# Primer on Catastrophe Bonds and Disaster Relief Bonds

**What is a Disaster Relief Bond?**

A Disaster Relief Bond (DRB) is a proposed new Asian Development Bank (ADB) ex-ante disaster relief funding mechanism. It is based upon a well-established product, a Catastrophe Bond (commonly known as a "cat bond"), adapted to explicitly promote effective disaster risk management including disaster risk reduction as well as efficient disaster response[1].

**What is a Cat Bond?**

A cat bond is a means to transform an insurance transaction into a financial instrument that may be placed into the capital market, it is NOT a debt obligation for the covered entity (the sponsor). It has two core elements, an insurance contract (or derivative equivalent) to provide catastrophe insurance coverage for the sponsor and a bond to perfectly hedge this contingent liability in the capital markets[2].

**Sovereign Cat Bonds**

Whilst most cat bonds are sponsored by private companies, predominantly insurers and reinsurers, there has been a steady increase in the issuance of cat bonds sponsored by sovereign governments and/or regional risk pools[3].

All such bonds to date have been issued via the World Bank's (WB's) Capital at Risk Notes Program. This program allows the WB to provide the insurance cover and to issue the cat bond[4]. Typically, the covered entity enters into a swap agreement[5] with the WB swapping a "fixed rate" sum (the premium equivalent) for a "floating amount" (the insurance pay-out equivalent). For simplicity in this document, we refer the amount paid by the covered entity to transfer risk as a premium.

The WB can choose to either reinvest the bond proceeds in a risk-free instrument or the proceeds can be used by the WB for sustainable lending[6]. Since a disaster event can trigger a payment at any time, the necessary liquidity needs to be ensured. Whilst there is no formal separation of funds into a collateral account, the sponsor is protected by the AAA rating of the WB. However, the bond investors are investing in an unrated bond.

Eighteen sovereign cat bonds have been issued since the first in 2014, which protected the Caribbean Catastrophe Risk Insurance Facility. Figure 1 shows for all bonds the relationship between the Expected Loss (EL) of the bond as a percentage of the bond amount (broadly the probability of loss of the bond proceeds) on the horizontal axis, and the risk multiple (of the expected loss), a measure of price used in the cat bond market that express the ratio of premium equivalent to EL, on the vertical axis. The more remote the cover, the higher the risk multiple, broadly reflecting how insurance pricing typically scales. The chart does disguise the recent increase in the cost of cat bonds, the most recent bond issuances for Jamaica and Chile (larger blue circles) being above the best-fit line, driven by a general increase in the price of commercial cat bonds. However, sovereign cat bonds generally trade at a significantly lower price than an equivalent commercial bond, reflecting the diversifying nature of these bonds for investors, especially for re/insurance company investors.

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[1] A DRB is designed to integrate with other ADB modalities such as Policy-Based Loans (PBLs), Contingent Disaster Finance (CDF), and ex-post emergency assistance loans and grants.

[2] Typically, a Special Purpose Vehicle (SPV) is created to offer insurance to the sponsor. The SPV receives annual risk premiums and pays claims. The SPV is capitalised by issuing bonds to investors, the investors receiving an enhanced coupon as their investment is at risk. The bond holders lose some or all of their invested capital if defined events occur, matching the insurance cover that the SPV offers to the sponsor. The coupon of the bond comprises two elements, one matching the premium paid to the SPV reflecting the risk of non-repayment, the second a defined risk-free return (the SPV invests bond proceeds in defined risk-free investments, bond investors receive a matching risk-free rate). In a DRB, ADB is replacing the SPV, providing the insurance cover and issuing the cat bond, coupon being the premium plus ADB funding rating).

