An Unconventional Solution to Sovereign Parametric Flood Insurance in data scarce environments: Lessons From Laos

By

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Abstract

In 2021 SEADRIF developed a bespoke parametric flood insurance policy for Laos that provided the Government with additional response funding when large flood events occurred in the country. This product utilized novel, technology-driven, solutions to develop a combined risk-profiling and triggering approach. However, over the duration of the policy it became apparent that this approach did not meet the client's expectations in terms of coverage, transparency or alignment with on-the-ground impacts. To enable a renewal of coverage, SEADRIF, supported by Gallagher Re, experimented with alternative approaches. As a result, a new multi-peril, 2-year policy was placed in May 2025 that uses reported disaster impact data as a trigger and overcomes many of the previous product's limitations. This placement is part of SEADRIF's broader strategy to bring parametric insurance products closer to the needs of public sector clients in the region.

Overview

Peril/s	2021 – 2025: Flood parametric product, with a separate finite component that protected against basis risk and non-flood events 2025 – 2027: Multi-peril
Geography/Region	Lao, People's Democratic Republic (PDR)
Years of	Initial 3-year flood policy incepted in January 2021. The policy underwent rolling renewals until April 2025. New multi-peril 2-year policy incepted in May 2025
Exposure covered	Government disaster response costs through the national budget
Trigger type/s	2021 – 2025: Two triggers. Hard trigger using a modelled loss solution and a finite component that triggers upon the declaration of disaster occurrence by the Government 2025 – 2027: Reported impact data from National Disaster Management Office
Trigger mechanism/s	2021 – 2025: Number of people affected using a modelled loss approach 2025 – 2027: Number of people affected based on National Disaster Management Office (NDMO) reported impact data
Key information	
Annual Limit	2021 – 2024: Parametric component - $9.5 million per policy year, finite component - $1.5 million per year 2024 – 2025: Various 2025 – 2027: $8 million per policy year
Issuer	SEADRIF Insurance Company
Cedant	Ministry of Finance, Lao PDR
Parties Involved	Gallagher Re, Laos National Disaster Management Office, World Bank, Guy Carpenter, JBA, Deltares, CIMA, LiST and ESA

DETAIL

Motivation

What is the motivation behind this product?

Laos has experienced significant disasters over the course of its recent history with events such as Tropical Storm Podul, Tropical Depression Kajiki, Tropical Storm Bebinca and Typhoon Yagi all providing a key reminder of the risk the country faces. When large disaster events occur, vulnerable communities relied upon the Government to provide emergency relief and response interventions, putting a strain on existing budgets. The Government's motivation for this product was to ensure that swift financing is available following large events to support response activities, whilst for SEADRIF it highlights the value the company can bring to the region through bespoke modelling and structuring solutions in countries with limited insurance history or prior experience.

SEADRIF's mandate is to support its members in becoming more financially resilient to climate shocks and natural disasters through the application of insurance solutions. As SEADRIF Insurance Company is fully owned by its member countries, SEADRIF can develop experimental solutions that are not available to countries through traditional markets. For Laos this motivation has enabled the insurance product to progress from a single peril policy that introduced catastrophe risk insurance but faced challenges in meeting government expectations in relation to coverage, simplicity and transparency, to a multi-peril cover that is much more aligned with government requirements and impacts experienced in the country.

At its core the Lao Government are motivated to provide communities with greater financial resilience in the face of growing climate events and have ambitions to develop a risk-layering approach. Meanwhile SEADRIF are motivated to develop solutions that respond to the needs of members and mobilise greater insurance industry capital to close the protection gap.

What is the context for wanting to obtain a parametric insurance product?

At the outset of discussions with Lao PDR it was clear that a traditional indemnity solution did not meet their requirements given the focus on financing general response costs (i.e. not tied to an existing program which makes it difficult to show proof of loss, required for indemnity), the need for swift money to support these response costs and the lack of robust modelling available for the country. Parametric insurance offered significant advantages in terms of the speed and efficiency with which payments can be made available to the insured and provided greater opportunity for experimentation.

What was the role and perception of basis risk?

Parametric insurance inherently carries basis risk, meaning discrepancies can arise between the parameter used to trigger a payout and the actual conditions experienced by people on the ground – for the 2021 policy this would have meant a difference in the modelled number of people affected compared

to the number actually impacted. This basis risk can materialise in either direction, i.e. the model might show significant impact where there is none or show no impact where there is substantial flooding.

In the initial policy, basis risk was identified as a potential issue given the lack of existing models, high levels of uncertainty associated with flooding and discrepancy in how the risk profile was developed compared to the triggering of the product (satellite data was used to support the assessment of flooding in real time, but could not be used as part of the risk profiling approach given the lack of available historical data available). This basis risk was partially managed through the inclusion of the finite component that triggered based on the Government declaring a state of emergency. The finite component was capitalised at the inception of the policy and provided coverage in three tranches (In Year 1, a third was available and if no payout was made in Year 1, then up to two-thirds was available in Year 2. If no payouts were made in Years 1 and 2, then up to the full amount was claimable in Year 3).

