Industry*. NATO Science Series, Springer Academic Publisher, 344 pp.
- [Book] Troccoli A, Harrison M, Anderson DLT and Mason SJ, eds (2008) *Seasonal Climate: Forecasting and Managing Risk*. NATO Science Series, Springer Academic Publishers, 467 pp.

### References

- C3S Energy – Operational (2018-2020) <https://climate.copernicus.eu/energy>
- H2020 SECLI-FIRM (2018-2021) [www.secli-firm.eu](http://www.secli-firm.eu)
- C3S Climate & Energy Educational Demo (2019-2020) <http://www.wemcouncil.org/wp/projects/c3s>  
<http://www.wemcouncil.org/wp/projects/c3s-climate-and-energy-education-demonstrator/climate-and-energy-education-demonstrator/>
- C3S Energy – ECEM Proof of concept (2015-2018) [ecem.climate.copernicus.eu](http://ecem.climate.copernicus.eu)

|   |                       |     |        |   |
|---|-----------------------|-----|--------|---|
| 5 | Electricité De France | EDF | France |  |
|---|-----------------------|-----|--------|---|

#### Brief description

EDF Group is the world's leading electricity company and it is particularly well established in Europe, especially France, the United Kingdom, Italy and Belgium. Its business covers all electricity-related activities, from generation to distribution and including energy transmission and trading activities to continuously balance supply with demand. A marked increase in the use of renewables is bringing change to its power generation operations, which are underpinned by a diversified low-carbon energy mix founded on nuclear power capacity. With activities across the entire electricity value chain, EDF is reinventing the products and services it offers to help residential customers manage their electricity consumption, to support the energy and financial performance of business customers and to support local authorities in finding sustainable solutions for the cities of the future. As today's increasingly digital world dramatically changes the way we produce and consume, research into electricity generation, transmission and consumption is of decisive importance. To succeed in the energy transition, the 2,000 EDF's R&D division staff (representing 29 nationalities) are currently working on many different projects designed simultaneously to deliver low-carbon power generation, smarter energy transmission grids and more responsible energy consumption.

#### **Foreseen exploitation strategy in FOCUS Africa**

Use **climate products/services** developed during the project to better understand the past climate and energy indicators interannual variability, as well as the effect of climate change. The information will particularly be used to support investment decision making processes of the International Division and foreign local offices. The service will first be used in South Africa and then replicated to other areas of the World. Targeted beneficiaries: Industry, innovators

Website address: <https://www.edf.fr/en/meta-home>

#### Role in project

EDF R&D and EDF Development South Africa Ltd will co-develop and implement case study on renewable energy sector, mainly in **Malawi** (specifically for the Mpatamangariver catchment), with possible extension to Mozambique, Zimbabwe and Lesotho.

#### Key staff


| Name                      | Gender   | Short CV  |
|---------------------------|--|---|
| Laurent Dubus             | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Engineer and PhD in Physical Oceanography. Expert researcher in Energy Meteorology. He has skills and experience in climate system modelling, weather and climate forecasts and power systems management. His activities are dedicated to improving the effective integration of high-quality weather and climate information into energy sector decision making processes. |
| Paul-Antoine Michelangeli | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | PhD in meteorology.<br>Project Manager: EDF's internal Climate Service development  |
| Sylvie Parey              | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Engineer.<br>Senior researcher on climate variability and climate change, climate change impacts and extreme events.  |

## Publications

- Troccoli, A., **L. Dubus** and S.E Haupt (Editors), 2014: Weather Matters for Energy, Springer, 2014, 528p. Doi 10.1007/978-1-4614-9221-4 - **Book**
- **Dubus, L.**, S. Muralidharan & A. Troccoli, 2018: What Does the Energy Industry require from Meteorology ? In “Weather and Climate Services for the Energy Industry”, A. Troccoli Ed., Springer, ISBN 978-3-319-68417-8, DOI 10.1007/978-3-319-68418-5\_4 – **Book Chapter**
- **Dubus, L.**, A. Troccoli, S.E. Haupt, M.S. Boulahya & S. Dorling, 2018 : Lessons Learned Establishing a Dialogue Between the Energy Industry and the Meteorological Community and a Way Forward. In “Weather and Climate Services for the Energy Industry”, A. Troccoli Ed., Springer, ISBN 978-3-319-68417-8, DOI 10.1007/978-3-319-68418-5\_13 – **Book Chapter**
- Soares, M.B., A. Troccoli, **L. Dubus**, S.E. Haupt, M.S. Boulahya & S. Dorling, 2018: Forging a Dialogue Between the Energy Industry and the Meteorological Community. In “Weather and Climate Services for the Energy Industry”, A. Troccoli Ed., Springer, ISBN 978-3-319-68417-8, DOI
- Troccoli, A., P. Audinet, P. Bonelli, M.S. Boulahya, C. Buontempo, P. Coppin, **L. Dubus**, J.A. Dutton, J. Ebinger, D.J. Griggs, S.-E. Gryning, D. Gunasekera, M. Harrison, S.E. Haupt, T. Lee, P.J. Mailier, P.P. Mathieu, R. Schaeffer, M. Schroedter-Homscheidt, R. Zhu, J. Zillman, 2013: Promoting New Links Between Energy and Meteorology. Bulletin of the American Meteorological Society 94(4):36- DOI 10.1175/BAMS-D-12-00061.1

## References

- C3S Energy – ECEM Proof of concept (2015-2018) [ecem.climate.copernicus.eu](http://ecem.climate.copernicus.eu)
- C3S Energy – Operational (2018-2020) <https://climate.copernicus.eu/energy>
- H2020 S2S4E (2017-2020) [www.s2s4e.eu](http://www.s2s4e.eu)
- FP7 EUPORIAS [www.euporias.eu](http://www.euporias.eu)
- FP6 ENSEMBLES

|   |  |              |              |   |
|---|--|--------------|--------------|---|
| <b>6</b>  | <b>African Centre of Meteorological Applications for Development</b> | <b>ACMAD</b> | <b>NIGER</b> |  |
| <b>Brief description</b>  |  |              |              |   |
| <p>ACMAD is the <b>continental weather and climate watch institution</b> for Africa and the <b>African Centre of excellence for meteorological Application for sustainable development</b> (United Economic Commission for Africa’s Conference of Ministers, 1996). ACMAD provides:</p> <ul style="list-style-type: none"> <li>– Regular continental <b>medium to long range weather and climate prediction</b></li> <li>– <b>Continental early warnings on drought, tropical cyclones and other extremes</b></li> <li>– Capacity building on the applications of meteorology for sustainable social and economic development at the national level;</li> <li>– Development of methodologies and techniques for applications at national and sub regional levels;</li> <li>– Stronger participation in global climate and weather watch programmes;</li> <li>-Specialized training to relevant professionals and development practitioners in Africa;</li> <li>– Appropriate research, data, and networking facilities to research programmes in Africa.</li> </ul> <p><b>Foreseen exploitation strategy in FOCUS Africa</b></p> <p>Develop <b>services to train future trainers</b> in NMHS and regional Climate Centers in Africa on the job training and climate services delivery demonstration exercises. Climate services targeting the energy and water sectors will be the focus of training and services developments.</p> <p>Targeted beneficiaries: Policy-makers, Research communities.</p> |  |              |              |   |

Website address: <http://www.acmad.net/new/NEWSITEACMAD/>

#### Role in project

Co- Leader of WP7 “develop capacities”

#### Key staff

| Name                 | Gender  | Short CV  |
|----------------------|---|---|
| Godefroid Nshirimana | M   | Master degree in Climate Change , Bachelor of science in Meteorology, experience in weather simulations using WRF, provider of seasonal forecasts and updates, advisories and watches, organizer of climate fora at regional and national levels, has worked in national and regional projects developing delivering and communication weather and climate information for risk management and building resilience to disasters           |
| Victor Indasi        | M   | PhD in Applied Physics with focus on wind field investigations at Lake Turkana wind farm in Kenya. Experience on regional climate outlooks and climate prediction, application of LIDAR and numerical modeling with WRF and Wind Atlas Analysis and Application Program to assess wind energy potential, impacts of climate change on water and energy, generation of user relevant climate information in the context of southern Africa |
| CHeikh Dione         | M <input type="checkbox"/> X F <input type="checkbox"/> | PhD in Atmospheric physics with a focus on initiation and mechanisms of local deep convection over Sahel during the transition period of the monsoon. Experience on observing field camping and research on nocturnal jets and clouds, Influence of local processes and synoptic circulation on temperature anomalies   |

#### Publications

Seasonal forecasting, chapter 8 of the book on meteorology of tropical west africa: the forecasters’ handbook by douglas j. Parker and mariane diop-kane. Wiley blackwell. Edition published 2017 © 2017 by john wiley & sons ltd;

Kamga, f., a. Et al. : wmo research and development activities in air quality, weather and climate to benefit africa. *Bulletin of wmo, no. 58*, january 2009.

Wwrp/thorpex african science plan, 2008. *Wmo/td no. 4122*.