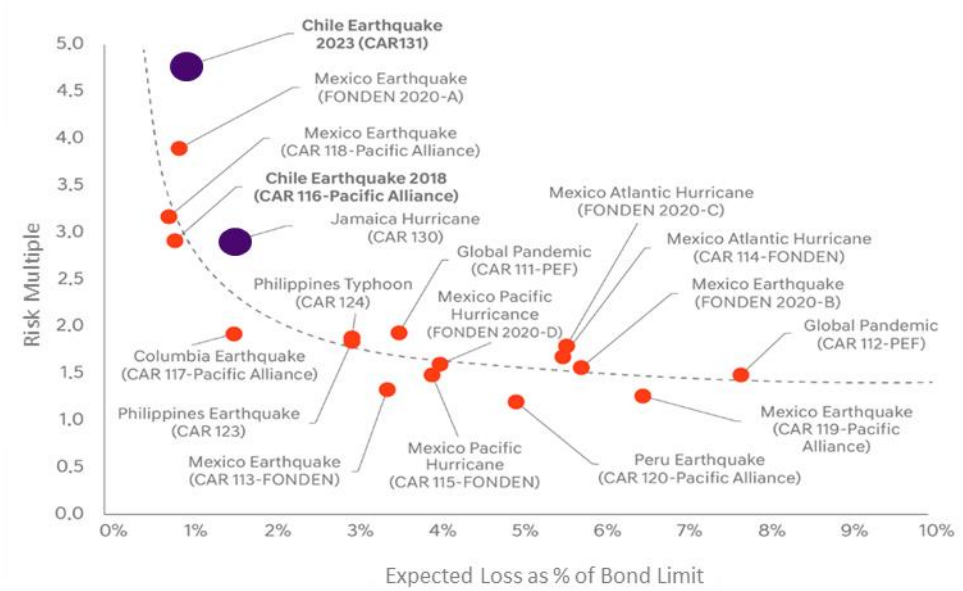
[3] https://www.artemis.bm/news/world-bank-sells-hurricane-earthquake-catastrophe-bond-for-ccrif/.

[4] The WB takes the place of the SPV used in a standard commercial cat bond, reducing frictional costs. https://blogs.worldbank.org/voices/disaster-risk-using-capital-markets-protect-against-cost-catastrophes

[5] https://alegaldictionary.com/catastrophe-reinsurance-swap/.

[6] https://www.worldbank.org/en/news/feature/2023/04/13/innovative-strategies-to-finance-sustainable-development.

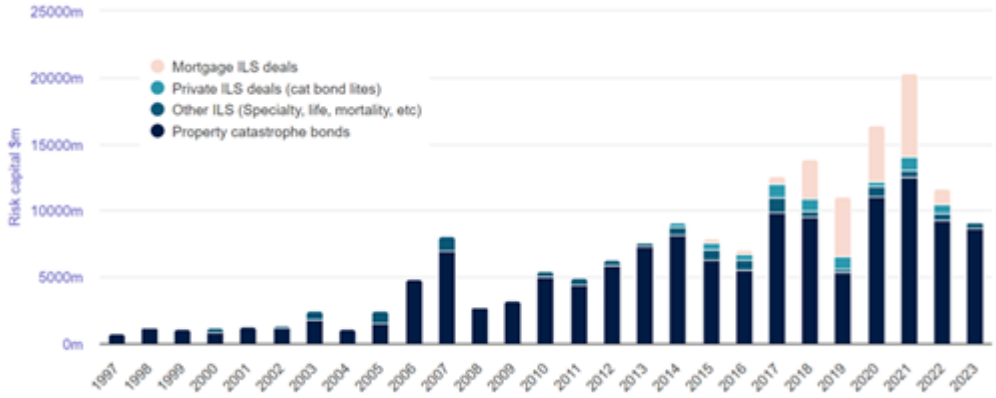
*Figure 1: Sovereign Cat Bonds Issued to Date (Source Artemis.bm)*




**How large is the market?**

The cat bond market is very large and growing, the majority of cat bond issuance relates to property catastrophe risk[7]. As-at end June 2023 cat bond issuance in the year-to-date totalled $9.7 billion[8], a half year record, making 2023 the 4th largest year for cat bond issuance already with over $41 billion outstanding from prior years[9].

*Figure 2: Cat Bond and ILS Risk Capital Issued by Type and Year (Source: Artemis.bm)*




**Why are catastrophe bonds increasingly popular for sovereigns?**

Whilst catastrophe bonds are generally more expensive than equivalent insurance policies, and have higher frictional costs, the demand is growing; the World Bank is promoting them actively[10]. They are a proven instrument that have provided funding for emergency response needs quickly after a disaster event (see Box 1) and may attract more donor subsidies going forward[11]. Unlike most commercial cat

[7] Cat bonds are used where reinsurance is unavailable in the traditional insurance markets. This is driven less by the size of any individual transaction (multi-billion-dollar re/insurance transactions are common), but by excess accumulations of catastrophe risk from many sources in areas with high concentration of value and risk, such as Florida, California and Japan, and/or by the recent shrinking of the retrocessional (reinsurance of reinsurers) market after a series of large losses.

