Pacific Catastrophe Risk Insurance Company
Bermuda House, Tutakimoa Road
Avarua, Rarotonga, Cook Islands

Expressions of Interest

Date:	4 -03-2022
To:	Risk Assessment & Modelling to Support Parametric Rainfall Product
From:	Pacific Catastrophe Risk Insurance Company
Subject:	CALL FOR EXPRESSIONS OF INTEREST (EOI) FOR RISK ASSESSMENT AND MODELLING TO SUPPORT PARAMETRIC EXCESS RAINFALL INSURANCE PRODUCTS FOR PACIFIC ISLAND COUNTRIES

Closing Date for Expressions of Interest: 18 March 2022 at 4pm (Cook Islands)
Contract Type/Period: Lump-Sum to 31 December 2022
Selection Method: Consultant Qualification Selection (Individual/Firm)

The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) insurance program provides climate and disaster risk insurance to member countries in the Pacific region. Its primary aim is to provide a quick injection of cash to help participating governments deliver relief efforts as quickly as possible after a disaster. The PCRAFI insurance program provides parametric earthquake and tropical cyclone insurance solutions that increase the financial response capacity of Pacific Island Countries, helping them to meet post-disaster funding needs without compromising their fiscal balances and development. The insurance provides cash payouts to insured governments within 15 working days after a qualifying disaster event.

Following a successful pilot of the PCRAFI Insurance Program, the PCRAFI Facility was established by legal statute in the Cook Islands on June 10, 2016, to provide the insurance program to Pacific Island Countries (PICs) going forward. The PCRAFI Facility was established as the Pacific Catastrophe Risk Insurance Foundation (PCRIF) that own a group captive insurer, the Pacific Catastrophe Risk Insurance Company (PCRIC). As the PCRIC is being operationalized a series of initial arrangements have been made to enable the commencement of key operations, including the appointment of a Board of Directors, Chief Executive, key service provider contracts and establishment of fully operational captive insurance facility in the Cook Islands.

Assignment Description

The Pacific Island Countries (PICs) are threatened by many types of natural disasters including, tropical cyclones, earthquakes, intense rainfall, and meteorological drought; being geographically small means that the entire country or very large parts often suffer during extreme events, negatively affecting the entire national economy.

The PCRIC's current risk modelling capabilities (and insurance product offering and re-insurance strategy) rely on models developed by AIR Worldwide for Tropical Cyclones (including damages from wind, storm surge and rainfall) and Earthquakes (including earthquake-induced tsunamis).

The PCRIC is now requesting the support of a suitably experienced and qualified firm (or consortium of firms), 'the Consultant', to facilitate the PCRIC offering a sovereign level parametric insurance product for excess rainfall events (XSR) to PICs through -

1. The design of a suitable post event loss / impact calculation methodology that can be used to evaluate and trigger parametric insurance pay-outs.

2. An evaluation of historic XSR events (from both tropical storms and non-tropical storm events) and the development of appropriate impact functions for the various PICs.
3. The provision of country level risk assessment, based on the parametric trigger design, suitable for the calculation of both inwards insurance premiums required and outwards reinsurance purchase.

The outcome of this project should enable PCRIC to offer a sovereign level parametric insurance in advance of the 2022/2023 South Pacific Tropical Cyclone season.

Two prior projects, led by the World Bank Disaster Risk Finance Insurance Program, have explored the feasibility of both excess rainfall and drought insurance products, including potential product design. The outcomes of these earlier projects will be shared with the Consultant to inform this study.

The assignment will consist of 5 distinct components as detailed below. The Consultant is expected to work jointly with the PCRIC Catastrophe Modelling Advisor on all stages of the project and to provide advice to management when requested.

In addition, the following criteria expected to be met by the Consultant (see further details under Firm and Model Qualifications) -

- *The **Consultant is expected to have an existing model or framework, consistent with modern Catastrophe Model design, for the evaluation of the risk of excess rainfall**, including distinction between tropical storm and non-tropical storm events, with spatial and temporal resolutions appropriate to the geography and distribution of exposure on PICs.*
- *The **Consultant is also expected to be willing to serve as a calculation agent** for any parametric trigger, in exchange for a fee, after future disaster events.*
- *The Consultant is also expected to be willing to engage in and support discussion with the government of Pacific Island Countries and the PCRIC insurance manager, reinsurance brokers and reinsurers as required on the results of this assignment.*

Note: In these terms of reference, Pacific Island Countries (PICs) refers to those included in the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI): the Cook Islands, the Republic of Fiji, the Republic of Kiribati, the Republic of the Marshall Islands, the Federated States of Micronesia, the Republic of Nauru, Niue, the Republic of Palau, the Independent State of Papua New Guinea, Samoa, the Solomon Islands, the Republic of Tonga, Tuvalu, and the Republic of Vanuatu.

