



**FINAL REPORT:**  
Understanding the role of  
publicly funded premium  
subsidies in disaster risk  
insurance in developing  
countries

December 2016

: vivideconomics



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# Abbreviations

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A&O	Adjustments & all Other Expenses
ACRE	Agriculture and Climate Risk Enterprise Ltd.
ARC	African Risk Capacity
ART	Alternative Risk Transfer
ASEAN	Association of Southeast Asian Nations
CAT DDO	Catastrophe Draw Down Option
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CDB	Caribbean Development Bank
CIF	Climate Investment Fund
DFID	Department for International Development
FONDEN	Fondo Nacional para el Desarrollo Nacional (Mexico)
GAD	Government Actuary's Department
GFDRR	Global Facility for Disaster Reduction and Recovery
HARITA	Horn of Africa Risk Transfer for Adaptation
IBLIP	Index Based Livestock Insurance Project (Mongolia)
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFW	Insurance-for-work
JICA	Japan International Cooperation Agency
NAIS	National Agricultural Insurance Scheme (India)
NFIP	National Flood Insurance Programme (USA)
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PCRIP	Pacific Catastrophe Risk Insurance Pilot program
PICs	Pacific Island Countries
PREP	Pacific Resilience Program
R4	R4 Rural Resilience Initiative (Ethiopia and Senegal)
SEEC CRIF	Southeast Europe and Caucus Catastrophe Risk Insurance Facility
TCIP	Turkish Catastrophe Insurance Pool
USAID	United States Agency for International Development
WFP	World Food Program

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# Executive Summary

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Disaster insurance offers many advantages, particularly when compared to reliance on post-disaster aid, but remains relatively under-used in developing countries. High premiums are often considered as one of the key reasons why uptake remains low, suggesting that those who see disaster insurance as a development priority should consider interventions to reduce the price of insurance, which would increase affordability for households, and ease potential short term fiscal and political constraints for countries.

This is the starting point of our investigation, which is tasked to explore the role of publicly funded premium subsidies in increasing the uptake of disaster insurance in developing countries. While considering evidence from different disaster risk insurance types, the main focus of our analysis are sovereign risk pools and national insurance schemes.

The focus of this report is relatively narrow – and there is a danger that the overarching questions around suitability of insurance, donor goal setting and costs and benefits of different approaches are left in the background. Determining how best to support and increase take up of an insurance scheme should only be considered once disaster insurance has been identified as a suitable instrument to achieve those objectives and respond to specific risks.

Furthermore, it is important to recognize that any decision about design and implementation of disaster insurance needs to be seen in the wider context of policy objectives from the funding organization (here: the donor) and the country-specific risk characteristics.

- **Is affordability a dominant issue in reducing demand for insurance in developing countries, particularly at the meso and sovereign scales?**

Evidence from existing disaster insurance schemes and the literature suggest that the price of insurance can be an important consideration for those who consider taking out insurance, alongside other barriers. The economic analysis in this report therefore assumes that price can be a barrier to take-up of insurance. However, we note inconclusive evidence for meso and sovereign level insurance schemes, indicating that a case-by-case assessment is needed. For example, some high-risk developing countries have stated that without premium payment support they would be unable to pay for insurance; however, there are other cases where governments appear willing and able to pay risk-based premiums. The concept of affordability may be less suited to the context of sovereign risk pools as a government's decision to take out insurance is also influenced by political and fiscal consideration. The decision to seek insurance protection can thus be seen as a political choice, subject to conflicting budgetary pressures and political priorities. Terms such as ability or willingness to pay may therefore be more accurate – however measuring these at government level is difficult. As this study looks at the underlying costs of insurance and explores if and how premium subsidies can spur an increase in uptake by reducing the price of insurance it is important to also keep those broader factors in mind.

- **How prominent are premium subsidies in current and past insurance schemes?**

Our investigation of existing and proposed disaster insurance schemes in developing countries finds that premium subsidies are relatively common, particularly in agricultural insurance, and geographically in Latin America and the Caribbean. Interestingly many of the 44 schemes that operated premium subsidies also used other subsidies (2016

Compendium). The evidence emerging from the field illustrates how premium subsidies are used, but also highlights a lack of information about funding sources and structure of subsidies. This would need further investigation.

- **What structures do they take?**

Premium subsidies can be direct (in other words, on the demand side) and in full or part, or indirect (subsidising the supply side which allows insurers to lower premiums) through, for example, the provision of donor capital to finance a risk layer and hence reduce reinsurance costs. According to the Compendium the most common form of support is direct premium subsidies. They can be applied with a time limit, or phased out over time, or on a continuous basis. However, it should be noted that there are few precedents for withdrawing subsidies while sustaining demand. While a few were financed through donors (e.g. GIIF grants), most of them were financed by governments (2016 Compendium).

