WRITING THE FINE PRINT: DEVELOPING REGIONAL INSURANCE FOR CLIMATE CHANGE ADAPTATION IN THE PACIFIC

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Proposals to form an insurance mechanism to support Small Island Developing States' adaptation to climate change were first raised in 1991. At that time, the Alliance of Small Island States proposed an international, state-based insurance framework to assist adaptation to sea level rise. After two decades, an effective agreement and institutional structure on climate change insurance is yet to be realised. However, in the last two years, insurance has resurfaced in negotiations within the United Nations Framework Convention on Climate Change *process. The 2013 United Nations climate conference meeting in Warsaw created a loss and damage mechanism and reinvigorated interest in risk transfer mechanisms to assist developing countries in adapting to climate change. This article argues that an existing regional international disaster risk-pooling facility, the Caribbean Catastrophe Risk Insurance Facility, offers an instructive model for a regional risk transfer mechanism to further adaptation to climate change-related extreme weather events in the Pacific. The article concludes that there is a good case, on pragmatic grounds and also under existing burden sharing principles in global climate governance, for leading developed states to take a leadership role in developing regional risk-pooling initiatives in the Pacific.*

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I INTRODUCTION

Many Small Island Developing States ('SIDS') lie only metres above sea level, making them particularly vulnerable to the impacts of climate change in both the shorter (eg storm surge during large tropical cyclones) and longer (eg

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sea level rise) terms.[1] The modest ambition for mitigation (ie reduction)[2] of greenhouse gas emissions in the *United Nations Framework Convention on Climate Change* ('*UNFCCC*'),[3] *Kyoto Protocol*[4] and *Copenhagen Accord*[5] means that the prospect of avoiding an increase in mean surface temperature of less than two degrees is now very low.[6] The latest climate science suggests the Earth is on a path that will lead to a rise in mean surface temperature of between three and six degrees by 2100.[7] Unless there is a significant reduction in greenhouse gas emissions over coming decades, SIDS are likely to experience tropical cyclones of greater severity, disrupted rainfall patterns and sea level rise.[8] Recent extreme weather events in the Asia-Pacific region, such as Typhoon Haiyan[9] and Cyclone Ian,[10] demonstrate the significant impact of these events on SIDS.[11]

The lack of success in mitigating greenhouse gas emissions has led to adaptation to climate change impacts gaining greater prominence within the United Nations climate negotiations. Adaptation to climate change has been

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1 See Christopher B Field et al (eds), *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2012) 263–4 ('*IPCC SREX*'). See also Leonard A Nurse et al, 'Small Islands' in Vicente R Barros et al (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability — Part B: Regional Aspects — Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2014) 1613 ('*WGII AR5*').

2 Ross Garnaut, *The Garnaut Climate Change Review: Final Report* (Cambridge University Press, 2008) 612.

3 *United Nations Framework Convention on Climate Change*, opened for signature 4 June 1992, 1771 UNTS 107 (entered into force 21 March 1994) arts 4(1)(b), 4(1)(c) ('*UNFCCC*').

4 *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, opened for signature 16 March 1999, 2303 UNTS 162 (entered into force 16 February 2005) art 3 ('*Kyoto Protocol*').

5 Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Fifteenth Session, Held in Copenhagen from 7 to 19 December 2009 — Addendum — Part 2: Action Taken by the Conference of the Parties at Its Fifteenth Session*, UN Doc FCCC/CP/2009/11/Add.1 (30 March 2010) Decision 2/CP.15 paras 4–5 ('*Copenhagen Accord*').

6 Kevin Anderson and Alice Bows, 'Beyond "Dangerous" Climate Change: Emissions Scenarios for a New World' (2011) 369 *Philosophical Transactions of the Royal Society A* 20, 41.

7 Global Carbon Project, *Global Carbon Budget Highlights 2014* (21 September 2014) <http://www.globalcarbonproject.org/carbonbudget/14/hl-full.htm>. See also 'Summary for Policymakers' in Thomas F Stocker et al (eds), *Climate Change 2013: The Physical Science Basis — Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2013) 20–1.

8 See Field et al, above n 1, 263–4; Nurse et al, above n 1; 'Summary for Policymakers', above n 7, 25–6.

9 For detailed reporting on Typhoon Haiyan and its aftermath: see 'Typhoon Haiyan — The Latest News and Comment on Typhoon Haiyan', *The Guardian* (online), 2014 <http://www.theguardian.com/world/typhoon-haiyan>.

10 See Dominique Schwartz, 'Cyclone Ian Causes "Widespread Destruction" on Tonga's Central and Northern Islands', *ABC News* (online), 12 January 2014 <http://www.abc.net.au/news/2014–01–12/cyclone-ian-moves-away-from-tonga/5195954>.

11 See World Bank, 'Pacific Islands — Pacific Catastrophe Risk Insurance Project' (Project Information Document No 73102, World Bank, 1 October 2012) <http://documents.worldbank.org/curated/en/2012/10/16931813/pacific-islands-pacific-catastrophe-risk-insurance-project> 2–4 ('PCRIP Project Document'). See also below nn 105–106 and accompanying text.

defined as '[a]djustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities'.[12] Adaptation may take many forms, including pre-emptive action to limit damage from climate change-related events (eg implementing more ambitious building codes to make buildings more resilient to storms) and building institutions to aid recovery after a climate-related event (eg improving emergency services capacity to respond in the immediate aftermath of adverse weather events).

Domestically, insurance is an established mechanism to spread financial risk of adverse events and build societal resilience. However, at an international level, the issue of climate change-related insurance has only proceeded in fits and starts. Proposals for an insurance mechanism to support the adaptation of SIDS to climate change date back to 1991. At that time, the Alliance of Small Island States ('AOSIS') proposed an international, state-based pool to provide insurance against the impacts of climate change-related sea-level rise.[13] Despite this early call by AOSIS, a climate change-related insurance mechanism was not included in either the *UNFCCC* or the *Kyoto Protocol*. In 2007 climate change-related insurance emerged again on the *UNFCCC* agenda as the *Bali Action Plan* launched international discussion on enhanced action on adaptation 'including risk sharing and transfer mechanisms such as insurance'.[14] In 2008 AOSIS made a submission under the *Bali Action Plan* to include an insurance mechanism as part of a broader response to climate-related loss and damage.[15] In a departure from its earlier proposal in 1991, the 2008 AOSIS submission called for insurance cover for climate change-related extreme weather events such as hurricanes, floods and droughts.[16] In 2010 the *Cancun Agreements* also invited submissions on the development of a climate risk insurance facility, as a part of an enhanced adaptation framework, to address impacts from extreme weather events.[17] The 2012 Conference of the Parties ('COP') 18 meeting in Doha

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12 Garnaut, above n 2, 608.

13 See Intergovernmental Negotiating Committee for a Framework Convention on Climate Change: Working Group II, *Vanuatu*: *Draft Annex Relating to Article 23 (Insurance) for Inclusion in the Revised Single Text on Elements Relating to Mechanisms (A/AC.237/WG.II/Misc.13) Submitted by the Co-Chairmen of Working Group II*, 4th sess, Agenda Item 2(b), UN Doc A/AC.237/WG.II/CRP.8 (17 December 1991) ('*Vanuatu Draft Annex*').

14 Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Thirteenth Session, Held in Bali from 3 to 15 December 2007 — Addendum — Part 2: Action Taken by the Conference of the Parties at Its Thirteenth Session*, UN Doc FCCC/CP/2007/6/Add.1 (14 March 2008) Decision 1/CP.13 para 1(c)(ii) ('*Bali Action Plan*').

15 Ad Hoc Working Group on Long-Term Cooperative Action under the Convention, United Nations Framework Convention on Climate Change, *Ideas and Proposals on the Elements Contained in Paragraph 1 of the Bali Action Plan*, 4th sess, Agenda Item 3(a)–(e), UN Doc FCCC/AWGLCA/2008/Misc.5/Add.2 (Part I) (10 December 2008) Paper No.3A ('*AOSIS Input into the Assembly Paper on Adaptation*').

16 Ibid 14.

17 Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Sixteenth Session, Held in Cancun from 29 November to 10 December 2010 — Addendum — Part 2: Action Taken by the Conference of the Parties at Its Sixteenth Session*, UN Doc FCCC/CP/2010/7/Add.1 (15 March 2011) Decision 1/CP.16 paras 11–35 ('*The Cancun Agreements: Outcome of the Work of the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention*') ('*Cancun Agreements*').

appeared to be a breakthrough in the development of institutions to assist adaptation to climate change. The Doha COP 18 meeting resolved to establish an institution to address loss and damage of developing countries that are particularly vulnerable to climate change.[18] The Warsaw international mechanism for loss and damage associated with climate change impacts ('Warsaw international mechanism') was established the following year at the 2013 COP 19 meeting in Warsaw.[19] Climate-related insurance will therefore be prominent in coming years as the Warsaw international mechanism is developed to coordinate efforts to address climate-related loss and damage under the *UNFCCC*.

The existing legal literature on insurance and climate change falls into three broad categories. First, there is a body of work on domestic legal liability and property damage issues arising from climate change impacts. This literature examines how climate impacts will affect the business model of commercial insurers and their ability to provide cover for risks under existing traditional insurance lines.[20] This work primarily focuses on the effect of climate change on domestic commercial insurance. It analyses the changes that might be required to the style and content of domestic insurance so as to ensure viability of the transnational insurance and reinsurance markets that stand behind it. Secondly, there is a body of legal literature that analyses the options for commercial insurers working with governments at a domestic level to assist in planning for adaptation to climate change impacts.[21] This literature explores the possibilities of commercial insurers working with governments to, for instance, implement planning that avoids development in low lying areas that will be prone to storm surge and/or sea level rise. Additionally, commercial insurers are viewed as playing a crucial role in public policy arenas by assisting governments in shaping

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[18] Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Eighteenth Session, Held in Doha from 26 November to 8 December 2012 — Addendum — Part Two: Action Taken by the Conference of the Parties at Its Eighteenth Session*, UN Doc FCCC/CP/2012/8/Add.1 (28 February 2013) Decision 3/CP.18 para 9 ('*Approaches to Address Loss and Damage Associated with Climate Change Impacts in Developing Countries That Are Particularly Vulnerable to the Adverse Effects of Climate Change to Enhance Adaptive Capacity'*) ('*Doha Climate Gateway Decision*').

[19] Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on its Nineteenth Session, Held in Warsaw from 11 to 23 November 2013 — Addendum — Part Two: Action Taken by the Conference of the Parties at Its Nineteenth Session*, UN Doc FCCC/CP/2013/10/Add.1 (31 January 2014) Decision 2/CP.19 para 1 ('*Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts*') ('*Warsaw Outcomes Decision*').