[http://www.wmo.int/pages/prog/arep/wwrp/new/thorpex\\_new.html](http://www.wmo.int/pages/prog/arep/wwrp/new/thorpex_new.html)

Wwrp/thorpex african implementation plan, 2008. *Wmo/td no.1461*

Wmo technical document: guidelines on communicating forecasts uncertainties, 2008. *Wmo/td no.4122*

Kamga, f. A. And e. Buscarlet. Simulation of the present-day climate of tropical africa using the hadley center regional climate model ( precis). *Journal of the french meteorological society “la meteorologie”*. Feb 2006.


(<http://www.aiaccproject.org/> or [http://precis.metoffice.com/other\\_links.html](http://precis.metoffice.com/other_links.html) or [http://precis.metoffice.com/useful\\_links/publications/paperlameteorologie.pdf](http://precis.metoffice.com/useful_links/publications/paperlameteorologie.pdf)

Kamga f. A. Et al. Evaluating the national center for atmospheric research coupled system model over west africa: present –day and 21<sup>st</sup> century a1 scenario. *Journal of geophysical research*, jan 2005.

[https://www.researchgate.net/publication/259305157\\_Evaluating\\_the\\_National\\_Center\\_for\\_Atmospheric\\_Research\\_Climate\\_System\\_model\\_over\\_West\\_Africa\\_Present](https://www.researchgate.net/publication/259305157_Evaluating_the_National_Center_for_Atmospheric_Research_Climate_System_model_over_West_Africa_Present)  
[https://www.researchgate.net/publication/259305157\\_Evaluating\\_the\\_National\\_Center\\_for\\_Atmospheric\\_Research\\_Climate\\_System\\_model\\_over\\_West\\_Africa\\_Present-day\\_and\\_the\\_21st\\_century\\_A1\\_scenarioday\\_and\\_the\\_21st\\_century\\_A1\\_scenario](https://www.researchgate.net/publication/259305157_Evaluating_the_National_Center_for_Atmospheric_Research_Climate_System_model_over_West_Africa_Present-day_and_the_21st_century_A1_scenarioday_and_the_21st_century_A1_scenario)

## References

- Quantifying the impact of +2C global warming over Europe and vulnerable regions in the world (IMPACT 2C)
- Satellite and Weather Information for Disaster Resilience in Africa (SAWIDRA)
- Monitoring of the Environment for Security in Africa (MESA)
- Climate Services for Increased Resilience in the Sahel
- Africa Adaptation to climate change and food security

|  |   |             |                     |   |
|--|---|-------------|---------------------|---|
| 7  | <b>Council for Scientific and Industrial Research</b> | <b>CSIR</b> | <b>South Africa</b> |  |
| Brief description  |   |             |                     |   |
| <p>The Council for Scientific and Industrial Research, commonly known as the CSIR, is a world-class African research and development organization established through an Act of the South African Parliament in 1945. The CSIR undertakes directed, multidisciplinary research and technological innovation that contributes to the improved quality of life.</p> <p><b><u>Foreseen exploitation strategy in FOCUS Africa</u></b><br/>           The CSIR will <b>refine research</b> into climate change for a specific area and provide support to the Land Bank to inform their strategic management of climate change risks and thus support investment decision making. Targeted beneficiaries: Policy-makers / Industry</p> <p>Website address: <a href="http://www.csir.co.za/">www.csir.co.za/</a></p> |   |             |                     |   |
| Role in project  |   |             |                     |   |
| <p>Leader of WP2 “Assess end-user’s challenges and climate services requirements”. Leader of two case studies:</p> <ul style="list-style-type: none"> <li>• South Africa Food Security</li> <li>• Mauritius Water Security</li> </ul>  |   |             |                     |   |

## Key staff

| Name           | Gender   | Short CV   |
|----------------|--|--|
| Johan Malherbe | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Highest Qualification: PhD (Meteorology) 2014, University of Pretoria, South Africa. Work experience, Since 2000: Agrometeorology, remote sensing, climate variability, climate change. Number of peer-reviewed papers authored / co-authored, on climate change, climate variability and seasonal forecasting: 13.  |
| Asmerom Beraki | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Highest Qualification: PhD (Meteorology), 2016, University of Pretoria, South Africa. Work experience. Work experience, Since 1999: Soil science and meteorology with extensive experience in climate modelling on global and regional scales. A significant contribution to advancing climate prediction research and climate prediction capability in South Africa. . Number of peer-reviewed papers published (authored / co-authored) in climate change, climate variability and seasonal forecasting: 10. |

|                 |  |  |
|-----------------|--|--|
| Lerato Mpheshea | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Highest Qualification: MSc (Ocean and Climate Dynamics), University of Cape Town. Work experience, since 2014: Experience in development of high resolution and large ensemble numerical weather prediction and early warning systems. |
|-----------------|--|--|

### Publications

- **Malherbe J**, Engelbrecht FA and Landman WA. 2013. Projected changes in tropical cyclone climatology and landfall in the Southwest Indian Ocean region under enhanced anthropogenic forcing. *Climate Dynamics* 40:2867-2886.
- **Malherbe J**, Dieppois B, Maluleke M, Van Staden M, Pillay DL. 2016. South African droughts and decadal variability. *Natural Hazards*. 80: 657 – 681. DOI 10.1007/s11069-
- **Beraki AF**, Landman W, DeWitt D and Olivier C, 2016. Global Dynamical Forecasting System Conditioned to Robust Initial and boundary forcings: Seasonal Context, *International Journal of Climatology*, DOI: 10.1002/joc.4643

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- **Beraki AF**, Landman W, DeWitt D, 2015. Comparison on the seasonal predictive skill of global circulation models: coupled versus uncoupled, *Journal of Geophysical Research Atmosphere*, 120, doi:10.1002/2015JD023839.
- Muthige, M.S., **Malherbe, J.**, Englebrecht, F.A., Grab, S., **Beraki, A.**, Maisha, T.R. and Van Der Merwe, J., 2018. Projected changes in tropical cyclones over the South West Indian Ocean under different extents of global warming. *Environmental Research Letters*, 13(6), p.065019.

### References

- Contract Number QRSA-009-16: for the provision of Extreme Climate Index Review & Climate Simulation Services. For the WFP (2018).
- Analysis of global and regional projections of future climate. For Ibis Consulting (2019).
- The South Africa Risk and Vulnerability Atlas (SARVA) for the Department of Science and Technology (2017)
- The Green Book : Adapting South Africa’s settlements to the impact of climate change for the International Development Research Centre (2019)
- Analysis of regional projections of future climate in the Orange River Basin. For WRP Consulting Engineers. (2019)

Significant infrastructure and/or any major items of technical equipment

Access to and space on the Center for High Performance Computing for climate modeling (a multi-year existing relationship).

|   |                |     |        |   |
|---|----------------|-----|--------|---|
| 8 | LGI Consulting | LGI | France |  |
|---|----------------|-----|--------|---|

### Brief description

LGI is a French SME, founded in 2005, that aims at fostering transition through sustainable innovation. We support ideas and projects that address social or environmental challenges, and which generate economic return for businesses. With innovation at the heart of the process, our approach is based on insights into advanced technological developments, social drivers of change, and novel business models. The company counts a team of 30 enthusiasts in France, Belgium, Germany and Spain. LGI's approach is usually multidisciplinary and European (the staff have competences in law, economics, finance, science & engineering, IT and are fluent in French, English, German, Italian, Spanish, Portuguese, Czech, Chinese).

LGI has developed extensive experience in European research and innovation programmes since the 6th Framework Programme (FP6). We build proposals, lead projects, work packages or tasks, and use our knowhow to deliver and deploy new sustainability solutions. Our key strategic sectors are: Low Carbon Energy, Climate & Environment, and Smart & Sustainable Cities.

LGI offers a wide range of advisory services to support our clients' decision-making with a strategy base. The firm's strategic marketing approach is based on insight into both advanced technological developments and novel business models, with innovation at the heart of the process. LGI's approach combines the analysis of technological development with market and social drivers to support our customers with a global innovation approach. Our services include market research and forecasts, global industry analysis, stakeholder mapping, which enable our clients to address their key challenges and exploit their strategic opportunities. LGI has developed a recognised expertise on business modelling, technologies and market assessments, especially in the sectors of energy, environment, circular economy and smart cities.

LGI regularly leads work packages in EU projects on the company's areas of expertise such as innovation management, market, exploitation, technology assessments, public communication. LGI has coordinated several FP7 and H2020 projects, and intervenes with management support in many collaborative networks.

**Foreseen exploitation strategy in FOCUS Africa**

Improve two **services** already included in our portfolio and provided to customers developing innovative product/services, namely (1) the evaluation of socio-economic impact assessment and (2) the design of sustainable business models. For the first one, the methodology will be updated to better consider the Water-Food-Energy

nexus. For the second, the approach will better consider existing gender biases and suggest solutions that empower women.