- **How were they targeted and what was their rationale?**

The overall rationale of premium subsidies is the attempt to increase take-up by reducing the price of insurance. Subsidies may be universal or targeted, for example aimed at low/middle income earners. They can be rolled out universally, available to all countries (in a multi-country pool) or individuals in a country. Alternatively, subsidies can be targeted on the basis of location, category (e.g. age), means-testing or self-selection (e.g. insurance for work). Targeted subsidies aim to promote equity by making insurance affordable to the most vulnerable sections.

Justification for premium subsidies is linked to the benefits that insurance offers – particularly in comparison to reliance on post-disaster, as well as for co-benefits of risk modelling, know-how and speed of payouts.

- **Is there evidence that premium subsidies increase demand for insurance?**

Premium subsidies do help to increase demand – as indicated by several agricultural insurance schemes that have seen significant increases in demand after the introduction of generous subsidies. For sovereign insurance evidence suggests that premium subsidies facilitate or increase uptake particularly for countries that would otherwise be unlikely to take out insurance, for example Haiti, where premiums are paid in full by donors. However, some data challenges remain – the monitoring of demand over time as well as an assessment of driving forces behind an increase in demand remain scarce. In the Compendium demand and subsidy data was available for only 24 schemes, but even for those schemes it is possible that demand may have increased due to reasons other than subsidies (e.g. increase in insurance awareness). In addition, there are other factors that may have reduced premium levels, such as changes in risk, scope of cover or level of participation the growth of a scheme can reduce premium levels for all participants as risk is more diversified and economies of scale are achieved in operational costs, as seen in the example of ARC.

- **Is this demand sustained over time? What is the elasticity?**

The underlying hypothesis of this report is that the price of insurance can pose a barrier for take up and efforts to reduce the premiums can therefore increase take up. There is evidence of negative price elasticity in agriculture insurance, indicating that increased premiums lead to a drop in demand for insurance, while lower premiums would see a rise in demand. For example, a cut in subsidy levels is seen as a key factor in reducing demand for agricultural insurance in Brazil. The price elasticities vary across countries, suggesting that the impact that premium subsidies can have would also vary.

Overall the price of insurance should be seen as one factor amongst others determining uptake of insurance. This applies especially at sovereign level, where the price of insurance needs to be considered alongside other political drivers.

Some examples suggest that countries would discontinue cover if prices are deemed unaffordable, but this is a subjective rather than analytical assessment. For example, 61% of CCRIF members have indicated that they would discontinue cover in the case of financial difficulty.

One aspect that requires further investigation is the timing of intervention and duration of impact, e.g. a premium subsidy has a direct, but time-limited impact, while technical support is indirect, but with possibly wider implications beyond an insurance scheme.

- **Apart from premium subsidies, what other options are available to governments to improve affordability by reducing premium costs?**

A range of interventions can influence premium levels – aimed at supply, risk-level or demand side for example insurance for work schemes (e.g. R4 IFW program), or improving efficiency of insurance delivery (e.g. TCIP).

The different measures observed in the Compendium are covered in Table 12, with the results of the economic assessment summarized in the table below:

	<b>Direct premium subsidies</b>	<b>Donor capitalisation</b>	<b>Payment of reinsurance costs</b>	<b>Technical assistance</b>	<b>Payment of operational costs</b>	<b>Risk reduction</b>
<b>Effect on premiums</b>	Large effect	Medium effect	Medium effect	Small effect (but can vary significantly)	Small effect	Small effect

Our economic assessment concludes that premium subsidies are likely to be more effective than other interventions at addressing demand side issues such as fiscal constraints: Compared to capital grants, or other supply-side interventions, they are not limited to targeting a specific element of premium makeup and, pound for pound, are likely to lead to the largest fall in premiums. They are particularly attractive in allowing support to be targeted towards the poorest countries. By contrast, the supply side measures considered in this report typically support the entire risk pool, implying premium support is provided to countries that do not necessarily require it.

However, the interventions considered are not perfect substitutes, and there are many instances where other interventions may be more effective than premium subsidies in supporting a scheme. All existing sovereign risk insurance pools have received significant support in the form of technical assistance (mostly surrounding risk modelling and insurance brokerage) and capital provision. Supply side assistance such as this is typically necessary and effective to setup and support a risk pool. In addition, government schemes often suffer from leakages and inefficiencies and may achieve low volumes if designed/administered poorly. However, if the, narrowly defined, goal is how to effectively reduce premium levels for one or more specific (prospective) member countries, then other interventions are unlikely to be as effective as premium subsidies.

- **What are their advantages and disadvantages?**

See Table 12 for a summary.

- **Beyond reducing premium costs, what other approaches exist to increase demand for and uptake of insurance and how successful are these when compared to premium cost reductions?**

Examples include financial education/risk-awareness campaigns, mandating compulsory insurance/risk reduction, and risk pooling. There is limited evidence for assessing the effectiveness of these measures in increasing demand. Overall this depends on the underlying barriers that an insurance scheme faces. In particular, for schemes where supply side barriers such as lack of data or lack of technical capacity are the key barriers, premium subsidies are unlikely to be the appropriate intervention. Although not formally assessed, there are likely to be a range of co-benefits that can arise from other approaches – for example risk reduction and adaptation efforts, improved regulation and legislative certainty and other enabling conditions that would amongst other benefits also support trust and understanding of insurance schemes.