[20] See Howard C Kunreuther and Erwann O Michel-Kerjan, 'Climate Change, Insurability of Large-Scale Disasters, and the Emerging Liability Challenge' (2007) 155 *University of Pennsylvania Law Review* 1795; Michael G Faure, 'Insurability of Damage Caused by Climate Change: A Commentary' (2007) 155 *University of Pennsylvania Law Review* 1875; Christina Ross, Evan Mills and Sean B Hecht, 'Limiting Liability in the Greenhouse: Insurance Risk-Management Strategies in the Context of Global Climate Change' (2007) 26(A) *Stanford Environmental Law Journal* 251; Ernst Rauch, 'Effects of Climate Change on the Insurance Industry' (2007) 26(A) *Stanford Environmental Law Journal* 239.

[21] See Alberto Monti, 'Climate Change and Weather-Related Disasters: What Role for Insurance, Reinsurance and Financial Sectors?' (2009) 15 *Hastings West-Northwest Journal of Environmental Law and Policy* 151. See also Kola O Odeku, 'The Potential Role of Insurance Law in Addressing Climate Change-Related Risks and Disasters in South Africa' (2012) 39 *Journal of Human Ecology* 103.

climate adaptation practices to lessen the severity of future damage.[22] Finally, there is a body of legal literature linking insurance to the wider issue of climate adaptation in the international climate negotiations, including calls for developing an insurance mechanism under the *UNFCCC*.[23] This work departs from a focus on commercial insurance markets to chart attempts at negotiating insurance schemes at an international level to assist states adversely affected by climate change. This article augments this third body of literature by arguing that some existing regional insurance arrangements provide a useful model for the development of institutions to build adaptive capacity to climate change-related extreme weather events. We argue that an existing institution for sharing disaster risks in the Caribbean offers a model for a regionally-based climate insurance mechanism to assist SIDS in the Pacific area. Whether within or outside the UN climate regime, such a regional insurance pooling mechanism would remain consistent with burden sharing principles that inform the operation of the *UNFCCC* and assist in building state resilience to climate-related disasters in the Pacific.

This article proceeds as follows. Part II examines the link between human-induced climate change and extreme weather events and explains the extent to which extreme weather events such as hurricanes and extreme rainfall are climate related. Part III provides the necessary institutional background to the current revived interest in insurance schemes in the international climate change negotiations. We achieve this by providing a brief history of the linking of insurance and adaptation in discussions under the *UNFCCC*. Part IV describes how interest in an international insurance mechanism has again flared in the context of discussions at recent COP meetings under the *UNFCCC*. Part V identifies two distinct conceptualisations of insurance, inclusive and exclusive, which inform later discussion of potential international climate insurance mechanisms. Part VI describes the Caribbean Catastrophe Risk Insurance Facility ('CCRIF'), an existing successful regional insurance scheme for the pooling of some climate change-related risks.[24] Part VII emphasises the viability of a regional insurance initiative in the Pacific, modelled on the CCRIF, as a short-term adaptation strategy. This part also demonstrates that regional insurance initiatives may be informed by the *UNFCCC* burden sharing principle of 'common but differentiated responsibilities' ('CBDR')[25] and could be developed under the umbrella of that treaty, particularly through the Warsaw international mechanism. In Part VIII, we recognise that climate change-related insurance has limitations in the medium and longer term. Part IX concludes that there is a good case, on pragmatic grounds and under existing burden sharing

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22 See Monti, above n 21, 155–6; Odeku, above n 21, 111.

23 See M J Mace, 'Funding for Adaptation to Climate Change: *UNFCCC* and *GEF* Developments since COP-7' (2005) 14 *Review of European Community and International Environmental Law* 225; E Lisa F Schipper, 'Conceptual History of Adaptation in the *UNFCCC* Process' (2006) 15 *Review of European Community and International Environmental Law* 82; M J Mace, 'The Bali Road Map: Can It Deliver an Equitable Post-2012 Climate Agreement for Small Island States?' (2008) 17 *Review of European Community and International Environmental Law* 183.

24 Caribbean Catastrophe Risk Insurance Facility, *The Caribbean Governments' Insurance Fund for Earthquake and Hurricane Catastrophes* (2014) <http://www.ccrif.org/>.

25 *UNFCCC* art 3(1).

principles in global climate governance, for leading developed states to take a leadership role in developing such an initiative.

II CLIMATE CHANGE AND EXTREME WEATHER EVENTS

The latest Intergovernmental Panel on Climate Change ('IPCC') Reports have confirmed that '[w]arming of the climate system is unequivocal',[26] and there is human contribution to climate change.[27] The expected impacts of climate change fall into two broad categories.[28] First, 'slow onset events' are those that occur gradually over a substantial time period; these include sea level rise, temperature rise, changes in rainfall patterns, ocean acidity and the melting of glaciers and permafrost.[29] Secondly, 'extreme weather events' are incidents of a short duration and include wind-storms (eg cyclones), drought, storm surge, flooding and heat waves.[30] This article focuses particularly on these extreme weather events, including cyclones and rainfall.

Human-induced climate change has long been expected to alter the frequency, intensity, duration and timing of extreme weather events.[31] However, asking the right questions is important when exploring the extent to which a specific extreme weather event might be attributable to human-induced climate change.[32] Wholly attributing a specific extreme weather event to human-induced climate change may never be possible in a system as complex as the Earth. Instead, a more practical approach is to set aside a focus on immediate, direct causation to allow questions as to whether anthropogenic climate change has altered the likelihood of a specific extreme weather event occurring.[33] This approach allows quantification of the contribution of anthropogenic climate change to the increased chance of a particular extreme weather event having occurred.

Writing with an interest in developing 'a relatively objective approach to quantifying the role of human influence on climate in cases of actual harm',[34] climate physicists Myles Allen et al outline 'the methodological challenges that

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26 'Summary for Policymakers', above n 7, 4.

27 Ibid 17.

28 For a useful overview of the approaches to defining the impacts of climate change that have arisen in the *UNFCCC* process: see Linda Siegele, 'Loss & Damage: The Theme of Slow Onset Impact' (Policy Briefing, Loss and Damage in Vulnerable Countries Initiative, August 2012) <http://www.lossanddamage.net/download/6532.pdf>.

29 *Cancun Agreements*, UN Doc FCCC/CP/2010/7/Add.1, Decision 1/CP.16 para 25 n 3; United Nations Framework Convention on Climate Change, *Mechanisms to Manage Financial Risks from Direct Impacts of Climate Change in Developing Countries — Technical Paper*, UN Doc FCCC/TP/2008/9 (21 November 2008) ('*Technical Paper: Mechanisms to Manage Financial Risks*') [103]–[109]. See also Siegele, above n 28, 5–6. While these slow onset impacts are critical considerations in relation to adaptation to climate change, there is a consensus that insurance mechanisms have limited capacity in the context of longer term adaptation: see below n 197 and accompanying text. This observation is particularly relevant in the context of the Caribbean Catastrophe Risk Insurance Facility ('CCRIF') model analysed in this article. For that reason, insurance in relation to slow onset events is not expressly addressed in this paper.

30 *Technical Paper: Mechanisms to Manage Financial Risks*, UN Doc FCCC/TP/2008/9, [97]–[102]; Field et al, above n 1, 115: See also Siegele, above n 28, 5.

31 See Field et al, above n 1, 158–63.

32 Myles Allen et al, 'Scientific Challenges in the Attribution of Harm to Human Influence on Climate' (2007) 155 *University of Pennsylvania Law Review* 1353, 1354.

33 Ibid.

34 Ibid.

are likely to confront any attempt to establish a direct causal link between greenhouse gas emissions and specific damaging weather events'.[35]

Allen et al adopt a gambling analogy to explain causation between anthropogenic climate change and extreme weather events:

> The simplest analogy is with a loaded die. If a die is loaded to double the odds on a six, and it comes up six, then there is a clear sense in which some of the risk of that six occurring can be attributed to the loading. It makes no sense to say that three of the six dots on the face of the die are due to the loading, and three are due to chance, but this is what we would be doing if we were to try to dissect a weather event into a component due to human influence and a component due to natural variability.[36]

A proportion of the probability of an extreme weather event occurring can be attributed to anthropogenic greenhouse gas emission using a method known as 'Fraction Attributable Risk' ('FAR'),[37] as adopted from population studies in epidemiology. The FAR method helps to answer questions about the likelihood of a specific extreme weather event given the presence of human-induced climate change.[38] The starting point for the FAR method is the current state of the atmosphere, including the existing build-up in anthropogenic greenhouse gases. A comparison is made between the current climate system and 'the climate that would have occurred in the early twenty-first century in the absence of specific human influences'.[39] This comparison allows estimation of the probability of an extreme weather event (such as hurricane or extreme rainfall) occurring both in the current climate system and the climate system as it would have been in the absence of the build-up in anthropogenic greenhouse gases.

To date the FAR method has been applied to large-scale weather events such as heatwaves and floods. The heatwave that struck Western Europe in 2003, causing around 35 000 premature deaths and at least €13.1 billion in lost agricultural production and fire damage was one such event.[40] This was an extreme weather event that might have occurred in the absence of human-induced climate change. However, application of the FAR method suggested human influence increased the risk of the event occurring by a factor of four to ten, with the most likely value being six.[41] Put another way, human interference with the climate system was responsible for approximately 85 per cent of the risk of the heatwave occurring.[42] The FAR method was also applied to large-scale flooding in the UK during 2000.[43] This analysis suggested that in

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35 Ibid.

36 Ibid 1386.

37 See Stocker et al, above n 7, 914–17.

38 Dáithí A Stone and Myles R Allen, 'The End-to-End Attribution Problem: From Emissions to Impacts' (2005) 71 *Climatic Change* 303.

39 Allen et al, 'Scientific Challenges', above n 32, 1366.

40 Met Office, *Extreme Temperatures on the Rise* (26 March 2008) <http://www.metoffice.gov.uk/news/releases/archive/2008/extreme-temperatures>.

41 Allen et al, 'Scientific Challenges', above n 32, 1392–3. Note that Allen et al provide a detailed review of the various factors affecting the FAR analysis, and explain the level of certainty with which conclusions are expressed: at 1393.

42 Ibid 1393.

43 Pardeep Pall et al, 'Anthropogenic Greenhouse Gas Contribution to Flood Risk in England and Wales in Autumn 2000' (2011) 470 *Nature* 382.

two out of three models, human-induced climate change increased the risk of that extreme weather event by at least 90 per cent.[44] The FAR method has also been applied more broadly, beyond individual extreme weather events, to analyse rainfall patterns across the Northern Hemisphere.[45]

The key point we derive from the work of Allen et al is that human-induced climate change alters the frequency and hence probability of extreme weather events. We are particularly interested in extreme weather events, such as hurricanes and extreme rainfall, which have an increased frequency of occurrence in certain regions due to human-induced climate change. In the following analysis, we refer to these as 'climate change-related extreme weather events'. It is important for the international community to respond to the scientific evidence of increased probability of climate change-related extreme weather events by designing institutions that might respond by building the adaptive capacity of potentially affected states.

The following Part commences the search for such institutions by describing existing efforts at building adaptive capacity to climate change impacts within the international climate negotiations.