Targeted beneficiaries: Industry, innovators

Website: [www.lgi-consulting.com](http://www.lgi-consulting.com)

**Role in project**

Leader of WP6, "Assess the socio-economic value of the prototypes and prepare their exploitation". Leading tasks in Communication and Project Management Office

| Key staff          |  |   |
|--------------------|--|---|
| Name               | Gender   | Short CV  |
| Bastien Duplantier | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Bastien Duplantier, senior consultant and deputy general manager of LGI has a background in engineering and 17 years of experience in project management. In particular, he has managed several large integration projects with geographically-dispersed technical teams, including a 3 years' experience in China as department manager. Since joining LGI in 2008, he has been involved in more than 20 projects of the EU Framework Programmes |





|                |  |  |
|----------------|--|--|
| Mathieu Salel  | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | <p>Mathieu is a consultant of the Innovation &amp; Strategy business unit with 4+ years of professional experience in the aeronautics and energy sectors across France, Germany and China. At LGI he carries out strategic studies and innovative technology analyses, particularly in the energy and water sectors.</p> <p>Prior to joining LGI, he worked for the Smart Grids department of the main French DSO (ENEDIS) where he analysed the technical results of innovative smart grid solutions. In a previous research project on renewable marine energies in China, he developed a model to estimate the global potential of electricity production from OTEC. Before joining the energy sector he spent three years working for the Airbus System Engineering Community, comanaging continuous improvement projects on processes, methods &amp; tools.</p> <p>Mathieu holds a general engineering degree (ICAM, Toulouse) and an power engineering degree (Tsinghua University, Beijing). He completed his education with a post-masters in future energy alternatives (Mines ParisTech, Paris).</p> |
| Joanne Schanté | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | <p>Passionate about scaling solutions in the face of climate change and in particular nature-based solutions, Joanne recently joined LGI's Innovation and Strategy Business Unit as a Senior Innovation Strategist. She leverages her 5 years of past experience as a social entrepreneur, consultant and business developer in sustainability and climate change, and 7 years as project manager in the airline industry.</p> <p>Through her social enterprise OpenTeam, she developed a multi-stakeholder platform for the COP21 French Presidency, developed and facilitated peer learning and scaling acceleration programs for climate solutions at an international level, and gained accreditation to join as a speaker and civil society representative at the COPs. Her favorite topics include carbon sequestration, agroforestry, circular economy, indigenous people's rights, and knowledge management.</p> <p>Prior to this, Joanne steered cross-airline synergy projects in the IT domain as product owner. She holds a telecommunication engineer degree and an MBA at</p>                    |
|                |  | INSEAD. Joanne Is French-American and speaks fluently French, English and Spanish  |

|                         |  |   |
|-------------------------|--|---|
| Jean-Yves Moisseron     | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Jean-Yves Moisseron is a Socio-economist, Senior Research Fellow (Directeur de Recherche), IRD (French Institute of Research for Development), Director of the IRD Research Center in Egypt (2002-2007), Affiliated Professor at the University Cadi Ayyad (Morocco). His research focuses on Gouvernance, Energy, Gender, Development economics and politics, transition in Arab world, microfinance, Euromed partnership. He teaches in several academic institutions and tutors PhDs at the University of Paris. He is The President of the Scientific Committee of the Maghreb Bureau of the French Ministry of Foreign Affairs (2017-), Elected member of the Scientific Committee of Social Sciences of the Institute of Research for Development (IRD) (2012-2014). He won several calls including H2020, The French Development agency, Moroccan CNRST and is an expert for the FAO, the UE...He is Chief Editor of the Maghreb-Machrek academic review. He has published or edited 15 books and reviews and as published 60 papers or book chapters. |
| Chloé Chavardes         | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Communication Consultant in charge of public communication activities at LGI. She works closely with partners to define, coordinate and implement project communication strategies, plans and activities. Her work covers online, print and multimedia communication as well as event management and planning. Prior to joining LGI in 2012, she spent five years working in corporate communications at the European Space Agency in the Netherlands and France and has conducted communications research in the energy sector in the United States  |
| Niclette Bukasa Kampata | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Project manager, has completed her study with a degree in International Development Studies and Project management. After working on development projects in African and European NGO's, she started working on European collaborative projects. She has managed several EU-funded projects within Tempus program (coordination of EU-AU projects), FP7 and H2020 (research projects). She has worked on different field: Capacity building and Energy.   |

#### References

- S2S4E – H2020 research project: develop a sub-seasonal to seasonal (S2) climate forecasting tool to make the EU energy system more resilient to climate change (€ 4.7m, 12 partners from 7 countries, 36 months)
- MARCO – H2020 research project: analyse climate adaptation needs and promote the development/adoption of appropriate climate adaptation services (1.5M €, 11 partners from 6 countries, 26 months)

|                          |  |                |                     |   |  |
|--------------------------|--|----------------|---------------------|---|--|
| 9                        | <b>Global Change Institute – University of the Witwatersrand</b> | <b>WitsGCI</b> | <b>South Africa</b> | <br><small>link · learn · enable · change</small> | <br><small>UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG</small> |
| <b>Brief description</b> |  |                |                     |   |  |

The Global Change Institute (GCI) of the University of the Witwatersrand in South Africa addresses problems and opportunities related to global change, climate change and sustainability in a multidisciplinary and transdisciplinary matter. It focuses on helping to co-create, understand and inform global change solutions at various levels of decision making (in business, industry and government, municipal, provincial and national); and to function as an enabling platform to support progressive change through collaborations with stakeholders.

The GCI's multidisciplinary and transdisciplinary research across the value chain of climate change adaptation is underpinned by a state-of-the-art regional climate modelling capability embedded within a world-class Earth System Modelling capability. The simulation of climate variability and future climate change at the GCI takes place through the lens of climate change in Africa and the Southern Hemisphere, with the aim of informing climate change adaptation strategies on the continent.

#### **Foreseen exploitation strategy in FOCUS Africa**

Develop training **services** to transfer knowledge about climate change risk assessments and new insights on predictability to the Landbank in southern Africa. It will particularly deal with benefits of enhancing resilience of the agricultural sector in the SADC region to both climate variability and change. Targeted beneficiaries: Policy-makers

Website address: [www.wits.ac.za/gci](http://www.wits.ac.za/gci)

#### **Role in project**

Contributing in WP 2, 3 and 4. Involved in case study of Hydropower in **Malawi** and water security in Mauritius

#### **Key staff**

| <b>Name</b>                | <b>Gender</b>  | <b>Short CV</b>   |
|----------------------------|--|---|
| Prof. Francois Engelbrecht | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Francois Engelbrecht is Professor of Climatology at the Global Change Institute (GCI) of the University of the Witwatersrand in South Africa. Engelbrecht specializes in numerical climate model development and the simulation of African climate variability and change. In particular, he currently leads the development of an African-based Earth System Model. His research has led to new insights into the changing rainfall and circulation patterns over the continent under enhanced anthropogenic forcing. Engelbrecht served as an invited Lead Author of the IPCC's Special Report on Global Warming of 1.5 °C, which was published in 2018, and he is currently an invited Lead Author of Working Group I of Assessment Report Six of the IPCC. He is also an invited member of the Working Group on Numerical Experimentation of the World Climate Change Research Program (WCRP), and a steering group member of the Climate and Ocean: Variability, Predictability and Change (CLIVAR) project of the WCRP. |
| Me. Dawn Mahlabo           | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Dawn Mahlabo has recently completed her PhD research at the University of the Witwatersrand, on the topic of changing Hadley cell dynamics over southern Africa under climate change. She is to join the Wits Global Change Institute (GCI) as a post-doctoral researcher during the second semester of 2019.   |


#### **Publications**

- Engelbrecht F., Adegoke J., Bopape M-J., Naidoo M., Garland R., Thatcher M., McGregor J., Katzfey J., Werner M., Ichoku C. and Gatebe C. (2015). Projections of rapidly rising surface temperatures over Africa under low mitigation. *Env. Res. Letters*. 10 085004.

- Engelbrecht F.A., McGregor J.L. and Engelbrecht C.J. (2009). Dynamics of the conformal-cubic atmospheric model projected climate-change signal over southern Africa. *International Journal of Climatology* 29 1013-1033. DOI: 10/1002/joc.1742.
- Engelbrecht F.A., Marean C.W., Cowling R., Engelbrecht C., Nkoana R., O’Neal D., Fisher E., Shook E., Franklin J., Neumann F.H., Scott L., Thatcher M., McGregor J.L., Van der Merwe J., Dedekind Z. and Difford M. (2019). Downscaling Last Glacial Maximum climate over southern Africa. *Quaternary Science Reviews*. In Review.
- Engelbrecht C.J. and Engelbrecht F.A. (2016). Shifts in Köppen-Geiger climate zones over southern Africa in relation to key global temperature goals. *Theoretical and applied climatology* 123 247-261. DOI 10.1007/s00704-014-1354-1.
- Mahlobo D.D., Ndarana Y., Grab S., Engelbrecht F. (2018). Integrated climatology and trends in the subtropical Hadley cell, sunshine duration and cloud cover over South Africa. *International Journal of Climatology*. <https://doi.org/10.1002/joc.5917>.

