



An initiative of the Organisation of African, Caribbean and Pacific States funded by the European Union

## TERMS OF REFERENCE FOR DATA AND PRODUCTS VISUALIZATION EXPERT

### Intra-ACP Climate Services and Related Applications (ClimSA) Project

#### 1. Introduction

The Horn of Africa (HA) region has a highly variable climate and is prone to climate extremes such as droughts and floods that exacerbate food and water insecurity. Economies and livelihoods of the HA countries (Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan, and Uganda) are dependent on rain-fed agriculture that is highly sensitive to weather as well as climate variability and change. Rainfall plays a significant role in determining agricultural production and thus the economic and social well-being of rural communities.

Climate change in the region could result in an increase in the frequency and intensity of extreme weather/climate events, leading to more intensive flash floods and more recurrent drought and water scarcity. Climate risks impacting the livelihoods and food security situation of pastoralists and agro-pastoralists are also increasingly associated with resource-based conflicts in countries such as Kenya, Somalia, Ethiopia, Uganda and South Sudan that could lead to a further deterioration in vulnerability of the affected populations in the region. It is expected that climate change will enhance the variability in climate as currently observed.

#### 2. Project Background

The Intra-ACP Climate Services and Related Applications (ClimSA) project is a direct grant award by the **11th European Development Fund** to support the climate information services value chain in the IGAD region with technical and financial assistance, and infrastructure and capacity building to improve wide access and use of climate information, and to enable and encourage the generation and use of climate services and applications for decision making processes at all levels.

The overall objective of the Action is to support the climate information services value chain with technical assistance, financial assistance, infrastructure and capacity building to improve wide access and use of climate information, and to enable and encourage the generation and use of climate services and applications for decision making processes at all levels. The Action will strengthen the tools to bridge climate services stakeholders and users in climate-

sensitive sectors to resource and implement GFCS at all levels. The Action will further contribute to six SDGs (1, 2, 5, 7, 13, 15) by (i) building the resilience of poor people and minimizing the risk to climate-related extreme events and early warning, (ii) enhancing food production through improved uptake, access and use of food-security tailored climate services through engagements of the regional multi-stakeholder Food Security and Nutrition Working Group (FSNWG), by closely working with IGAD Secretariat and its other implementing regional bodies (especially IDDRSI and Cross-Border Cooperation Working Group) and international organizations, and (iii) enhancing cooperation between institutions to tackle a major issue of common concern i.e. supports improvement and capacity building on use of climate services for improved adaptation planning from regional down to national and local levels. The Action complements ICPAC's Strategic Plan 2016-2020 of enhancing the livelihoods of the people of the region so as to mitigate climate-related risks and disasters.

The specific objectives of this Action is to (1) ensure improved interaction between the users, researchers and climate services providers in the IGAD region through structured and strengthened User Interface Platforms (UIPs); (2) guarantee the provision of climate services at regional and national levels; (3) expand access to climate information; (4) enhance the capacity to generate and apply climate information and products; and (5) mainstream climate services into policy processes at regional and national levels.

As part of delivering climate services in the region, ICPAC has developed a suite of web applications for monitoring climate and other hazards that affect the region. These applications play an important role in visualizing risk information as well as presenting data and products in a way that supports informed decision making by different stakeholders in the region. These applications include:

### [The East Africa Hazards Watch](#)

The [EAHW](#) is a web application that aggregates risk information from different specialized systems and presents them in one platform. Its main goal is to collect, store, and analyze required data from different sources and present them in a color-coded system indicating different levels of alert and urgency. Additionally, it provides analysis functionality allowing to view statistical information for a given risk for any point, administrative unit or custom area in the region.

The application pulls data from many different sources, and thus on its own does not generate any data, but depends on data from other sources. For example, for the Drought Risk information, the data is pulled from a specialized drought watch system at ICPAC. Other layers like Food Insecurity are pulled from our partner's **public portals**. This kind of integration requires a system that can handle data from varied sources.

### **Technologies used:**

A Microservices approach was taken in developing different components for the system. Different services that manage specific sections of the system are deployed in Docker Containers. The main tools and technologies used include:

- React / Next JS for the main frontend interface development
- Mapbox GL as the main web mapping library. The Mapbox Style Specification is used as the main specification for describing data layers in various configurations and map rendering
- PostGIS as the spatial database of choice for managing spatial datasets in different contexts. We have a number of microservices that connect to PostGIS databases to access and transform spatial data into formats, (for example as vector tiles or geojson) that can be visualized on maps and charts
- **GSKY** as the main spatial geospatial data server.
- Docker for building, testing and deploying of the different components of the system
- Docker Compose as a tool for defining and orchestration of docker containers
- Github for code hosting and version control
- Google Cloud for cloud deployment and hosting
- Wagtail as the preferred content management system. Wagtail is written in Python and built on top of the Django Python framework.
- Python is used to develop scripts that need to interact with spatial data files and develop data automation processes
- Golang is used to develop a number of APIs that mostly interact with databases and for development of lightweight utility tools