III ADAPTATION IN THE INTERNATIONAL CLIMATE REGIME

The *UNFCCC*, the first global treaty on climate change, was a landmark in international environmental law.[46] The *UNFCCC* acknowledged the dangers of human-induced climate change,[47] outlined principles to inform the global response to climate change[48] and established a course of COP meetings through which the global response to climate change is negotiated.[49] An important distinction between developed countries (listed in Annex I of the *UNFCC*) and developing countries (those countries not listed in Annex I of the *UNFCC*) underpins the *UNFCCC*, particularly the commitments of the parties to the *Convention*.[50] The *UNFCCC* acknowledges that some developing countries require significant support in adapting to the impacts of anthropogenic climate change;[51] these include the 'least developed countries' and '[s]mall island countries', which are recognised as particularly vulnerable to the impacts of climate change.[52] Small island states remain active participants in the *UNFCCC* process through AOSIS.[53]

All parties to the *UNFCCC* agreed in principle to undertake actions to mitigate greenhouse gas emissions and to cooperate in adapting to the adverse effects of climate change, subject to national and regional priorities and

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44 Ibid 382, 384.

45 Seung-Ki Min et al, 'Human Contribution to More-Intense Precipitation Extremes' (2011) 470 *Nature* 378.

46 For a comprehensive review of the negotiation and formation of the *UNFCCC*, see Daniel Bodansky, 'The *United Nations Framework Convention on Climate Change*: A Commentary' (1993) 18 *Yale Journal of International Law* 451.

47 *UNFCCC* art 2.

48 *UNFCCC* art 3.

49 *UNFCCC* art 7(4).

50 *UNFCCC* art 4. See also Bodansky, above n 46, 505–8.

51 *UNFCCC* art 4(8).

52 *UNFCCC* arts 4(8)–(9).

53 See Alliance of Small Island States, *About AOSIS* (2014) <http://aosis.org/about/>.

circumstances.[54] The nature and scope of these actions is also informed by the burden sharing principle of CBDR.[55] Thus, developed countries bear responsibility for taking the lead in implementing mitigation actions under the *UNFCCC*[56] and supporting the adaptation efforts (including by meeting adaptation costs) of those countries particularly vulnerable to the impacts of climate change.[57] In contrast, the obligation of developing countries to fulfil their commitments under the *Convention* is contingent upon them receiving support (including financial support) from developed countries.[58]

Over the last two decades the *UNFCCC* negotiations have primarily focused on mitigation. This has involved states negotiating binding targets for developed countries to reduce their emissions during the first commitment period of the *Kyoto Protocol*[59] and rules to establish the flexibility mechanisms of the *Protocol*.[60] More recently, the mitigation effort has been directed at negotiating non-binding emission reduction pledges for states that will operate until 2020, most notably in the 2009 *Copenhagen Accord*.[61] The second commitment period under the *Kyoto Protocol* (agreed in 2012) also sacrificed binding targets in favour of voluntary emission reduction pledges.[62]

Despite this focus on mitigation, adaptation to climate change impacts is prominent in the text of the *UNFCCC* and has received modest institutional development through the yearly COP meetings. The *UNFCCC* provides that states parties will formulate and implement policies and measures to 'facilitate adequate adaptation to climate change' and '[c]ooperate in preparing for adaptation to the impacts of climate change' including those relevant to 'coastal

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54 *UNFCCC* art 4(1)(b).

55 *UNFCCC* art 3(1). For further discussion and analysis of this principle, see Lavanya Rajamani, *Differential Treatment in International Environmental Law* (Oxford University Press, 2006); Jeffrey McGee and Ros Taplin, 'The Asia-Pacific Partnership on Clean Development and Climate: A Retreat from the Principle of Common but Differentiated Responsibilities?' (2009) 5 *McGill International Journal of Sustainable Development Law and Policy* 11.

56 *UNFCCC* art 4(2)(a).

57 *UNFCCC* art 4(4).

58 *UNFCCC* art 4(7).

59 The first commitment period was from 2008–2012: *Kyoto Protocol* art 3(7).

60 Detail on the flexibility mechanisms is available at: *Kyoto Protocol* art 4(6) (for joint implementation), art 17 (for international emissions trading), art 12 (for the clean development mechanism).

61 *Copenhagen Accord*, UN Doc FCCC/CP/2009/11/Add.1, Decision 2/CP.15 paras 4–5.

62 Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties Serving as the Meeting of the Parties to the* Kyoto Protocol *on its Seventh Session, Held in Durban from 28 November to 11 December 2011 — Addendum — Part Two: Action Taken by the Conference of the Parties Serving as the Meeting of the Parties to the* Kyoto Protocol *at its Seventh Session*, UN Doc FCCC/KP/CMP/2011/10/Add.1 (15 March 2012) Decision 1/CMP.7 paras 1, 5 ('*Outcome of the Work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the* Kyoto Protocol *at its Sixteenth Session*'); Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties Serving as the Meeting of the Parties to the* Kyoto Protocol *on its Eighth Session, Held in Doha from 26 November to 8 December 2012 — Addendum — Part Two: Action Taken by the Conference of the Parties Serving as the Meeting of the Parties to the* Kyoto Protocol *at its Eighth Session*, UN Doc FCCC/KP/CMP/2012/13/Add.1 (28 February 2013) Decision 1/CMP.8, paras 1–4 ('*Amendment to the* Kyoto Protocol *Pursuant to its Article 3, Paragraph 9 (the Doha Amendment)*').

zone management, water resources and agriculture'.[63] Broad references to adaptation activities are relatively easy for states to agree upon. However, the more difficult issue, particularly for developing countries, is obtaining financial resources to implement adaptation activities. The *UNFCCC* contains broad statements requiring developed countries to assist developing countries that are 'particularly vulnerable to the adverse effects of climate change' in meeting the costs of adaptation.[64] The *Kyoto Protocol* also contains broad statements committing all parties to formulate and implement measures to facilitate adequate adaptation to climate change.[65] Importantly, art 8 of the *Kyoto Protocol* provides that a share of the proceeds from the emission reduction credits of the Clean Development Mechanism ('CDM') are to be used to assist developing countries that are most vulnerable to climate change. An Adaptation Fund was established under the *Kyoto Protocol* that collects two per cent of the value certified emission reduction credits generated under CDM project activities.[66] Since becoming operational in 2009, the Adaptation Fund has committed US$265 million to climate adaptation projects in 45 countries.[67] This is very modest funding, particularly given the scale and extent of adaptation that is required in developing countries.

However, in the 2007 *Bali Action Plan* agreed at the COP 13 meeting in Bali, Indonesia raised the profile of adaptation within the *UNFCCC* by calling for 'urgent implementation of adaptation' measures, particularly in vulnerable developing countries, least developed countries, SIDS and African countries at risk of 'drought, desertification and floods'.[68] Adaptation was further elevated to prominence at the 2010 COP 16 meeting in Cancún. At the time of this meeting, reputable analysis suggested that if the voluntary pledges of the *Copenhagen Accord* were fully implemented the world would be on course for a rise in average surface temperature well into the range that was considered dangerous for humanity.[69] In the wake of the very modest mitigation ambition under the *UNFCCC* and its likely long-term effects, the necessity for adaptation was therefore brought more sharply into focus. The 2010 *Cancun Agreements* therefore state that '[a]daptation must be addressed with the same priority as mitigation and requires appropriate institutional arrangements to enhance adaptation action and support'.[70] Similarly, the *Cancun Agreements* continued to elevate adaptation on the institutional agenda of the *UNFCCC* by calling for '[m]obilization and provision of scaled-up, new, additional, adequate and predictable financial resources … to address the adaptation … needs of

63 *UNFCCC* arts 4(1)(b), 4(1)(e).

64 *UNFCCC* art 4(4).

65 *Kyoto Protocol* art 10(b).

66 Adaptation Fund, *About the Adaptation Fund* (2014) <https://www.adaptation-fund.org/about>.

67 Adaptation Fund Board Secretariat, 'Adaptation Fund Doubles Direct Access Climate Financing, Approves South-South Grants' (Press Release, 10 October 2014) <https://www.adaptation-fund.org/node/4058>. For further information regarding the location of specific projects, see Adaptation Fund, *Interactive Map of Projects and Programmes* (2014) <https://www.adaptation-fund.org/funded_projects/interactive>.

68 *Bali Action Plan*, UN Doc FCCC/CP/2007/6/Add.1, Decision 1/CP.13 para 1(c)(i).

69 Climate Action Tracker, *Current Pledges Far from Implementing Agreed Goal* (20 November 2013) <http://www.climateactiontracker.org/>.

70 *Cancun Agreements*, UN Doc FCCC/CP/2010/7/Add.1, Decision 1/CP.16 para 2(b).

developing countries'.[71] The *Cancun Agreements* contain pledges from developed countries to significantly increase funding for adaptation.[72] The COP 18 meeting in Doha endorsed enhanced action on adaptation through the *Cancun Agreements* including reviewing support given to developing countries and enhancing the role of regional centres and networks.[73] This theme was further developed at the 2013 Warsaw COP 19 meeting, with the parties emphasising that formation and implementation of adaptation actions is a matter of urgency.[74] The 2013 Warsaw COP 19 also recognised the importance of cooperation at both the international and regional levels in the development and implementation of adaptation actions.[75]

The next part provides a brief history of discussions regarding insurance as a possible adaptation mechanism in the international climate negotiations under the *UNFCCC*.

IV INSURANCE AND ADAPTATION IN THE INTERNATIONAL CLIMATE REGIME

In 1991, at the third meeting of the Intergovernmental Negotiating Committee for the *UNFCCC*, AOSIS called for an insurance mechanism to compensate developing countries for the impacts of the slow onset event of sea level rise.[76] Despite this, insurance is only mentioned broadly in art 4(8) the text of the *UNFCCC*:

> In the implementation of the commitments in this Article, the Parties shall give full consideration to what actions are necessary under the *Convention*, including actions *related to funding, insurance and the transfer of technology*, to meet the specific needs and concerns of developing country Parties.[77]

Adaptation initially took a back seat in negotiations under the *UNFCCC*, as states parties focused on reaching agreement on binding emission reduction targets for developed countries. In 1997 the *Kyoto Protocol* formalised agreement on binding emission reduction targets for developed countries. Nonetheless, the *Kyoto Protocol* mentioned the first meeting of its parties would

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71 Ibid para 2(d).

72 Developed countries agreed to a non-binding commitment to collectively provide new and additional financial resources approaching US$30 billion for the period 2010–2012 for a balanced allocation between mitigation and adaptation activities. There was also a similar commitment by developed countries to collectively mobilise US$100 billion per year for the needs of developing countries by 2020. See *Cancun Agreements*, UN Doc FCCC/CP/2010/7/Add.1, Decision 1/CP.16 paras 95–8.

73 Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Eighteenth Session, Held in Doha from 26 November to 8 December 2012 — Addendum — Part Two: Action Taken by the Conference of the Parties at Its Eighteenth Session*, UN Doc FCCC/CP/2012/8/Add.1 (28 February 2013) Decision 1/CP.18 paras 55–7 ('*Agreed Outcome Pursuant to the Bali Action Plan*').