[8] https://www.artemis.bm/news/catastrophe-bond-market-breaks-half-year-issuance-record/.

[9] https://www.artemis.bm/dashboard/ gives current year-to date updates of these amounts.

[10] https://www.artemis.bm/news/demand-for-world-bank-cat-bonds-risk-management-to-rise-jorge-familiar-treasurer/

[11] The Jamaica Cat Bond has benefited from strong donor support (https://www.worldbank.org/en/news/press-release/2021/07/19/world-bank-catastrophe-bond-provides-jamaica-185-million-in-storm-protection).

bonds, all sovereign cat bonds have been structured to pay on the occurrence of a pre-defined event (parametric insurance) rather than on proof of loss (indemnity insurance). This makes them ideal to fund emergency response as they pay out quickly, often within 14 days. Unlike insurance, there is minimal counterparty risk, and a three-year (or more) tenor is available, giving countries budget certainty.

Box 1: Examples of catastrophe bond pay-outs.

1. Mexico: On Sept. 7, 2017, an 8.2-magnitude earthquake, shook southern Mexico, killing nearly 100 people and causing extensive damage. The country had finalized a $360 million cat bond just weeks earlier. The pay-out to Mexico was $150 million, the entirety of the earthquake tranche of the bond (other tranches were covering Pacific and Atlantic tropical cyclone). The premium equivalent for this tranche (IBRD CAR 113) was 4.5% ($6.75 million) per annum.
2. Peru: The IBRD CAR 120 cat bond was triggered by a magnitude 8.0 earthquake that struck the country on Sunday 26th May 2019, the pay-out of $60 million represented 30% of the $200 million bond, reflecting its occurrence in a relatively unpopulated area. The premium equivalent of the bond was 6% or $12 million per annum.
3. Philippines: Super typhoon Rai in December 2021 triggered a partial 35% pay-out of the typhoon tranche of IBRD CAR 123-124, $52.5 million of a principal amount of $150 million tranche. The premium equivalent of that tranche was 5.65% or $8.475 million per annum.
4. Pandemic Emergency Financing Facility: The PEF bond (IBRD CAR 111-112) proved very controversial within the WB and amongst commentators and donors. It was structured in 2 tranches, tranche one for $225 million primarily covering influenza (with a $37.5 million maximum payment for coronavirus), tranche two for $105 million covering a greater range of pathogens including coronavirus. It was widely believed to be too expensive and faced criticism for not paying out for the 2018/2019 Ebola outbreak in the Congo and paying too slowly for Covid-19. There certainly were design issues with the bond, but it did pay for Covid-19 in April 2020, paying $142.5 million in total, the annual premium equivalent for the bond being $26.45 million.

**Why should CAREC member countries consider an ADB regional Disaster Relief Bond?**

There are a number of compelling reasons why CAREC member countries should consider DRBs:

1. Unlike standard cat bonds, a DRB is designed explicitly to complement, encourage and catalyse Disaster Risk Management (DRM) and Disaster Risk Reduction (DRR) measures. This makes the instrument more attractive to potential donors, who may not only subsidise the costs of the DRB, but also support technical assistance for complementary DRM and DRR projects.
2. The DRB may also explicitly target post-event pay-outs at defined vulnerable groups, including pre-agreed implementation plans for use of financing received, facilitating a co-ordinated, efficient disaster response. With its more explicit social purpose, the DRB could also attract a range of investors actively seeking bonds with an ESG and/or climate action focus, reducing the cost of the cover provided.
3. By co-operating collectively, CAREC members can effectively cover (transboundary) climate and disaster risks benefitting from regional knowledge transfer and reducing their own individual costs of issuance and of cover without imperilling the probability of receiving a pay-out.
4. The ADB have an issuance platform, the Global Medium-Term Notes (GMTN) program, that can be adapted to be the equivalent of the WB's Capital at Risk Notes Program platform (see Figure 3). The ADB will be able to leverage its program to attract new donor and investor interest and support. In combination these factors will further drive reduced costs.

*Figure 1: GMTN Structure applied to a DRB (Source: WTW adapted from ADB materials)*

5. A regional DRB would be an important exemplar of the value of regional co-operation and can act as the catalyst for the creation of the CAREC Risk Facility.

