**Appendix 2**

**TERMS OF REFERENCE**

**CONSULTANCY SERVICES FOR BUILDING THE CAPACITY OF YOUNG PROFESSIONALS IN CLIMATOLOGY, METEOROLOGY, HYDRO-METEOROLOGY AND RELATED FIELDS**

1. **Introduction**

Recognising the importance of building critical mass in weather, climate and hydro-meteorological professionals to the region's resilience to climate change, increasing climate variability and extreme weather, the Caribbean Institute for Meteorology and Hydrology (CIMH) initiated a young professionals programme in 2006 focused on students in the B.Sc. Programme in Meteorology at the University of the West Indies Cave Hill Campus. The programme subsequently expanded to include individuals from different disciplines including civil engineering, water resources management, climate science and remote sensing - all closely linked to the core programmes of the CIMH. In recent years, the programme has been further expanded to include individuals from the social sciences in recognition of the fact that engaging persons in these disciplines is critical to building professional relationships that are essential for understanding and better defining sectoral needs for applications of weather, climate and hydro-meteorological information. Currently, the programme caters to young professionals in undergraduate and graduate programmes. The attachments last between three months to two years depending on the nature of the investigation.

Three-month attachments generally focus on exposing young professionals in undergraduate programmes to interesting and challenging problems with well constrained solution strategies that can be implemented in the requisite timeframe. The individuals are introduced to basic elements of research that builds their independent problem solving skills and expands their knowhow and knowledge base. The outputs from several of these attachments have been converted by the CIMH into products and services used by the international community. For example, the CIMH Terminal Aerodrome Forecast software which is used by National Meteorological and Hydrological Services (NMHSs) in the Caribbean, has been translated into Spanish, and now used by NMHSs in Central and South America started out as a summer attachment project. Several young professionals have also extended their projects into research projects for graduate degrees.

Longer attachments, usually on in the order of 1–2 years are undertaken by recent graduates seeking to extend their skillsets before either seeking employment or entering graduate programmes. These attachments focus on building prototypes of either new products or services. A good example is the implementation of the Wavewatch-3 software to build an operational high-resolution marine significant wave height forecasting platform for the Caribbean Sea and adjacent oceans (http://ww3.cimh.edu.bb). The young professionals support their supervisors by conducting a significant portion of the basic work required to complete and operationalise the project. Several young professionals in recent years have supported investigations into boundary problems related to climate and (a) tourism, (b) energy and (c) agriculture. For example, one individual is currently investigating how geological hazards, when integrated with meteorological processes, can disrupt renewable energy production and civil aviation. Another individual is examining the application of virtual reality to meteorological and hydrological training and situational awareness and risk-informing the disaster management community. The results from these attachments have been quite promising. Several individuals have converted their opportunities into graduate research projects.

1. **About the Caribbean Institute for Meteorology and Hydrology**

The CIMH is an Institution of the Caribbean Community (CARICOM) and the technical Organ of the Caribbean Meteorological Organization (CMO). The mandate of the CIMH is “to assist in improving and developing the Meteorological and Hydrological Services as well as providing the awareness of the benefits of Meteorology and Hydrology for the economic well-being of the CIMH member states. This is achieved through training, research, investigations, and the provision of related specialized services and advice”.

In achieving its mandate, the CIMH in 1973 established an affiliation with the University of the West Indies in which its primary responsibility is the delivery of the B.Sc. programme in Meteorology in the Faculty of Pure and Applied Sciences. The CIMH is recognized regionally and globally as:

* The World Meteorological Organization (WMO) Regional Training Centre for the Caribbean;
* A centre for applied research and development in meteorology, hydrology/water resources, climatology and related areas including disaster risk reduction and impacts forecasting;
* The WMO Regional Instrument Centre for the Caribbean;
* A WMO Centre of Excellence for Training in Satellite Meteorology;
* The WMO Regional Climate Centre (RCC) for the Caribbean;
* The Caribbean Centre for Climate and Environmental Simulations;
* The Climate Data Archive for CMO Member States;
* The Pan American Centre for the WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS);

The CIMH has strong collaborations with other Regional Institutions, national organizations in CMO Member States and the international community. Since 2006, the CIMH has been providing internships opportunities to graduate and undergraduate students registered at regional and international universities. While the majority of internships have supported research and development in Earth and Atmospheric Sciences, in recent years the areas of focus have been expanded to include Social Sciences, Computer Science and Information Technology. Internships commonly range from 3-months to 1-year with the potential for an increase to two years. Many interns have converted their projects to publications and conference presentations as well as M.Sc. and PhD graduate research programmes.

**Position 1:** *Computer Science Intern - CID* – To support the improvement of the content and functionality of the Caribbean Climate Impacts Database (CID)

1. **Scope of Work**

The impacts of climate variability and change pose a serious threat to the social and economic development of the Caribbean region. This has been well demonstrated by past weather and climate-related events in the Caribbean which are associated with more economic damage and loss cumulatively than other types of natural hazards. Projections suggest that weather and climate events are likely to continue to incur losses, providing a compelling socio-economic case for action, especially in key sectors that remain highly sensitive to climate.

