



## Terms of Reference

### **Assignment Title: Consulting Services for an Individual Consultant to recommend improvements to CCRIF's DFA Modelling**

#### **1 Background**

In 2007, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) was formed as the first multi-country risk pool in the world, and was the first insurance instrument to successfully develop parametric policies backed by both traditional and capital markets. It was initially designed as a regional catastrophe fund for Caribbean governments to limit the financial impact of devastating hurricanes and earthquakes by quickly providing financial liquidity when a policy is triggered. CCRIF was developed under the technical leadership of the World Bank and with a grant from the Government of Japan. It was capitalized through contributions to a multi-donor Trust Fund by the Government of Canada, the European Union, the World Bank, the governments of the United Kingdom and France, the Caribbean Development Bank and the governments of Ireland and Bermuda, as well as through membership fees paid by participating governments.

In 2014, the facility was restructured into a segregated portfolio company (SPC) to facilitate expansion into new products and geographic areas and is now named CCRIF SPC. The new structure, in which products are offered through a number of segregated portfolios, allows for total segregation of risk. In April 2015, CCRIF SPC signed an MOU with COSEFIN - the Council of Ministers of Finance of Central America, Panama and the Dominican Republic - to enable Central American countries to formally join the facility. The expansion to Central America and the Caribbean is supported through the World Bank administered Central America and Caribbean Catastrophe Risk Insurance Program Multi-Donor Trust Fund (MDTF) established for that purpose. The MDTF channels resources from various donors, including: Canada, through the Department of Foreign Affairs, Trade and Development, the United States, through the Department of the Treasury; the European Union, through the European Commission, and Germany through the Federal Ministry for Economic Cooperation and Development.

Funding under the Program has been allocated to: (i) expand the services and membership of CCRIF SPC through a recipient-executed Project implemented by CCRIF SPC. The Central America and Caribbean Catastrophe Risk Insurance Project (P149670) was approved by the Regional Vice President for Latin America and the Caribbean on June 30, 2015. The Project is implemented by CCRIF SPC (CCRIF Segregated Portfolio Company, formerly the Caribbean Catastrophe Risk Insurance Facility). The Project development objective is to improve affordability of high-quality sovereign catastrophe risk transfer associated with earthquakes and climate-related events for CCRIF participating countries. The expansion of membership into Central America has the potential to diversify the risk portfolio, improve access to reinsurance markets hence reduce the cost of risk transfer, allowing these benefits to be passed on to its members.

CCRIF SPC is registered in the Cayman Islands with a board of directors which is responsible for governance and the strategic direction of the company and a Chief Executive Officer with responsibility for managing the company on a day to day basis. It operates as a virtual organization, supported by a network of service providers covering the areas of risk management, risk modelling, captive management, reinsurance, reinsurance brokerage, asset management, technical assistance, and corporate communications and information technology. CCRIF SPC offers earthquake, tropical cyclone and excess rainfall policies to Caribbean and Central American governments. CCRIF SPC helps to mitigate the short-term cash flow problems small developing economies suffer after major natural disasters. CCRIF SPC's parametric insurance mechanism allows it to provide rapid payouts to help members finance their initial disaster response and maintain basic government functions after a catastrophic event.

Nineteen Caribbean governments are currently members of the facility: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, Montserrat, St. Kitts & Nevis, Saint Lucia, Saint Vincent & the Grenadines, Sint Maarten, Trinidad & Tobago and Turks & Caicos Islands. Nicaragua was the first Central American government to become a CCRIF SPC member, Panama, and Guatemala have since joined the facility.

CCRIF SPC's sustainability relies on certain key factors:

- Continuing operations with the capacity to fund payouts, within the agreed timeframe, while maintaining adequate capital and reserves
- Ability to attract members by offering relevant products with competitive pricing while at all times reinforcing the objectives and limitations of parametric insurance coverage
- Supporting the membership with technical assistance and ensuring a close working relationship with members that value the need for parametric insurance coverage in light of more frequent and severe natural disasters.

