The Commonwealth

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Climate Risk Management

Opportunities and Challenges for Risk Pooling

CONTENTS

What are small states?

The Commonwealth defines small states as sovereign states with a population size of 1.5 million people or less. Larger member countries – Botswana, Jamaica, Lesotho, Namibia and Papua New Guinea – are designated as small states because they share many characteristics of small states. Thirty of the fifty-two member countries of the Commonwealth are small states.

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Botswana, Lesotho, Mauritius, Namibia, Seychelles, Swaziland

Asia

Brunei Darussalam

The Caribbean

Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Saint Lucia, St Kitts and Nevis, St Vincent and The Grenadines, Trinidad and Tobago

Europe

Cyprus, Malta

The Pacific

Fiji, Kiribati, Nauru, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

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Policy-makers at the national, regional and international levels, as well as academic researchers, are invited to contribute their views and perspectives to this quarterly publication, which focuses on the opportunities and challenges faced by small states in the global economy. Synopses of policy research papers and analytical or descriptive reports on small states issues should be submitted to the Commissioning Editors as soon as possible for the next issue. Topics can cover international finance and capital markets, international trade, the environment, natural disasters, macroeconomic management, and economic and social development. Submissions should not exceed 1,500 words. Reader feedback, publication announcements and notices of upcoming events should reach the Commissioning Editor two weeks ahead of publication.

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Abbreviations and Acronyms

ARC	African Risk Capacity
AU	Africa Union
CCPs	Countercyclical Financing Provisions
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CDB	Caribbean Development Bank
COP	Conference of the Parties
DFID	Department for International Development
LPP	Livelihoods Protection Policy
L&D	Loss and Damages
FIP	Final Implementation Plan
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
ICT	Information and Communications Technology
IDA	International Development Agency
IFI	International Financial Institution
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PCRIP	Pacific Catastrophe Risk Insurance Pilot
PIC	Pacific island country
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

The loss and damages (L&D) agenda has been a contentious issue at climate negotiations, with several developed countries opposed to setting a legal precedent for compensation and liability towards developing countries (Hirsch 2015). Considering these facts, it is vital that governments investigate instruments and strategies within the United Nations Framework Convention on Climate Change (UNFCCC) and the private sector to manage climate risk, such that economic losses can be minimised.

Despite the inter-related link between climate adaptation and disaster risk management being well established, it is not well understood amongst decision makers. Considering this linkage, disaster risk reduction measures may be appropriate to alleviate risk arising from climate change (Warner *et al.* 2015). Historically, the financing of disaster management has relied upon a reactive approach,[1] consisting of funds being diverted from domestic budgets or finance gained from international donors (Arnold 2008). Reactive as opposed to proactive approaches may theoretically be able to address the scale of the financial costs more appropriately, as they are agreed after disasters occur. However, reactive approaches may face difficulty in delivering funds in a timely manner post disaster as damage assessments are required. They may also be inadequate in addressing severe weather events, which incur large economic costs. Since 1971, weather-and-climate related disasters have resulted in economic losses worth US$ 2.4 trillion (Prizzia 2015). Within the Commonwealth, 22 of the largest disasters since 2000 have resulted in economic losses of US$ 37.7 billion (Ghesquiere and Mahul 2012).

Insurance can be an effective approach to ensuring that sufficient funds are available post-disaster, especially for large catastrophes. Furthermore, insurance, as a form of risk management, offers a pragmatic approach to L&D (UNFCCC 2015; Liés and Bresch 2016). The coupling of insurance with parametric insurance policies can allow for quick payouts, which could be useful in a small-scale context where 'low-value assets' are at risk. This report interrogates the use of risk pooling, a form of climate insurance, owing to its use as a possible framework for small state climate risk management within which other complementary finance instruments may be used.

This report aims to offer preliminary insights to governments of small states, within the Commonwealth and outside, seeking to assess the feasibility of risk pooling strategies as a form of climate risk management. Furthermore, the report seeks to provide these governments with a greater understanding of different financial approaches to reduce climate risk, which could be important if risk pooling is deemed to be an unsuitable option.

This report initially provides a comprehensive overview of the financial approaches to climate risk management while contrasting the suite of financial instruments used to address hazards of varying frequency and severity or different phases of the disaster risk cycle (Section 2). Within Section 3, the experiences from the African Risk Capacity (ARC), Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) and Caribbean Catastrophe Risk Insurance Facility (CCRIF) are used to understand how risk pooling operates, what hazards are covered under risk pooling and what strategies can be implemented to attain better results[2]: Selected themes are further discussed to elaborate on the structural and design elements that need to be considered when pooling risk. The last section of the report outlines recommendations to entities looking to engage in risk pooling to mitigate climate risk.

2. Climate Risk Management

The rationale for small states to engage in disaster financing is their vulnerability to the impacts of climatic hazards – owing to the size of their economies, low tax bases and remoteness (Boto and Biasca 2012). Some of these climate hazards include drought, flooding and hurricanes. Consequently, small states possess a general inability to accumulate sufficient reserves from domestic revenue streams, which has resulted in their reliance on international aid to manage the response to catastrophes. International aid can sometimes be inadequate to meet post-disaster needs and may be slow in reaching the worst affected households (Gurenko 2007). Delays in obtaining international aid can have secondary economic and social effects, such as deterioration in trade, budget imbalances and increases in poverty, with these effects being magnified in small states. Considering the plethora of competing demands for finance in small state budgets, it is difficult for governments to build reserves beyond a certain level.

A study undertaken by the International Monetary Fund (IMF) on the vulnerabilities of Caribbean small states stated that countries within the region have experienced climate-related losses equal to 1 per cent of gross domestic product (GDP) each year since 1960 (Cheasty 2013). These losses are expected to increase in the future, with the World Bank (2012) suggesting that a 1m sea-level rise in the Caribbean would lead to an 8.3 per cent loss of projected GDP in 2080. Furthermore, studies by Strobl (2012) suggest that the average hurricane reduces economic output by nearly 1 per cent.

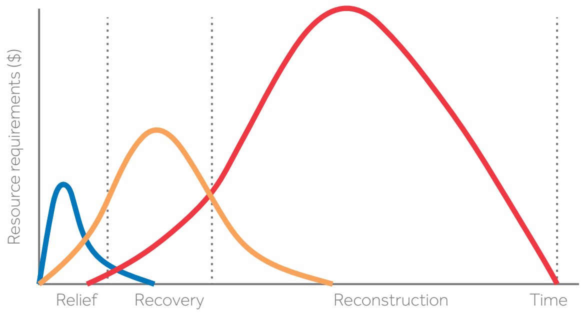
Building financial reserves may allow small states to manage high-frequency, low-severity events; however, for more severe weather events, financial reserves can quickly become exhausted or may be insufficient. This was demonstrated by Hurricane Ian, which hit Tonga in 2014: the total economic costs incurred were estimated at US$ 50 million (Razafindrazay 2014). Tonga was able to receive a payout from the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) worth US$ 1.27 million (World Bank 2015). This amount was more than half of the reserves within the Tonga National Reserve Fund. This demonstrates the significant shortfall that may be experienced by small states national reserve funds. Considering that the economic losses from Hurricane Ian equated to 11 per cent of the country's GDP, Tonga may face difficulties in accumulating sufficient reserves. The systemic use of budget reallocations owing to frequent disasters experienced by small states can also threaten development programmes, which have often required years of preparation (Ghesquiere and Mahul 2010).

Generally, climate risk management involves a process whereby entities such as governments, businesses and individuals plan to reduce or prevent the impacts of climate hazards, react during and immediately following hazards, and undertake initiatives for post-disaster recovery. Different phases of the risk management cycle have different resource requirements, as seen in Figure 2.1. The remaining residual losses (residual risks),[3] which are not covered by prevention and reduction initiatives, therefore need to be addressed by ex-ante and ex-post financing strategies (Watson *et al.* 2015).

2.1 Avenues of disaster finance

Governments vulnerable to climate hazards generally have access to various sources of financing. These sources are used to fund the immediate response (relief), recovery and reconstruction, post disaster. These sources can be categorised as ex-post and ex-ante financing instruments (Ghesquiere and Mahul 2010). Ex-post instruments refer to sources of finance that do not require advanced planning

Figure 2.1 Resource requirements during different disaster risk management phases (Ghesquiere and Mahul 2010)



to be mobilised, such as budget reallocation, domestic credit, external credit, tax increases and donor assistance (Mahul 2012). The use of ex-post instruments may still require governments to specify how they plan for funds to be used, post-disaster. Conversely, ex-ante instruments require foresight and a degree of proactive planning, and include risk-retaining and risk-transfer mechanisms (described later in the document). Risk-retaining instruments, such as catastrophe reserves, budget contingencies and contingent credit, act as a form of self-insurance – where entities assume all or part of the risk, instead of buying partial or full insurance (Suarez and Linnerooth-Bayer 2011). Risk-transfer instruments are instruments through which risk is ceded to a third party, such as traditional insurance, risk pooling, micro-insurance, catastrophe bonds and weather derivatives (Arnold 2008).