74 Conference of the Parties, United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Nineteenth Session, Held in Warsaw from 11 to 23 November 2013 — Addendum — Part Two: Action Taken by the Conference of the Parties at Its Nineteenth Session*, UN Doc FCCC/CP/2013/10/Add.1 (31 January 2014) Decision 1/CP.19 para 6 ('*Further Advancing the Durban Platform*').

75 Ibid para 7.

76 *Vanuatu Draft Annex*, UN Doc A/AC.237/WG.II/CRP.8.

77 *UNFCCC* art 4(8) (emphasis added).

'consider what actions are necessary to minimize the adverse effects of climate change', including 'the establishment of funding and transfer of technology'.[78]

Despite these references to insurance in the *UNFCCC* and *Kyoto Protocol*, no insurance mechanisms had been agreed upon at the time of the 2007 COP 13 meeting in Bali. The *Bali Action Plan* agreed at COP 13 was designed to set in train a two year period of negotiations under the *UNFCCC* for a comprehensive post-2012 climate agreement to be finalised at the 2009 COP 15 meeting in Copenhagen. The 2007 *Bali Action Plan* called for '[e]nhanced action on adaptation, including, inter alia, consideration of ... [r]isk *management and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance*'.[79]

The major outcome of the 2009 COP 15 meeting, the *Copenhagen Accord*, is primarily directed at a new system of voluntary mitigation pledges for both developed and developing countries and contains no reference to insurance as an adaptation strategy. However, the 2010 COP 16 meeting in Cancún produced an outcome that more seriously engaged with adaptation to climate change, with specific reference to insurance as an adaptation technique. The *Cancun Agreements* invite all countries

> to enhance action on adaptation under the *Cancun Adaptation Framework*, taking into account their common but differentiated responsibilities and respective capabilities, and specific national and regional development priorities, objectives and circumstances, by undertaking, inter alia, the following: …
>
> (e) Enhancing climate change related disaster risk reduction strategies, taking into consideration the *Hyogo Framework for Action*, where appropriate, early warning systems, risk assessment and management, and *sharing and transfer mechanisms such as insurance*, at the local, national, subregional and regional levels, as appropriate.[80]

The *Cancun Agreements* build on this reference to the development of 'sharing and transfer mechanisms' by establishing a work program 'to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change'.[81]

The *Cancun Agreements* specifically refer to the '[p]ossible development of a climate risk insurance facility to address impacts associated with severe weather events' as a potential agenda item for this work program.[82] The COP 16 meeting established a work program, tasked to the *UNFCCC* Subsidiary Body on Implementation ('SBI'), to develop approaches to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to adverse effects of climate change.[83] The SBI Work Program on Loss and Damage invited all parties to enhance action on addressing

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78 *Kyoto Protocol* art 3(14).

79 *Bali Action Plan*, UN Doc FCCC/CP/2007/6/Add.1, Decision 1/CP.13 para 1(c)(ii) (emphasis added).

80 *Cancun Agreements*, UN Doc FCCC/CP/2010/7/Add.1, Decision 1/CP.16 para 14 (emphasis added) (citations omitted).

81 Ibid para 26.

82 Ibid para 28(a).

83 Ibid paras 26–8.

loss and damage associated with the adverse effects of climate change by '[i]dentifying … designing and implementing country-driven risk management strategies and approaches, including … risk transfer and risk sharing mechanisms, such as insurance'.[84] The SBI Work Program on Loss and Damage recommended the establishment of an international mechanism to address loss and damage due to the adverse effects of climate change. It was suggested that this mechanism should complement existing arrangements for adaptation by developing country parties, including SIDS and other developing states, which are particularly vulnerable to the adverse effects of climate change.[85]

However, after 20 years, significant institutional development on climate change-related insurance appears to be opening up on two fronts. First, the Intergovernmental Panel on Climate Change ('IPCC') has recently produced two key reports related to climate change adaptation. In mid-2012 the IPCC released a special report titled: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation ('SREX')*.[86] This report was commissioned in 2008 by Norway and the UN International Strategy for Disaster Reduction. The report recommends expanded use of risk sharing and transfer mechanisms at all levels to increase resilience to climate extremes.[87] The *SREX* report addresses the role and significance of various types of insurance at local, national, regional and international levels.[88] In late 2013/early 2014 the IPCC released its *Fifth Assessment Report* ('*AR5*'), which consolidates knowledge regarding climate change science, adaptation and mitigation. The Working Group II report to *AR5* (which specifically addresses the issue of adaptation) identifies a key role for insurance in the planning and implementation of climate change adaptation,[89] while also examining critical economic factors likely to influence the effectiveness of insurance as an adaptation measure.[90]

Secondly, one of the key recent outcomes of the *UNFCCC* climate process is that insurance for climate change-related extreme weather events is now firmly part of discussions regarding adaptation to climate change and climate-related loss and damage. The 2012 Doha COP 18 meeting referred to 'country-driven risk management strategies and approaches, including risk reduction, and risk transfer and risk-sharing mechanisms'[91] in outlining priorities in responding to climate-related loss and damage. The 2012 Doha COP 18 also identified risk assessment, data collection and promotion of 'an enabling environment that would encourage investment … in climate risk management' as activities that would enhance action on climate-related loss and damage.[92] The 2013 Warsaw

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84 Subsidiary Body for Implementation, United Nations Framework Convention on Climate Change, *Approaches to Address Loss and Damage Associated with Climate Change Impacts in Developing Countries That Are Particularly Vulnerable to the Adverse Effects of Climate Change to Enhance Adaptive Capacity*: *Draft Conclusions Proposed by the Chair*, 37th sess, Agenda Item 10, UN Doc FCCC/SBI/2012/L.44 (1 December 2012) annex para 9(b).

85 Ibid annex para 10.

86 See Field et al, above n 1.

87 Ibid 10–11.

88 See ibid 321–3 (local), 371–3 (national), 524–5 (regional), 418–21 (international).

89 See Nurse et al, above n 1, [15.4.4].

90 Ibid [10.7], [17.5.1].

91 *Doha Climate Gateway Decision*, UN Doc FCCC/CP/2012/8/Add.1, Decision 3/CP.18 para 6(b).

92 Ibid paras 6(a), (c), (e).

COP 19 meeting fulfilled the commitment of the 2012 Doha COP 18[93] by establishing the Warsaw international mechanism. The COP 19 meeting also saw steps taken to establish the governance structure through which the Warsaw international mechanism will function.[94]

Despite the increased interest in climate change-related insurance, neither the *SREX* or *AR5* reports nor the Doha and Warsaw COPs provided definitive recommendations on the type or conceptualisation of insurance that might be used to achieve the risk reduction, risk transfer and/or risk sharing mooted at the COP meetings. The Doha COP did not provide any detail on the nature or potential operation of the 'risk transfer and risk-sharing mechanisms'[95] identified as part of the enhanced action on climate adaptation. Similarly, the Doha and Warsaw COPs foreshadowed work on regional collaborations in the specific context of 'risk reduction, risk sharing and risk transfer initiatives'[96] and in relation to climate-related loss and damage more broadly.[97] This opens the possibility for including regional risk transfer and risk-sharing mechanisms for climate-related impacts within the *UNFCCC* process. This may occur in both development of climate change adaptation frameworks of the *UNFCCC* and operation of the Warsaw international mechanism.

The following part describes two conceptualisations of insurance that are used in the balance of the article to explain the insurance mechanisms previously mooted for the *UNFCCC* and our preferred model, the CCRIF.

V MODELS FOR CLIMATE CHANGE INSURANCE

At its core, insurance is a mechanism for pooling and transferring financial risk.[98] The term insurance system is used broadly to refer to the ensemble of formal institutions and practices which societies use to pool and transfer financial risks.[99] 'Inclusive' and 'exclusive' insurance indicate two common but distinct forms of insurance. Inclusive insurance is evident in government-provided or public forms of insurance such as universal health care, unemployment benefits and age pensions. The insurance provided is inclusive in the sense that it applies across all members of the given society. At a domestic level, inclusive forms of insurance are associated with state provision of inclusive welfare systems. Under such arrangements, access to inclusive insurance is through citizenship. Insurance conceptualised in this way provides an essential, even civilising public role, with the purpose of providing a degree of economic security for all, whilst still recognising different capacities to

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93 Ibid para 9.

94 *Warsaw Outcomes Decision*, UN Doc FCCC/CP/2013/10/Add.1, Decision 2/CP.19 paras 1–4, 9–10.

95 *Doha Climate Gateway Decision*, UN Doc FCCC/CP/2012/8/Add.1, Decision 3/CP.18 para 6(b).

96 Ibid para 7(d).

97 *Warsaw Outcomes Decision*, UN Doc FCCC/CP/2013/10/Add.1, Decision 2/CP.19 paras 11, 13.

98 C A Kulp and John W Hall, *Casualty Insurance* (Ronald Press, 4th ed, 1968) 10–11; Irving Pfeffer and David R Klock, *Perspectives on Insurance* (Prentice-Hall, 1974) 3–4.

99 Liam Phelan et al, 'Ecological Viability or Liability? Insurance System Responses to Climate Risk' (2011) 21 *Environmental Policy and Governance* 112, 113.

contribute to the costs of such systems.[100] Exclusive insurance, on the other hand, requires payment of a financial premium before the financial risk is transferred and pooled. The insurance is 'exclusive' in the sense that access to the insurance is only available to those who have paid a financial premium for the relevant period of risk coverage. Insurance conceptualised in this way is consistent with private insurance markets offering property damage cover for individuals, businesses and local governments on an indemnity basis.

The wider insurance system includes both inclusive and exclusive insurance, institutions, regulatory and market frameworks. Conceptualised this way, the insurance system represents a significant proportion of the global economy, conservatively estimated to be at least US$8 trillion or at least 15 per cent of global GDP of US$54 trillion in 2007,[101] the most recent year for which comparable data is available. Within the global insurance system more than US$3 trillion (annual expenditure) represents government forms of insurance and at least US$5 trillion (annual revenue) commercial forms of insurance.[102]

The following part contains a discussion of the CCRIF, a recent regional insurance initiative that responds to catastrophic weather events. As the latest science indicates that human-induced climate change alters the frequency, intensity, duration and timing of extreme weather events,[103] such initiatives have particular application in the context of adaptation measures which address the impacts of climate change-related extreme weather events. The CCRIF draws on elements of both inclusive and exclusive insurance models to provide an example of how an insurance mechanism might function at a regional level. We highlight unique features of the CCRIF which demonstrate its utility where states might seek to build adaptive capacity to climate change-related extreme weather events, thus demonstrating its value as an autonomous initiative and the potential to incorporate such initiatives within the *UNFCCC* process.

VI CARIBBEAN CATASTROPHE RISK INSURANCE FACILITY

The CCRIF was launched three years after Hurricane Ivan, a 2004 category five hurricane that caused substantial property damage losses in the Caribbean region.[104] The financial losses in Grenada and the Cayman Islands from Hurricane Ivan were close to 200 per cent of the annual GDP of those states.[105] By comparison, the financial losses caused by Hurricane Katrina in 2005 (a similarly destructive extreme weather event) amounted to only 1 per cent of the

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100 Inclusive insurance systems may require different citizens to contribute different amounts, based on capacity to pay. An example is the progressive taxation systems that are present in most Western democracies.

