Terms of Reference

For Consultancy on Data Management, Enhancement and Strengthening of Customised Climate Database Functionality

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TERMS OF REFERENCE (TOR)

Title of project:	Intra-ACP Climate Services and Related Applications Programme (ClimSA)
Project duration:	Four years
Donor:	European Union
Executing Entity:	Caribbean Institute for Meteorology and Hydrology (CIMH)
Consultancy:	Consultant for the data management, enhancement and strengthening of customised climate database functionality

1. Programme Description

1.1. Project Introduction

The Intra-ACP Climate Services and Related Applications Programme (ClimSA) is a four-year project funded through the European Union (EU) African, Caribbean, Pacific (ACP) Secretariat and being implemented by the Caribbean Institute for Meteorology and Hydrology (CIMH).

Its goal is to support the climate information services value chain with technical and financial assistance, infrastructure, and capacity building. This will ultimately result in improved access and use of climate information, services, and applications at all levels of decision-making and will lead to improved adaptation measures that allow for the Caribbean region to become more sustainable and resilient.

The ClimSA work programme is aligned to the Regional Roadmap and Plan of Action 2020-2030 for Climate Services in the Caribbean to achieve

- Interaction between the users, researchers and climate services providers is structured;
- Provision of climate services at regional and national levels is effectively guaranteed and secured; Access to climate information is improved;
- Capacity of Caribbean region to generate and apply climate information and products relevant to concerns is strengthened;
- Climate-informed decision-making is enhanced, and climate services are mainstreamed into policy processes at regional and national levels.

For the Caribbean, these activities are timely and necessary since climate variability and change are already having and will continue to have severe impacts on national economies and key socio-economic sectors in the absence of this type of large scale, resilience intervention.

The ClimSA Caribbean Programme will be executed through pilot activities aimed at strengthening the climate services value chains in the:

- health sector of Dominica,
- water sector of Jamaica and
- agriculture and food security sector of Guyana.

Key partners of the programme at the national level are the National Meteorological and Hydrological Services (NMHSs), government ministries with national responsibility for health, water and agriculture/food security sectors and private sector entities and end users of products and services from the three target sectors.

The 16 Member Countries of the Organisation of the African, Caribbean and Pacific States (OACPS) will benefit from the programme through regional capacity building initiatives, sharing of lessons learned and results from the three pilot countries and the institutional and capacity building at the CIMH.

1.2. Project Outcomes and Outputs

The ClimSA programme has the following Outcomes:

- Outcome 1 - Interaction between the users, researchers and climate services providers in the Caribbean regions is structured;
- Outcome 2 - Provision of climate services at Regional and National levels is effectively guaranteed and secured;
- Outcome 3 - Access to Climate Information is improved;
- Outcome 4 - Capacity of Caribbean region to generate and apply climate information and products relevant to concerns enhanced;
- Outcome 5 - Climate-informed decision-making is enhanced and climate services are mainstreamed into policy processes at regional and national levels.

2. Scope of Consultancy and Activities

The CIMH hosts the Caribbean Climate Data Archive for Member States of the Caribbean Meteorological Organization (CMO). As such, the CIMH (i) collects historic and near real-time meteorological and hydrological data from a range of sources, (ii) quality assures the collected data, (iii) publishes the data, (iv) visualises/presents near real-time information through simple analyses of regional climate based on the data and (v) disseminates the data to global databases, researchers, and the private sector – the latter under special conditions.

The CIMH also manages and maintains several near real-time observation networks across the Caribbean – particularly the eastern Caribbean. Data from these networks are received by CIMH through (i) cellular transmission networks; (ii) satellite transmission networks (GOES) and (iii) the Internet. These data are ingested and published on platforms such as the Caribbean Dewetra Platform (CDP) and the CariCOF Outlook Generator (CAROGEN) to support impact-based forecasting for rapid onset hydro-meteorological events and prepare regional and national seasonal climate outlooks, respectively. This ensures that all climate related datasets are consolidated in one location and will support the improvement of climate services delivery.
This consultancy will allow CIMH to further enhance its customised database by extending its functionality, particularly with respect to (i) reporting, quality control and security and (ii) its ability to integrate data from other common climate and hydrological databases. The consultant/consulting firm will therefore be required to:

1. Implement the automated generation of Summary Statistics and Reports:
    a. Determine daily, monthly, and yearly extremes i.e., maximum, and minimum values;
    b. Calculation of totals and averages i.e., daily, monthly, and yearly;

c. Calculation of 1991 to 2020 standard climatological normals.

2. Expand the existing quality control module:
    a. Ability to choose stations, elements, date ranges for tests outlined in ***2d*** to ***2f*** below;
    b. Selected stations should be displayed on a map view with pointers for each station location;
    c. Data output should be displayed as both tables and graphs/charts;
    d. Ability to profile elements in a dataset before selecting specific quality control tests:
        i. Determine mean, median and mode;
        ii. Provide the number of occurrences of all values appearing in the dataset, represented as both a list and a bar chart;
    e. Completeness Tests
        i. Checks a dataset for missing values;
        ii. Displays the number of, and relevant dates of, any missing values;
    f. Consistency Tests
        i. Internal
            1. Add a standard list of pre-defined tests to compare associated elements e.g., ensure wet bulb temperature is not greater than dry bulb temperature taken during same observation;
            2. Ability for a user to define a customized test;
        ii. Temporal
            1. Ability to check the variation of an element with time;
                a. Ability to compare the prior and subsequent values of an element with the value being considered;
        iii. Spatial
            1. Ability to compare the value of an element with values taken at the same time at nearby stations;
        iv. Summarization
            1. Ability to use different summaries as checks against each other e.g., sum of monthly rainfall totals for a year can be compared to sum of daily rainfall totals for the same year;
    g. Tables should use a color code to visually indicate the state of data values being checked e.g., red for incorrect data and yellow/orange for suspicious data;
    h. Hovering or clicking on an incorrect data point should create a tooltip message giving the reason(s) why the data is incorrect;
    i. If any data values are changed, the original data values must be retained in the database.