2.2 Risk-layering approach

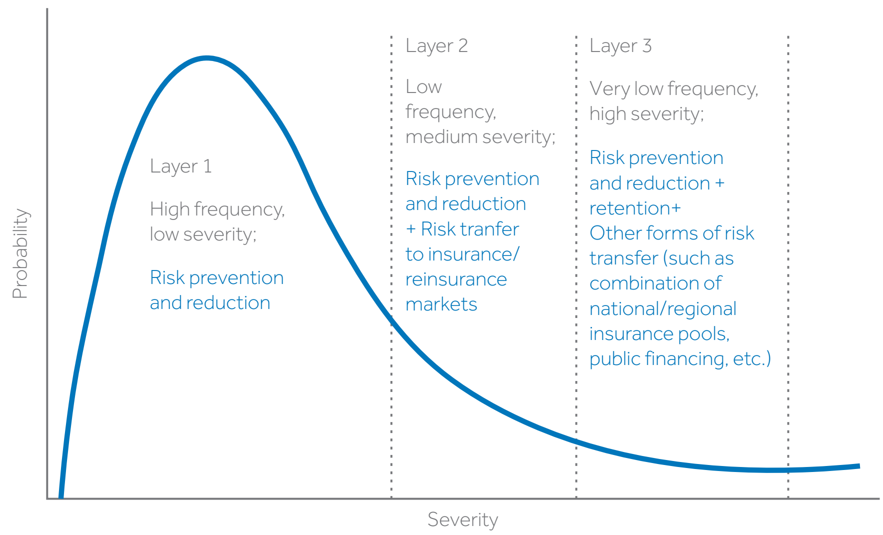
Risk reduction, risk-retaining and risk-transfer instruments are often framed within a layered strategy to risk management (see Figure 2.2) (Linnerooth-Bayer and Hochrainer-Stigler 2015). Different hazards[4] occur at different severities and frequencies. A risk-layering approach allows for the management of risks according to these parameters, while at the same time considering the capacity of the entity to manage financial losses as a result of the hazard. According to Warner *et al.* (2013), for climate risks that occur more often (high frequency) but are less serious (low severity), prevention measures, risk reduction and risk-retention measures may be the most cost effective (Figure 2.2, Layer 1). The less-frequent and medium-severity risks (Figure 2.2, Layer 2) could be transferred to the private and public insurance markets. Layer 3 represents residual risks, which may evolve further as a result of climate change and which cannot be transferred to the insurance markets in a cost-efficient manner. Layer 3, which represents low-frequency, high-severity hazards, requires a combination of risk prevention and reduction, together with risk-retention and risk-transfer strategies.

Considering the wide variety of risk-financing instruments available and the risk-layering approach, which entails ascribing different financial instruments to manage hazards of varying severity and frequency, a critical analysis is needed to investigate the costs and benefits of different financing instruments. Section 2.3 aims to provide a detailed comparative investigation into the different climate risk instruments, subset into risk-retaining and risk-transfer instruments.

2.3 Comparing climate risk instruments

Table 2.1 provides an overview of the commonly used risk-retaining and risk-transfer mechanisms. Sections 2.3.1 and 2.3.2 explore some of these

Figure 2.2 Risk-layering approach to support decision-making process in climate risk management



Source: Warner *et al.* 2013

Table 2.1 Risk-retaining and risk-transfer instruments used with disaster risk management

Instrument	Disbursement timelines (months)	Advantages	Disadvantages
Ex-post risk-financing instruments			
Donor support (relief)	1–6	Avoids use of domestic budget Avoids transaction and administrative costs associated with other risk financing instruments	Delays in accessed funds reaching those most affected – 'the last mile' Possibly insufficient to address losses incurred Donor priorities may not match local priorities
Donor support (recovery and reconstruction)	4–9	Avoids use of domestic budget Avoids transaction and administrative costs associated with other risk financing instruments	Knock-on effects if funds are delayed: stagnation of economic growth, debt obligations
Budget contingencies	0–9	Funds immediately available post-disaster Reduce reliance on international aid	Often funds insufficient to cover large disasters and may be easily exhausted Funds may be earmarked for different emergencies, not just natural hazards
Ex-ante risk-financing instruments			
Catastrophe reserve funds	0–1	Funds immediately available post-disaster Reduce reliance on international aid	Often funds insufficient to cover large disasters and may be easily exhausted Risk of changes during political cycles
Contingent credit	0–1	Access to larger funds than the domestic budget can manage Fast payouts from international financial institutions (IFIs) offering loans	Exacerbation of the debt burden, with possible effects to the credit rating High administrative costs to maintain access to loans at pre-determined rates
Countercyclical financing provisions (CCPs)	0–1	Immediate cash relief and fiscal space in the event of a disaster Avoid a payment default and costly associated reforms Prevent further debt restructuring	Debt moratorium periods provide immediate relief, but if small may be insufficient to fully alleviate the need for debt restructuring Depending on the way it is structured, triggering a CCP may not be fully debt neutral, due to the recapitalisation of interest

(*Continued*)

Table 2.1 Risk-retaining and risk-transfer instruments used with disaster risk management (continued)

Instrument	Disbursement timelines (months)	Advantages	Disadvantages
Parametric insurance	1–2	Fast payouts (determined on environmental triggers) Reduced moral hazard	Prevalence of basis risk[5] if environmental triggers not correctly correlated with economic losses Extensive data requirements to assess environmental thresholds
Catastrophe bonds	1–2	Financial markets have more capacity than reinsurance markets Lower transaction costs than insurance	New instrument requires more technical expertise Coupon rates could be exorbitant if the issuer does not possess a favourable credit rating
Traditional insurance	2–6	Less basis risk, as loss assessments conducted Less technical capacity needed, as there is no loss modelling	Slower payouts (determined on economic losses) Moral hazard prevalent within these schemes

Source: Ghesquiere and Mahul 2010

instruments in detail, assessing their strengths and weaknesses, while comparing them to other instruments where possible.

2.3.1 Risk-retaining instruments

'Risk retention' refers to a form of self-insurance where entities retain risk by paying for losses from their own reserves, instead of transferring risk to a third party. Risk-retaining instruments have an advantage over other disaster risk-financing instruments, as payouts are usually quick; however, funds may also be insufficient to cover economic losses. Further, risk-retaining instruments operating in isolation would result in the country concerned having to cover the entire costs of a catastrophe. The three primary types of risk-retaining instruments – namely catastrophe reserves, budget contingencies and contingent credit – are discussed in detail in the following paragraphs.

Catastrophe reserves

Catastrophe reserve funds are usually set up by the government affected; funds could consist of donations, grants, philanthropic contributions and domestic budget payments (Ghesquiere and Mahul 2010; Suarez and Linnerooth-Bayer 2011; Linnerooth-Bayer and Hochrainer-Stigler 2015). A concern with these approaches is that they do not transfer or diversify risk; the country is still responsible for the full cost of a hazard. Therefore, it is possible that budget contingencies and catastrophe reserve funds may be insufficient to cover high losses, or may become quickly exhausted.

Budget contingencies

Budget contingencies are usually about 2 to 5 per cent of government expenditure and may not be earmarked for climate hazards alone (Ghesquiere and Mahul 2010). Catastrophe reserve funds are also at risk to changing government administrations and political priorities. An advantage of budget contingencies and reserve funds is that they can usually provide timely payouts, as compared to international aid or contingent loans from international financial institutions (IFIs) (Ghesquiere 2016).

Government loans and contingent credit

The most common post-disaster financing instruments are government loans offered by IFIs. These loans are usually insufficient to meet the reconstruction needs, post disaster (Ghesquiere and Mahul 2010). To avoid this problem, governments can set up contingent credit by paying fees for the option for a guaranteed loan at a pre-determined rate, with fixed repayment conditions, contingent on a disaster or some other defined event occurring (Clarke and Mahul 2011; Linnerooth-Bayer *et al.* 2012). Contingent credit spreads risk inter-temporally, as compared to risk pooling, for example, which transfers risk spatially (Hochrainer *et al.* 2013). Even though these instruments allow for timely payouts, they may have higher administrative costs and come with inflated interest rates. Contingent credit arrangements can potentially offer governments a lower cost of capital, as compared to insurance or catastrophe bonds (Mahul and Gurenko 2006). The disadvantage of contingent credit is that capital received after a disaster must repaid, which can exacerbate the country's debt burden and jeopardise credit ratings. Therefore, for countries that have lower-risk exposure to disasters, contingent credit may be a more cost-effective tool.