- **What is the evidence on their relative cost-effectiveness?**

Overall we notice that there is very limited analytical evidence of the performance of different intervention options over time – partly because many disaster risk insurance schemes have not been in operation over a long period and partly because robustly testing this issue would be challenging.

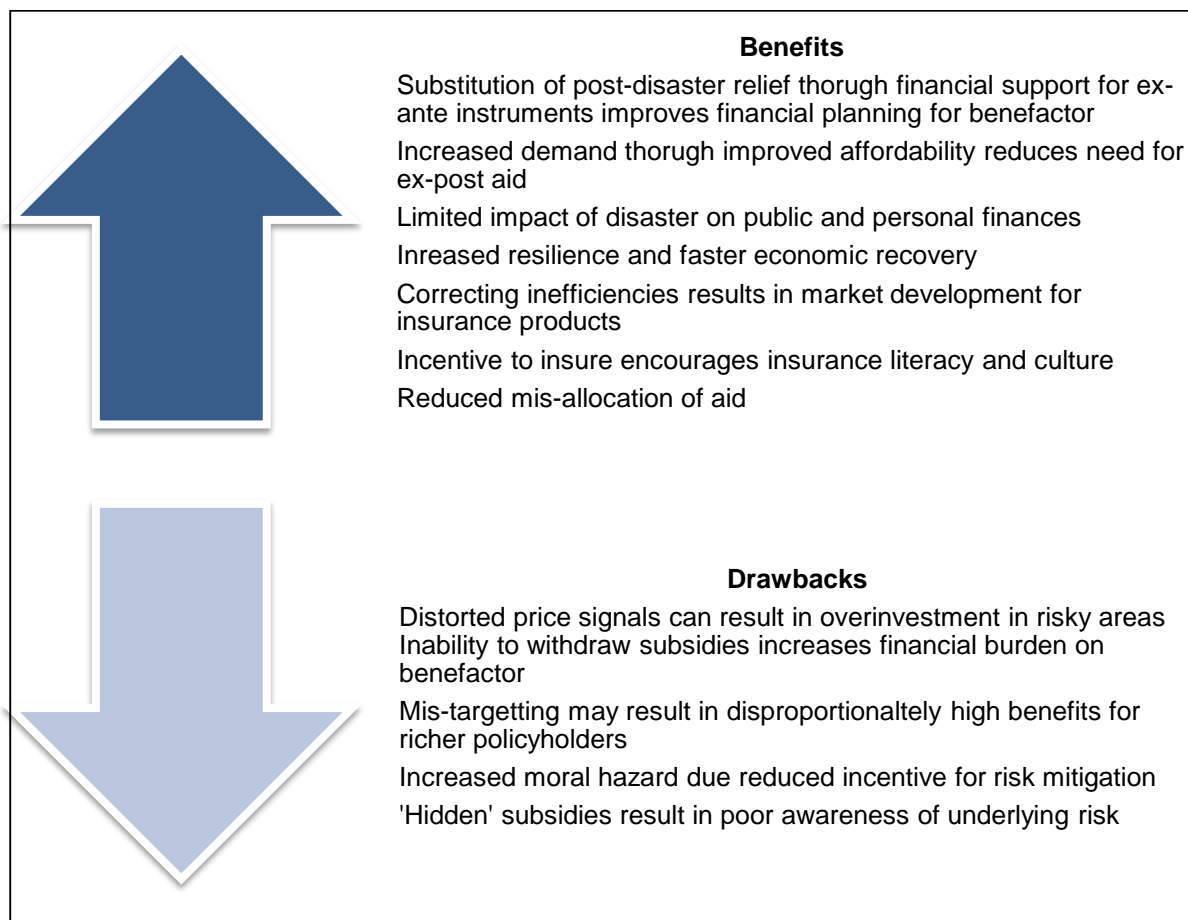
- **What is the evidence on the relative benefits of different approaches to designing premium subsidies (including their duration) and the impacts of withdrawal of subsidies?**

There is limited evidence – see Table 13 for a summary. One example is the R4 Insurance for Work scheme, which has increased uptake to 34%. One aspect that requires further investigation is the timing of intervention and duration of impact, e.g. a premium subsidy has a direct, but time-limited impact, while technical support is indirect, but with possibly wider implications beyond an insurance scheme.