101 Liam Phelan, Ann Henderson-Sellers and Ros Taplin, 'Mitigation of the Earth's Economy: A Viable Strategy for Insurance Systems' in Walter Leal Filho (ed), *The Economic, Social and Political Elements of Climate Change* (Springer, 2011) 81, 84–6.

102 Ibid.

103 See Part II above.

104 Stacy R Stewart, *Tropical Cyclone Report: Hurricane Ivan* (Report, National Hurricane Center, 27 May 2005) 1 < http://www.nhc.noaa.gov/pdf/TCR-AL092004_Ivan.pdf>.

105 Caribbean Catastrophe Risk Insurance Facility, *Why Was the CCRIF Established?* (2014) <http://www.ccrif.org/node/34>.

United States' GDP.[106] The exposure of the Caribbean to forceful hurricanes caused states in that region to consider forming a scheme to allow governments of affected states access to financial resources to maintain essential functions in the weeks immediately after the event. In this period the necessity for government action to coordinate recovery action is at its highest and most expensive. However, revenue flowing to the state from taxation typically declines, particularly for states heavily reliant upon tourism and/or agricultural exports.[107] Following Hurricane Ivan, governments in these Caribbean countries were caught in the difficult position of having a huge demand upon their resources with only uncertain short-term disaster aid as a possible supplement to a rapidly declining income base. This experience made it clear that the Caribbean states were in need of a form of 'business interruption insurance' to provide short-term liquidity to governments in the aftermath of catastrophic events.[108]

In 2007 the CCRIF was established with funding from Japan and initial capitalisation from Bermuda Canada, Caribbean Development Bank, the European Union, France, Ireland, United Kingdom and the World Bank.[109] The CCRIF currently has 16 member states from the Caribbean area.[110] The CCRIF provides participating governments with insurance for financial losses caused by two 'triggering' events: tropical cyclones and earthquakes.[111] For tropical cyclones, the insurance cover is limited to damage caused by wind and storm surge,[112] although the CCRIF began offering coverage for excessive rainfall in 2013.[113] The CCRIF is designed to provide Caribbean states with a source of

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106 Ekhosuehi Iyahen and Simon Young, 'Understanding the CCRIF Mechanism and Policies' in Caribbean Catastrophe Risk Insurance Facility (ed), *CCRIF: A Natural Catastrophe Risk Insurance Mechanism for the Caribbean — A Collection of Papers, Articles and Expert Notes: Volume 2* (Caribbean Catastrophe Risk Insurance Facility, 2011) 9, 10 <http://www.ccrif.org/publications/collection-papers-articles-and-expert-notes-volume-2>.

107 Ibid. See also Simon Young, Ekhosuehi Iyahen and Elizabeth Emanuel, 'Helping Caribbean Countries Understand Hurricane Risks and Enhancing Their Preparedness During Hurricanes: CCRIF's Real-Time Forecasting System (RTFS)' in Caribbean Catastrophe Risk Insurance Facility (ed), *CCRIF: A Natural Catastrophe Risk Insurance Mechanism for the Caribbean — A Collection of Papers, Articles and Expert Notes: Volume 2* (Caribbean Catastrophe Risk Insurance Facility, 2011) 32.

108 Caribbean Catastrophe Risk Insurance Facility, *What is the Main Purpose of the CCRIF?* (2014) <http://www.ccrif.org/node/35>. 'Business interruption insurance' is a well-established form of domestic commercial insurance whereby businesses are able to insure against a loss of revenue caused by a physical event such as fire, earthquake, flood etc: National Insurance Brokers Association, *Insurance for Your Business* (2014) <https://www.niba.com.au/html/34056.cfm>.

109 Caribbean Catastrophe Risk Insurance Facility, *About Us* (2014) <http://www.ccrif.org/content/about-us>.

110 Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, and Turks and Caicos Islands. See Caribbean Catastrophe Risk Insurance Facility, *Who Are the Members of CCRIF?* (2014) <http://www.ccrif.org/node/89>.

111 Caribbean Catastrophe Risk Insurance Facility, *Triggering Event* (2014) <http://www.ccrif.org/faq/triggering-event>.

112 Caribbean Catastrophe Risk Insurance Facility, *Caribbean Countries Renew CCRIF Catastrophe Insurance Policies for 2012–2013* (5 June 2012) <http://www.ccrif.org/news/caribbean-countries-renew-ccrif-catastrophe-insurance-policies-2012-2013>.

113 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2012–2013' (Report, October 2013) 26–7 <http://www.ccrif.org/sites/default/files/publications/CCRIFAnnualReport-November2013.pdf>.

insurance cover for immediate financial losses caused by severe tropical cyclone events (ie tropical cyclones that typically occur not more than once every 15 years and earthquakes that typically occur not more than once every 20 years).[114]

The maximum amount of insurance available to a state for tropical cyclones and earthquake damage in a given year is US$100 million.[115] However, in taking out insurance with CCRIF, a state must decide the level of financial risk it wishes to accept in the event of a tropical cyclone or earthquake. In particular, a state joining the CCRIF must decide on (i) an 'attachment point' for the insurance (ie a 'floor' of financial loss below which the insurance will not operate) and (ii) an 'exhaustion point' for the insurance of up to US$100 million in any one year (ie a ceiling of financial loss above which the insurance will not operate).[116] The premium paid by a state for cover under the CCRIF is partly based on the attachment and exhaustion points that are selected. A state is thus able to select a level of insurance under the CCRIF that reflects its willingness to accept risk and contribute premium.

The CCRIF is the world's first state-based risk-pooling scheme and has several innovative features.[117] First, as a not-for-profit company established for the collective benefit of member states, the CCRIF is able to provide less costly catastrophe insurance than would otherwise be available to individual states through commercial insurance and reinsurance markets. Although the CCRIF interacts with private sector actors in commercial insurance and reinsurance markets, government representatives contribute to the operation of the scheme, therefore ensuring that decision-making reflects the needs of the member states.[118] Secondly, by pooling risk at a regional level, Caribbean countries are able to avoid having to set aside large amounts of public monies to cater for the risk of a catastrophic tropical cyclone or earthquake.[119] Thirdly, the pooling of risk at a regional level provides efficiencies in insurance administration. Rather than each state having a separate catastrophic risk insurance administration, this function is centralised at a regional level through the CCRIF.

Fourthly, unlike with commercial insurance, there is no necessity for the CCRIF to pursue a competitive market return to investors. The CCRIF is therefore able to devote all its resources to providing lower cost insurance and carrying out educative activities surrounding the risks of tropical cyclones and earthquake. In the event that the CCRIF does not exhaust its resources in a given period, the benefits can be passed on to members in the form of reduced

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114 Caribbean Catastrophe Risk Insurance Facility, *What Products Does CCRIF Offer?* <http://www.ccrif.org/node/36>. See also Caribbean Catastrophe Risk Insurance Facility, 'Semiannual Report: June–November 2013' (Report, 2013) 4, 8 <http://www.ccrif.org/sites/default/files/publications/CCRIF_Semiannual_Report_June_November_2013.pdf> ('Semiannual Report June–November 2013').

115 Caribbean Catastrophe Risk Insurance Facility, *RTFS: FAQs — CCRIF Insurance Policies and Payouts* (2014) [1] <http://www.ccrif.org/content/rtfs-faqs>.

116 Iyahen and Young, 'Understanding the CCRIF Mechanism and Policies', above n 106, 18–20.

117 Caribbean Catastrophe Risk Insurance Facility, *What is CCRIF?* (2014) <http://www.ccrif.org/node/3>.

118 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2012–2013', above n 113, 10.

119 Caribbean Catastrophe Risk Insurance Facility, *How is the Financial Stability of CCRIF Sustained?* (2014) <http://www.ccrif.org/node/98>.

premiums, expanded coverage and/or by resourcing projects which aim to limit the damage caused by a catastrophic weather event. For example, the CCRIF offered members renewing coverage for the 2013/2014 policy year the opportunity to lower the minimum attachment point for tropical cyclone events (with the effect that the catastrophe insurance cover could be triggered by less severe events) and was able to provide a 25 per cent reduction in premium because no policies were triggered in the 2012/2013 period.[120] The CCRIF has also supported recovery activities in member countries in situations where insurance policies were not triggered.[121]

Fifthly, the CCRIF typically only looks to cover a small proportion of the potential claims through contributions from the member states. Instead, the CCRIF purchases reinsurance cover on international reinsurance markets to cover claims up to a conservative level in a given year. The centralisation of catastrophic insurance at a regional level provides the CCRIF with increased leverage to negotiate insurance rates and terms from reinsurers.[122] For example, for the year 2012–13, the CCRIF aggregate exposure to claims was just over US$625 million.[123] US$25 million was retained in cash to be paid out by the CCRIF and a further US$120 million in cover purchased by the CCRIF in international reinsurance and capital markets.[124] This provided an overall capacity of the CCRIF to pay claims up to the conservative figure of US$145 million in that year.[125]

Sixthly, the catastrophe insurance cover under the CCRIF is based on a parametric trigger mechanism.[126] A parametric trigger links insurance coverage to a precise measure of the severity of catastrophes (for example the magnitude of an earthquake or the wind velocity for a tropical cyclone at a particular location).[127] If the severity of the weather event exceeds the parametric trigger the insurance cover affected will be available. A key advantage is that the parametric trigger insurance allows rapid settlement of claims. The amount to be paid under the insurance is pre-determined by a loss estimation model. The model identifies the amount owed to the insured state following a tropical

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120 Caribbean Catastrophe Risk Insurance Facility, 'Semiannual Report: June–November 2013', above n 114, 8.

121 Ibid 8–9.

122 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2012–2013', above n 113, 14. See also Caribbean Catastrophe Risk Insurance Facility, *How is the Financial Stability of CCRIF Sustained?* (2014) <http://www.ccrif.org/node/98>.

123 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2012–2013', above n 113, 14.

124 Ibid. During this period the reinsurance was purchased from leading global reinsurance corporations Munich Re, Swiss Re, Partner Re, Hanover Re and Lloyd's of London syndicates Hiscox, Catlin and Beazley, as well as a 'catastrophe swap' (ie a financial derivative that enables risk of catastrophic events to be purchased by investors on capital markets) organised by the World Bank Treasury.

125 Ibid.

126 Caribbean Catastrophe Risk Insurance Facility, *What is the Main Purpose of the CCRIF?* (2014) <http://www.ccrif.org/node/35>.