2.3.2 Risk-transfer instruments

Risk-transfer instruments allow for risk to be transferred to a third party. Such instruments are well placed to manage large catastrophes, when risk-retention strategies are insufficient to deal with the magnitude of economic losses. Furthermore, certain risk transfer may be able to: incentivise proactive adaptation initiatives; attract a new suite of institutional investors from the financial markets; and facilitate timely payouts to affected entities. The following sections describe various risk-transfer tools, while evaluating the pros and cons of each mechanism.

Climate insurance

Climate insurance is a well-known example of a risk-transfer instrument and can be broken down into three categories, namely traditional insurance, risk pooling and micro-insurance (Suarez and Linnerooth-Bayer 2011). Traditional insurance is designed to protect an entity against financial losses in exchange for a premium. In the event of a loss, the insurer will pay out an agreed upon amount (coverage) as per the terms of the contractual obligation. Risk pooling is similar to traditional insurance; however, schemes consist of several individual risk holders who wish to aggregate their risks. Risk pooling usually occurs when there is a spatial element to allow for risks to be spread geographically.

Risk pooling in the context of catastrophes is often implemented with parametric insurance policies. This allows for timely payouts as these are based on environmental triggers, as opposed to intensive post-disaster loss and damage assessments to determine the economic costs incurred (Arnold 2008). Parametric insurance policies do have a certain degree of basis risk (Ghesquiere and Mahul 2010).

Micro-insurance is targeted at lower-income individuals who cannot afford the premiums of traditional insurance and is characterised by low premiums (Suarez and Linnerooth-Bayer 2011).

Catastrophe bonds and catastrophe swaps

Catastrophe bonds are high-yield (above-market return) debt instruments meant to raise money in case of a catastrophe such as a hurricane or earthquake. They have a special condition stipulating that should a loss from a particular pre-defined catastrophe be experienced, then the issuer's obligation to pay interest and/or repay the principal is either deferred or completely forgiven (Durand *et al.* 2016). Catastrophe bonds can have relatively low transaction costs as compared to insurance (approximately 1 per cent of the cover amount) (Cardenas *et al.* 2007). Considering that catastrophe bonds are relatively new instruments, technical support from international organisations may be required to issue the bond, which may increase transaction costs.

Catastrophe bonds serve the same purpose as reinsurance,[6] yet the risks are absorbed by the financial markets via investors rather than reinsurance companies. International financial markets have many times the capacity of the reinsurance market (Gurenko 2007; Yago and Reiter 2008). Catastrophe bonds could be attractive to a different set of investors (investors interested in non-correlated investments) (Risk Management Solutions [RMS] 2012). The coupon rate of the catastrophe is affected by the credit rating of the issuer; hence catastrophe bonds may not be cost-effective for developing or small states.

Catastrophe bonds do hold an advantage over reserve funds or budget contingencies, as the risk of funds being internally reallocated is avoided.

Catastrophe swaps are relatively new to the suite of disaster risk-financing instruments. Catastrophe swaps allow for exchanges between two parties (an insurer and an investor) with different exposures of catastrophe risk. Catastrophe swaps have less administrative and set-up costs than catastrophe bonds and are able to be tailored to the needs of both parties (Ng 2014).

Countercyclical financing provisions (CCPs)

CCPs are ex-ante mechanisms included in loan and debt securities that allow debt service obligations to temporarily fall, or to cease, in the event of an external shock that is measured in a predetermined way (e.g. using parametric data to assess the impact and costs of a storm). These instruments offer three main advantages: 1) immediate cash relief and fiscal space in the event of a disaster; 2) avoidance of a payment default and costly associated reforms; and 3) the mitigation of further debt restructuring. The Commonwealth Secretariat is documenting the relative merits of operational examples (i.e. countercyclical loans offered by the Agence Française de Développement [AFD] and Grenada's 2015 hurricane clauses) and mapping out options to improve the CCPs and encourage uptake, as part of a more sophisticated financial risk management strategy.

Climate insurance versus other risk-transfer instruments

Despite catastrophe bonds ('cat bonds') and catastrophe swaps ('cat swaps') being innovative financing solutions with possibly lower transaction costs, insurance products are still the most commonly used risk-transfer instruments in climate risk management (Wilcox 2016). According to Wilcox (2016), this is owing to insurance being a better-established instrument as compared to cat-bonds or cat swaps. Additionally, a review of insurance industry practices by Mills (2009) suggests that there is a large number of initiatives currently being explored (643 specific activities in 244 insurance entities) related to climate change.

Insurance may not be a suitable approach to deal with all losses and damages associated with the physical risks of climate change. It can support adaptation measures in some cases, but cost-benefit analysis must be conducted in order to compare other adaptation strategies, and must be complimented with other risk-transfer tools. Insurance can address hazards that may be exacerbated by climate change, such as floods and drought; however, for hazards such as ocean acidification and sea-level rise, too little information is known regarding the geographic distribution, economic consequences and the severity of the impacts (UNFCCC 2008). Insurance can also be a costly solution: premiums are usually inflated above the expected losses to guard against the payment of claims in the event of large or multiple disasters. Moreover, insurance, based on non-parametric policies, requires economic loss assessments, post disaster, which can delay the mobilisation of relief funds and their distribution to households in need.

Rationale for risk pooling as a risk-transfer instrument

Risk pooling is a possible solution to address the pitfalls of traditional insurance. The following paragraphs focus on the pros and cons of risk pooling as a type of climate insurance, and set up the rationale why risk pooling may be a suitable form of insurance for small states to manage the impacts of low-frequency, high-severity weather hazards. Focus will also be placed on risk pooling facilities using parametric insurance policies.

Risk pooling that incorporates sufficient technical expertise can provide cost-efficient solutions to participating countries. Most risk pooling facilities currently in operation are based upon parametric insurance policies. This allows for risk pooling to provide timely payments to affected entities, as payouts are based on environmental triggers (e.g. wind-speed thresholds) and thresholds rather than post-disaster loss assessments. Furthermore, administrative and transaction costs are also reduced. The use of index-based insurance reduces moral hazard,[7] as it is not influenced by individual behaviour. Considering the low insurance penetration rates (less than 5 per cent of low-income households, globally), sovereign risk pooling at a national level can extend insurance coverage to uncovered poorer households to cope with the effects of climate hazards, if funds are able to filter to affected households in a timely manner (Organisation for Economic Co-operation and Development

[OECD] 2015). Risk pooling allows member countries to gain better access to reinsurance facilities to attain catastrophe reserves on better terms with lower premium costs, owing to well-diversified risk portfolio (Global Facility for Disaster Risk Reduction [GFDRR] 2011).

There are certain barriers to risk pooling, such as member states being reluctant to divert public finance towards premiums – particularly as international aid is expected post disaster (UN Economic and Social Commission for Asia and the Pacific [UNESCAP] 2015). This reluctance may be compounded by a lack of understanding of how insurance works, the subsequent benefits of insurance and how to effectively engage with the insurance sector to gain the best value. Risk pooling based on parametric insurance policies may require large amounts of data to create loss and hazard probabilistic models (Kalra 2016). This may be difficult in certain states if there is a lack of public asset registers, as this makes it difficult to estimate the economic value of entities at risk from a climate hazard (Lucas 2015), or good records on environmental parameters (e.g. historic rainfall or future rainfall forecasts).

The use of risk pooling in conjunction with other risk-transfer tools (catastrophe bonds, micro-insurance and catastrophe swaps) and risk-retention instruments (contingent credit and catastrophe reserves) can ensure that responses to most hazards, varying in probability and severity, are financed (Ammann 2016). Risk pooling is a useful instrument in addressing low-frequency, high-severity events: this is important, as small states have limited financial capacity to deal with these hazards. According to Lewis and Murdock (1996), for optimal risk diversification, both securities and insurance should be used since neither in isolation is ever sufficient. Consequently, risk pooling provides a useful framework to investigate how risk-financing tools may be work in combination with each other.

3. Risk Pooling Facilities

Traditional insurance is the primary risk-transfer instrument used to address climate hazards (Wilcox 2016). Consequently, strategies must be developed and investigated to overcome what traditional insurance cannot offer. Countries may choose to develop a risk pooling facility if they face exposure to the same hazard in the same geographical region. Owing to the spatial spread of risks, risk pooling can also allow for reduced premium costs, as there is less likelihood of multiple catastrophes affecting multiple countries within a given year.

This section seeks to provide an overview of the three prominent risk pooling facilities, namely: the African Risk Capacity (ARC), Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) and the Caribbean Catastrophe Risk Insurance Facility (CCRIF). Specifically, the overview highlights parameters such as the participating countries, hazards covered, total coverage, payout timelines and how payouts are to be used, among others. Thereafter, these risk pooling facilities are examined within the context of selected themes, which were recognised to be important during the review of literature and interviews undertaken. Table 3.1. provides a snapshot of the characteristics of the risk pooling facilities under investigation.