- **If premium subsidies are used, can the potential negative impacts be reduced?**

The potential negative effects are indicated in the figure below. Compared to other interventions, there is a risk that premium subsidies encourage moral hazard or ongoing subsidy dependence. However, these concerns may be overstated in the context of sovereign risk pools and may also be mitigated by ‘smart’ subsidy design. The fact that sovereign schemes only pay out a relatively small proportion of total losses and are linked to parametric triggers further reduces moral hazard concerns. To address moral hazard, subsidies can be made conditional on risk reduction activities, with a credible mechanism for withdrawing subsidies if these activities are not adopted. Declining subsidy profiles should be identified upfront if the barrier to insurance take-up is thought to be short term budget constraints.

Maintaining as close a relationship between the premium and risk levels is key to minimising perverse incentives. For insurance schemes targeted at households, there is evidence from agricultural insurance that the degree of the premium subsidy can be designed so that policyholders still pay the risk-part of the premium. A potential way to achieve this is to subsidise a set percentage of the premium level. This contrasts with, for example, capping premium levels at a defined value. In the case of, for example, agricultural insurance capped premium levels can result in large gaps between the premium paid and the expected loss, which creates a perverse incentive to over develop and insure high risk crops, particularly for relatively higher income households who can afford the premium.



- **Overall conclusion**

Our findings suggest that premium subsidies do play an effective role in supporting low income households and governments in purchasing insurance products.

*For farmers and households* there are examples, such as China's national agricultural insurance schemes, where premium subsidies have significantly increased penetration rates<sup>1</sup>. Ideally, by providing initial subsidies, schemes can reach scale quickly and charge lower premiums due to greater risk diversification and administrative efficiencies allowing long-term commercial sustainability. However, it should be recognized that this effect is limited with households on incomes of less than \$1.25 per day generally thought to require subsidies to afford insurance regardless of the maturity of the scheme (Vivid Economics, 2015).

*For sovereign insurance* the concept of unaffordability for low income national governments is harder to define as the alternative range of items that a government could spend its resources on is greater than at the household level, while there is also often the flexibility to increase taxes or run budget deficits. A government decision to take out insurance is foremost a question of political priorities, built around the decisions of who to protect and how to protect them. Premium subsidies can influence these decisions — there is indicative evidence<sup>2</sup> from both CCRIF and PCRIP that numerous governments would choose not to participate without premium subsidies. This suggests that premium subsidies may be

<sup>1</sup> See section 5.2 for more detail  
<sup>2</sup> See section 5.2.

justified in order to encourage take up of sovereign insurance where there is evidence that countries may otherwise understandably choose not to prioritise paying premiums.

# SECTION 1

## Introduction

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### 1.1 The aim of this report

It is widely acknowledged that insurance can shift the mobilisation of financial resources away from ad-hoc post-event payments, where funding is often unpredictable and delayed, towards more strategic and efficient approaches set-up in advance of disastrous events (Hallegatte, 2011) (Hallegatte, 2014; Clarke & Wren-Lewis, 2016) (Surminski, et al., 2016). However, insurance is rarely available in developing countries, with less than 1% of losses due to natural catastrophes between 1980 and 2012 being covered by insurance in lower middle and low income countries (Munich Re, 2013) (Swiss Re, 2016). Amidst the growing recognition of the benefits of insurance for disaster resilient development a range of new insurance schemes are now being tested across the developing world, ranging from sovereign risk transfer to micro-insurance aimed at poor and vulnerable individuals.

The majority of those initiatives are being supported by international donors – facilitating design and set-up, capacity building and operational functions as well as providing capital funds – while the payment of the premiums remains the duty of those insured. While this approach is in line with the general principles of insurance it can also present a barrier, with the premium payment possibly acting as a deterrent to taking out insurance.

For donors, a range of intervention options exist to reduce the price of insurance in order to support uptake. Premium subsidies, where donors or national governments pay in full or in part insurance premiums for the insured, are one possibility. However, concerns about moral hazard and the loss of any behavioural incentives if those who benefit from insurance do not or only pay a reduced price prevail. The difficulties in aligning risk-signalling of insurance with affordability are well known and have received renewed attention in the context of rising risk levels due to climate change and misguided socio-economic developments.

In this report we investigate the role of public premium subsidies in increasing the uptake of disaster insurance. In particular, we investigate the effectiveness of premium subsidies as a mechanism for increasing demand for disaster insurance schemes, as highlighted in the Terms of Reference for this project (see Appendix D).

We synthesise and discuss the existing evidence of premium subsidies and conduct an analysis of their impact with the aim of informing development policy and practice. In our discussion with stakeholders at the outset and during the investigation we have detected concerns about the relatively narrow focus on the advantages and disadvantages of premium subsidies. We therefore recognize that any appraisal or analysis cannot be seen in isolation from country specific factors, the stated aims behind an insurance scheme and the different intervention forms available to achieve this. Our findings offer guidance to those tasked with enhancing the use of disaster risk transfer in developing countries through our overarching conclusions. However, we do not offer a clear ‘yes’ or ‘no’ answer as there are too many variables that determine the effectiveness of premium subsidy interventions. requiring a case-by-case assessment of individual country and risk profile, donor objectives and the reasons behind low insurance uptake.