### References

- Earth System Science Research Programme, National Research Foundation, South Africa – SOCCESM (First African-based Earth System Model and the Southern Ocean).  
Reference: Jonathan C.Diederiks (Jonathan.diederiks@nrf.ac.za)
- Earth System Science Research Programme, National Research Foundation, South Africa – OWDSA (Origins of Wet-Dry Seasonality in Africa)  
Reference: Jonathan C.Diederiks (Jonathan.diederiks@nrf.ac.za)
- Climate change hazard, vulnerability and risk assessment study to the benefit of the City of Cape Town.  
Reference: Belynda Petrie (belynda@oneworldgroup.co.za)

|    |                         |     |              |   |
|----|-------------------------|-----|--------------|---|
| 10 | University of Cape Town | UCT | South Africa |  |
|----|-------------------------|-----|--------------|---|

### Brief description

The Climate System Analysis Group (CSAG), based at the University of Cape Town, South Africa, is a multidisciplinary research centre that has been evolving a unique strategy for research in Africa. Established in 1992, CSAG now offers a distinctive resource in Africa on climate change through blending core disciplinary depth in atmospheric science with a transdisciplinary approach to climate services and user support activities in order to bridge the divide between scientific research and societal relevance.

### **Foreseen exploitation strategy in FOCUS Africa**

- Conduct further research on regional climate variability, climate change, and seasonal forecasting skill
- Develop and test climate science/climate services training curricula and courses • Publish academic articles on relevant climate dynamics and analysis methodologies
- Provide downscaled climate data and projections to support case studies.

Targeted beneficiaries: Research community, Policy makers

Website address: <http://www.csag.uct.ac.za>

### Role in project

Contributing in WP 2, 3, 4 and 7. Involved in case study in Tanzania (infrastructure) and **Malawi** (hydropower)

### Key staff

| Name | Gender | Short CV |
|------|--------|----------|
|------|--------|----------|

|                        |  |  |
|------------------------|--|--|
| Dr Christopher Jack    | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Senior researcher with background in climate modeling and computer science. Lead developer of the CSAG climate information platform <a href="http://cip.csag.uct.ac.za">http://cip.csag.uct.ac.za</a> and key lead in UCT Climate Services engagements. Co-PI of the FRACTAL project <a href="http://www.fractal.org.za">http://www.fractal.org.za</a> . ACIDI research fellow, Urban Climate Risk Management. |
| Dr Piotr Wolski        | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Piotr is a hydro-climatologist with 25 years of experience in research in southern Africa. Since 2012, he has been a Senior Researcher at CSAG, UCT, where he is involved in studies on climate change impact and adaptation, seasonal forecasting, climate change attribution, and develops new methods of analysing, visualizing and utilizing climate data  |
|                        |  | in monitoring, seasonal forecast and climate projections contexts.   |
| Anna Steynor           | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Anna is the head of climate services at CSAG, UCT. Anna implements and manages climate services projects at CSAG as well as implements regional capacity building initiatives. Her current research foci include the transdisciplinary coproduction of climate information and the role of risk perception on the uptake and use of climate services in Africa.  |
| Dr Christopher Lennard | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Christopher has a background in Zoology but for the past 10 years has focused on regional climate modeling. He has lead the CORDEX-African initiative including coordinating a number of African researcher writing activities which have produced a number of key CORDEX-Africa publications.   |


#### Publications

- **Jack, C.** & Katragkou, E. 2019. Evaluation of downscaling methods over Europe: Results of the EUCOST action VALUE. *International Journal of Climatology*, 39: 3689-3691. doi:10.1002/joc.6184.
- Daron, J., Burgin, L., Janes, T., Jones, R. G., & **Jack, C.** (2019) Climate process chains: examples from Southern Africa. *International Journal of Climatology*. doi:10.1002/joc.6106
- **Wolski, P., Jack, C., Tadross, M., van Aardenne, L., Lennard, Ch.** 2017. Interannual rainfall variability and SOM-based circulation classification. *Climate Dynamics*
- Dosio, A., Jones, R. G., **Jack, C., Lennard, C., Nikulin, G., & Hewitson, B.** (2019). What can we know about future precipitation in Africa? Robustness, significance and added value of projections from a large ensemble of regional climate models. *Climate Dynamics*, 1-26.
- Vogel, C., **Steynor, A.** and Manyuchi, A. 2019. Climate Services in Africa: re-imagining an inclusive, robust and sustainable service. *Climate Services: In Press*

#### References

- DFID/NERC funded Future Climate For Africa consortium: Future Resilience for African Cities and Lands (FRACTAL) £ 4 million. CSAG is lead of this project which has just received a costed extension of 18 months.
- DFID/UK Met. Office WISER TRANSFORM £165 000 CSAGs key roles are developing guidance and learning with regard to best practice in co-production, research into maximising the update of weather and climate services through behavioural psychology approaches and facilitating capacity development activities that span the entire WISER programme

- USAID/Winrock \$140,000 Assessing Sustainability and Effectiveness of CIS in Africa: As part of a multi-national consortium, CSAG contributed to an assessment of the capacity of African National Meteorological and Hydrological Services (NMHSs) to deliver climate information services. In particular, CSAG undertook an assessment of the Department for Climate Change and Meteorological Services in Malawi. Based on assessments of seven African NMHSs, CSAG undertook a capacity gaps and needs assessment for each NMHS.
- DEA/GIZ Review of provincial climate change response strategies, R1 456 000: CSAG led a review of existing climate vulnerability assessments, strategies and action plans of four provinces in South Africa.

|  |              |       |       |   |
|--|--------------|-------|-------|---|
| 11   | Amigo s.r.l. | Amigo | Italy |  |
| Brief description  |              |       |       |   |
| <p>Amigo is an Italian SME specialized in providing climate services to large international organizations. It developed an expertise in the co-design of solutions for the evaluation of climate risk, and a direct knowledge of the most advanced innovations in the market of risk management for the agricultural sector.</p> <p>Since 2014, Amigo has been selected by the UN World Food Programme as a provider of climate and risk transfer services. Amigo is also participating to the Climate-KIC WINnERS project. It has worked on the assessment of weather indices for insurances and on the development of a new generation of methods for climate risk management at macro scale.</p> <p>Amigo started to operate with a consultancy model: first clients were approached through the founders' personal networks providing them with quick and highly specialized ad-hoc solutions to their current problems including: climate analysis, risk assessment, calculation and design of climate indexes and related software development. Codesign, rapid iterations and long-term support are the pillars of Amigo's operations. Working for, and in close collaboration with, large international organizations allowed Amigo to grow, increase yearly turnover, the staff, build a solid network of clients and a strong project portfolio in relation to climate services for the insurance sector and agribusiness.</p> <p>In parallel, Amigo remained close to academia, constantly presenting and publishing results from the field in order to contribute advancing knowledge in the domain of climate science.</p> <p><b><u>Foreseen exploitation strategy in FOCUS Africa</u></b><br/> Develop and sell <b>products/services</b> with innovative processes and software to provide climate services to customers.<br/> Targeted beneficiaries: Industry, innovators</p> <p>Website address: <a href="http://www.amigoclimate.com">www.amigoclimate.com</a></p> |              |       |       |   |
| Role in project  |              |       |       |   |
| Contributing to WP 3, 4, 5, and 6. Contributing to the case study in Malawi (food security) and Tanzania (infrastructure)  |              |       |       |   |

| Key staff        |  |   |
|------------------|--|---|
| Name             | Gender   | Short CV  |
| Marcello Petitta | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Physicist, he is the scientific director of Amigo. Since 2002, he has been involved in managing national and European projects in the field of climate and remote sensing. His skills range from earth observation, statistics of extreme events and climatology. |

|                 |  |   |
|-----------------|--|---|
| Elisa Arnone    | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Environmental engineer with Ph.D in hydrological science, she has been carried out interdisciplinary researches which involves fields of climate, hydrology and water resources management. She has expertise in physically-based hydrological modeling, rainfall-runoff extremes.    |
| Sara Dal Gesso  | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Physicist, she pursued a PhD at the Royal Netherlands Meteorological Institute on atmospheric science. Since 2010, she has been actively involved in researches on climate-change associated issues, mostly related to extreme meteorological events, risk management and adaptation. |
| Marco Venturini | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Big data engineer he has gained a strong multidisciplinary background, with vast experiences in scientific programming and climate data analysis. In Amigo, he takes care of the software development, to bring the products from a prototype level to a completely working tool.     |