3.1 Comparative analysis of ARC, PCRAFI and CCRIF

3.1.1 Member countries

The Caribbean Catastrophe Risk Insurance Facility (CCRIF) was the world's first multi-country risk pooling and insurance facility, established in 2007. There are 15 Caribbean member countries (Anguilla, Antigua and Barbuda, Bahamas, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St Kitts and Nevis, Saint Lucia, St Vincent and The Grenadines, Trinidad and Tobago, and Turks and Caicos) and two Central American countries (Honduras and Nicaragua) under the CCRIF. The largest facility in terms of member state participation is the ARC. As of January 2016, the ARC had 32 signatories after having been established in 2014 as a specialised agency of the African Union (AU).

The number of member states participating within a risk pooling facility is critical to ensuring a diversified risk portfolio, which results in the benefit of reduced premium costs: a minimum of eight countries is suggested for a risk pool to be viable and cost efficient (Ghesquiere 2016). It must be noted that the Pacific Catastrophe Risk Insurance Pilot (PCRIP) under the PCRAFI is still in its pilot phase. Established in 2013, there are five countries participating in the PCRIP; however, this is expected to grow once the pool is more mature.

3.1.2 Covered hazards and payout timeliness

Within a risk pooling facility, a participating country has the choice of selecting coverage against hazards, with these choices also determining the premium costs. A high level of technical expertise can ensure that the selected coverage is the most cost-efficient option. The CCRIF and PCRAFI are similar, as they both aim to reduce or limit the financial impact of sudden-onset events on national governments by providing immediate liquidity post disaster. The ARC is different, as it seeks to address drought, which is a slow onset or creeping hazard. Therefore, the focus of the pooling facility is to reduce the systemic risks of drought, such as food price increases. All three pooling facilities are based on parametric insurance policies, which results in timely payouts. Parametric insurance policies use environmental thresholds to trigger a payout if the parameter exceeds a pre-defined limit, as opposed to economic loss assessments used by traditional insurance which can be time-consuming. In the case of the ARC, CCRIF and PCRAFI, all facilities transfer funds within 7 to 14 days of a threshold being exceeded.

3.1.3 Premium financing

The financing of premiums is often suggested to be the major barrier to gaining member state participation within risk pooling facilities. This is the case in the CCRIF and PCRAFI, where premium support is needed in the form of grants and subsidies from international organisations and donors, and from other national governments. Within the ARC, premiums are paid by covered member states to the ARC Insurance Company (ARC Ltd.), while governments within the CCRIF

Table 3.1 A comparative overview of the ARC, PCRAFI and CCRIF

Category	ARC	PCRAFI	CCRIF
No. of participating countries	32 African Union member states signatories (January 2016)[8]	5 Pacific island states	15 Caribbean islands states and 2 Central American states
Types of hazard covered	Drought	Earthquakes, tropical cyclones and tsunamis	Earthquakes, tropical cyclones, excess rainfall
Parametric trigger	Rainfall threshold	Wind speed, seismic activity	Wind speed, seismic activity, rainfall threshold
Category of hazard	Slow onset	Sudden onset	Sudden onset
Payout timelines	7–10 days	7–14 days	7–14 days
Total coverage	US$ 190 million	US$ 100 million	US$ 43 million
Total payouts	US$ 25 million (Jan. 2015)	US$ 38 million (June 2015)	US$ 3.7 million (March 2015)
Coverage purpose	Food price stabilisation, securing of food commodity imports early, maintaining grain flows to the country (systemic risks of drought)	Core public services: includes infrastructure reconstruction, re-establishment of ICT and electricity services, payment of public servants, servicing debt and borrowing debt	Core public services: includes infrastructure reconstruction, re-establishment of ICT and electricity services, payment of public servants, servicing debt and borrowing debt
Premium financing	Domestic budget of participating countries	Government of Japan	Internal Development Association (IDA), Caribbean Development Bank (CDB) and Governments of Canada and Japan
Frequency of hazards covered	1 in 5 to 1 in 50	1 in 10, 1 in 15 and 1 in 20	1 in 10, 1 in 15, 1 in 20
Financial stability	Reserves, reinsurance and possibly catastrophe bonds	Reserves, reinsurance and catastrophe swaps	Reserves, reinsurance and catastrophe swaps
Commonwealth member states	Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone and Zambia	Samoa, Tonga and Vanuatu (Solomon Islands – first season only)	Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Jamaica, Saint Lucia, St Kitts and Nevis, St Vincent and The Grenadines, Trinidad and Tobago

contribute between US$200,000 and US$ 4 million. The Pacific island countries (PICs) within the PCRIP were fully supported by a grant provided by the Japanese government for the first year of the pilot, and thereafter had to make US$ 200,000 nominal contributions.

3.1.4 Public-private partnerships

All risk pooling facilities engage in partnerships for either technical or financial support (see Annex A). In the case of ARC, initially the UK Department for International Development (DFID) and the KfW (acting on behalf of Germany) committed a total of £100 million and €50 million to the ARC, respectively. CCRIF is guided by the technical leadership of the World Bank. The facility is capitalised by contributions to a multi-donor trust fund by the European Union, the World Bank, the governments of Canada, the UK, France, Ireland and Bermuda, the Caribbean Development Bank (US$ 47 million), a grant from the Government of Japan and membership fees paid by participating countries. PCRAFI was a joint initiative undertaken by the Pacific Island Applied Geosciences Commission, the Secretariat of the Pacific Community, the World Bank, the Asian Development Bank, as well as numerous other actors. During 2014, the Government of Japan donated a grant to PCRIP, which acted as premium support to complement country contributions.

3.1.5 Coverage and total payouts

In terms of maximum coverage size available, PCRIP is the smallest (US$43 million). ARC Ltd. issues drought insurance policies, which were equivalent to US$ 130 million in coverage for a total premium cost of US$ 17 million as of February 2015. Within CCRIF, participating countries pay an annual premium in exchange for US$ 100 million worth of coverage. As of mid-2015, CCRIF had made 13 payouts to 8 member governments worth approximately US$ 38 million. The first disaster payouts by ARC totalled US$25 million and were paid out in January 2015 to Senegal, Niger and Mauritania from premiums totalling US$ 8 million. Within PCRIP, total payouts until February 2015 have equated to US$ 3.17 million.

3.1.6 Financial stability

A comprehensive climate risk management strategy (CCRMS) with a risk-layering approach is critical to ensure the long-term financial stability of a given risk pooling facility. A CCRMS requires the use of complementary financial instruments to address hazards of varying severity and frequency. In the case of ARC, CCRIF and PCRIP, a combination of retained reserves, reinsurance, catastrophe bonds and catastrophe swaps are used.

3.2 Analysis of risk pooling themes

Following the literature review and interviews conducted, the following themes were identified to be critical within the design considerations of a risk pooling facility from a small state perspective:

- types of hazards;
- payout timeliness;
- payout use and impact;
- premium financing;
- public-private partnerships;
- financial stability;
- gaining political buy-in; and
- extending coverage.

These themes are analysed in detail in following sections.

3.2.1 Types of hazards

The types of hazards recognised by a risk pooling facility will affect the timeliness and use of a payout and the thresholds used within parametric insurance policies. Furthermore, the category of hazard affects whether a financial instrument is appropriate or not. Hazards can be broken down into two categories, namely sudden-onset and slow-onset events. The UNFCCC takes a different approach to categorising hazards, where weather hazards that can be exacerbated by climate change are referred to as 'climate hazards', while hazards that are a direct result of climate change such as sea-level rise and ocean acidification – are defined as 'climate change hazards' (UNFCCC 2008). Insurance is an appropriate instrument to address climate hazards such as tropical cyclones, which may increase in intensity owing to climate change. However, for ocean acidification, the geographic spread, economic costs and severity of the hazard is not known in sufficient detail to develop an insurance product, although this may change as technology advances.

CCRIF and PCRAFI cover sudden-onset climate hazards such as hurricanes, earthquakes, tsunamis, storm surges and excess rainfall (CCRIF 2015). ARC is different to CCRIF and PCRAFI, as it covers the occurrence of drought, which can be described as a slow-onset natural hazard. Slow-onset events evolve gradually from incremental changes occurring over a longer period of time (Balogun 2013) and can be difficult to integrate into index-based insurance (Ghesquiere 2016). The type of hazard covered by a risk pooling facility also influences the triggers used within parametric insurance policies. In the case of CCRIF and PCRAFI, clean triggers[9] are present, such as high wind speeds and seismic activity. Within ARC, payouts are based on whether the trigger has reached a certain threshold or not – that is, whether the rain has fallen or not, which is used as a proxy for drought. Slow-onset events may therefore have definitional issues, as it is unclear at what point a drought is considered to be a drought; this is the case with ARC (Rhyner 2016).

In summary, selecting whether a pooling facility uses parametric insurance policies or not (and the associated thresholds) is dependent of the types of hazards recognised. Parametric insurance policies can aid fast payouts for sudden-onset events.