There is an opportunity for CAREC member countries, supported by the ADB, Asia's Climate Bank, to define and implement an integrated approach to DRM, DRR, DRF and disaster risk response planning, supported by a suite of climate and disaster risk financing products customisable to the differing needs of each individual country, complementing and adding to existing products and strategies.

**A CAREC Disaster Relief Bond issued by ADB**

Last year's devastating floods in Pakistan affected around 33 million people and caused an estimated $30 billion in damage. This year, the country was rocked again by a 6.5 magnitude earthquake which also affected neighbouring Afghanistan and five Central Asian republics. This underlines the transboundary nature of the risk and the needs for complementary regional climate and disaster risk financing instruments.

ADB's current TA, "Developing a Disaster Risk Transfer Facility in the CAREC region", offers an opportunity to demonstrate the value and potential of a regional DRB. Multi-country bonds are rare; the Pacific Alliance Bond[12] issued by the WB in 2018 covered 5 tranches over 4 Latin American countries for Earthquake. The 5 tranches were marketed together as a single bond but allowed investors to choose which tranches to support. The issuance attracted great interest; each tranche was placed at a coupon well below expectation. An enhanced version of this form of bond, labelled as an ADB issued regional DRB, could offer significant savings in cost compared to a traditional catastrophe bond issued by each country individually. The premium of less developed countries, A and B according to ADB's Classification of developing member countries[13], could, subject to donor support, be partially or fully funded, conditional to a participation in a funded DRM/DRR programme with the ADB. CAREC countries classified C may be self-funding but get the benefit of the lower costs of participation in a multi-country issuance, likely with frictional cost support.

There are an infinite number of potential permutations with structure adjusting to budget and need. In the example below, each country receives coverage of $15 million of cover for flood and, separately, earthquake for a 3-year period. It is assumed that all active countries in CAREC participate, some donor funded, others self funded. The bond is designed so that it is highly unlikely that multiple countries will receive full pay-outs over the bond period. Modelling disaster frequency and severity shows that it is possible to reduce the bond size to $57.5 million, whilst maintaining a level of safety that the bond will pay-out claims with a 99.9% modelled confidence level, allowing lower pricing per country and hazard. Additional cover (as insurance or swap[14]) may be purchased to complement the bond, giving additional funding in the event of a very large single event and/or multiple large event losses exhausting the bond amount over the bond period.

*Figure 2: Illustrative 3-Year Bond for Earthquake and Flood - 10 Countries Covered (Source: WTW)*

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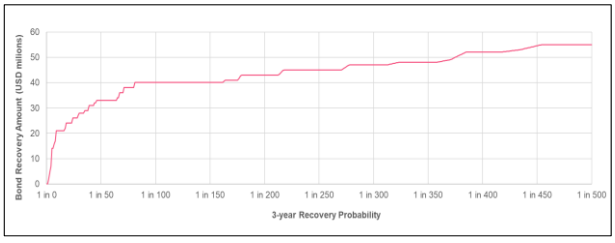
|---|---|
| **Cover per Country and Hazard (USD)** | |
| For 1 in 100 hazard event | 3,000,000 |
| For 1 in 250 hazard event | 10,000,000 |
| For 1 in 500 hazard event | 15,000,000 |
| **Overall Bond Limit (USD)** | 57,500,000 |
| **Annual Premium Equivalent (USD)** | 4,250,000 |
| **Per Country Premium per Hazard (USD)** | 212,500 |
| **Annual cost to cover per Country and Hazard** | 1.42% |
| **Annual Coupon berfore Risk Free Element** | 7.39% |




Each country has a maximum of $30 million of cover over the two hazards, but their share of the annual cost of cover is only $425,000 ($212,500 per hazard), a rate of just 1.42% per annum. Whilst the cover is limited and relatively remote, it will provide valuable emergency response funding. Countries may buy additional cover around the common core programme.

[12] https://www.artemis.bm/news/pacific-alliance-cat-bond-to-settle-at-1-36bn-priced-below-guidance/.

[13] Operations Manual Policies and Procedures (Section A1) - Classification and Graduation of Developing Member Countries (adb.org). Kyrgyz Republic and Tajikistan are A countries, while Mongolia, Pakistan, and Uzbekistan belong to the category B. Azerbaijan, Georgia, Kazakhstan, PRC and Turkmenistan are C categorized countries.

[14] https://www.artemis.bm/news/chile-cat-bond-swaps-a-step-towards-resilient-public-finances-minister/.