127 Münchener Rückversicherungs-Gesellschaft, *Munich Re ART Solutions: Risikotransfer in den Kapitalmarkt; Nutzung der Kapitalmärkte für das Management von Versicherungsrisiken* [*Munich Re ART Solutions: Risk Transfer in Capital Markets; Using Capital Markets for Managing Insurance Risks*] (Münchener Rückversicherungs-Ges, 2001) 7.

cyclone or earthquake of particular severity.[128] The CCRIF is therefore able to quickly distribute monies to the affected states and avoid delays that occur under the indemnity property damage policies available in commercial insurance markets. Traditional indemnity insurance policies commonly cover actual damage and therefore require a lengthy loss adjustment process where actual damage is inspected, verified and the cost of repairs calculated.[129] As at November 2013, the CCRIF had paid eight claims totalling US$32 179 470.[130] The claims ranged from US$418 976 paid to Saint Lucia following an earthquake in November 2007 to US$8 560 247 paid to Barbados following tropical cyclone Tomas in October 2010.[131] In all eight claims, the amount calculated by the CCRIF loss estimation model was paid out in full within a month.[132]

Seventhly, a further key advantage of the parametric trigger mechanism of the CCRIF is that it is less likely than traditional indemnity insurance systems to discourage insured parties from undertaking risk-reduction activities as part of a broader risk management strategy.[133] As claims are settled on the basis of the severity of an extreme weather event (rather than on the basis of the actual damage caused by the event), there is less incentive for a state to avoid reducing existing risks due to funding being available through insurance policies that will cover all or most of the relevant damage if an extreme weather event occurs.

Eighthly, the CCRIF provides a mechanism for state and non-state actors outside the Caribbean to contribute financially to the CCRIF's reserves. The establishment and initial capitalisation of the CCRIF in 2007 was partly funded by developed countries and international organisations from outside the Caribbean region. As the CCRIF explained in 2009:

> In June of 2007, the CCRIF raised US$47.5 million in donor support from Canada, the World Bank, the United Kingdom, France and the Caribbean Development Bank; that same year CCRIF member governments paid a participation fee equal to their premium in the first year which, added to the donor support, allowed the CCRIF to offer policies at a low cost. Early [in 2008] Ireland gave US$2.4 million to the CCRIF and [in May 2008] Bermuda became the first government to be both a donor and member of the CCRIF when it gave US$500,000.[134]

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128 For details of the underlying catastrophe model of the Caribbean Catastrophe Risk Insurance Facility, see Caribbean Catastrophe Risk Insurance Facility, *What is the Main Purpose of the CCRIF?*, above n 126.

129 European Commission, 'Green Paper on the Insurance of Natural and Man-Made Disasters' (Report, 16 April 2013) 10 <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0213:FIN:EN:PDF>.

130 Caribbean Catastrophe Risk Insurance Facility, *About Us*, above n 109. See also Caribbean Catastrophe Risk Insurance Facility, 'Semiannual Report: June–November 2013', above n 114, 4.

131 Caribbean Catastrophe Risk Insurance Facility, *About Us*, above n 109.

132 Ibid.

133 Asian Development Bank, 'Natural Catastrophe Risk Insurance Mechanisms for Asia and the Pacific' (Main Report, 4–5 November 2008) 18 <http://www.adb.org/sites/default/files/publication/27991/natural-catastrophe-risk-insurance.pdf >.

134 Caribbean Catastrophe Risk Insurance Facility, 'European Union Donates Euro12.5 Million to the CCRIF' (Press Release, 2 April 2009) <http://www.ccrif.org/press_releases/european-union-donates-euro125-million-ccrif>.

Further, the CCRIF has continued to attract donations and financial support from developed countries. In 2009 the CCRIF received a further donation from the EU of €12.5 million.[135] This demonstrates a significant willingness on the part of developed countries to financially contribute in advance to build greater adaptive capacity in developing countries that suffer from catastrophic events.

Ninthly, the CCRIF supports the process of generating expertise and experience of catastrophe risks in Caribbean governments and civil society.[136] The real time forecasting service for hurricanes, as developed by the CCRIF, has been instrumental in raising knowledge of governments and intergovernmental agencies of the likely impact of tropical cyclones within the Caribbean and allows for better disaster planning and response.[137] The knowledge generated about catastrophic events in the Caribbean is thus beneficial for governments, intergovernmental and international agencies operating in the region.

The main disadvantage for states insured under the CCRIF is that the financial losses suffered as a result of the catastrophic event may differ from the amount calculated under the loss estimation model, leaving member states with a shortfall in cover. Although this 'basis risk' has potential to be a significant disadvantage, insured parties often accept this kind of risk in order to ensure rapid access to funds and in circumstances where it might be difficult to accurately assess the actual loss associated with an extreme weather event.[138] There is also no cover where significant damage occurs but the event that caused the damage does not activate the parametric trigger for the policy and/or attachment point selected by the state. For example, the CCRIF has used wind speed as part of its tropical cyclone insurance product since its inception. This can be problematic where significant property damage has occurred (as a result of precipitation, for example) but the relevant parametric trigger has not been reached.[139] The CCRIF has therefore acknowledged the potential to use other parametric triggers for climate-related insurance products (eg precipitation levels).[140] There has also been criticism that some data used to construct the CCRIF loss model leads to anomalous payouts, particularly in regard to the initial claim upon the CCRIF by Dominica for the earthquake in 2007.[141]

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135 Ibid.

136 Young, Iyahen and Emanuel, 'Helping Caribbean Counties', above n 107, 32–4.

137 Ibid. 'The Real-Time Impact Forecasting System ('RTFS') is a storm impact forecast tool which provides users (CCRIF member countries and various international development partners) with access to real-time estimates of the expected hazard levels and impacts on population and infrastructure for all tropical cyclones': at 34.

138 See Asian Development Bank, above n 133, 17–18. Note that basis risk may, in some circumstances, favour the insured party (ie the insured party may receive a payout which exceeds the value of the damage caused by the event which activates the parametric trigger).

139 For a detailed analysis of some of the limitations potentially associated with insurance which utilises a parametric trigger in the specific context of the CCRIF, see Lauren Brooks, 'The Caribbean Catastrophe Risk Insurance Facility: Parametric Insurance Payouts Without Proper Parameters' (2011) 2 *Arizona Journal of Environmental Law and Policy* 135, 149–51. See also Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2010–2011' (Report, September 2011) 24.

140 Caribbean Catastrophe Risk Insurance Facility, *Caribbean Countries Renew CCRIF Catastrophe Insurance Policies for 2012–2013*, above n 112.

141 Brooks, above n 139, 149–50. As Brooks explains, despite minimal actual damage, the parametric trigger was activated by the earthquake and the CCRIF loss estimation model generated a payout to Dominica of over US$500 000.

Positive operation of the CCRIF was demonstrated in the aftermath of Tropical Cyclone Tomas in October 2010. In late October 2010, Tomas impacted the eastern Caribbean, triggering hurricane coverage under the CCRIF for Barbados, Saint Lucia and Saint Vincent and the Grenadines,[142] The entire island of Barbados was affected, resulting in a payout of US$8 560 247; Saint Lucia and Saint Vincent and the Grenadines received payouts of US$3 241 613 and US$1 090 388 respectively.[143] The CCRIF released 50 per cent of each payout on 7 November 2010, just seven days after Tomas impacted the islands (the remaining 50 per cent of the payout was provided ten days later).[144] The Prime Minister of Saint Vincent and the Grenadines noted that the payment facilitated 'urgent restoration of services and clearing of the affected areas',[145] providing the CCRIF members with liquidity to assist in dealing with the immediate aftermath of the disaster. The information and expertise-related benefits of the CCRIF were also demonstrated in relation to Tropical Cyclone Tomas. For example, UN officials used information provided by the CCRIF's Real-Time Forecasting System to plan evacuation of tent camps in Haiti (housing victims of the devastating earthquake of January 2010) so as to avoid loss of life.[146]

Concerns have been expressed regarding the disparity in the payouts to Barbados and Saint Lucia in relation to Tropical Cyclone Tomas, particularly given the substantial damage suffered by Saint Lucia.[147] This example highlights some of the more challenging aspects of parametric trigger-based insurance. Much of the damage in Saint Lucia was related to rainfall and secondary hazards (such as flooding and landslides), which were not covered under the CCRIF's Tropical Cyclone insurance product.[148] Decisions regarding policy arrangements made by Saint Lucia and Barbados, particularly decisions relating to the attachment and exhaustion points for their individual policies, also affected the size of their respective payouts under the CCRIF insurance system.[149] Despite these limitations, one might observe that the CCRIF achieved its primary objective of ensuring short-term liquidity in the countries most affected by Tropical Cyclone Tomas.

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142 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2010–2011', above n 139, 21–5.

143 Caribbean Catastrophe Risk Insurance Facility, 'Semiannual Report: June–November 2013' above n 114, 4.

144 Caribbean Catastrophe Risk Insurance Facility, *Caribbean Governments Receive US$12.8m Insurance Payout from CCRIF Following Passage of Tomas* (17 November 2010) <http://www.ccrif.org/news/caribbean-governments-receive-us128m-insurance-payout-ccrif-following-passage-tomas> ('*Tomas Payout*'); Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2010–2011', above n 139, 6.

145 Caribbean Catastrophe Risk Insurance Facility, *Tomas Payout*, above n 144.

146 Ibid.

147 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2010–2011', above n 139, 24; Caribbean Catastrophe Risk Insurance Facility, *RTFS: FAQs*, above n 115, [5].

148 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2010–2011', above n 139, 24. Note, however, that the CCRIF has launched an excess rainfall product, which might have gone some way to addressing some of the concerns raised in relation to Saint Lucia in this instance: see Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2012–2013', above n 113, 26–7. See also Caribbean Catastrophe Risk Insurance Facility, 'Caribbean Governments Now Insured against Excess Rainfall' (Press Release, 4 August 2014) <http://www.ccrif.org/news/caribbean-governments-now-insured-against-excess-rainfall>.

149 Caribbean Catastrophe Risk Insurance Facility, *RTFS: FAQs*, above n 115.

Despite its innovative elements, the CCRIF can be understood with reference to the inclusive–exclusive models of insurance outlined in Part V above. The CCRIF draws on the exclusive model of insurance in that the entitlement to disaster insurance is based on a state choosing to participate in the scheme, selecting attachment and exhaustion points for the insurance, and paying the premium that reflects the amount of risk that is pooled to the CCRIF. The premiums that are paid by the member countries are used to administer the scheme, pay out claims under the scheme and further pool risk through commercial international reinsurance markets. Cover under the CCRIF is only available to those who have made a premium contribution for the period in which the catastrophic event occurs. In this sense, the CCRIF operates on a contractual, premium-for-cover basis and essentially follows the exclusive model of insurance. However, the CCRIF also draws on elements of the inclusive model of insurance whereby benefits flow from group membership (ie the SIDS of the Caribbean). In particular, the information generated by the CCRIF loss estimation model and work carried out by the CCRIF in tracking approaching storms performs a useful educative function across the region. This information also allows countries to prepare prior to a catastrophic weather event, and thus helps to minimise the damage they incur. These benefits are available irrespective of membership or whether a particular event will activate the insurance scheme by exceeding the relevant parametric trigger. Further, when a state decides to join the CCRIF, it receives the benefits of the developed country financial contributions to the CCRIF that effectively subsidise the insurance cover and make it affordable to SIDS. The CCRIF might thus be viewed as a successful combination of elements of the exclusive (ie premium based) and inclusive (ie citizenship based) models of insurance, as discussed above

The CCRIF is no longer the only significant regional risk-pooling scheme in operation. The Pacific Catastrophe Risk Insurance Pilot ('PCRIP'), a scheme that bears similarities to the CCRIF, has been launched with the support of Japan, the World Bank and the Secretariat of the Pacific Community.[150] The World Bank and Indian Ocean Commission have also initiated the first phase of the Southwest Indian Ocean Risk Assessment and Financing Initiative ('SWIO RAFI'), which may provide the basis for a future risk-pooling scheme in that region.[151] Finally, the African Risk Capacity ('ARC') is a regional risk-pooling initiative that aims to provide swift access to financial relief for member countries whose agricultural production is likely to be affected by severe drought

150 The development and operation of the Pacific Catastrophe Risk Insurance Pilot ('PCRIP') are addressed in greater detail in Part VII below.