3.2.2 Payout timelines

Payout timelines are directly related to the types of hazards covered under a pooling facility and are particularly important in the context of the sudden-onset climate hazards, as immediate liquidity is required. To ensure that payouts are timely, ARC, CCRIF and PCRAFI are all based on parametric insurance policies. Parametric insurance policies increase the transparency of risk pooling, which can assist in political buy-in of member states. However, environmental thresholds can equally appear 'unfair' when there is no trigger for payout, but damages occur (basis risk). CCRIF, PCRAFI and ARC have all exhibited timely payouts to participating countries, most occurring within 7 to 14 days *once a trigger has been initiated* (CCRIF 2015; World Bank 2015; Wilcox 2016).

The speed of payout in comparison to other forms of financial assistance is effectively illustrated by the case of Haiti, when the country experienced a magnitude 7.0 earthquake in January 2010. CCRIF paid out US$ 7.5 million and this was the first set of funds to be received by the Government of Haiti inclusive of all pledges, regional and international (CCRIF 2010). This also represented 50 per cent of the total aid received by Haiti in the first ten weeks of the disaster. According to Sharkey and Larrimore (2013), three years after the 2010 earthquake, Haiti continued the struggle to rebuild, as much of the relief aid had failed to be appropriately used owing to corruption. It is difficult to state in absolute terms how effective the funds provided to Haiti from CCRIF were in reducing loss of livelihoods and rebuilding core public services. However, Kalra (2016) does suggest that a more impact-led and robust monitoring and evaluation programme guiding countries on how funds are to be used could ensure that risk pooling is more effective.

Fast payouts may not be favourable in the context of slow-onset events. When a payout is initiated under ARC, funds are transferred to the affected government within 7 to 10 days (Wilcox 2016). It is expected that these funds filter to the last households within 120 days, as it is believed that this is when a household's capacity to cope is reduced. This illustrates that payouts may take place even though there is a possibility that rainfall may return while the payout process is ongoing. Therefore, payouts prior to harvesting may not be advantageous to the scheme as a whole (Clarke and Hill 2013).

Parametric insurance policies are advantageous, as once the trigger is defined payouts are not only timely but also cheap to verify – which make such insurance ideal in responding to a disaster. A disadvantage of parametric insurance policies is that payout estimates are based on loss models. Loss models are envisioned to replicate as closely as possible the losses felt on the ground; however, there is a risk of over or under compensation (basis risk). In the case of persistent over compensation, the financial stability of a risk pool can be compromised over time. Meanwhile, in the case of under compensation, the impacts of a disaster may not be adequately managed, thereby reducing the effectiveness of the pool to respond to hazards. Basis risk can be reduced over time as more data is gathered. A major concern caused by basis risk is the long-term acceptance of a risk pool by participating member states, which will be discussed further in Section 3.2.7.

In conclusion, if payout timeliness is critical to the effectiveness of the risk pooling facility's ability (depending on the hazard types covered), then parametric insurance policies can allow for immediate payouts, so minimising the impacts to people – particularly during a low-frequency, high-severity event.

3.2.3 Payout use and impact

Risk pooling is not envisioned to cover all economic losses experienced from a catastrophe. According to GFDRR (2011), the payouts gained are estimated to cover the needs for the first three to six months after a major disaster. Risk pooling is not initiated to simply cover a certain percentage of losses; rather the focus can be more specific gap filling, such as on providing liquidity as soon as possible, post disaster. Even though CCRIF is estimated to cover 20 per cent of all economic costs, a facility does not have any control over the percentage of costs covered by a payout (Linnerooth-Bayer *et al.* 2012). It is rather the country that determines an estimation of this percentage by its selection of coverage. This reinforces the need for risk pooling to be part of a greater disaster risk management strategy. The selection of coverage is often determined by a cost-benefit analysis of the selected coverage in relation to other streams of finance that can be stimulated by the occurrence of a catastrophe. For example, considering that Tonga's reserve fund is worth approximately US$ 600,000, a higher amount of coverage was possibly purchased such that the reserve fund would not be exhausted by a larger disaster (World Bank 2015). Tonga was the first country to receive assistance from the pilot, a total payout of US$1.27 million in 2015 (UNESCAP 2015).

In the case of CCRIF and PCRAFI, funds are primarily used for core public services, post disaster, which could include infrastructure reconstruction and re-establishment of information and communications technology (ICT) and electricity services (CCRIF 2015). According to Ghesquiere (2016), funds may also be used for the payment of public servants, servicing debt and borrowing debt. There are no formal restrictions on what payouts may be used for within CCRIF; conversely, ARC requires detailed contingency plans and approved final implementation plans (FIPs) stipulating how funds are to be used when a payout is triggered (AU 2011). Once the ARC board has approved the contingency plans, the member state is issued with a Certificate of Good Standing (CGS). Even though the requirement of FIPs and contingency plans may slow down the payout process, it does provide a level of transparency and accountability – ensuring that payouts reach the household level (Syroka 2016). FIPs and contingency plans are more appropriate for slow-onset events covered by risk pooling, where rapid payouts are not as critical.

The focus of ARC is different to CCRIF and PCRAFI. Payouts are envisioned to secure food commodity imports early, to lock-in prices and ensure that grain flows to the country are predictable (Syroka and Nucifora 2010). The funds also ensure the social safety net is scaled up in a disciplined manner, guaranteeing a higher coping capacity at the household level. The use of funds in this manner can be likened to use of flood insurance, where payouts are envisioned to restore a covered loss to its pre-condition phase (Federal Emergency Management Agency [FEMA], 2016). Lastly, the funds can also be used to support the distribution of farming inputs for subsequent seasons should payouts occur after the harvesting period. Therefore, even though there is a risk that payouts may occur despite rains returning, ARC can support investment in climate smart agriculture and resilience building, such that the threats of drought can be in subsequent years.

3.2.4 Premium financing

Premium support is perhaps the greatest barrier to achieving the buy-in of potential member states. Even though risk pooling may reduce the cost of premiums – as is the case with ARC, CCRIF and PCRIP, where member countries have experienced a 52 percent, 45–50 per cent and a 50 per cent reduction in the cost of premiums, respectively – premium affordability is still a concern (Linnerooth-Bayer *et al.* 2012; Mahul and Cook 2014; ARC 2016). Premium support can be facilitated through public-private partnerships. There are two avenues to address these concerns, namely the implementation of premium support in the form of direct finance or the adopting of strategies that can aid the development of the institutional landscape, thereby reducing the cost of premiums indirectly (Rhyner 2016). Both direct premium support and support strategies to reduce the cost of premiums exist within CCRIF and PCRAFI, and are enabled by strong bilateral engagements and partnerships with international donors and IFIs. ARC is unique, as it does not rely on direct premium support. This was the decision made by the executive board, as it was believed that premiums paid from domestic budgets would increase the political buy-in and interest by member states. Wilcox (2016) stated there were no restrictions to premium support; however, the executive board of ARC would determine its acceptance.

Direct premium support can be undertaken through a mix of concessionary loans and grants. Under CCRIF, Haiti received a full premium subsidy from the International Development Agency (IDA), Caribbean Development Bank (CDB) and the Government of Canada for each of its eight years of participation (ARC 2016a). Eight countries received concessional financing for up to half of their premiums from CDB in the third policy year of CCRIF (Ibid). With the expansion of CCRIF into Central America, IDA funding will provide full premium support for three to five years for Honduras and Nicaragua (Ibid).

Within PCRAFI, premiums for all five initial members (Marshall Islands, Samoa, Tonga, Vanuatu and Solomon Islands) were fully grant supported for the first year. The grant was provided by the Government of Japan (World Bank 2015). Grant support was also used to partially finance premiums for the second and third years of PCRAFI. For the second pilot season, participating countries made a nominal contribution of US$ 200,000, except for the Cook Islands, which paid its premiums in full. The country premium was increased to US$400,000, with the Cook Islands also paying its premiums in full. Premium support is particularly important in the context of the PICs, owing to their small economic size. According to World Bank (2016), the GDP of the PICs as a whole was US$ 8.6 billion. In the case of the Cook Islands, the premium cost represents 0.2 per cent of the total GDP, 183 million dollars (UN 2016).

To complement the direct premium finance support, there are also various strategies to reduce the cost of premiums. The use of parametric insurance policies can reduce administrative and transaction costs, and this can reduce the cost of premiums. There may, however, be significant start-up costs to consider, such as the development of risk models to assess risk profiles; these costs can be recovered over a given period of time (e.g. five years) (Mahul 2011). A well-diversified portfolio (diversified risks) can also help reduce the costs of premiums, as is evident within CCRIF. National investments towards the reduction of risk exposure by member countries could also reinforce the pool and result in lower premiums; however, there is little evidence to suggest this is true within ARC, CCRIF or PCRAFI. According the Ammann (2016), it is unclear whether premiums are influenced by preventative measures. This is owing to the fact that climate adaptation initiatives occur at the local or site-specific level, which makes it difficult to price in a risk pool that operates at a national level. Furthermore, there is no link between the amount of money spent on prevention and economic losses incurred (Ammann 2016). Reinsurance premiums may also be high owing to their exposure to high-severity risks (Linnerooth-Bayer 2016). Technical assistance can enhance the hazard data and its use allows for more knowledge of risks, which allows better targeting of premiums – possibly reducing the costs of premiums (Kalra 2016). Lastly, the retaining of pooled risks as reserves results in less risk being transferred to the reinsurance markets. Therefore, the premium costs may be reduced, as the facility is required to pay less premiums to reinsurance companies (OECD 2015).