## 1.2 Methodology and approach

We understand the concept of ‘public premium subsidy’ to include any effort of either paying or in full or in part the premium that the insured is charged. This can take many forms, such as directly paying the premium, or including cross-subsidization between high-risk and low-risk customers. Examples of this can also be found in developed insurance markets, for example in the case of Flood Re in the UK, where a subsidized pool for high risk properties has been created, paid for a levy charged on all insurance customers, as well as the premium voucher schemes that have been tested in the US.

While acknowledging the experience with premium subsidies in developed markets our assessment focuses on the situation in emerging and developing countries, where the introduction of insurance and the development of schemes has become a growing area for international development cooperation and bilateral aid agreements.

In doing this we compare premium subsidies to other intervention measures available to donors, such as the provision of capital and reinsurance. A particular focus rests on sovereign risk and nationally-arranged schemes for disaster risk.

The findings of this report are based on four pillars:  
a review of the existing evidence in the wider literature, considering both primary and secondary literature in order to illustrate the available evidence and to summarize the latest academic thinking on this topic.

- an update of the Compendium of Disaster Risk Transfer schemes in developing countries to provide a snapshot of current application of premium subsidies and to include operational experiences in our investigation;
- discussions with insurers, brokers, donor agencies, NGOs and sovereign risk pool operatives to inform the direction and methods of the study, and to provide expert review input; and
- a detailed qualitative and quantitative analysis of premium subsidies in comparison to other public intervention options for encouraging uptake of insurance.

We begin with a reflection on the discussions we held with stakeholders throughout this project (section 2). Section 3 provides an update on the current application for disaster risk insurance in developing countries, with a special focus on the role of national governments in the design and implementation of this tool. The challenge presented by the price of insurance is considered in section 4, summarizing recent findings on the importance of premium levels for insurance uptake. Section 5 looks at different intervention options for the public sector to reduce the price of insurance, and section 6 explores in greater detail the application of premium subsidies. In section 7 we report the findings of our quantitative and qualitative in-depth analysis of six intervention options and their impact, before reflecting on implications for design and implementation of premium subsidies in section 7.5. We conclude with a discussion of our key findings in section 9.

A full table of our findings in response to the tasks set in the TOR is provided in Appendix A.



# SECTION 2

## Brief reflection on stakeholder views

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Throughout this project we have spoken to several experts in the industry and to stakeholders engaged in running national level insurance and sovereign risk insurance schemes about the aim of this study and sought their input for the development of the technical framework. Full details of these discussions are included in the appendix. These discussions took the form of semi-structured interviews (5 in total) and informal conversations by telephone and in person.

Below is a summary of the key comments and observations that emerged during our discussions:

- Important to consider premium subsidies in the wider context, reflecting on overarching aims, objectives, barriers and alternative intervention options. A stand-alone focus on suitability of premium subsidies would be too narrow.
- In addition to country specific aspects the justification of premium subsidies depends on prioritization and guiding principles for the donor, with some trade-offs likely, for example solvency, cost-effectiveness, reaching the poor, and expanding private market involvement.
- Cost-effectiveness of sovereign risk transfer schemes and public interventions to support those schemes need to be assessed on a case-by-case basis – general guidance is ok, but cannot replace country-specific analysis.
- The overall cost-effectiveness of insurance schemes is difficult to assess – the high fixed costs when setting up a scheme require a significant capital outlay at the start, when it is unclear what the level of uptake and utilization of the insurance schemes will be over time.
- It is necessary to reflect on the balance between capitalization of a scheme and underlying premium structure when determining the timing of any intervention and the sequencing of policy steps – as highlighted by the example of ARC, which is seen as being overcapitalized: premiums are set based on average expected loss (to ensure the scheme is sustainable), which appears to prohibit a number of potential countries from joining, leaving the underlying capital 'unused'.
- For some countries premium subsidies are widely seen to be the only option in involving them in sovereign risk transfer schemes (Haiti in CCRIF, Zimbabwe as a possible candidate for ARC).
- Overall lack of data is a concern. Beyond anecdotal evidence there is little to determine positive and negative impacts of premium subsidies – even for those schemes that have been in operation for a few years. Unclear if and how the database can capture this, but important to highlight gaps in our understanding.
- Premiums are split between technical and operational costs, differentiating between a risk based part and a mark-up part, which includes transaction, administration, profit (unless a not-for-profit vehicle) and capital/reinsurance costs. In developing countries, lack of risk data (with uncertain return periods) and limited financial infrastructure can lead to high indemnity insurance premiums. Addressing those underlying structural issues can reduce premiums and make schemes more viable.
- The duration of a public intervention is important when seeking justification: e.g. a one-off initial payment to cover the cost of setting up an insurance scheme might be

easier to justify than an ongoing commitment to subsidise premiums over several years.