### 3. Tasks and responsibilities

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| <b>Task 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p><b>The Consultant will be involved in maintaining the EAHW system, developing new functionalities as required and continuously innovating and customizing the system to meet user needs, based on feedback and new requirements.</b></p> <p><b>The Consultant will work together with different sectors at ICPAC and with our partners to identify needs and opportunities for improving hazards and risk information visualization on the EAHW.</b></p> |
| <b>Task 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>The Consultant will support the maintenance of other systems.</b>                                                                                                                                                                                                                                                                                                                                                                                        |

Other systems and applications that support data access, dissemination and visualization include the following:

- [The East Africa Agriculture Warning Explorer](#) developed in collaboration with the Joint Research Centre of the European Commission
- [The ICPAC Geoportal](#) - Developed on the Geonode Platform
- [The ICPAC Website](#) - Developed with Wagtail. The website also hosts a number of spatial data visualizations tools, mostly developed with Leaflet JS or Mapbox GL and consuming data from OGC standards compliant sources at ICPAC

### Task 3

The Consultant will support the maintenance of these systems (ICPAC Geoportal, ICPAC Website, Agriculture Warning Explorer) to ensure they work as expected.

The Consultant will also support the integration of these product and visualization platforms with the ICPAC mobile app (HUSIKA) which aims at improving early warning dissemination. He/She may also be required to improve or develop new functionalities and tools on top of these systems to ensure they meet new requirements and user needs as necessary.

## 4. Required Qualifications and Experience

- Master's degree in Geo-Informatics, Computer Science, IT or related field
- Minimum of two (2) years of relevant experience in fullstack geo-applications design and development
- Experience in **Web GIS development**.
  - Solid knowledge and understanding of fundamental GIS concepts
  - Solid and demonstrated understanding of how to develop and integrate GIS components on top of the typical web development
  - Experience with **spatial databases**, specifically PostGIS and a good understanding of spatial queries and interfacing databases with GIS tools
  - Experience with web mapping libraries including **Mapbox GL JS** ( we use the [open source](#) alternative which has a similar API ), [Mapbox Style Specification](#) and [Leaflet JS](#). Open Layers is a plus.
  - Experience in manipulating and analyzing Earth Observation data in different data formats. Our data is mostly in NetCDF and Geotiff formats. An understanding of packages like GDAL/OGR is key.
  - Experience with Geospatial Data Servers is required. This includes but not limited to an understanding of [OGC concepts and standards](#), **open-source** tools like Mapserver / Geoserver, Vector Tile Servers e.tc
  - Skilled in picking the right tool for the task at hand. Have a wide knowledge of existing tools for accomplishing different GIS related tasks and be able to do research and benchmarking of the latest web GIS related tools.
- Experience in **Backend development** using various languages and frameworks including Django, Go and Node JS.

- Experience developing microservices and exposing them as REST APIs. Most of our APIs are built on either Python, Go or Node JS. Experience with other languages is a plus.
- Experience developing content management systems that can be used to update and interface with data and web content (images, documents, data files etc). Most of our CMSs are built with [Wagtail](#)
- Experience with developing automated processes and workflows for ingesting and processing of spatial data. Our existing processes are mostly written in Python. A few other utility processes are written in Go.
- Experience in **NoSQL databases**, specifically MongoDB
- Experience in **Responsive Frontend development** with Javascript and Javascript libraries, specifically React JS and styling with CSS/Sass
- Experience in **application containerization** using Docker, orchestration with **Docker Compose** and deployment on cloud infrastructure. We currently use Google Cloud for our cloud deployments.
- Experience in **software version control** using Git and Github
- A good understanding of **Open-Source** concepts and tools. We strive to use open-source tools and technologies where possible. We also strive to make most of our developed tools open source on our [Github](#)

## 5. Core Competencies

- Teamwork
- Communication
- Continuous improvement and knowledge sharing
- Problem solving
- Result oriented

## 6. Reporting

The selected Individual Consultant will report to the ClimSA Coordinator.

## 7. Remuneration

Negotiable within the IGAD consultancy policy which is attractive based on the applicant qualification and experience.

## 8. Contract Duration

The position will be for eleven months with possibility of renewable subject to performance and availability of funds.

## 9. Work Station

The Expert will be based within the Nairobi Metropolitan Area.

## **10. How to Apply**

All applications must be received in the email (Hard copies will not be accepted) with the subject line “Application for Individual consultancy on ClimSA data and products visualisation. Applications should be received by 30 September 2022 at 17:00 HRS EAT, include Cover Letter, detailed Consultant Curriculum Vitae and clear Technical and Financial proposal to the following Address:

The Director  
IGAD Climate Prediction and Applications Centre (ICPAC)  
Ngong town, Kibiku area,  
P O Box 10304 GPO 100, Nairobi, Kenya  
Tel (+254) 20-3514426  
Email: [procurement@icpac.net](mailto:procurement@icpac.net)  
The subject of the email must clearly specify the title of the Consultancy