In summary, premium financing can be a substantial hurdle to initiating a risk pooling facility. However, through public-private partnerships, premium costs can be reduced by direct premium finance support or by strategies to indirectly influence the cost and cost-effectiveness of premiums.

3.2.5 Public-private partnerships

One of the most important features of all risk pooling facilities is the presence of multiple stakeholders, who contribute different expertise and services towards the functioning of the financial instrument. According to Wilcox (2016), the development of partnerships is driven by the risk pooling facility itself, with the partners selected very much driven by the needs required. CCRIF, ARC and PCRAFI have similar partnership models, consisting of organisations promoting technical capacity (meteorological departments, disaster management agencies and risk modellers), international donor organisations, reinsurance companies and financial intermediaries. Partnerships have operated very well within CCRIF and ARC and this is demonstrated by growing country participation (Wilcox 2016); the partnership model of PCRAFI is difficult to evaluate, as it is currently a pilot.

Partnerships can play a crucial role in the influencing political buy-in. For example, the selection of the World Bank as an intermediary in the case of PCRIP was owing to a lack of understanding of insurance products and disaster risk-financing tools (Ghesquiere 2016). Often these member states were reluctant to purchase insurance from private agents for bureaucratic reasons. Moreover, many smaller governments do not have specialised risk-financing departments, which can make dialogue difficult thus capacity building is necessary. According to the Ghesquiere (2016), international organisations are often selected as intermediaries, as they are trusted by national governments. Furthermore, they also have a development agenda with less concern for a return on investment and possess a variety of technical expertise including hazard modelling, public finance and risk management. Partnerships can also be critical in terms of technical capacity and data acquisition. Given that risk pooling facilities such as ARC, CCRIF and PCRAFI are based on parametric insurance policies – with exhaustive environmental data requirements and sophisticated modelling technologies necessary to ensure that appropriate thresholds are set and basis risk is avoided – public-private partnerships can help facilitate data sharing and the exchange of technical best practices (Lal *et al.* 2012).

The initial capitalisation costs of a risk pooling facility can be considerable. Capitalisation allows a facility to remain financially stable within the initial years of operation, ensuring that reinsurance can be accessed. In the case of ARC, international donors such as DFID and the KfW (acting on behalf of Germany) committed a total of £ 100 million and € 50 million in the form of interest-free loans, respectively. In this case, the driver for engaging in a public-private partnership was financial need (without which the facility would not be operational).

The development of partnerships is not seen to be a significant barrier with political buy-in, with the understanding of parametric insurance cited as being a more obstructive issue (Ghesquiere 2016).

3.2.6 Financial stability

Maintaining financial stability of risk pooling facilities can be approached in various ways, namely by:

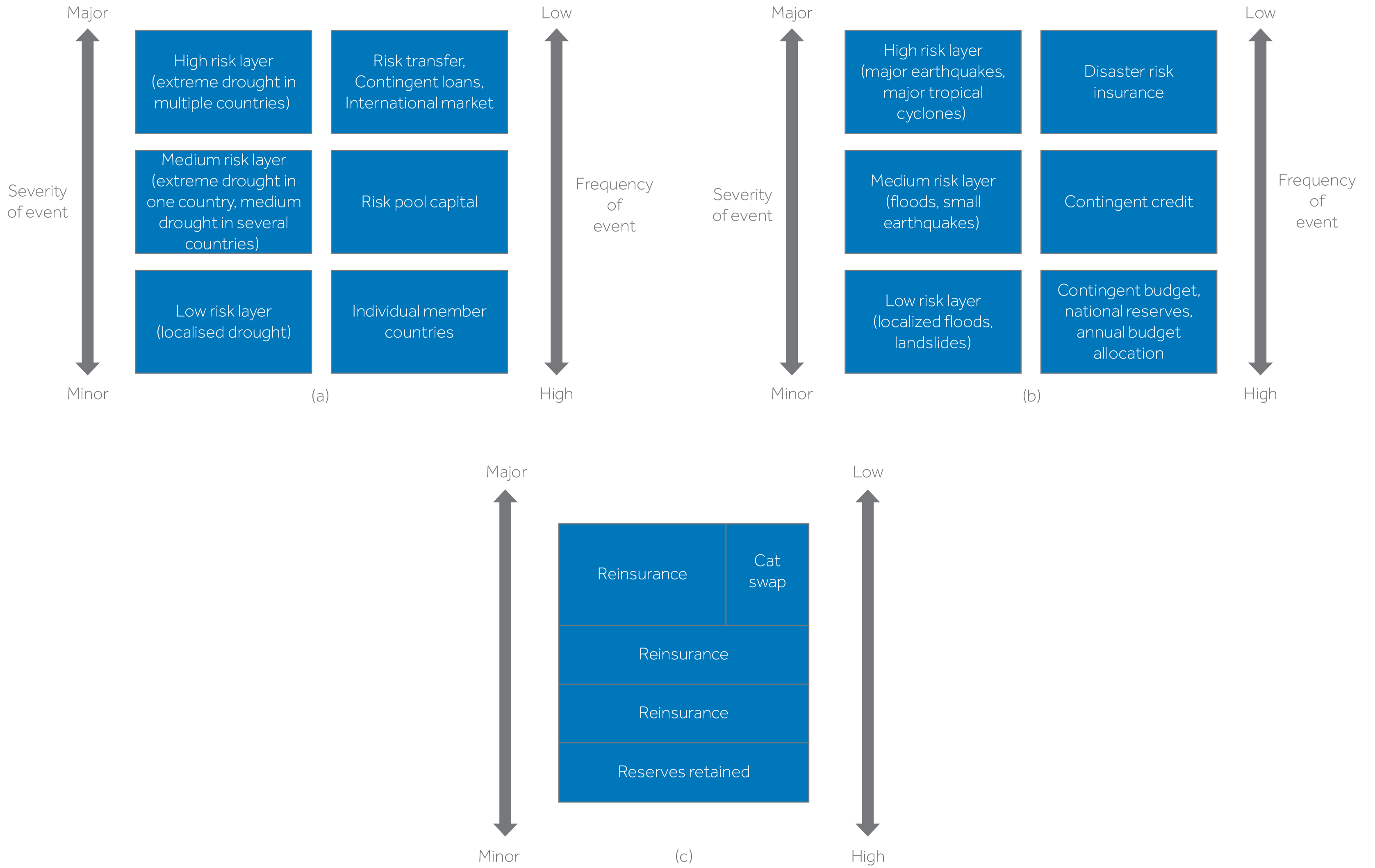
- ensuring that a risk-layering strategy is adopted to reduce and manage risk in the most cost-effective manner;
- engaging in partnerships to provide premium support and initial capitalisation to reduce costs (discussed in Sections 3.2.4. and 3.2.5., respectively); and lastly
- the implementation of strategies to create an enabling environment to diversify risk.

PCRAFI, CCRIF and ARC use risk pooling as part of a larger integrated disaster risk-financing and insurance strategy (as demonstrated by Figure 3.1). For example, PCRAFI has a three-tier risk-layering strategy; it retains funds in the form of a contingency budget and national reserves to finance small but recurrent disasters; it possesses a liquidity mechanism for less frequent but more severe events in the form of contingent credit; and it possesses disaster risk insurance to cover major natural disasters. CCRIF and ARC are similar to PCARFI in that they possess multiple risk layers. CCRIF retains the first layer of risk through reserves (US$ 10 million); reinsurers underwrite the second and third layers of risk (US$15 million and US$ 25 million, respectively); and the fourth risk layer is financed via reinsurance and catastrophe swaps organised by the International Bank for Reconstruction and Development (IBRD) Treasury. In ARC, retained reserves are based on annual premiums in addition to donor capitalisation, while some risk is transferred in the form of insurance, derivatives and possibly catastrophe bonds.

Even though the inclusion of a wide variety of risk-financing instruments within a risk-layering framework can help lower risk against market failures and systemic risk, evidence from ARC, CCRIF and PCRAFI suggests that reinsurance is still the preferred choice. This may be owing to reinsurance being more understandable as a financial instrument, as compared to catastrophe swaps and catastrophe bonds. The risk of using a financial instrument such as reinsurance in isolation is demonstrated by the economic shock felt after Hurricane Sandy, where insurance premiums increased by between 20 and 25 per cent following the disaster (Sebayan 2014). Therefore, a diverse risk-financing strategy inclusive of catastrophe bonds, catastrophe swaps and catastrophe reserves may not be the most financially efficient approach; however, it could be more resilient to economic shocks. The use of other complementary risk-financing instruments may also attract a different suite of investors. Institutional investors interested in adding non-correlated securities to their portfolio are likely to take up catastrophe bonds, as was the case with CCRIF. This is also positive from a financial stability perspective, as the financial markets often have greater capacity than the reinsurance markets (Yago and Reiter 2008).