- For some donors an exit strategy is important – concerns that stopping premium subsidies is hard, while phasing out other support interventions (technical, capital etc.) is easier.
- The duration and scale of impact of the intervention is very relevant, but difficult to quantify: a direct premium subsidy has only impact at point of sale and only for the particular risks covered through the scheme, while other interventions such as funding of risk modelling, capacity building etc. can have positive impacts beyond the specific insurance case. This suggests that premium subsidies should be considered as ‘last options’.
- Capturing the range of benefits that you can get from an intervention is an important aspect to consider for the analysis – however it is widely seen as gap in the existing analysis, with only anecdotal evidence available.
- There are some ethical questions that need to be considered – there may be concerns about aid money being channelled through to private insurance companies via public premium support - robust evidence and justification would be required, but unclear how this could be done in a pragmatic way.
- Any assessment should start with the identification of the value that membership of these schemes brings, in terms of risk understanding, risk management and contingency planning as well as greater financial certainty, earlier receipt of funds.
- A key criterion for comparing the different subsidy/investment mechanisms should surely be the increased probability of a country joining (and later staying in) a scheme.
- Technical advisory functions are important, but there is a risk of duplicating efforts by focusing on in-house capacity building (for example for a pool) rather than using existing private sector capacity (for example broking, modelling, structuring and broking advice). However in-house capacity needs to be developed to support better in country engagement – ARC Agency type organization seems a useful approach.
- Premium subsidies can help build awareness of the value of insurance for new schemes and therefore could be a path to sustainable financing.

We have taken these views into account when interpreting evidence and analytical findings, and when developing guidance for donors and policy makers.

# SECTION 3

## Disaster risk insurance in developing countries

### 3.1 Overview of different types of disaster risk insurance

There are many disaster risk insurance schemes in place around the world, varying greatly in how they operate. A useful classification is by risk coverage, as shown in Table 1.

Category	Description
<b>Sovereign disaster risk transfer</b>	Strategies that aim to increase the financial response capacity of governments in the aftermath of natural disasters, while protecting their long-term fiscal balances, through the use of risk transfer instruments including insurance and insurance-linked securities (e.g. catastrophe bonds, catastrophe swaps, and weather hedges).
<b>Property catastrophe risk insurance</b>	Schemes aimed at developing catastrophe insurance markets and increasing property catastrophe insurance penetration among homeowners, small and medium enterprises, and public entities.
<b>Agricultural insurance</b>	Schemes aimed at developing programs for farmers, herders and agricultural financing institutions (e.g. rural banks, microfinance institutions) to increase their financial resilience to adverse natural hazards. These schemes can be sub-classified as “index-based” or “indemnity-based”, according to the type of insurance instrument used. Agricultural insurance schemes that cover low income farmers can be further classified as “agricultural insurance”, rather than under “disaster micro-insurance”.
<b>Disaster micro-insurance</b>	Schemes that facilitate access to disaster insurance products to protect the livelihoods of the poor against extreme events.

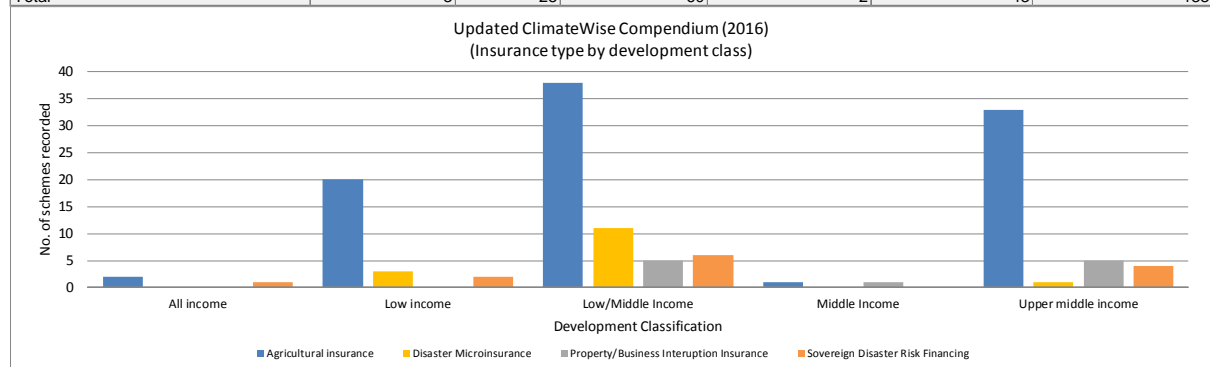
*Source: (Surminski & Oramas-Dorta, 2011)*

**Table 1 Categorisation of natural hazard risk transfer programs**

In 2012, there were 123 natural hazard risk transfer programmes, of which 84 focused on agricultural insurance. There were only 12 sovereign risk disaster risk insurance schemes. 76 of the 123 programmes were in Low or Low/Middle income countries (ClimateWise, 2012). The results from the updated compendium, developed for this report, are shown in Figure 1.