### Publications

- Arnone E., M. Cucchi, S. Dal Gesso, M. Petitta, 2019. A Drought Alert system based on seasonal forecasts. In Garrote L., Tsakiris G., Tsihrintzis V.A., Vangelis H., Tigkas D., (eds.) 2019. Managing Water Resources for a Sustainable Future. Proc. of the 11th World Congress of EWRA on Water Resources and Environment, 25-29 June 2019, Madrid, Spain. ISBN: 978-618-84419-0-3
- Dal Gesso S., E. Arnone, M. Venturini, M. Cucchi, M. Petitta, 2019. SOON: Station Observation Outlier Finder. In Garrote L., Tsakiris G., Tsihrintzis V.A., Vangelis H., Tigkas D., (eds.) 2019. Managing Water Resources for a Sustainable Future. Proc. of the 11th World Congress of EWRA on Water Resources and Environment, 25-29 June 2019, Madrid, Spain. ISBN: 978-618-84419-0-3
- Arnone E., M. Cucchi, S. Dal Gesso, M. Petitta, 2018. A multi-hazard Extreme Climate Index across Europe. EPiC Series in Engineering, ISSN: 2516-2330
- Arnone E., D. Pumo, A. Francipane, G. La Loggia, L.V. Noto. 2018. The role of urban growth, climate change and their interplay in altering runoff extremes. Hydrological Processes, <https://doi.org/10.1002/hyp.13141>
- Fekete, A., K. Tzavella, J. Armas, ..., M. Petitta, et al., 2015. Critical Data Source; Tool or Even Infrastructure? Challenges of Geographic Information Systems and Remote Sensing for Disaster Risk Governance, ISPRS International Journal of Geo-Information vol. 4 (4) p. 1848-1869
- Callegari, P. Mazzoli, L. de Gregorio, C. Notarnicola, L. Pasolli, M. Petitta, and A. Pistocchi. 2015. Seasonal River Discharge Forecasting Using Support Vector Regression: A Case Study in the Italian Alps, Water, vol. 7, no. 5, pp. 2494–2515.

### References

### **H2020 RUR-02, DESIRA (2019-2023)**

Funds: EU-H2020.

Objective: Digitisation: Economic and Social Impacts in Rural Areas. Fill the socio-economic knowledge gaps on digitisation of agriculture in rural areas, including impacts on existing and future challenges.

Role of AMIGO: Carrying out a case study development in five Living Labs in the context of ICT development applied to agriculture and rural areas.

### **H2020 LC-CLA-08, TiPES (2019-2023)**

Funds: EU-H2020.

Objective: Tipping Points in the Earth System. Develop the underpinning science for safe operation of the Earth system, with special attention to the risk of crossing tipping points.

Role of AMIGO: to bridge between the scientific community and the economic sectors of relevance and to consolidate its position as a provider of services based on sound scientific knowledge.

### **H2020 SME Instrument Phase 1, AMIGOClimate (2018)**

Objective: Developing an innovative solution for climate risk analysis and weather index insurance design which helps insurance companies in one of the key strategic challenges: dealing with Climate Change.

Rome of Amigo: Main contractor

### **H2020 NEPTUNE, Subgrant CrossClimate (2018)**

Funds: EU-H2020.

Objective: Create a product for water management for water utilities using seasonal forecast.

Role of AMIGO: Provide, analyse and produce seasonal forecast information for water managers.

Stakeholders: MAP Ltd (Greece), Polo Tecnologico Padano (PTP), Zakynthos Island (GR). **H2020**

### **FRONTIERCITIES2, Subgrant IDA (2018)**

Funds: EU-H2020.

Objective: commercialize a platform for managing climate change risk for insurance sector, smart cities, water manager, agriculture manager.

Role of AMIGO: create a commercialization strategy for selling the IDA product. Stakeholders:

ARC Agency, frontiercities team, other insurance companies..

### **H2020 INNOSUP , subgrant CaseXtreme (2017-2018)**

Funds: EU-H2020.

Objective: Provide the baseline for the design of innovative financial products and risk management tools. Role of AMIGO: Main Contractor. Identify a suitable metric for the Statistical Significance of Changes in the Statistics of Extremes.

Stakeholders: ARC Agency, University of Reading. Web:

<https://euraxess.ec.europa.eu/jobs/191982>

### **XCF Extreme Climate Facility (2015-2018)**

Client: African Risk Capacity Agency.

Objective: provide for the adaptation to climate change.

Role of AMIGO: design a new extreme climate index; design a methodology to track changes in the frequency of climate extremes.

Stakeholders: Governments of African Countries

WFP Web: [www.africanriskcapacity.org/2016/10/31/extreme-climate-facility-xcf/](http://www.africanriskcapacity.org/2016/10/31/extreme-climate-facility-xcf/).

### **LEAP - Livelihood Early Warning and Protection (2016)**

Client: World Food Programme.

Objective: Trigger contingency funds for the national drought early warning system in Ethiopia.

Role of AMIGO: validate the platform for climate index computation.

Stakeholders: Government of Ethiopia.

Web: <http://www.amigoclimate.com/leap-livelihoods-early-assessment-and-protection/>


Significant infrastructure and/or any major items of technical equipment



Amigo has an adequate office spaces to host 10 people, with an internal room dedicated to a small cluster for light parallel computing. The Cluster host also the database with several climatological and meteorological data, satellite images and other ancillary data for a total space of about 60 TeraBytes of data. Moreover, Amigo is using cloud facilities to back up the dataset and for high parallel computing needs. The cloud services used are IBM Bluemix, Microsoft Azure and Amazon Services.

#### References

- Extension of the Storm Surge Early Warning System for the Republic of Mauritius.

|    |                            |      |       |   |
|----|----------------------------|------|-------|---|
| 13 | Scuola Superiore Sant'Anna | SSSA | Italy |  |
|----|----------------------------|------|-------|---|

#### Brief description

Sant'Anna School of Advanced Studies is a public university institute - with special autonomy - working in the field of applied sciences: Economics and Management, Law, Political Sciences, Agricultural Sciences and Plant Biotechnology, Medicine, and Industrial and Information Engineering.

#### **Foreseen exploitation strategy in FOCUS Africa:**

Conduct **further research** to improve food security and more particularly the development of varieties and management practices best adapted to climate conditions. Targeted beneficiary: Research communities

Website address: <https://www.santannapisa.it/en/>

#### Role in project

Leading the case study on food security in Mozambique. Contributor to WP 3, 4, 5 and 7

#### Key staff

| Name              | Gender   | Short CV  |
|-------------------|--|---|
| Roberto Buizza    | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Full Professor of Physics. Leading scientist and key developer of the ECMWF medium-range/monthly ensemble, considered the most accurate and reliable source of global forecasts for this time range.            |
| Matteo Dell'Acqua | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Assistant Professor of Agricultural Genetics. Junior scientist with expertise in adaptation genomics, landscape genetics, and population genetics. Working on developing tools to inform climate-ready breeding |

#### Publications


- Brunazzi, Alice, Davide Scaglione, Rebecca Fiorella Talini, Mara Miculan, Federica Magni, Jesse Poland, Mario Enrico Pè, Andrea Brandolini, and Matteo Dell'Acqua. "Molecular diversity and landscape genomics of the crop wild relative *Triticum urartu* across the Fertile Crescent." *The Plant Journal* 94, no. 4 (2018): 670-684.
- Kidane, Yosef G., Chiara Mancini, Dejene K. Mengistu, Elisabetta Frascaroli, Carlo Fadda, Mario Enrico Pè, and Matteo Dell'Acqua. "Genome wide association study to identify the genetic base of smallholder farmer preferences of durum wheat traits." *Frontiers in plant science* 8 (2017): 1230.

- Dell'Acqua, Matteo, Andrea Zuccolo, Metin Tuna, Luca Gianfranceschi, and Mario Enrico Pè. "Targeting environmental adaptation in the monocot model Brachypodium distachyon: a multi-faceted approach." *BMC genomics* 15, no. 1 (2014): 801.
- Buizza, R., and colleagues, 2018: Advancing global and regional reanalyses. *Bull. Amer. Met. Soc.*, (DOI: <https://doi.org/10.1175/BAMS-D-17-0312.1>)
- Buizza, R., & Leutbecher, M., 2015: The Forecast Skill Horizon. *Q. J. Roy. Meteorol. Soc.*, 141, Issue 693, Part B, 3366–3382 (DOI: <https://doi.org/10.1002/qj.2619>)

#### Significant infrastructure and/or any major items of technical equipment

Server for big data analysis

#### Partner description

| #  | Legal name        | Short name | Country | Logo  |
|----|-------------------|------------|---------|---|
| 14 | PLAN ITALIA Onlus | PLAN       | Italy   |  |

#### Brief description

Plan International was founded over 80 years ago with a mission to promote and protect the rights of children. Today, is a global organization that is active in over 70 countries to advance children's rights and equality for girls. Plan International has been operating in Mozambique since 2006, currently working in the provinces of Inhambane and Nampula. In Nampula, Plan works in the rural districts of Nampula City, Rapale, Mogovolas and Moma.

#### **Foreseen exploitation strategy in FOCUS Africa:**

Conduct **societal activity** to support smallholder farmers' livelihoods through **services** developed by the project, aiming for a **policy change** addressing smallholder farmer communities.