A well-diversified portfolio can also promote financial stability by being able to attract reinsurance on better terms, which reduces the premium costs paid by member states. NASDAQ (2016) defines a well-diversified risk portfolio as one that 'includes a variety of securities so that the weight of any security is small. The risk of a well-diversified portfolio closely approximates the systematic risk of the overall market, and the unsystematic risk of each security has been diversified out of the portfolio'.

Figure 3.1 Disaster risk-financing strategies of: (a) ARC, (b) PCRAFI and (c) CCRIF



Source: AU 2011; Mahul and Cook 2014; CCRIF 2015; World Bank 2015

The restructuring of portfolios can also reduce risk and thereby ensure that costs are reduced. In the case of CCRIF, there were new product offerings in segregated portfolios and the expansion of the mechanism to new geographical regions (CCRIF 2015). The separation of portfolios reduces the cross-subsidisation of risk from region to region: this ensures that risk is based on the particular risk profiles of the countries in that region (ibid). Public-private partnerships can also attract reinsurance companies. In the case of PCRAFI, Japanese reinsurance companies have become interested in PIC risk; this could be owing to the Japanese governments' involvement in grant support to PCRIP.

3.2.7 Gaining political buy-in

According to Kalra (2016) and Ghesquiere (2016), one of the most significant challenges to implementing a risk pooling facility is gaining political buy-in from potential member states. The underlying cause of certain countries' reluctance to join a risk pooling facility is a general lack of understanding of how parametric insurance operates. The ability of a country to make informed choices about the level of coverage needed against various hazards will be driven by the level of technical support obtained. Two aspects of parametric insurance that need to be understood by potential member states are basis risk and credible environmental triggers.

Within PCRAFI, Solomon Islands discontinued its insurance coverage for season 2 of PCRIP after the Santa Cruz earthquake was not covered (it was not severe enough). This demonstrates a lack of understanding of how environmental triggers work and a lack of acceptance that not all hazards will trigger a payout within a given insurance policy. Ensuring that countries are aware of how parametric insurance products operate is critical to maintaining a constant pool of participants under a given risk pooling facility. For a risk pool to be viable and cost efficient, at least eight countries should be member countries, as this allows for the appropriate level of risk diversification and premium contributions. An adequately sized risk pool ensures that premiums remain at a low cost and long-term financing against climate hazards is sustainable. This is of particular concern within PCRAFI, as only five members are currently participating within the third year of the pilot.

From a basis risk perspective, when Hurricane Dean imposed damage on Jamaica in 2007, wind speeds were not sufficient to trigger compensation from the pool. Payouts may also not be triggered if the damage is caused by an environmental parameter that is not covered within the insurance policy. For example, in 2008, Haiti experienced three hurricanes, which collectively caused considerable damage; however, most of the damage was due to flooding and not wind, and thus a payout was not triggered.

It is important to note that an understanding of how parametric insurance works and the subsequent benefits and limitations does not guarantee participation by potential participants. In the case of ARC, Zimbabwe did not want to participate as it thought that its domestic budget could be more appropriately spent on other needs, as opposed to premiums (Wilcox 2016). There may also be limitations in terms of integrating risk pooling into legislation. According to Wilcox (2016), ARC has an advantage over CCRIF and PCRAFI, as it is backed by an international organisation (AU); by comparison, PCRIP is currently a pilot and CCRIF is a segregated portfolio company. This provides African governments with a sense of ownership, which is critical in facilitating the transition from grant-supported premiums to premiums embedded within national budgets. This is also illustrated by the fact that all premiums within ARC are fully funded by member states.

3.2.8 Extending coverage

As mentioned in Section 3.2.2, risk pooling with parametric insurance policies has been used to address immediate economic losses as a result of a catastrophe (slow or sudden onset). The lack of post-relief funds may therefore represent a financial gap, leaving vulnerable groups susceptible to further economic losses in the long term. 'Vulnerable groups' refers to low-income populations, but may also cover gender differences in terms of insurance coverage. Globally, less than 5 per cent of low-income households have access to insurance (Lloyds n.d.; OECD 2015). Micro-insurance can help bridge this gap and extend coverage to those who are still vulnerable after risk pooling payouts occur. This gap also represents an opportunity for the insurance market to create new financial products targeted to the needs of the poor.

There is acknowledgement from ARC that there is a need for risk pooling facilities to co-ordinate their initiatives with micro-insurance pilot projects, such as those undertaken in Ghana and Malawi (ARC n.d.). CCRIF Segregated Portfolio Company (SPC) has a livelihoods protection policy (LPP) under its mandate to address insurance directed at low-income individuals (Emanuel 2015). The micro-insurance product is designed to provide coverage to farmers and tourism workers against extreme weather hazards. The LPP uses parametric insurance policies to cover high wind speeds and excessive rainfall, with timely payouts envisioned of approximately 7 to 14 days. As of December 2015, 600 LPPs had been sold within the Caribbean (ibid).

Gender-specific concerns may be integrated into risk pooling facilities under the terms of payout use. In the case of CCRIF, there is no restriction on how payouts may be used; therefore, it may be difficult to assign amounts (or proportions) of the payouts towards gender-specific risks. In the case of ARC, monitoring and evaluation is more robust; therefore, gender-specific risks may be more effectively addressed. The issue of basis risk may also limit the funds available for gender specific risks. There has been more research undertaken on the consideration of gender within micro-insurance products. According to the Banthia *et al.* (2009), a well-designed micro-insurance product encompassing gender issues would allow for women-specific risks to be considered, while acknowledging the role of women as household-risk and resource managers and the gender dynamics at the household level.

Another possible avenue to facilitate increased insurance penetration and coverage is the use of complementary disaster insurance targeted at the homeowner level (OECD 2015). The benefits of this approach have been highlighted by New Zealand's Earthquake Commission (EQC), which covers loss and damages to residential dwellings in the event of earthquakes, natural landslips, volcanic eruptions, hydrothermal activities and tsunamis. The EQC allowed for a high rate of repair and rebuilding after the Canterbury earthquake, which was significant considering as the National Disaster Fund had become exhausted (EQC 2014). A similar approach has also been taken by Japan's earthquake insurance system for homeowners. According to Kalra (2016), further studies are needed on financial coping mechanisms within grassroots communities.

4. Recommendations

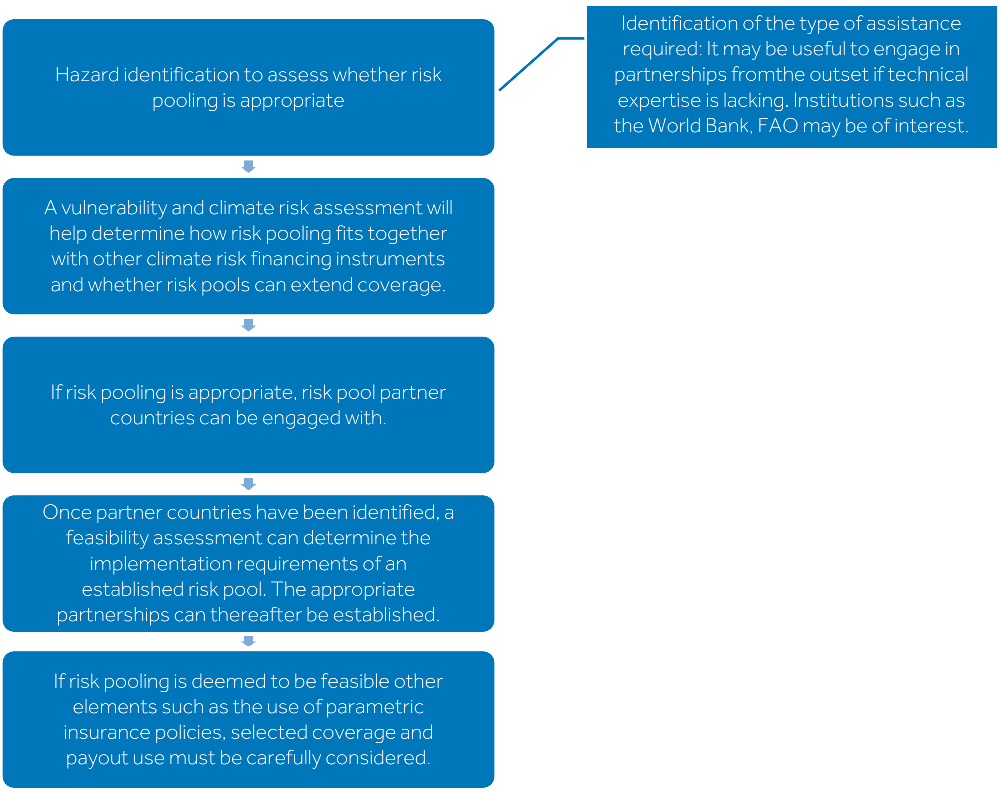
In general, Commonwealth small member states face significant challenges in responding to climate hazards owing to limited borrowing capacity, a lack of economic diversity, narrow revenue base and poor access to reinsurance markets. Considering these limitations, there is a need for Commonwealth small states to consider alternatives such as risk retaining or risk transfer mechanisms.