Component 1: Review Prior Project Material & Define Priorities Regions

Objective

The first objective of component 1 is to evaluate the conclusions of prior projects to ensure the Consultant's solutions and proposed work to be undertaken in Components 2-4 builds upon previous projects where appropriate.

Component 1 should review the work undertaken in both prior projects

1. Pacific Rainfall Hazard Data for Parametric Insurance, undertaken by DHI in 2018
2. Feasibility Study of Excess Rainfall and Drought Insurance for Pacific Island States, undertaken by Celsius Pro in 2020

(Available reports, data, and documentation to be provided to the Consultant).

The second objective of component 1 is to define, with the PRCIC, any regional / country priorities necessary to ensure delivery of a sovereign level parametric insurance in advance of the 2022/2023 South Pacific Tropical Cyclone season.

The output of Component 1 is intended to help inform and steer Component 2 - 4. Specifically, based on the output of Component 1, the PCRC may, in agreement with the Consultant, refine the expected output and deliverable of Components 2 -4.

Key Actions

Key actions will include, but should not be limited to:

- An expert review of reports, data, and documentation created for both prior projects.
- Detailed discussion with the PRCIC technical & leadership teams to establish any regional / country priorities.

Expected Outputs

1) A short technical report or presentation to management (and Board if required) highlighting the Consultant's conclusions on the prior work and recommendations for geographic/country priorities and or modifications to Components 2-4.
2) A technical discussion with the PCRIC Catastrophe Modelling Advisor and Technical Specialists with agreed action items and agreed modifications to Components 2-4.

Component 2: Event Definitions, Evaluation of historic XSR events and Development of Impact Functions.

Objective

With due consideration of the conclusions of Component 1, Component 2 will recommend: appropriate event definitions, XSR hazard parameters, and impact relationship(s) suitable for a parametric insurance product that can act as disaster risk finance instrument for Pacific Island Countries, specifically to support the government emergency response costs.

Key Actions

Key actions will include, but should not be limited to:

- For excess rainfall events impacting each Pacific Island Country, either collectively or across all Islands (as justified based on their climatology and geography);
    - recommend appropriate event definitions (both temporal and spatial)
    - recommend appropriate XSR hazard metrics (based on the geography and spatial distribution of exposure)

  The proposed event definition and metrics should consider, and justify, whether to distinguish between events causing direct damage due to the physical impacts of intense precipitation and those leading to flood e.g., peak intensity and duration.

  Appropriate geographical areas should be also considered (i.e., "risk zones", based on catchments and the underlying exposure at risk). PCRIC will provide access to previous collated exposure information held by the SPC in the PacRIS system. *The consultant will be expected to review, supplement, adjust, correct, and update this data as required based on generally available sources.*

- Evaluate historic XSR events (based on proposed event definitions and hazard metrics, and the consultant's analysis of observed rainfall data, or own modelling) and recommend associated impact relationship(s) and resultant metrics, for each defined event, considering reported damages across various asset types (to be determined in consultation with PCRIC), as well as other impacts and people affected.

  The Consultant's choice of observed rainfall data or modelling of historic events should be justified and contrasted with prior projects.

  PCRIC will provide access to previous collated impact and damage assessments form historic events. *The Consultant will be expected to review, supplement, adjust, correct, and update this data as required based on generally available sources (insurance reports, EM-Dat, AusAID etc.)*

  Note that the development of a full suite of vulnerability functions relating excess rainfall directly to physical damages or a full flood model is considered beyond the scope of this engagement.

Expected Outputs

1) A detailed technical report presenting to management (or Board if required) and justifying the recommendations from this component.
2) A presentation to and technical discussion with the PCRIC Catastrophe Modelling Advisor and Technical Specialists.
3) A catalogue / database, in a suitable commonly used data format, of historic events, based on recommended event definitions and hazard metrics and associated impact metrics by PIC.

Component 3: Design of Parametric Index, Trigger and Post-Event Loss Calculation Method

Objective

With due consideration of the conclusions of Components 1 & 2, Component 3 will recommend an appropriate parametric index design, objective trigger mechanism, and implement a real-time calculation methodology / system.

The proposed parametric indices and Post-Event Loss Calculation should be easy to explain and should be understandable by non-technical experts; they should also be acceptable for financial transactions in the international (re)insurance market.