Insufficient climate impacts reporting has limited our understanding of the full extent of the impacts of climate on the performance of key social and economic sectors and ultimately the Caribbean’s socio-economic development. In response to this gap, the Caribbean Institute for Meteorology and Hydrology (CIMH) in collaboration with the Caribbean Disaster Emergency Management Agency (CDEMA) and national disaster management agencies in the Caribbean have developed the Caribbean Climate Impacts Database (CID). The CID is an open-source geospatial inventory which archives among other things, historical sector-based climate impacts. Hosted and managed by the CIMH, the CID provides a centralized evidence-based information archive that supports the forecasting and modelling of climate risk.

The successful candidate will work with the IT Technical Officer, Social Scientist, and the Climate Product Development Specialist to improve the content and functionality of the CID. Specifically, the Intern will:

1. Ingest positive and negative impacts data and metadata into the CID;
2. Implement an Application Programming Interface (API) for the CID database to support development and integration with other products and services;
3. Design and implement quality checks and assurance mechanisms for data in the CID;
4. Perform application stress tests and browser (Safari, Chrome, Mozilla Fox, Internet Explorer, Opera) functionality and compatibility testing; as well as
5. Any other duties.
6. **Deliverables**
7. A comprehensive, geo-referenced, searchable inventory of positive and negative climate impacts in the CID;
8. Functional API technology linked to the CID; and
9. A summary report documenting among other things, the results of the stress testing and quality checks, as well as any relevant recommendations on improving the CID and its use.
10. **Qualifications**

Candidates applying for the position should have as a minimum, a BSc degree in Computer Science and/or Information Technology.

1. **Experience**

Candidates should have strong working knowledge of Python Programming Language; HTML, CSS and PHP; and MySQL databases. Experience working with GIS based technology and writing reports would be considered an asset.

Given the regional and interdisciplinary nature of CIMH’s work, the successful intern should also possess:

* Strong cultural and social IQ;
* Excellent written and oral communication skills;

1. **Duration**

The duration of the internship is three (3) months.

1. **Reporting**

The successful candidate will be required to submit monthly progress reports and a final report within two weeks following the completion of the assignment detailing the activities performed under the internship.

**Position 1:** *Computer Science Intern - CAROGEN* – To support the implementation software fixes to ensure smooth back-end operations of the Caribbean Regional Climate Centre (RCC)’s Caribbean Climate Outlook Forum (CariCOF) Outlook Generator (CAROGEN) Platform.

1. **Scope of Work**
2. Work with the CAROGEN back-end operations expert to provide trouble-shooting assistance and document solutions for back-end operation errors in CAROGEN with respect to its use in generating and viewing CariCOF’s regional and national climate outlook maps as needed;
3. Implement necessary fixes to the CAROGEN system for a smoother operation in the absence of a back-end operations expert.
4. Assist in the preparation of a catalogue of back-end operation errors in CAROGEN;
5. Implement necessary fixes to the system’s documented problems with respect to the preparation of CPT scripts, ensuring correct ingestion of input data into CPT, manual validation of test results on CAROGEN server, and back-end troubleshooting for National Meteorological Service and CIMH users;
6. Implement residual fixes as needed to ensure a smooth back-end operation of CAROGEN with respect to CariCOF’s regional and national climate outlook maps generation and viewing;
7. Document and rigorously annotate\* implemented fixes into an annex to the catalogue of back-end operation errors in CAROGEN for the benefit of CAROGEN IT and non-IT administrative users.
8. Porting, upgrading and testing of the map generation code from Windows to Linux for single operability within a Linux environment.

\*By “rigorously annotate” the following is meant: both annotations using technical terms targeting IT staff as well as annotations using non-technical descriptions for non-IT CAROGEN administrative users.

1. **Deliverables**
   1. All fixes documented in the catalogue of back-end operation problems in CAROGEN implemented;
   2. Annex to the catalogue of back-end operation problems in CAROGEN containing implemented fixes delivered;
   3. Map generation code for operability in Linux.
2. **Qualifications**

Candidates applying for the position should have as a minimum, a BSc degree in Computer Science and/or Information Technology.

1. **Experience**

Candidates should have strong working knowledge of Python Programming Language; HTML, CSS and PHP; and MySQL databases. Experience working with GIS based technology and writing reports would be considered an asset.

Given the regional and interdisciplinary nature of CIMH’s work, the successful intern should also possess:

* Strong cultural and social IQ;
* Excellent written and oral communication skills;

1. **Duration**

The duration of the internship is three (3) months.

1. **Reporting**

The successful candidate will be required to submit monthly progress reports and a final report within two weeks following the completion of the assignment detailing the activities performed under the internship.