Figure 4.1 provides a suggested roadmap for a country wishing to investigate the feasibility of risk pooling. This roadmap is based on the learnings of investigated themes under Section 3.2., the following paragraphs discuss learnings that were realised:

Types of Hazards: The selection of which potential hazards are to be covered in a risk pooling scheme influences a range of factors within a climate risk management framework including the use of payouts and environmental thresholds set for parametric insurance. Certain hazards cannot be covered by risk pooling such as ocean acidification. The starting point for Commonwealth small states in this context is *identification of appropriate hazards* that can be covered by risk pools. This could be supplemented by the evaluation of historical exposure to the hazard (noting parameters such as the frequency, economic losses and severity) and forecasting how parameters may change in the future;

Vulnerability Assessment and Instrument Selection: One of the primary functions of risk pooling is to provide financial support to those most affected by a particular hazard. A *vulnerability assessment* could illuminate on the level of vulnerability to a hazard, the groups most likely to be affected by a hazard and determine whether risk pooling is the most appropriate

Figure 4.1 A suggested road map for countries looking to evaluate the feasibility of risk pooling



instrument. A vulnerability assessment would determine the amount required from a payout (coverage) and allow for better planning for payout use. To supplement this vulnerability assessment, it is critical to understand other implemented risk financing initiatives and how risk pooling could complement these instruments in enhancing coverage. A climate risk assessment may be necessary to understand how risk financing instruments can be integrated within a larger climate risk management strategy;

Risk Pool Partner Countries: One of the critical factors of risk pooling is the *common exposure of countries to the same hazard*. This allows for appropriate level of risk diversification such that the benefits of risk pooling can be realised, such as reduced premium costs. There are two avenues to engage in risk pooling, that is, a Commonwealth small state may join an existing risk pooling facility (e.g. Guyana joining CCRIF) provided that they are exposed to the hazards covered by the parametric policies of the facility and are eligible to be covered under the rules of the facility; or, a group of Commonwealth states that are exposed to a common hazard in close geographic proximity wish to pool their risks (for example, Mauritius, India, Sri Lanka, Pakistan, Bangladesh could enter into an Indian Ocean risk pool to guard against tsunamis). Should countries be exposed to the same hazard, there may still be a reluctance to joining a risk pool. Engagements with other countries about the benefits of risk pools can entice countries to develop partnerships. This may require capacity building of government officials to increase the understanding of how risk pooling works;

Partnership Needs: The investigated risk pools (ARC, CCRIF and PCRAFI) demonstrate the imperative need for public-private partnerships. Initially, Commonwealth States should identify the type of assistance the require (e.g. technical assistance, premium support, capitalization support etc.). International donors, international organisations such as the FAO and Multilateral Development Banks (MDBs) may be useful partners during the inception phase of risk pools. MDBs such as the World Bank are also attractive owing to their status as a trusted, multidisciplinary financial institution with a clear development mandate.

Parametric Insurance Policies: One of the common features of several risk pooling facilities is the use of parametric insurance to allow for quick payouts. Parametric insurance policies have high data and monitoring requirements of environmental parameters such that threshold exceedances can be detected. The purpose of implementing a financial instrument is critical. For example, if a rapid pay-out is the primary reason for initiating an instrument, then a risk pooling with parametric insurance policies is a better option than risk pooling based on economic losses (as in traditional insurance).

In conclusion, the Suarez and Linnerooth-Bayer (2011) notes that there is no "one size fits all solution" or "silver bullet" risk-financing tool. Therefore, when designing a risk financing strategy, it is important to understand the country, region and hazards so that a tailored combination of risk financing tools can be applied to a given scenario to develop a comprehensive climate risk strategy.

5. Glossary of Terms

Basis risk The risk that the measure of loss under an index or parametric form of insurance will not equate with the actual loss incurred.

Disaster risk management The systematic process of using administrative decisions, organisations, operational skills and capacities to implement policies, strategies and coping capacities of a society to reduce the impacts of disasters.

Disaster risk reduction A series of interconnected actions to minimise disaster vulnerability by avoiding (prevention) or limiting (mitigation and preparedness) the adverse effects of hazards within the broad context of sustainable development.

Ex-ante Financing Instruments Ex-ante financing instruments refer to sources that do not require advance planning and includes budget reallocation, domestic credit, external credit, tax increases and donor assistance.

Ex-post Financing Instruments Ex-post financing instruments require pro-active advance planning and include reserves, budget contingencies, contingent debt and risk transfer mechanisms.

Hazard A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption, or environmental degradation.

Moral hazard The prospect that a party insulated from risk may act in a manner adverse to the interests of a party bearing the risk, such as by acting carelessly or negligently.

Parametric insurance An insurance contract in which payment is based on the occurrence of a specified event, as opposed to the measure of loss suffered by the insured.

Parametric index insurance An insurance contract in which payment is based on an index as a proxy for the actual loss suffered. The index itself can be linked to objective factors such as storm intensity or location, or can be based on industry or modelled losses.

Risk transfer A contractual process whereby the burden of financial loss is shifted to another party, via the use of insurance or other financing instruments, in return for a payment or premium.

Reinsurance Reinsurance is the practice of insurers transferring portions of risk portfolios to other parties, by some form of agreement, in order to reduce the likelihood of having to pay a large obligation resulting from an insurance claim. The intent of reinsurance is for an insurance company to reduce the risks associated with underwritten policies by spreading risks across alternative institutions.

Slow-onset Disasters These disasters, sometimes referred to as creeping hazards, are defined as hazards that emerge gradually over time. Examples of slow-onset disasters include drought, desertification, sea level rise and ocean acidification.

Sudden-onset Disasters Sudden-onset disasters (also known as rapid-onset disasters) refer to hazards that emerge quickly or unexpectedly. Examples of sudden-onset disasters include earthquakes, volcanic eruptions, flash floods and hurricanes.

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Endnotes

1 A reactive approach to disaster risk management focuses on relief and rehabilitation post disaster while a proactive approach while the proactive approach, seeks to reduce or avoid the impacts of disasters, by appropriate land-use planning, construction and other pre-event measures.

2 This report is based on a detailed literature review as well as interviews undertaken with representatives of the investigated risk pooling facilities (ARC, CCRIF and PCRAFI), consultants working with these facilities and researchers working in the area of disaster risk financing and climate adaptation.

3 'Residual risk' refers to the remaining risk left after inherent risks have been reduced by risk controls.

4 Hazards can be broken down into two categories, namely sudden-onset and slow-onset events. Sudden-onset events refer to natural catastrophes with impacts that are instantaneous, such as hurricanes or floods, whereas slow-onset events (sometimes referred to as 'creeping events') possess impacts that occur gradually over time, such as drought.

5 'Basis risk' refers to the risk that the measure of loss under an index or parametric form of insurance will not equate with the actual loss incurred.

6 Reinsurance refers to risk transferred by insurance companies with less financial capacity to larger, usually international, insurance companies to ensure financial stability in the face of large catastrophes.

7 'Moral hazard' refers to the prospect that a party insulated from risk may act in a manner adverse to the interests of a party bearing the risk, such as by acting carelessly or negligently.

8 In the case of ARC, it is not compulsory that signatories choose to purchase coverage from the facility.

9 'Clean triggers' refer to thresholds that result in hazards being clearly definable. For example, seismic activity is a clean trigger for earthquakes hazards, as losses and damages can be equated to the magnitude of the earthquake. For some hazards, such as drought, clean triggers are absent because the definition of drought may not only be dependent on a lack of rainfall, but also on the infiltration rate of rainfall, geomorphology, soil types and others.

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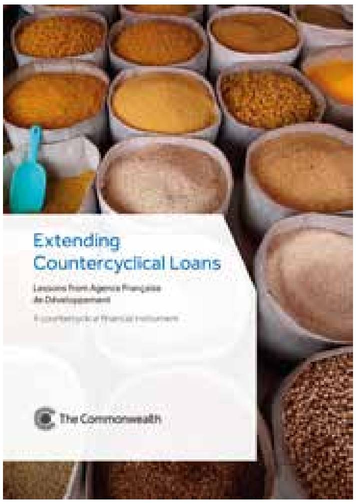

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