Key Actions

Key actions will include, but should not be limited to:

- Design and recommend parametric indices for excess rainfall and events affecting PICs based on the impact metric determined in Component 2.
- Produce an analytical assessment of whether the proposed index has sufficiently low basis risk compared to impacts defined in Component 2 for insurance purposes and can act as a suitable disaster risk finance instrument for Pacific Island Countries.
- Define an objective trigger based on publicly available third-party information, e.g., from the regional Met Office or other official source. Proposal may include options for multiple triggers e.g. NWP output, satellite derived flood extents etc
- Implement a real-time calculation methodology and system.

Expected Outputs

1) A detailed technical report presenting to management (or Board if required) and justifying the recommendations from this Component.
2) A presentation to and technical discussion with the PCRIC Catastrophe Modelling Advisor and Technical Specialists.
3) Demonstrate the real-time Post-Event Loss Calculation methodology (/ and system).

Component 4: Risk Assessment

Objective

It is anticipated that the Consultant will already have an existing excess rainfall stochastic event set / catastrophe model framework for PICs.

The objective of this Component is to apply the event definitions, impact relationships and parametric index definitions from Components 2 & 3 to the catastrophe risk model framework to enable risk profiles for each PIC to be calculated.

The output of this analysis should be suitable for the calculation of both inwards insurance premiums required and outwards reinsurance purchase and be acceptable, without additional modification, to the international (re)insurance market.

This Component also includes the provision of underlying model meta-data and methodology to enable the PCRIC to validate the Consultant's catastrophe risk model methodology including stochastic event set. It is expected that sufficient information about the model's historic baseline, and event characteristics will be provided to allow an expert to adjust the model or perform sensitivity tests with respect to climate change and / or natural variability (e.g., ENSO)

Key Actions

Key actions will include, but should not be limited to:

- Based on the agreed event definition, impact relationships and parametric index definitions from Components 2 & 3 calculate a stochastic risk profile for each of the PICs based on all XSR events, Tropical Cyclone only events, and non-Tropical Cyclone events.

Expected Outputs

1) A detailed technical report presenting to management (or Board if required) and justifying the output of this Component.
2) A presentation to and technical discussion with the PCRIC Catastrophe Modelling Advisor and Technical Specialists
3) Document on the Consultant's Model, including validation.
4) Risk profiles by PIC in a suitable commonly used data format. *Output is expected to include, as would be expected for a market-standard catastrophe model, OEP and AEP curves, AAL maps, Year-Event Catalogues (including Hazard Metrics, Impacts, and Index Calculations).*
5) Event meta-data in a suitable commonly used data format. *All data necessary for a catastrophe risk expert to perform sensitivity tests, with respect to climate variability i.e., ENSO, and Climate Change will be provided.*

Component 5: Support Product Placement and Future Product Development

Objective

The objectives of this Component are to

1) Support the placement of products with PICs and the PCRIC reinsurance arrangements though the creation of supporting material and by engaging in discussions with the PCRIC technical personnel, key service providers (e.g., the PCRIC's reinsurance broker) and with representatives of Pacific Island Country governments as necessary.
2) Define the Consultant's future role as a the PCRIC's Calculation Agent.
3) Advise on appropriate methods to maintain the relevancy of the risk analysis conducted for component 4, both with respect to changing exposure across the region and changes in the risk (e.g., due to climate change),
4) Advise on the potential to extend the products developed by this assignment beyond sovereign level disaster risk financing to household or local products.

Note: with regards the second objective, throughout this assignment, the Consultant is expected to use exposure information maintained by SPC in the PacRIS system. This information is however currently being updated by SPC and while the assignment does not specifically involve the licencing or development of a software framework to re-analyse / reset the analysis and index calculation based on updated exposure information, such a requirement may be arise in the future.

Key Actions

Key actions will include, but should not be limited to:

- Development of materials, as agreed with the PCRIC, necessary to support discussions with the PICs.
- Development of materials, as agreed with the PCRIC & the PCRIC's reinsurance broker, necessary to support discussions with the reinsurance partners.
- Lead Discussions with the PCRIC technical personnel and leadership around recommendations regarding the Consultant's future role as a PCRIC Calculation Agent.
- Lead Discussions with the PCRIC technical personnel and leadership on the future development of the Consultant's model, proposal(s) for resetting analysis based on updated exposure across the PICs, and proposal(s) for extending modelling solutions to household or local levels.

Expected Outputs

1) A brief, < 5page, report which explains the excess rainfall product in layman terms, for publication on the PCRIC website and to provide to PICs / stakeholders as necessary.
2) A short technical summary report (or presentation) to management (or Board if required) including an overview and executive summary of Components 1-4 with explicit commentary and recommendations for:
    a. Any future development of the Consultant's model.
    b. Proposal(s) for resetting analysis based on updated exposure across the PICs. *--Both simple / approximate method and complex comprehensive solutions should be considered.*
    c. Proposal(s) for extending modelling solutions to household or local levels.