Conduct training and dissemination **services** with local farmers cooperatives to transfer knowledge about climate change risk, climate-ready crop varieties and forecasting tools developed by project partners. The action will enhance resilience to climate change of the agricultural sector in Nampula Region in Mozambique. Targeted beneficiaries: Policy-makers / Civil society, citizens

Website address: <https://plan-international.org>

#### Role in project

Involved in the case study in Mozambique (food security). Contributing to WP 2 and 6

#### Key staff


| Name                 | Gender   | Short CV  |
|----------------------|--|---|
| Rosaria Mabica       | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Head of Programmes for Plan International in Mozambique. Development professional and educationist with over 15 years of experience in international development programs.                              |
| Giulia Bianchini     | M <input type="checkbox"/> F <input checked="" type="checkbox"/> | Project manager for Plan Italia Onlus. Expert in development and humanitarian programs, with 11 years of experience in direct international project management.   |
| Cláudio Massingarela | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | MEAL Specialist with Plan International in Mozambique. With 13 years of experience on socio-economic research on household wellbeing, monitoring and evaluation of programs and development strategies. |

#### Publications

- Participation in the Farmers Fair organized annually by MOZGROW project - a national program that which aims to promote agribusiness in its full value chain.
- Participation in small fairs at Nampula level.
- Publications on PLAN social media for dissemination of project activities and results.

#### References

- Women & Girls Health - Project implemented in Nampula region
- “Yes I DO” Project implemented in Nampula region
- WUTOMI Project – Project implemented in Maxixe
- “18+” - Project implemented in Maxixe
- Menstrual Hygiene Management - Project implemented in Maxixe

|    |  |             |                   |   |
|----|--|-------------|-------------------|---|
| 15 | <b>Insittuto de Investigacao Agraria de Mocambique- IIAM</b> | <b>IIAM</b> | <b>Mozambique</b> |  |
|----|--|-------------|-------------------|---|

#### Brief description

IIAM, Mozambique's Institute of Agricultural Research, aims to generate knowledge and technological solutions for sustainable development of agribusiness and food and nutrition security. Its basic function is to coordinate, command politics, strategies, programs and projects of agricultural research in the region. IIAM has four zonal centers of Agricultural Research (CZIA)--in the south (Chokwe), the center (Chimoio), the northeast (Nampula), and the northwest (Lichinga).

#### **Foreseen exploitation strategy in FOCUS Africa:**

Develop **products/services** to increase resilience of smallholder farming systems. In particular, integrate FOCUS innovation in breeding practices and training to local farmers. The tools developed throughout the project will serve as a base for decision-making of national policy-makers in the Agronomic sector. The products, services, and best practices will be first used in Mozambique then replicated to other areas of the World. Targeted beneficiaries: Policy-makers / Civil society, citizens

Website address: <http://www.iiam.gov.mz>

#### Role in project

Involved in the case study of food security in Mozambique. Contributing to WP 2 and 5

#### Key staff


| Name         | Gender   | Short CV  |
|--------------|--|---|
| Manuel Amane | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Researcher at IIAM, involved in participatory variety selection and pre-breeding for pulses and cereals |

#### Publications (Max. 5)

- Amane, Manuel I.V. et al. “Using innovative approaches in selecting and disseminating bean varieties in Mozambique: lessons learnt.” (2011). In *10th African Crop Science Conference Proceedings, Maputo, Mozambique, 10-13 October 2011*, pp. 283-286. African Crop Science Society, 2011.
- Venkata, Sameer Kumar Chanda et al. “Pigeonpea improvement: An amalgam of breeding and genomic research.” (2018). *Plant Breeding* (2018).

- Jochua, Celestina Nhagupana et al. “Virulence Diversity of the Common Bean Rust Pathogen Within and Among Individual Bean Fields and Development of Sampling Strategies.” *Plant disease* 92 3 (2008): 401-408
- Dias, Darren J. et al. “Yield response of soybean genotypes to different planting dates in Mozambique.” (2011). In *African Crop Science Conference. African Crop Science Society, Uganda*, pp. 539-541. 2011.
- Amane, Manuel I.V. et al. “Getting back to basics: creating impact-oriented bean seed delivery for the poor (and others): experience of seed production with smallholder farmers in Mozambique.” (2009). ([https://pdfs.semanticscholar.org/d24d/0779180cc6d68b4110147a7cca9fa6b5dc69.pdf?\\_ga=2.151198713.1177787827.1564123833-38052920.1564123833](https://pdfs.semanticscholar.org/d24d/0779180cc6d68b4110147a7cca9fa6b5dc69.pdf?_ga=2.151198713.1177787827.1564123833-38052920.1564123833))

## Linked third party

|   |   |              |               |   |
|---|---|--------------|---------------|---|
| <b>WMO Linked third party</b>   | <b>Ministry of Natural Resources, Energy and Mining</b> | <b>MRNEM</b> | <b>Malawi</b> |  |
| <b>Brief description</b>  |   |              |               |   |
| <p>The Department of Climate Change and Meteorological Services, DCCMS, part of Ministry of Natural Resources, Energy and Mining (MNREM), is mandated to monitor, predict and provide information on weather, climate, and climate change that would contribute towards the socio-economic development of the Malawi. The department has 4 divisions, namely; (i) Observation and Forecasting division, (ii) Engineering and Communication division, and (iii) Weather, Climate, Climate Change and Research division. The department has 21 principal meteorological stations, 4 of which are at airports and provides expert and infrastructural support to over 100 volunteer rainfall observing stations. DCCMS provide regular service to the general public and agriculture, disaster risk management, water, energy, health and transport sectors.</p> <p><b>Foreseen exploitation strategy in FOCUS Africa:</b><br/> Upgrade, build new training materials or train the trainers. our training strategy include training of trainers at continental level using resources developed with global centres and scaling up targeting all NMHSs through Regional Economic Communities/RCCs.</p> <p>Website address: <a href="http://www.metmalawi.gov.mw">www.metmalawi.gov.mw</a></p> |   |              |               |   |
| <b>Role in project</b>  |   |              |               |   |
| Involved in a case study on food security in Malawi   |   |              |               |   |

| <b>Key staff</b> |  |   |
|------------------|--|---|
| Name             | Gender   | Short CV  |
| Jolamu Nkhokwe   | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Jolamu Nkhokwe is the Director of DCCMS, Malawi. He has MSc in Applied Meteorology and Climatology (University of Birmingham, 2012).  |
| Amos Mtonya      | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Amos Mtonya is a Chief Meteorologist for communications in DCCMS. He has MSc in Applied Meteorology and Climatology (University of Birmingham, 2012). He is the focal point for DCCMS in the Green Climate Fund project, M-CLIMES                               |
| Clement Boyce    | M <input checked="" type="checkbox"/> F <input type="checkbox"/> | Clement Boyce is a Chief Meteorologist for Climate in DCCMS. He holds MSc in Agro-meteorology (University of Zimbabwe, 2005). He heads the Climate and data section and coordinates agro-meteorological activities of DCCMS. A focal point for GFCS-APA Malawi. |

## References

- Global Framework for Climate Services – Adaptation Programme for Malawi (2015 - current)
- Saving Lives and Protecting Agriculture-based Livelihoods in Malawi: Scaling Up the Use of Modernized Climate Information and Early Warning Systems (M-CLIMES) , 2017 - current

### 4.2 Third parties involved in the project (including use of third party resources)

|   |            |
|---|------------|
| <b>1. WMO</b>   |            |
| Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)  | <b>NO</b>  |
| Does the participant envisage that part of its work is performed by linked third parties<br><br>MNREM is linked third party of WMO.<br><br>Its role in the project is described in the WP in which it is involved as well as in the section 4 in their description (see the relevant partner description sheet).<br><br>Foreseen budget for this linked third party is 35 625 euros | <b>YES</b> |
| Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)  | <b>NO</b>  |
| Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?  | <b>NO</b>  |

|  |            |
|--|------------|
| <b>6. ACMAD</b>  |            |
| Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)   | <b>YES</b> |
| <p>The subcontracting is requested by ACMAD. The total amount of subcontracting is 163925 euros, to cover the engagement of local experts (working in public met services) in countries where FA is not represented. The subcontractors will be engaged to cover the tasks and ensure engagement with local stakeholders in the following countries: Botswana, Mauritius and Tanzania.</p> <p><b>In Botswana</b>, the local consultant will be working on the following tasks: Task 1.1. (Plan and execution of stakeholders workshops and consultations – participation and feedback); Task 1.4 (Implement communication and dissemination actions and develop materials to boost engagement – policy brief and final report); Task 2.2 (Climate risk and vulnerability assessment – support collection of data from SARCOFs on user requirements in the SADC region for ewater, food and energy sectors and contribute to the development of climate risk assessment) ; Task 7.1 (Assess capacity development needs and review and upgrade curricula - action 1); Task 7.3 (Develop online resources – action 3 and action 7 – development of online content ; report drafting ; and lead testing of new materials at SARCOFs.).</p> <p><b>In Mauritius</b>, the local consultant will be working on the following tasks: Task 1.1. (Plan and execution of stakeholders workshops and consultations); Task 1.4 (Implement communication and dissemination actions and develop materials to boost engagement); Task 2.1 (Climate services requirements, co-production and end users challenges landscape – work on Action 2 (engagement with the Mauritius Water Ressource Unit for CS8)); Task 4.3 (Implementation of multi-model downscaling for seasonal forecasts – action 3 that also includes development of drought indices; Task 5.1. (Collate output required to develop prototypes – Action 2 and Action 9 (Collection of appropriate climate products for water resource managers for Mauritius Water Security Study (CS 8)); and Task 6.2.1 (Evaluation of the socio-economic situation).</p> |            |