The Chief Executive Officer is the most senior full-time officer of the Facility and is ultimately responsible to the Board for the effective management of the company. The day-to-day operations of the CCRIF are managed by the Chief Operations Officer supported by a team of service providers undertaking risk management, financial planning and the management of technical assistance programmes. Working under the supervision of the CEO, the Chief Risk Management officer (CRMO) is responsible for providing technical leadership and advice to the management and board as it relates to the areas of risk management, financial planning, catastrophe modeling, and (re)insurance placement. This position will therefore seek to provide technical input and review as well as act as an independent evaluator to the work two of CCRIF's main service providers – the Risk Management Specialist (RMS) and the Placing Broker.

The CRMO supervises the work of the RMS in order to ensure that individual country pricing models and the linked Dynamic Financial Analysis (DFA) Model are effectively maintained,

operated, and refined as appropriate to facilitate as accurate as possible policy structure and pricing to ensure CCRIF's financial survivability and long-term sustainability as per the company's financial security policy and in line with its members' catastrophe risk profiles;

The outcomes of the DFA are the main tool for assessing the solvency and the short and long-term sustainability of the different SPs of the CCRIF. For this purpose, the DFA tool allows to assess if the current financial position of each Segregated Portfolio complies with the solvency requirements stated in the CCRIF's Pricing and Financial Security Strategy on a stand-alone basis or, in an extreme scenario, by recurring to the Core Capital.

The Dynamic Financial Analysis (DFA) Model is a MS Excel® spreadsheet-based stochastic simulation model which generates key metrics for the CCRIF over a ten-year time horizon. The model generates premiums by country and peril, can test alternate reinsurance structures, and projects underwriting income and balance sheet position. Additionally, the model calculates key performance measures such as the probability of survival and the loss due to insolvency. The main input of the financial modelling process consists of year loss table output from perils models per country and peril, representing 10,000 as-if years. Policies written, or proposed to be written, by CCRIF, are modeled in policy specific models and their recoveries for each event calculated, considering policy terms including minimum recovery amounts and limited reinstatements. Output from these models is fed into the DFA. Correlation, where not explicitly modelled by regional event IDs, needs to be added. With the simulated policy losses, the DFA then computes a projected underwriting result for each Segregated Portfolio. Outward reinsurance is then added and its net impact on income and capital calculated. This is run over a 10-year period, so rules on future insurance and reinsurance pricing are applied. With the result of the simulations, several metrics are produced for each point in the 10-year period: average capital by SP, probability of default, extra capital needed to ensure solvency, amongst other factors. The MS Excel Add-In @Risk from Palisade Corporation is used to perform the stochastic simulations, therefore it is highly desirable that the Consultant engaged for this assignment has access to that Add-In, so he/she can execute the stochastic simulations.

CCRIF plans to engage a Consultant qualified on the subject to perform a review of the DFA assumptions and methodology to recommend improvements, which once implemented, will support the refinement of policy structures and pricing as well as adequacy of the reinsurance structures.

## **2 Objectives**

As a risk management strategy, this consultancy is being commissioned to obtain an independent and comprehensive understanding of the recommended improvements to the DFA model. Upgrade of the DFA model will ultimately improve the risk transfer strategy and reinsurance structures, the pricing of the direct insurance policies, and the overall solvency and capital adequacy.

### 3 Scope of the Assignment

The Consultant will review the assumptions and methodology of the model taking into consideration the following:

- (i) Does the year loss table input data, as produced by the SPHERA and XSR 2.5 models
  - a. Correctly capture the underlying risk, including correlation between countries, policies and hazards?
  - b. Provide sufficient information to model losses to policies offered by CCRIF individually and collectively within each SP and so correctly reflect the insurance risk assumed by CCRIF from a multi-peril, multi-country perspective?
  - c. Help understand and minimise basis risk per country and per peril
- (ii) Does the methodology used to calculate recoveries to individual policies and to each SP correctly reflect the insurance risk assumed including
  - a. Correlation by hazard, country/region and time for each policy, SP and CCRIF SPC?
  - b. Tail risk for each policy, SP and CCRIF SPC?
  - c. Suitable for assessment of multi-year and/or semi-finite covers?
- (iii) Is the current combination of country models and SP-specific DFAs appropriate for calculating premium, including, for example, estimating each policy's contribution towards capital depletion?
- (iv) Does the DFA provide a sound decision making framework to determine reinsurance (and or other risk transfer mechanism) adequacy and optimization, consistent with the financial security policy, including assessment of multi-year and/or semi-finite covers?
- (v) Is the DFA model a reasonable tool to inform and monitor the capital and solvency position of each SP and the CCRIF as a whole?
- (vi) Do the solvency parameters stated in the DFA reports convey all the relevant information for decision makers?