151 World Bank, 'The Southwest Indian Ocean Island States Launch a Risk Assessment and Financing Initiative to Address Vulnerability' (Press Release, 28 April 2014) <http://www.worldbank.org/en/news/press-release/2014/04/28/the-southwest-indian-ocean-island-states-launch-a-risk-assessment-and-financing-initiative-to-address-vulnerability>. It would seem that the Southwest Indian Ocean Risk Assessment and Financing Initiative is likely to serve a largely similar purpose to the Pacific Catastrophe Risk Assessment Financing Initiative: see below n 160 and accompanying text.

and disrupted rainfall patterns.[152] It is notable that climate change was cited as a factor influencing the establishment of each of the PCRIP, SWIO RAFI and ARC.[153] This suggests increasing interest in combining the inclusive–exclusive models of insurance to create regional risk-pooling in response to increased risk of climate change-related extreme weather events.

The following Part VII explains how a parametric-based insurance mechanism, similar to the CCRIF, might assist in building adaptive capacity within the SIDS of the Pacific. In addition, we argue that the development of a regional risk-pooling mechanism supported by developed countries is consistent with the burden sharing principle of CBDR contained in the *UNFCCC*. Thus the development of a regional risk-pooling mechanism for Pacific SIDS, although valuable as an autonomous institution, could be usefully developed within the *UNFCCC* process.

VII CLIMATE CHANGE INSURANCE AND THE PACIFIC ISLAND STATES

As discussed above, developed countries (and other international organisations) have contributed to the establishment and continued operation of the CCRIF. Although the CCRIF was established outside the *UNFCCC* process, the financial contributions from developed countries help satisfy their obligation under the *Convention* to 'assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation',[154] including '[s]mall island countries' and developing states.[155] Further, financial contributions from developed countries to the CCRIF are consistent with the *UNFCCC* principle of CBDR.[156] The CBDR principle recognises that there are important differences in states' contributions to creating human caused climate change and important differences in states capabilities to respond and adapt.[157] The Caribbean countries have contributed very little in absolute terms to the build-up of greenhouse gases in the atmosphere. The member countries have only modest financial capacity to respond to adverse climate change impacts such as tropical cyclones of greater intensity. They are also particularly exposed to greater intensity in tropical cyclones as a result of climate change.[158] Under the CBDR principle, developed countries should assist in building adaptive capacity to climate change impacts in developing countries in the Caribbean. In our view, the CCRIF is a step in the right direction in implementation of this key principle of the *UNFCCC* by building state capacity to adapt to climate change impacts through affordable and responsive catastrophe

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152 For a brief comparison of the CCRIF and African Risk Capacity, see African Risk Capacity, *How ARC Works* <http://www.africanriskcapacity.org/about/how-arc-works>. See also OECD Secretariat, 'Disaster Risk Financing in APEC Economies — Practices and Challenges' (Report, APEC and OECD, 2013) 58–9 <http://www.oecd.org/daf/fin/insurance/OECD_APEC_DisasterRiskFinancing.pdf>.

153 See World Bank, 'The Southwest Indian Ocean Island States', above n 151; Pacific Catastrophe Risk Assessment Financing Initiative, below n 160; African Risk Capacity, above n 152.

154 *UNFCCC* art 4(4).

155 *UNFCCC* art 4(8).

156 On the principle of common but differentiated responsibilities, see *UNFCCC* art 3(1).

157 McGee and Taplin, 'The Asia-Pacific Partnership on Clean Development and Climate', above n 55, 24–34.

158 See Nurse et al, above n 1.

insurance. The development of a regional risk-pooling scheme for Pacific SIDS can also be justified on a similar basis.

Steps have already been taken towards establishing a regional risk-pooling mechanism in the Pacific. In the mid-2000s, Japan and the Asian Development Bank hosted a forum to explore the viability of a risk-pooling mechanism in the Pacific.[159] The Pacific Catastrophe Risk Assessment and Financing Initiative ('PCRAFI'), which provides Pacific SIDS with up-to-date disaster risk information to support disaster risk management, commenced in 2006.[160] These activities not only supported Pacific SIDS in developing their risk management capacity, but also provided the information base for a parametric disaster risk insurance mechanism similar to the CCRIF.[161] Further, in January 2013 the PCRIP was launched with the support of Japan, the World Bank and the Secretariat of the Pacific Community ('SPC').[162] The PCRIP uses parametric triggers (for tropical cyclones and earthquakes) in a similar manner to the CCRIF.[163] Participation in the PCRIP is limited, with six countries[164] participating during a two-year program.[165] The use of parametric triggers in the PCRIP reflects the major priority of the scheme, that is, to ensure liquidity in the immediate aftermath of extreme weather events.[166] The PCRIP has already demonstrated its potential in the Pacific, with Tonga receiving a US$1 270 000 payout in the aftermath of Cyclone Ian in January 2014.[167] The Tongan Minister for Finance and National Planning observed that the funding would 'ensure that response efforts … can continue without interruption or delay'.[168]

Although valuable as a stand-alone institution, a regional risk-pooling mechanism in the Pacific could be further developed within the *UNFCCC* process. Regional risk-pooling mechanisms, such as the PCRIP, could be brought within the scope of activities under the Cancun Adaptation Framework[169] and the Warsaw international mechanism.[170] As an autonomous institution, the PCRIP has already added to local disaster planning and relief by enhancing domestic knowledge of the impact of extreme weather events in the

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159 See Asian Development Bank, above n 133, v.

160 Pacific Catastrophe Risk Assessment and Financing Initiative, 'Catastrophe Risk Assessment Methodology' (Summary Report, 2013) 7 <http:///pcrafi.sopac.org/documents/510>. See also OECD Secretariat, above n 152, 31–2.

161 Pacific Catastrophe Risk Assessment and Financing Initiative, above n 160, 76.

162 World Bank, '5 Pacific Island Nations To Be Insured against Natural Disasters' (Press Release, 18 January 2013) <http://www.worldbank.org/en/news/press-release/2013/01/18/5-pacific-island-nations-to-be-insured-against-natural-disasters>.

163 See World Bank, 'PCRIP Project Document', above n 11, 4–5.

164 The six participants in the second phase of the pilot are Cook Islands, Marshall Islands, Samoa, Solomon Islands, Tonga and Vanuatu: see World Bank, 'Cook Islands Joins Pilot Program to Insure against Natural Disasters' (Press Release, 1 November 2013) <http://www.worldbank.org/en/news/press-release/2013/11/01/cook-islands-participates-in-natural-disaster-risk-insurance-pilot-program>.

165 World Bank, 'PCRIP Project Document', above n 11, 4.

166 Ibid 4–7.

167 World Bank, 'Tonga to Receive US$1.27 Million Payout for Cyclone Response' (Press Release, 23 January 2014) <http://www.worldbank.org/en/news/press-release/2014/01/23/tonga-to-receive-payout-for-cyclone-response>.

168 Ibid.

169 See *Cancun Agreements*, UN Doc FCCC/CP/2010/7/Add.1, Decision 1/CP.16 para 14.

170 See *Warsaw Outcomes Decision*, UN Doc FCCC/CP/2013/10/Add.1, Decision 2/CP.19 para 5(c)(iii).

region and developing state adaptive capacity to climate change-related extreme weather events. Bringing the PCRIP (or wider Pacific-based insurance scheme) within the *UNFCCC* process would encourage developed countries in the region to consider a wider leadership role in administering and financing the scheme. Leadership from developed countries would be consistent with their obligations under the CBDR principle. The participation of the government of Japan in the formation and development of both the CCRIF and the PCRIP indicates willingness on the part of developed countries to contribute to adaptation in this context.[171] Developed countries may choose to make financial contributions to a regional risk-pooling scheme; even modest developed country financial support from existing aid budgets would likely prove sufficient. Developed countries might also contribute technical, technological and administrative support.[172] These measures would allow Pacific SIDS to start building greater resilience to climate-related extreme weather events, thus furthering adaptation to the negative impacts of climate change more broadly.

We acknowledge there are physical[173] and demographic[174] differences between Caribbean and Pacific Island states. There are also economic disparities between the two regions; the average per capita GDP of Caribbean SIDS is more than double that of Pacific SIDS.[175] Pacific SIDS also demonstrated greater volatility in economic output in the period between 1985 and 2007.[176] Pacific SIDS also have greater reliance on aid and remittances from developed countries.[177] These variations may mean that adaptation measures appropriate in the Caribbean are less suited to the Pacific region. However, we argue that the CCRIF model still has significant potential for the Pacific region. In many ways, the differences between Caribbean and Pacific SIDS mean that a regional risk-pooling mechanism modelled on the CCRIF would be even more valuable in the Pacific context. A regional risk-pooling initiative may assist poorer Pacific SIDS to access insurance that might otherwise be unaffordable for an individual state. Further, the relatively lower and more volatile economic output of Pacific SIDS makes them potentially more susceptible to the adverse economic consequences of climate change-related extreme weather events.[178] Parametric trigger-based insurance provides government with an immediate legal right to financial resources that may not otherwise be available in the immediate

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171 See Caribbean Catastrophe Risk Insurance Facility, *About Us*, above n 109. World Bank, '5 Pacific Island Nations To Be Insured against Natural Disasters', above n 162.

172 See World Bank, 'PCRIP Project Document', above n 11, 5. See also Joanne Linnerooth-Bayer and Reinhard Mechler, 'Insurance for Assisting Adaptation to Climate Change in Developing Countries: A Proposed Strategy' (2006) 6 *Climate Policy* 621, 626.

173 T'eo I J Fairbairn and DeLisle Worrell, *South Pacific and Caribbean Island Economies: A Comparative Study* (Foundation for Development Cooperation for the South Pacific Forum Secretariat, 1996) 2–3. See also Nurse et al, above n 1, 57.

174 Jerome L McElroy and Kimberly J Medek, 'Small Island Economies: Caribbean versus Pacific' (Discussion Paper No 4/2012, Islands and Small States Institute, 2012) 7 <http://www.um.edu.mt/__data/assets/pdf_file/0005/174947/No4_2012.pdf>.

175 Ibid 8.

176 Mark McGillivray, Wim Naudé and Amelia U Santos-Paulino, 'Vulnerability, Trade, Financial Flows and State Failure in Small Island Developing States' (2010) 46 *Journal of Development Studies* 815, 816–17.