|  |           |
|--|-----------|
| <b>In Tanzania</b> , the local consultant will be working on the following tasks: Task 1.1 (Plan and execution of stakeholders’ workshops and consultations – the workshop in Tanzania and the mid-term report namely) ; Task 1.4 (Implement Communication and Dissemination actions and develop materials to boost engagement – policy briefs and final report); Task 4.3 (Implementation of multi-model downscaling for seasonal forecasts –Action 3: review of existing applied forecasting methods and sharing in-situ observations on Onset and Cessation of rainfall in Tanzania) ; Task 4.3. (Implementation of multi-model and downscaling for seasonal forecasts - Action 9: review of the developed multi-ensemble forecasts with MO, JRC and BSC for the Tanzania case studies 4 and 6) ; Task 4.4. (Implementation of multi-model and downscaling for projections and decadal predictions – action 8 for Tanzania) ; Task 5.2 (Plan co-designed and co-developed case study prototypes – action 8) ; Task 5.3 (Development and delivery of prototype climate services – action 4) ; and and Task 6.2.1 (Evaluation of the socio-economic situation). |           |
| Does the participant envisage that part of its work is performed by linked third parties   | <b>NO</b> |
| Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)   | <b>NO</b> |
| Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?   | <b>NO</b> |

|  |            |
|--|------------|
| <b>12. JRC</b>   |            |
| Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)   | <b>YES</b> |
| <p>The subcontracting cost is requested by JRC in order to provide high-level technical support in the implementation of the planned and needed changes of the modelling tools described in the proposal, i.e. Wofost and ASAP. Technical expertise and experience in advanced agro-climatic and crop modelling as well in GIS applications is needed and it is not available in the consortium. The subcontracting will be performed as follows:</p> <ul style="list-style-type: none"> <li>• 120 days with a rate of 500 euro per day</li> <li>• Travelling not request</li> <li>• Work related to: Tasks 2.2 Climate risk and vulnerability assessment and Task 5.3 “Development and delivery of prototype climate services”</li> </ul> |            |
| Does the participant envisage that part of its work is performed by linked third parties   | <b>NO</b>  |
| Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)   | <b>NO</b>  |
| Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?   | <b>NO</b>  |

## 5 Section: Ethics and Security

### 5.1 Ethics

FOCUS Africa raises the ethical issues on processing/collecting of personal data of people involved notably in the stakeholder groups. Interactions with stakeholders are foreseen with collection of professional information. For this reason, informed consent is necessary and detailed information will be provided to the EC at the beginning of the project on the informed consent procedures that will be implemented.

All personal data will be anonymised and permission to publish will be requested from the sources of the data. All data management will be compliant with the European General Data Protection Regulation (GDPR): the partner in charge of data management (LGI) will deploy its GDPR-compliant tools and procedures (collect only useful data; used only for the purpose of the project; explicit opt-in; and cybersecurity).

FOCUS Africa also raises the ethical issues in putting individuals at risk because of potential unsafe situation in countries where the workshops will be held. The following measures will be applied in order to minimise the risks to participants and staff involved in this project :

- related national authorities, UN Department of Safety and Security, foreign offices of European participants countries will be contacted to request recommendations for joining the workshop locations
- A dedicated document will be provided to all the participants with recommendations regarding travelling to the workshop locations
- If required by national authorities of participants, specific insurance will be required for those participants attending the workshops

FOCUS Africa will meet all the Ethics Requirements on:

- Human (H)
- Protection of personal data (POPD)
- Non EU countries potential ethics issues and risks (NEC)

## ***5.2 Security***

Please indicate if your project will involve:

- activities or results raising security issues: NO
- EU-classified information' as background or results: NO

## ESTIMATED BUDGET FOR THE ACTION

<sup>1</sup> See Article 6 for the eligibility conditions.

<sup>2</sup> Indirect costs already covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary/linked third party that receives an operating grant during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant, unless it can demonstrate that the operating grant does not cover any costs of the action (see Article 6.2.E).

<sup>3</sup> This is the theoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reimbursement rate). This theoretical amount is capped by the 'maximum grant amount' (that the Commission/Agency decided to grant for the action) (see Article 5.1).

<sup>4</sup> The 'maximum grant amount' is the maximum grant amount decided by the Commission/Agency. It normally corresponds to the requested grant, but may be lower.

<sup>5</sup> Depending on its type, this specific cost category will or will not cover indirect costs. Specific unit costs that include indirect costs are: costs for energy efficiency measures in buildings, access costs for providing trans-national access to research infrastructure and costs for clinical studies. <sup>6</sup> See Article 5 for the forms of costs.

<sup>7</sup> Unit : hours worked on the action; costs per unit (hourly rate) : calculated according to the beneficiary's usual accounting practice.

<sup>8</sup> See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)). <sup>9</sup> Unit and costs per unit : calculated according to the beneficiary's usual accounting practice.

<sup>10</sup> Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs.

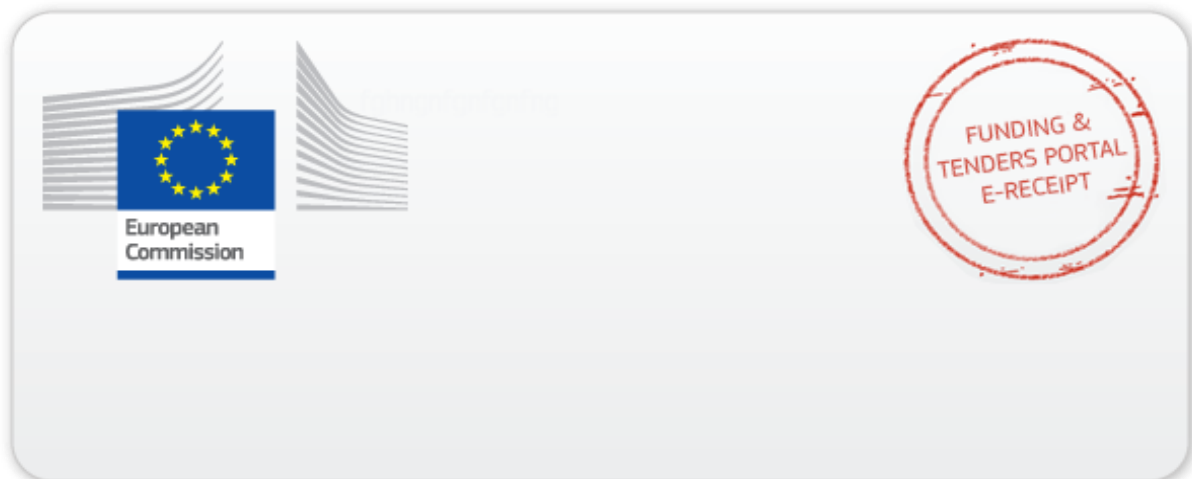
<sup>11</sup> See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).

<sup>12</sup> See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc).

<sup>13</sup> Only specific unit costs that do not include indirect costs.

<sup>14</sup> See Article 9 for beneficiaries not receiving funding. <sup>15</sup> Only for linked third parties that receive funding.





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## ESTIMATED BUDGET FOR THE ACTION