3) A short summary report (or presentation) regarding the Consultant's future role as a PCRIC Calculation Agent.

Supervision & Reporting

The Consultant will report to the CEO of PCRIC who will accept the deliverables but will liaise mainly with the Catastrophe Modelling Advisor on day-to-day operations. The Consultant may also work with the Project Coordinator, Insurance Manager, Technical Specialist and Reinsurance Broker and may also interact with the World Bank team providing technical assistance to PCRIC.

Institutional Arrangements

- The Consultant role will work from his/her own office.
- If required the Consultant is expected to travel to the Pacific Island Countries, once COVID-19 restrictions are lifted, and at times agreed with the PCRIC CEO.
- Travel costs will be covered by a lump-sum payment to be agreed with the Consultant

Selection Criteria

- The Consultant will have a detailed knowledge of catastrophe risk modeling and specifically the modeling of excess rainfall and flood hazards.
- The Consultant will have developed models or have experience of using such models which have been used in insurance transactions previously and ideally should have been directly involved in a catastrophe risk transaction previously, for example as a Calculation Agent.
- The Consultant will have advanced analytical skills, catastrophe risk modeling expertise, quantitative financial expertise, a strong knowledge of parametric insurance, excellent presentation skills and be able to develop strong relationships with the clients.
- The Consultant will closely interact and report to the PCRIC team that will accept the deliverables.
- The Consultant must be willing and able to undertake trips to the Pacific region to consult stakeholders and/or present outputs to clients if required.

Timetable

This period of this assignment is expected to be from 1-April 2022 until 31-Dec 2022, with an estimated schedule of outputs as follows:

Outputs	Expected Duration / Person-Working Days Assigned	Anticipated Completion date
Component 1 Report Due	10	Friday, 22-April 2022
Component 2 & 3 Reports, Database & Deliverables Due	65	Friday, 22-July 2022
Component 4 Report, Risk Profiles and Data Deliverables Due	25	Friday, 26-Aug 2022
Component 5 Reports & Deliverables Due	25	During Aug -> Oct 2022

Component 5 (Placement Support) is expected to be 25 person-working days during August – October 2022 covering creation of the materials / expected output as well as discussions and meeting with the PIC officials and other stakeholders as necessary.

Additional Notes:

- *The anticipated person-working assigned to each component are listed above with an anticipated completion date as guidance only.*
- *A review meeting for each component as specified in the 'Expected Output' of each component is expected to be held within 1-week of the component deliverable specified above.*
- *Sign-off / acceptance of the deliverables for each component will follow the review meeting.*
- *Placement support activities (Component 5) are expected to begin post completion of Component 3 and carried out in parallel with component 4.*

Payment Schedule

This assignment will be undertaken as a lumpsum contract and will be paid on acceptance of deliverables and an invoice.

Potential for future work

There is a possibility for work as the need arises and additional funds become available. The scope of this future work is expected to be similar to the work conducted under the current assignment but may be revised in the light of the results of the program. Furthermore, the continuation of the future work with the selected firm would depend on the firm's satisfactory implementation of this assignment.

Note on items that should be included in the Expression of Interest

The procurement method for this activity follows the World Bank procurement regulations for "Consultant Qualification Selection". EOI's should provide enough information to allow the individual most qualified for the job to be identified, but full costing or details of the

activity are not required at this stage. PCRIC will then invite the preferred candidate to submit a technical/financial proposal for negotiation.

EOIs may be submitted via email. While EOIs are to be brief, the following information should be included for use by PCRIC in assessing an individual's ability to meet the requirements of the contract:

- Full contact details
- CV's, including qualifications, experience and references
- Basic information on costing/consulting fees
- Brief overview of current/past assignments, preferably of a similar size scope/seniority
- Declaration of any potential conflicts of interest
- Confirmation of eligibility to apply for World Bank funded contracts

It is not necessary to provide a detailed proposed approach or fee as part of the EOI. A shortlist will be identified, and interviews held and the preferred candidates will then be asked to present a technical and financial proposal for services.

Submitting an Expression of Interest

EOIs should be submitted by email only to the CEO on the emails below arriving no later than 4pm on Friday, 18 March 2022 (Cook Islands).

Contact

For further information please contact us at the address below:
Aholotu Palu, CEO, PCRIC
ceo@pcric.org or aholotupalu@yahoo.co.uk