3. Expand data ingestion capabilities
    a. Ability to ingest sub-hourly data e.g., 5-minute, 10-minute etc. from e.g., CSV, Excel files;
    b. Ability to ingest data sent from an automatic weather station in near real time;
    c. Ability to ingest data from other databases e.g., ClimSoft, MCH, CAROGEN, CDP;
    d. Ability to ingest data from WMO encoded weather messages e.g., SYNOP, METAR, BUFR, CLIMAT.

4. Expand data processing capabilities
    a. Derive new datasets from existing datasets e.g., derive hourly from sub-hourly, daily from hourly, five-day, and ten-day from daily, monthly from daily etc.;
    b. Derive indices from time-integrated variables e.g., cooling degree hours / cooling degree days based on hourly or sub-hourly dry bulb temperature readings; hourly heat index from dry bulb temperature and relative humidity; etc.;
    c. Calculation of derived values using measured values e.g., calculation of dew-point temperature, vapor pressure, relative humidity, station pressure, mean sea level pressure;
    d. Ability to convert one measurement unit to another e.g., Fahrenheit to Celsius, inches to millimetres, knots to metres per second etc.;
    e. Export data in the preferred format for commonly used climate software packages e.g., CPT, R-Instat;
    f. Ability to generate WMO encoded weather messages e.g., BUFR, CLIMAT.

5. Add ability to backup data using the application front end
    a. Ability to generate data backup files via the graphical user interface;
        i. SQL, CSV, or Excel files
        ii. Can be performed manually or via an automated schedule
    b. Ability to restore the database contents using data backup files via the graphical user interface;

6. Further enhance data synchronization with off-site backup of data to CIMH
    a. Add indicator of progress of upload e.g., progress bar, and final message indicating whether the data upload was successful or not. If the upload was unsuccessful, there should be a message giving an indication of where / why it failed;
    b. Add ability to see which datasets have already been sent to CIMH;
    c. Add ability to automate the process of sending the data. There should be two options available:
        i. Option I: send data as it is entered into database – either in near real time or at a predefined time each day. This will include any changes later made to the data;
        ii. Option II: send data only after quality control checks have been completed;
        iii. Ability to exclude stations or datasets from this process of being sent to CIMH;
        iv. If data transfer fails, the system will either try again or alert the user via a message on the graphical user interface, including where / why it failed;
7. Ensure Proper Application Security
    a. Ensure all development work is carried out with the security of the data at the forefront
        i. The final delivered product must embody internationally recommended security practices.

3. Deliverables

1. Inception Report (including proposed schedule and methodology);
2. Report on the upgrading of the database, outlining all updates undertaken and linking those updates to the requirements in the scope of works; *(New version of CIMH climate database which has undergone rigorous testing, both by the developers themselves and by relevant focus groups including CIMH staff)*
3. Report and approval on testing;
4. Facilitation of the training workshop inclusive of development of training manuals and evaluation of the training; (*Training workshop for personnel from CMO Member States and CIMH)*
5. Development and the production of the following training materials:
    a. Instruction manual for general users;
    b. Instruction manual for administrators;
    c. A series of short training videos demonstrating the use of various features of the software to be uploaded to a free internet video service e.g., YouTube, Vimeo etc.

4. Selection Criteria

a) The candidate must have at least a B.Sc. Computer Science, Information Technology or similar. In the absence of a degree, professional certifications in areas relevant to the work to be carried out, may also be considered;

b) The candidate must demonstrate a strong background and have at least 3-5 working years of experience in web development and database development;

c) The preferred candidate should ideally have working experience and knowledge of Python, SQL, JavaScript, HTML and CSS;

d) Proven experience with using, creating, or enhancing weather/climate related databases would be an asset.

5. Duration & Expected Start Date

The term of the consultancy shall span a period of 12 months, with an expected start date in March of the year 2024.

The duration of the work period encompasses both in-home and on-site work. The breakdown of the deliverable payments can be found in the Deliverables section.

6. Contract Type and Price

The assignment will be contracted through a fixed-priced consultancy agreement. Remuneration will depend on the level and degree of expertise of the chosen consultant.

The contract will be concluded between the Consultant and CIMH and will contain the above stated deliverables.

Payment for consultancy services will be made upon the completion of the agreed-upon milestones to the satisfaction of the client.

7. Evaluation and Selection Criteria

The Evaluation Criteria and associated weighting that will be applied to this Terms of Reference (TOR) are outlined below:

Technical

Category	Description	Weighting
1	Level of education of applicant	15
2	Experience and qualifications of applicant	15
3	Experience in producing web applications written in Python	20
4	Evidence of track record with regards to development of database applications	20
	Total	70

Financial

The evaluation of the financials shall constitute 30% of the overall score designated for the submission.

8. Proposal Requirements

8.1. A comprehensive work plan encompassing the allocation of time for the provision of feedback.

8.2. Detailed financial proposal.

8.3. Hourly rate for any additional work beyond the scope mentioned.

8.4. A detailed curriculum vitae for every individual engaged in the execution of the work assignment including a description of main achievements where relevant.

Report and Supervision of contract

- The consultant will report to Adrian Trotman, Chief, Applied Meteorology and Climatology and Dr. David A. Farrell, CIMH Principal.