During the policy coverage period it became apparent that the modelling and triggering methodologies were not consistently aligning with reported on the ground impacts. In part this was due to the model only covering river driven flooding (fluvial) and not rainfall driven flooding (pluvial) but also due to the differences in how 'affected people' were defined by the different approaches. All parties accepted that the modelling approach had significant basis risk, which wasn't helped by the 'black box' nature of the model.

To support a renewed policy, SEADRIF experimented with many alternative approaches in an effort to reduce the levels of un-modelled risk (e.g. pluvial flooding), minimise the basis risk experienced by the policy, and increase alignment with government's own reported disaster impacts to improve trust and understanding. The adopted approach that supports the 2025 policy uses reported loss data from the National Disaster Management Office (NDMO) and thereby significantly reduces basis risk, almost removing it all together.

Description of the Coverage

2021 Policy

The risk profile was determined using a stochastic flood model that was developed by a consortium of Deltares, CIMA and LIST with JBA providing an evaluation of the model approach and ESA contributing part of the necessary raw data. This model provided a comprehensive view of potential risk, covering plausible events that might impact the country and outputted probabilistic hazard maps and event set. The model was developed using a mixture of local and global data and supported both the risk profiling (stochastic event set) and triggering (stochastic hazard maps) methodologies.

The triggering methodology used an approach that blended real-time weather input data, real-time gauge data and satellite data to determine the most representative flood footprint. For each sub-area of the model - each river basin in the model domain was divided into sub-areas that were defined by the delineation of watersheds by their hydrological and/or meteorological conditions - a tool selected the best matching flood hazard map for each input data source from a pre-compiled set of maps (13 Return Period hazard maps from RP1 to 1000) with an algorithm then deciding on the overall best hazard map

for that sub-area based. Each sub-area hazard map was then combined into a mosaic that provides a country wide hazard map that can overlaid with population data (WorldPop) to determine the estimated number of people impacted in an event (people living within an area as estimated to be affected by flooding over 25cm)

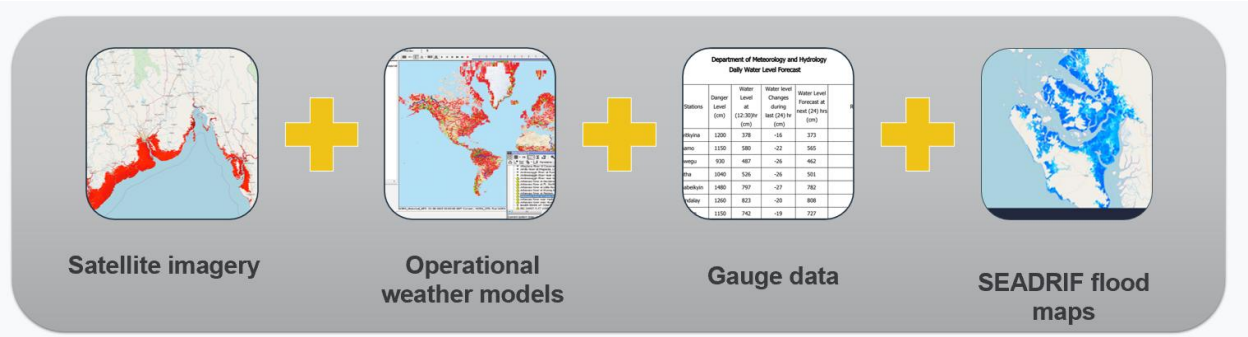

Figure 1: Data inputs for flood monitoring approach used to support 2021 policy

This solution was an early adopter of Satellite imagery in support of a flood insurance product and highlighted its potential for monitoring on-going events in country. Synthetic Aperture Radar (SAR) satellites were used given their ability to 'see' through cloud cover and an algorithm was developed to weight the selection of a hazard map based on the satellite imagery, weather models and gauge data.

During development the risk profile was evaluated against both key historical events using either satellite data on flood extent or reported impact data from a variety of sources. Whilst this evaluation showed reasonable levels of accuracy in terms of magnitude it did highlight significant volatility in results. In addition, the triggering approach was evaluated during the 2018 season to ensure that data sources were available, and the tools were operating correctly. Following this trial season updates were made to the model to automate many of the processing tasks and resolve a few issues.

Developing a parametric flood product is known to be very complex given the resolution of the peril, lack of robust data sets for input or calibration, inability to develop a solution for all types of flooding and limited gauge data available in developing regions of the world. These complexities were experienced in Laos, and led to the Government not having sufficient confidence in the modelling approach given its divergence from reported figures and the lack of transparency that is needed to build confidence. This experience highlighted the need for a revised approach to support future policies.

2025 policy

The risk profile for the 2025 policy was developed using historical reported impact data from a variety of sources including NDMO, EM-DAT, Relief Web, AHA Centre. Collating a variety of sources allowed for SEADRIF and Gallagher Re to produce a 34-year history of impact data for flood events occurring within the country. Whilst there were concerns over the differing procedures for determining number of people affected (i.e. who is included as affected within the reported data), comparative analysis between data sets and investigation into the different reporting mechanisms provided sufficient confidence that this did not lead to excessive discrepancies.

