Goal of Approach:

Caribbean Catastrophe Risk Insurance Facility (CCRIF) and Swiss Re Excess Rainfall Coverage for Caribbean Countries:

An Economics of Climate Adaptation (ECA) Study in the Caribbean led by CCRIF in collaboration with other partners revealed that natural hazards already represent a significant risk to inhabitants and economies in the Caribbean. Annual expected losses from wind, storm surge and inland flooding amount to up to 6% of GDP in some countries. Climate change has the potential to greatly exacerbate these risks, and could increase expected losses by 1 - 3% of GDP by 2030. These losses may triple by 2030 due to climate change. It is expected that climate change will have an impact on local sea levels, hurricane intensity, precipitation and temperature patterns.

Since early 2010, CCRIF has been engaged in research towards the development of an excess rainfall product for the Region. This has been in direct response to the interest expressed by many CCRIF participating countries and stakeholder partners in making available catastrophe flood coverage, as most of the countries are significantly exposed to the impacts of heavy rain.

In collaboration with Swiss Re, CCRIF has now designed and structured an Excess Rainfall (XSR) Product that could be used as an effective risk transfer solution. The product is aimed primarily at extreme high rainfall events of short duration (a few days).

Input provided by: Caribbean Risk Managers Limited (Facility Supervisors of CCRIF)

Main elements of the implementation strategy

As stated previously, the excess rainfall model was developed after CCRIF participating countries and stakeholders expressed a strong interest in purchasing catastrophic flood coverage.

CCRIF and Swiss Re's partnership for the development and launch of the parametric excess rain cover broadens coverage options for the region as countries seek to manage their financial exposures as climate change effects become tangible. As a result of this partnership between CCRIF and Swiss Re, countries did not incur any product development fees and Swiss Re's participation as reinsurer ensures the availability of risk transfer.

About the product:

The CCRIF/Swiss Re XSR model is based on data from the Tropical Rainfall Measurement Mission (TRMM), a research initiative undertaken by the US National Aeronautics and Space Agency (NASA) and the Japan Aerospace Exploration Agency (JAXA). TRMM provides a satellite-based estimate of aggregate rainfall at quarter-degree (~25km) resolution every 3 hours.

TRMM was selected as the rainfall data source as it provides an independent, real-time source which, while not generally as accurate as a ground-based measurement, does provide consistency across the Caribbean region in terms of data quality, and a very high degree of dependability as it is sourced directly from NASA.

The XSR model uses the TRMM data to compile a 5-day running aggregate of rainfall measurements at all of the TRMM grid nodes across a country. As used in other CCRIF products, the Multi-Peril Risk Estimation System (MPRES) exposure database is utilised to map exposures across a country at 30arcsecond (~1km) resolution.

Remote sensing data, economic and demographic statistics for 2010 were used to generate the exposure database. The database is designed to provide acceptable estimates for losses to physical assets from hydrometeorological and geophysical hazards.

Since the TRMM nodes are at ~25km resolution, the 1km MPRES exposure data is mapped onto the TRMM grid. This provides a distribution of the total MPRES values between the rainfall measurement points covering each country. For scaling purposes, 1% of the total MPRES exposure value is used as the base XSR exposure.

Calculating Index Losses

To calculate index losses for both historical and real-time analyses, a 5-day aggregate rainfall is calculated for each TRMM grid node

using a moving window, which ensures that peak measurements are captured. A rainfall event occurs when the 5-day aggregate exceeds 50mm and ends on the day before rainfall next falls below 50mm. Events are logged for each TRMM measuring point. For each event at each TRMM grid node, the single highest 5-day aggregate rainfall measurement for that event is used to calculate the index loss rate via a vulnerability curve which maps loss percentage to rainfall amounts.

The indemnity rate for each event is applied to the exposure value of the TRMM grid node, to give the individual index loss for the event for the grid node. To calculate the national index loss, the individual index losses at each grid node are added together each day. National-level events are defined as continuous periods where there is an ongoing event at one or more TRMM grid nodes. Therefore, once an event occurs at one or more of the TRMM grid nodes, a national loss is assigned to it with the date of the last day of the event as the event identifier. National losses are also aggregated on an annual basis, thus allowing coverage to be offered on a per-event or on an annual aggregate basis at the national level.

Targeted beneficiaries

The primary beneficiaries of this product are countries within the Caribbean which are significantly exposed to the impacts if rainfall. These include the 16 participating governments of CCRIF (Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Trinidad & Tobago and Turks & Caicos Islands) and countries which are not yet members of the facility i.e. Guyana and Suriname.

Any significant lessons learned

The impact of rainfall is extremely difficult to replicate in a numerical model, particularly in the Caribbean, where short-lived, high-rainfall events are the most damaging and where secondary effects such as flash flooding and landslides are both important and occur at very small scale.

Furthermore, baseline rain data to compile a representative rainfall history is generally both scarce and of poor quality (particularly in terms of the number of missing records).

Resource requirements

CCRIF's in-house efforts to build a rainfall hazard model (required due to the absence of sufficient historical rain gauge data and the scarcity of currently operating rain gauges which report in real time) required significant technical expertise and financial investment.

It is essential to acquire reinsurance support for new innovative insurance products and this takes time. CCRIF partnered with a major reinsurer to develop a first-generation rainfall product based on satellite rainfall estimates produced by NASA. These rainfall estimates are converted to quantitative impact estimates through a relatively simple loss module.

Potential for replication or scaling-up

There is considerable potential for replication in other regions. The methodology developed can be shared and replicated with the broader industry and will spur greater innovation in risk management in the region.

Any additional information

For additional information and resources, please visit http://www.ccrif.org/