177 Ibid 818–20.

178 See World Bank, 'PCRIP Project Document', above n 11, 2; Asian Development Bank, above n 133, 26.

aftermath of a climate change-related extreme weather event. This type of financial support may prove essential to the functioning of government, especially in developing states that do not have the economic capacity of more wealthy states.

To summarise, regional insurance mechanisms like the CCRIF and the PCRIP offer significant promise for building state resilience in the period immediately after climate change-related extreme weather events. A functioning state is a necessity to coordinate and fund emergency relief and restoration of essential infrastructure in SIDS hit by climate change-related extreme weather events. Taking steps to secure short-term resilience also encourages SIDS to examine adaptation measures, which might contribute to resilience in the longer term.[179] Regional insurance schemes are thus a tangible means by which developed countries such as Australia, Japan, New Zealand and the US might contribute short to medium-term funding to improve the adaptive capacity of the small island states of the Pacific. This also has a pragmatic benefit for developed countries of reducing potential exposure for disaster aid payments to developing countries in the immediate aftermath of climate change-related extreme weather events.

The following Part VIII considers the limitations of a regional insurance scheme as a medium to long-term adaptation strategy given both the increased unpredictability of climate change-related extreme weather events and the longer term impacts of climate change.

VIII VIABILITY OF CLIMATE INSURANCE AS A LONG-TERM ADAPTATION STRATEGY

Weather risk insurance schemes are traditionally based on analysis of the frequency and severity of past events in order to determine the probability of future events.[180] The price or premium charged for insurance is largely determined by the probability of the event occurring in the future. This reliance upon the pattern of past events will create some significant challenges for commercial insurance markets in a climate-changed world.[181] As discussed above, recent analysis of the current trajectory of greenhouse gas emissions indicates that the planet is on a path to a level of climate change that is considered to be dangerous for humanity.[182] This raises significant concerns regarding the capacity of insurance systems to continue to accurately predict the frequency, nature and severity of climate change-related extreme weather events. Climate science supports the view that human influences are shifting the Earth into an alternative state where the key physical systems of the planet are no longer as predictable as they have been over recent centuries.[183] Previously

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179 OECD Secretariat, above n 152, 19.

180 Garnaut, above n 2, 370–2; Tom Herbstein et al, 'Insurance, Climate-Risk and the Barriers to Change' in Tanja A Börzel and Ralph Hamann (eds), *Business and Climate Change Governance: South Africa in Comparative Perspective* (Palgrave Macmillan, 2013) 156; Deon C Nel, Clifford Shearing and Belinda Reyers, 'Insurers Could Help Address Climate Risks' (2011) 476 *Nature* 33.

181 Garnaut, above n 2, 370–2.

182 Global Carbon Project, above n 7.

183 See, eg, Will Steffen, Paul J Crutzen and John R McNeill, 'The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?' (2007) 36 *Ambio* 614.

dependable historical data describing climate patterns is rendered non-indicative of probabilities for future extreme weather events. Operational concepts for the actuarial assessment so crucial for insurance systems, such as 'hurricanes that are expected to occur, on average, less often than once every 20 years',[184] grounded in reliable probabilities for events that have been observed and recorded over time, start to lose their usefulness.

Climate change will likely alter the frequency and magnitude of weather risks and thereby raise uncertainty in predicting future extreme weather events. An example from the Atlantic region is instructive. In 2004, Hurricane Katrina and its aftermath, particularly the inadequate emergency response of the US government, made headlines primarily because of resulting social, economic and ecological impacts in New Orleans. However, another hurricane with a similar name a year earlier was even more remarkable from a climate science perspective. Hurricane Catarina, which crossed the coast of Brazil in March 2004, was the first ever recorded hurricane to form in the South Atlantic.[185] Hurricanes in this area of the planet were previously considered highly unlikely from a scientific perspective.[186]

Changes in Earth systems can be understood as thresholds that are crossed, rather than as linear, orderly and progressive changes.[187] Increasing rates of change in elements of the Earth system — continually in advance of predicted rates — such as Greenland's ice sheet melt and sea level rise,[188] are a feature of climate change as currently manifested and are examples of non-linear and faster-than-predicted change. Climate science is unable to provide certain predictions, or even detection, of key Earth system thresholds before they are crossed.[189] Some thresholds in physical systems have already been crossed, while others still lie ahead.[190] Needless to say, the implications are profound for human societies generally, not simply the insurance system.

Sea level rise is a prime example of the threat posed by the slow onset impacts of climate change for Pacific island states. Sea level rise is a phenomenon that differs from extreme weather events and other Earth system risks in key ways.

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184 Caribbean Catastrophe Risk Insurance Facility, 'Annual Report 2007–2008' (Report, 2008) 7 <http://www.ccrif.org/sites/default/files/publications/CCRIF-AnnualReport2008.pdf>.

185 See, eg, Alexandre Bernades Pezza and Ian Simmonds, 'The First South Atlantic Hurricane: Unprecedented Blocking, Low Shear and Climate Change' (2005) 32(15) *Geophysical Research Letters* L15712.

186 Ibid.

187 See, eg, Timothy M Lenton et al, 'Tipping Elements in the Earth's Climate System' (2008) 105 *Proceedings of the National Academy of Sciences of the United States of America* 1786.

188 Michael Oppenheimer and R B Alley, 'Ice Sheets, Global Warming, and Article 2 of the *UNFCCC*: An Editorial Essay' (2005) 68 *Climatic Change* 257, 258; Stefan Rahmstorf et al, 'Recent Climate Observations Compared to Projections' (2007) 316 *Science* 709.

189 Klaus Keller, Gary Yohe and Michael Schlesinger, 'Managing the Risks of Climate Thresholds: Uncertainties and Information Needs' (2008) 91 *Climatic Change* 5, 5, citing T F Stocker, 'Abrupt Climate Changes: From the Past to the Future — A Review' (1999) 88 *International Journal of Earth Sciences*, 365 and U Cubasch et al, 'Projections of Future Climate Change' in J T Houghton et al (eds), *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2001) 527.

190 Keller, Yohe and Schlesinger, above n 189.

First, it manifests globally and simultaneously, thus the spatial scale is larger.[191] Secondly, it is effectively an irreversible change, meaning it is likely to continue for 'at least 1,000 years',[192] thus the temporal scale impact is larger. Scientific certainty has solidified on human-induced climate change,[193] yet uncertainty of the timing and magnitude of specific impacts remains, including the estimated rise in sea level over the course of this century.[194] Recent predictions of the scale of global sea level rise have increased when compared with previous IPCC assessments, which were subject to criticism.[195] The 2014 *AR5* report provided a mid-range projection of a global 0.32–0.63m rise in sea level by 2100.[196] The long-term capacity of insurance mechanisms to deal with the losses from such non-linear and irreversible changes in physical systems is largely unexplored, but must be seriously questioned.[197]

It is important to emphasise that a Pacific regional insurance scheme modelled on the CCRIF would only provide liquidity to states in the immediate weeks and months after a catastrophic event. Insurance schemes modelled on the CCRIF will not respond to slow onset climate change impacts, such as sea level rise, which gradually worsen over decades and hence do not flow from a single catastrophic event. In the long-term, projected climate change impacts, such as sea level rise, represent an existential threat to low lying small-island developing states and will severely challenge all adaptation strategies.[198] Unless greenhouse gas emissions are significantly reduced over coming decades long-term adaptation strategies for Pacific SIDS will therefore likely involve migration and re-settlement.[199] The developed states in the Pacific region will not likely be immune from the effects of climate-related human displacement in the Pacific Region.[200]

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191 While a global phenomenon, sea level rise is not uniform: Robert J Nicholls and Anny Cazenave, 'Sea-Level Rise and Its Impact on Coastal Zones' (2010) 328 *Science* 1517, 1518.

192 Susan Solomon et al, 'Irreversible Climate Change Due to Carbon Dioxide Emissions' (2009) 106 *Proceedings of the National Academy of Sciences of the United States of America* 1704, 1704.

193 'Summary for Policymakers', above n 7, 3–19.

194 J E Hansen, 'Scientific Reticence and Sea Level Rise' (2007) 2 *Environmental Research Letters* 024002, 3.

195 Richard A Kerr, 'Pushing the Scary Side of Global Warming' (2007) 316 *Science* 1412, 1412; Ann Henderson-Sellers, *The IPCC Report: What the Lead Authors Really Think* (17 September 2008) Environmental Research Web <http://environmentalresearchweb.org/cws/article/opinion/35820>.

196 See 'Summary for Policymakers', above n 7, 25.

197 The conventional position is that insurance systems are not appropriate in the context of loss and damage associated with slow onset events: see Koko Warner et al, 'Insurance Solutions in the Context of Climate Change-Related Loss and Damage' (Policy Brief No 6, Munich Climate Insurance Initiative, November 2012) 13. For an exploration of the potential role of insurance in relation to slow onset consequences of climate change, see also Kehinde Balogun, 'Managing Loss and Damage from Slow Onset Events: Applicability of Risk Transfer Tools Including Insurance' (Report, Loss and Damage in Vulnerable Countries Initiative, September 2013) <http://www.lossanddamage.net/4949>.

198 Garnaut, above n 2, 148–50; Jane McAdam, *Climate Change, Forced Migration, and International Law* (Oxford University Press, 2012) 19.

199 McAdam, above n 198, 24–30.

200 Garnaut, above n 2, 149–50.

IX CONCLUSION

Insurance schemes have been proposed as elements of adaptive responses to climate change under the *UNFCCC* since its inception and continue during the current discussions on the Cancun Adaptation Framework. A climate change-related insurance scheme has yet to be formed under the *UNFCCC*. However, developments at the Doha and Warsaw COPs, which culminated in the establishment of the Warsaw international mechanism, suggest that risk-pooling schemes, such as regional insurance funds, could contribute to adaptation efforts under the *UNFCCC* process. Outside the *UNFCCC*, and without a specific climate change focus, the CCRIF has developed as a model for regional catastrophe insurance that provides short-term liquidity to states in the immediate aftermath of catastrophic events. The CCRIF uses an innovative parametric trigger and loss estimation model to provide cost effective catastrophe insurance and rapid payment of claims. The CCRIF draws on elements of both inclusive and exclusive models of insurance and demonstrates that through financial donations and other contributions from developed countries a regional insurance scheme can be designed which aligns with the *UNFCCC* burden sharing principle of CBDR. The CCRIF model for a regional catastrophe insurance scheme is currently being trialled in the Pacific through the PCRIP. A wider scheme could be used as an adaptation mechanism geared towards managing responses to climate change-related extreme weather events.

However, without an effective reduction in global greenhouse gases in the long-term, a regional climate insurance scheme for the Pacific alone will not provide effective adaptation for Pacific SIDS. As a short to medium-term measure, a regional insurance or risk-pooling scheme holds significant promise. On pragmatic grounds and also under existing burden sharing principles in global climate governance, there is a good case for leading developed states to take a leadership role in developing regional risk-pooling initiatives in the Pacific.