| Estimated eligible <sup>1</sup> costs (per budget category)     |              |   |                   |                                   |                                   |  |   |                                |                         | EU contribution   |                                      |                                   | Additional information  |                                      |  |        |
|---|--------------|---|-------------------|-----------------------------------|-----------------------------------|--|---|--------------------------------|-------------------------|---|--------------------------------------|-----------------------------------|---|--------------------------------------|--|--------|
| A. Direct personnel costs                                       |              |   |                   | B. Direct costs of subcontracting | [C. Direct costs of fin. support] | D. Other direct costs                      |   | E. Indirect costs <sup>2</sup> | Total costs             | Reimbursement rate %  | Maximum EU contribution <sup>3</sup> | Maximum grant amount <sup>4</sup> | Information for indirect costs                                | Information for auditors             | Other information  |        |
| A.1 Employees (or equivalent)                                   |              | A.4 SME owners without salary                             |                   |                                   |                                   | D.1 Travel                                 | D.5 Costs of internally invoiced goods and services |                                |                         |   |                                      |                                   | Estimated costs of in-kind contributions not used on premises | Declaration of costs under Point D.4 | Estimated costs of beneficiaries/ linked third parties not receiving funding/ international partners |        |
| A.2 Natural persons under direct contract                       |              | A.5 Beneficiaries that are natural persons without salary |                   |                                   |                                   | D.2 Equipment                              |   |                                |                         |   |                                      |                                   |   |                                      |  |        |
| A.3 Seconded persons  |              |   |                   |                                   |                                   | D.3 Other goods and services               |   |                                |                         |   |                                      |                                   |   |                                      |  |        |
| [A.6 Personnel for providing access to research infrastructure] |              |   |                   |                                   |                                   | D.4 Costs of large research infrastructure |   |                                |                         |   |                                      |                                   |   |                                      |  |        |
| Form of costs <sup>6</sup>                                      | Actual       | Unit <sup>7</sup>   | Unit <sup>8</sup> |                                   | Actual                            | Actual                                     | Actual  | Unit <sup>9</sup>              | Flat-rate <sup>10</sup> |   |                                      |                                   |   |                                      |  |        |
|   | a            | Total b   | No hours          | Total c                           | d                                 | e  | f   | Total g                        | 25%                     | h = 0,25 x (a +b+c+f+g +[i1] <sup>13</sup> + [i2] <sup>13</sup> -n) | j = a+b+c +d+[e]+f+g +h+[i1]+[i2]    | k                                 | l   | m                                    | n  | Yes/No |
| 1. WMO  | 494 000.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 390 000.00  | 0.00                           | 221 000.00              | 1 105 000.00  | 100.00                               | 1 105 000.00                      | 1 105 000.00  | 0.00                                 | No   | n/a    |
| - MNREM   | 7 500.00     | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 21 000.00   | 0.00                           | 7 125.00                | 35 625.00   | 100.00                               | 35 625.00                         | 35 625.00   | 0.00                                 | No   | n/a    |
| Σ beneficiary   | 501 500.00   | 0.00  |                   |                                   | 0.00                              | 0.00                                       | 411 000.00  | 0.00                           | 228 125.00              | 1 140 625.00  |                                      | 1 140 625.00                      | 1 140 625.00  | n/a                                  | n/a  | 0.00   |
| 2. BSC  | 531 441.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 51 000.00   | 0.00                           | 145 610.25              | 728 051.25  | 100.00                               | 728 051.25                        | 728 051.25  | 0.00                                 | No   | n/a    |
| 3. MO   | 416 816.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 41 000.00   | 0.00                           | 114 454.00              | 572 270.00  | 100.00                               | 572 270.00                        | 572 270.00  | 0.00                                 | No   | n/a    |
| 4. WEMC   | 571 613.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 61 000.00   | 0.00                           | 158 153.25              | 790 766.25  | 100.00                               | 790 766.25                        | 790 766.25  | 0.00                                 | No   | n/a    |
| 5. EDF  | 0.00         | 204 350.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 19 000.00   | 0.00                           | 55 837.50               | 279 187.50  | 100.00                               | 279 187.50                        | 279 187.50  | 0.00                                 | No   | n/a    |
| 6. ACMAD  | 164 785.00   | 0.00  | 0.00              | 0.00                              | 163 925.00                        | 0.00                                       | 34 000.00   | 0.00                           | 49 696.25               | 412 406.25  | 100.00                               | 412 406.25                        | 412 406.25  | 0.00                                 | No   | n/a    |
| 7. CSIR   | 244 283.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 34 000.00   | 0.00                           | 69 570.75               | 347 853.75  | 100.00                               | 347 853.75                        | 347 853.75  | 0.00                                 | No   | n/a    |
| 8. LGI  | 549 250.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 177 500.00  | 0.00                           | 181 687.50              | 908 437.50  | 100.00                               | 908 437.50                        | 908 437.50  | 0.00                                 | No   | n/a    |
| 9. WITS-GCI   | 193 039.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 17 000.00   | 0.00                           | 52 509.75               | 262 548.75  | 100.00                               | 262 548.75                        | 262 548.75  | 0.00                                 | No   | n/a    |
| 10. UCT   | 215 000.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 17 000.00   | 0.00                           | 58 000.00               | 290 000.00  | 100.00                               | 290 000.00                        | 290 000.00  | 0.00                                 | No   | n/a    |
| 11. AMIGO   | 335 295.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 37 000.00   | 0.00                           | 93 073.75               | 465 368.75  | 100.00                               | 465 368.75                        | 465 368.75  | 0.00                                 | No   | n/a    |
| 12. JRC   | 0.00         | 93 492.00   | 0.00              | 0.00                              | 20 000.00                         | 0.00                                       | 0.00  | 0.00                           | 23 373.00               | 136 865.00  | 100.00                               | 136 865.00                        | 136 865.00  | 0.00                                 | No   | n/a    |
| 13. SSSA  | 203 160.00   | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 101 000.00  | 0.00                           | 76 040.00               | 380 200.00  | 100.00                               | 380 200.00                        | 380 200.00  | 0.00                                 | No   | n/a    |
| 14. PLAN  | 51 800.00    | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 36 000.00   | 0.00                           | 21 950.00               | 109 750.00  | 100.00                               | 109 750.00                        | 109 750.00  | 0.00                                 | No   | n/a    |
| 15. IAM   | 58 800.00    | 0.00  | 0.00              | 0.00                              | 0.00                              | 0.00                                       | 60 150.00   | 0.00                           | 29 737.50               | 148 687.50  | 100.00                               | 148 687.50                        | 148 687.50  | 0.00                                 | No   | n/a    |
| Σ consortium  | 4 036 782.00 | 297 842.00  |                   | 0.00                              | 183 925.00                        | 0.00                                       | 1 096 650.00  | 0.00                           | 1 357 818.50            | 6 973 017.50  |                                      | 6 973 017.50                      | 6 973 017.50  |                                      |  | 0.00   |

<sup>1</sup> See Article 6 for the eligibility conditions.

<sup>2</sup> Indirect costs already covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary/linked third party that receives an operating grant during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant, unless it can demonstrate that the operating grant does not cover any costs of the action (see Article 6.2.E).

<sup>3</sup> This is the theoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reimbursement rate). This theoretical amount is capped by the 'maximum grant amount' (that the Commission/Agency decided to grant for the action) (see Article 5.1).

<sup>4</sup> The 'maximum grant amount' is the maximum grant amount decided by the Commission/Agency. It normally corresponds to the requested grant, but may be lower.

<sup>5</sup> Depending on its type, this specific cost category will or will not cover indirect costs. Specific unit costs that include indirect costs are: costs for energy efficiency measures in buildings, access costs for providing trans-national access to research infrastructure and costs for clinical studies.

<sup>6</sup> See Article 5 for the forms of costs.

<sup>7</sup> Unit : hours worked on the action; costs per unit (hourly rate) : calculated according to the beneficiary's usual accounting practice.

<sup>8</sup> See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)).

<sup>9</sup> Unit and costs per unit : calculated according to the beneficiary's usual accounting practice.

<sup>10</sup> Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs.

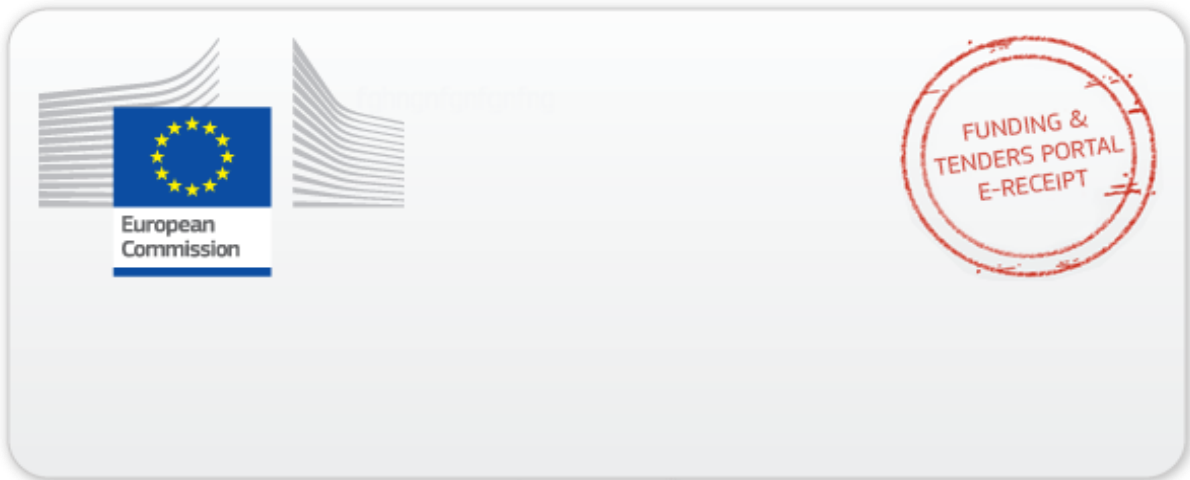
<sup>11</sup> See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).

<sup>12</sup> See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc).

<sup>13</sup> Only specific unit costs that do not include indirect costs.

<sup>14</sup> See Article 9 for beneficiaries not receiving funding.

<sup>15</sup> Only for linked third parties that receive funding.



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