**Figure 1 Disaster risk transfer programs by type and development classification**

Insurance Type	All income	Low income	Low/Middle Income	Middle Income	Upper middle income	Total
Agricultural insurance	2	20	38	1	33	94
Disaster Microinsurance		3	11		1	15
Property/Business Interruption Insurance			5	1	5	11
Sovereign Disaster Risk Financing	1	2	6		4	13
Total	3	25	60	2	43	133



Source: (ClimateWise, 2012), updated Compendium

The update of the Compendium from 2011 to 2016 suggests very few changes in scope or operation of existing insurance schemes. This may not provide a realistic picture as often information about changes in terms or conditions used by an insurance mechanisms are not publicly available. However, there is evidence that some of the existing schemes have expanded into new regions and countries. For instance, the HARITA programme in Ethiopia was the foundation for the R4 initiative for Ethiopia, Senegal, Malawi and Zambia, and the Index-based Livestock Insurance (IBLI) in Kenya has expanded into other districts in northern Kenya and into southern Ethiopia. In all, we identified 7 schemes where expansion has taken place.

### 3.2 The role of national governments in disaster risk transfer

Wealthy nations rarely hold sovereign insurance (Linnerooth-Bayer & Mechler, 2009) and there is little rationale for insuring public infrastructure because these governments can be risk-neutral. This risk neutrality arises from the government’s ability to spread risks over its citizens (through taxation) and large diversified portfolio of public assets (Arrow & Lind, 1970). However, neither of these reasons apply to small or low-income developing countries that have overstretched tax bases and highly correlated risks (Linnerooth-Bayer & Mechler, 2004).

If governments are unable to provide the necessary capital infusion for post-disaster infrastructure rebuilding and humanitarian assistance, the indirect costs of the disaster can surpass the direct losses (GFDRR, 2013). For example, the tropical storms of 2008 caused damages and losses of approximately \$1.6bn in Yemen (6% of GDP) but it was estimated that poverty rates in some regions rose dramatically from 28% to 51% and the national poverty rose by 1.1% (GFDRR, 2008).

Governments have often relied on budget rebalancing, international aid and development loans to finance post-disaster resource deficits but these sources have historically been inadequate (Suarez & Linnerooth-Bayer, 2011). For example, Johns and Fox (2010) point out that six months after the devastating earthquake in 2010, Haiti had received less than 2% of the \$5.3bn that international donors had promised.

The direct and indirect financial impact of disasters can significantly weaken public finances, as expenditures increase and tax revenues fall (GFDRR, 2014). The 2014 floods in Serbia plunged the country into recession and caused total damages and losses worth 4.8% of

GDP. The total amount required by the Serbian government for recovery and reconstruction was estimated to be EUR 1.35 billion in 2014 but as of May 2016, the government faced a funding gap of EUR 830m (Blagojevic, 2016). If the government were to divert funds from social and economic development program to help bridge this gap, long-term development of the country would suffer (GFDRR, 2014).

Clarke and Dercon (2016) argue that the key problem faced by disaster-prone countries is the poor funding model followed, which relies heavily on discretionary benefits provided by international donors. They also suggest governments to adopt a well-defined disaster plan which combines elements of risk retention and risk transfer (see Figure 2) as appropriate. For these reasons, it is essential that small and highly-exposed countries use insurance and other risk transfer mechanisms to protect public finances and public property, pay contingent liabilities to the private sector and support private risk transfer products (Linnerooth-Bayer, et al., 2005) (Mechler, et al., 2010).

**Figure 2 Financial instruments useful in designing disaster risk financing strategies**

FINANCIAL AND BUDGETARY INSTRUMENTS		
Goal	Ex ante instrument <i>[arranged before a disaster]</i>	Ex post instrument <i>[arranged after a disaster]</i>
Risk retention <i>[changing how or when one pays]</i>	Contingency fund or budget allocation	Budget reallocation
	Line of contingent credit	Tax increase Post-disaster credit
Risk transfer <i>[removing risk from the balance sheet]</i>	Traditional insurance or reinsurance Indexed insurance, reinsurance, or derivatives	Discretionary post-disaster relief
	Capital market instruments	

Source: (Clarke & Dercon, 2016)

In an attempt to insulate public finances against the financial impact of natural disasters, governments can engage in macro-level solutions (to protect the government) or micro-level insurance (to protect individuals and businesses).