As this risk profile was built using best available historical data, it closely matched the Governments experience of historical events. However, it was only available for a 34-year period which is too short a time period to determine the full risk profile (covering both frequent small events and infrequent severe events) and caused difficulties in identifying an estimated return period of historical events. To support a better understanding of the probability of the policy triggering, additional stress testing of the risk profile was performed by adding and removing key events. This risk profile and specific historical reported losses were also compared with available modelled views of risk (this used the original model, JBAs Global Flood Model, and an approach developed by Gallager Re using KatRisk hazard maps). These efforts confirmed that the 34-year loss history provided a reasonably consistent view of the risk and was sufficiently robust given the coverage required by Laos.

Achieving a representative risk profile using reported data enabled a much stronger parametric product with a more robust trigger that leverages a well-established data collection mechanism developed by NDMO. This is the reference data source and decision-making support information for all emergency response efforts in Lao PDR, following a process as set out in the national disaster management law. It offers the most comprehensive and objective means of assessing the impact of disasters following an event in the country. Under the law, NDMO has a duty to report estimates of number of people affected both during and after disaster events, aggregating data up from the village to the national level. This is primarily to report to the National Disaster Management Council, chaired by the Deputy Prime Minister, to inform national policy decisions. This same reported number of total people affected can then also be used to determine whether the policy has triggered.

Two additional benefits of this approach are that NDMO record impact data for all types of peril, which enabled the insurance policy to be multi-peril, and all sizes of event, which enabled the policy to be based on the aggregated impacts of all events over the course of a year. Through discussions with the Government and reinsurance market it was agreed that the policy would cover the perils of flood, tropical cyclone, earthquake, landslide and ensuing perils all of which are captured by NDMO.

The insurance policy incepted in May 2025 and continues for a period of 2-years. To support SEADRIF placing some of the risk with the international reinsurance market, an additional verification matrix was designed to provide reinsurers with additional comfort over the validity of any triggering event. Gallagher Re holds the role of calculation agent and uses publicly available data sets (e.g. AHA Centre, ReliefWeb, MRC, JMA, USGS etc) to corroborate that an event has occurred. This is not a secondary trigger and does not recalculate the reported number of people affected, it just confirms that a hazard event has taken place and should contribute toward payout determination under the policy's annual aggregate structure.

Using reported data significantly reduces the basis risk associated with the policy and offers a more economical approach given there is no cost for data collection (e.g. paying for earth observation data) and the calculation agent's role is greatly reduced. Communication channels have been setup between NDMO, SEADRIF and Gallagher Re to enable the simple exchange of data when an event does occur.

Payout

The payout structure of the policy has 5 steps, with payout amounts triggered by the cumulative number of people affected by covered disasters (flood, tropical cyclone, earthquake, landslide, and ensuing perils) during each 12-month policy period, as reported by NDMO and verified by Gallagher Re as the calculation agent. As cumulative impact thresholds are crossed, portions of the annual aggregate limit (USD 8 million) are released on a progressive schedule as shown in Table 1. The cumulative aggregate number of people affected resets each 12-month period within the two-year policy term.

Annual Payout Schedule (Per 12-Month Period)

Step	Aggregate Number of People Affected	Payout (% of Limit)	Payout (USD) Total if step is reached
	0 – 199,999	0%	0
1	200,000 – 299,999	12.5%	1,000,000
2	300,000 – 449,999	25.0%	2,000,000
3	450,000 – 599,999	37.5%	3,000,000
4	600,000 – 749,999	50.0%	4,000,000
5	750,000 and above	100.0%	8,000,000

Payouts are disbursed within 10 business days to the Ministry of Finance after the calculation agent completes validation. Because NDMO reporting begins as soon as an event occurs, the policy can trigger payouts even while a disaster is still unfolding. If a payout is triggered, funds are disbursed by SEADRIF to MoF and these funds are then used in accordance with a pre-agreed Contingency Plan, developed jointly by the Government of Lao PDR, the World Bank, and SEADRIF. The Contingency Plan also follows the World Bank's environmental and social framework to ensure the use of payouts in line with the intended purpose of disaster support.

On 1st September 2025, SEADRIF made a payout to Lao PDR of US$2 million following multiple medium-sized events impacting the country over the year to date. This payout provided the Government with response costs soon after the event, with the payment being made 6 days after NDMO reported final people impacted figures for the latest event to affect the country. This payout proved the operational readiness of the product and its alignment with Government of Laos expectations.

Conclusion

SEADRIF and the Government of Laos have, with the support of partners like Gallagher Re, delivered a groundbreaking parametric insurance solution that is anchored in the government's own emergency response protocols, thereby minimizing basis risk and ensuring payouts are aligned with operational realities. This multi-peril product provides a radically new approach for how Governments can access the global insurance industry and provide greater financial resilience to their population.

The approach retains the benefits of traditional parametric policies (e.g. speed and transparency) whilst also increasing the understandability of the solution and aligning with in-country expectations. The

success of the product can be seen in the willingness of the global insurance market to underwrite such a policy and the level of interest it has received since inception. There has been strong interest from donors and countries globally to learn from this policy and assess their ability to replicate a reported loss approach.