The scope of works will require the Consultant to work with the CCRIF Management, RMS and Placing broker to provide recommendations for improvements considering, but not limited to the following factors:

- Marginal impacts of each policy on capital and income to each SP, allowing a better understanding of pricing adequacy; supporting marketing and product development strategies.
- Similarly support for different reinsurance structures, creating a framework for assessment of cost benefit and a platform for optimization
- Support for different key performance indicators for capital management strategies for individual Segregated Portfolios and CCRIF, as a whole, including the Core.
- Support for correlation of losses between XSR and TC (and future climate derived policies such as drought) allowing assessment of impacts on SPs and CCRIF as whole and design of appropriate cross -policy and SP reinsurance structures.

- Better support for multi-year modelling, including temporal correlation of hazard (e.g., phase changes), post-loss pricing (inwards and outwards) and assumed management decision making, noting the need for transparency and avoidance of spurious accuracy.
- Better understanding of the uncertainty of the models, including multi-year modelling, could inform the nature, interpretation and use of KPIs for capital management.
- Ability of the models to test the sensitivity of CCRIF and its clients to climate change and/or seasonal variation, leading to changes in event frequency, severity, correlation and/or clustering.

These and other recommendations should be made as part of a general upgrade of the methodology of the DFA model(s). The Consultant should also provide options for use of platforms other than @risk, including platforms which may avoid license restrictions.

#### **4 Services**

Expected services from the successful Consultant are the following:

CCRIF SPC will provide the Consultant with information necessary for review of the model. The documentation may consist of, but is not limited to, the following items:

- A description of the assumptions, justifications, and methodology of the model
- Sample DFA reports, peer reviews and other documentation.

Before receiving any such material and access to the DFA and sample policy models, the Consultant will be required to sign a Non-Disclosure Agreement with CCRIF SPC.

Interaction with the CCRIF: The Consultant is expected to interact with the CCRIF and the RMS via electronic mail, WebEx, and other means for clarifications.

The Consultant will have access to the DFA model and sample policy models. He/she may also ask CCRIF to carry out specific analyses with the model and to report back the model output, if appropriate. The CCRIF SPC designated person will also provide the Consultant with comments about the findings.

The Consultant is expected to deliver the following reports:

- Interim Reports after the review of the material specified above giving an initial view of the adequacy of current models and scope for potential improvements.
- A Final Report for internal use of CCRIF SPC, with all findings reported at the level of detail necessary for the implementation of actions.

#### **5 Time Schedule and proposed Fees**

The assignment is expected to commence in September 2021 upon execution of the contract and the expected level of effort (LOE) is no more than 15 days over a two-month period.

The specific dates for deliverables will be agreed by contract.

## 6 Required Qualifications and Experience:

- An Actuary with a degree or certification in Actuarial Sciences or an equivalent and suitable qualification
- Experience in developing and reviewing DFA and a high degree of familiarity with catastrophe risk estimation model output and loss estimation metrics.
- At least 10 years of proven experience as a developer and /or reviewer of catastrophe risk estimation and DFA models.
- Excellent analytical skills, and ability to prepare professional narrative reports summarizing observations and conclusions.
- Good oral and written communication abilities in English are required and
- Experience and knowledge of the Central America and the Caribbean context, specifically regional insurance, reinsurance, regulation, and general governmental functions.

## 7 Application Process

All suitably qualified persons interested in this opportunity should submit an application by email to [jobs@ccrif.org](mailto:jobs@ccrif.org) by **September 24, 2021**, at 23:45 Cayman Islands time. (*Subject Line –DFA Improvements*)

Applications must include a cover letter, resume and professional references. Applicants will receive a confirmation of their submission via email.