**Macro-risk solutions** – Governments can transfer or retain risk by using ex-ante disaster risk financing arrangements that help cover the cost relief and reconstruction after disasters. The three main risk transfer instruments available to governments are (Suarez & Linnerooth-Bayer, 2011):

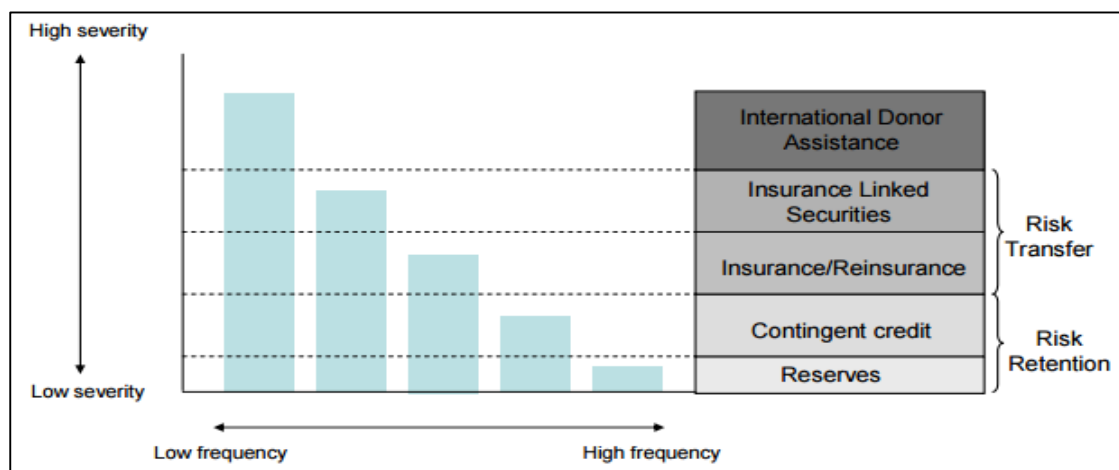
- **Contingent credit** – Contingent credit lines are currently provided by the IADB, IBRD, IMF and JICA and are provided with the aim of helping countries retain some risk in a cost-effective manner. The maximum amount granted by the IBRD is \$500mn and by JICA is approximately \$100mn. As seen in table 2, contingent credit lines are cheaper than other risk transfer mechanisms. Since they are pre-negotiated, they can help countries self-insure by relaxing short-term liquidity pressures in the aftermath of a disaster (Clarke & Mahul, 2011). But the amount borrowed may be inadequate if contingent credit is used in isolation because it is constrained by the borrowing capacity of the country in question (Ghesquiere & Mahul, 2010). Clarke and Mahul (2011) also mention that these are still loans that need to be repaid and can leave the country worse-off in extreme circumstances. As of March 2016, nine

countries held an active CAT-DDO (Catastrophe Draw Down Option) credit line (The World Bank, 2016).

- *Sovereign insurance* – Governments can purchase insurance which pays out depending on the severity of the natural disaster. This can be done through private arrangements or through participation in regional risk pools such as the PCRIF, CCRIF and ARC. Many such arrangements have hard parametric triggers and therefore provide a quick pay-out, for example CCRIF aims to make payment within 14 days of the disaster (Emanuel, 2015). Another advantage of using sovereign insurance is certainty of cost. But as seen in Table 2, it is slightly expensive compared to other disaster risk management instruments.
- *Insurance linked securities* – The most popular type of insurance linked securities are Catastrophe bonds (Cat bonds) which trigger payment upon the occurrence of a specified event. For example, FONDEN issued Cat bonds in 2009 which would have triggered payments of \$140mn on the occurrence of an earthquake of magnitude greater than 7.9 on the Richter scale (The World Bank Treasury, 2011). Insurance linked securities can provide large amounts due to the large risk appetite of financial markets, but they are also expensive (as shown in Table 2). However, it is also worth noting that the high demand for Cat bonds in recent years has driven down the cost, for example another issue by FONDEN in 2012 initially offered coupons from 8.75% p.a. to 9.50% p.a., however after being revised due to high demand they offered between 7.5% and 8% p.a. (Artemis News, 2012). A more recent article by Artemis News (2016) confirms that there is still great demand for Cat bonds.

Each of these risk transfer instruments has its benefits and limitations and according to Ghesquiere and Mahul (2010), countries should adopt a risk-layering approach by which they retain recurring risks which have a small financial impact and transfer the rarer events which cause greater financial damage. An illustration of such an approach is seen in Figure 3.

**Figure 3 Catastrophe Risk Layering**



Source: (Ghesquiere & Mahul, 2010)

*Micro-level solutions* – The GFDRR (2014) notes that disasters can increase demand on social programs if unemployment rises, as it did in Chile after the 2010 earthquake. These micro-level initiatives focus on correcting market inefficiencies, thereby making insurance a profitable venture for local companies and an affordable and valuable proposition for the general public. In doing so, the insurance penetration of the nation is expected to increase.

The cost to the taxpayer is substantially reduced through increased insurance penetration, a 1% increase in insurance penetration is associated with a reduced burden on the taxpayer of

one fifth of estimated total catastrophe damage (Lloyds, 2011). However, if governments leave it to insurance companies to try and persuade people to pay the full price of insurance, Clarke and Dercon (2016) mention that experience suggests that very few will end up purchasing insurance.

Governments may partner with private insurers and offer to pay part of the premiums for vulnerable sections of society or lower premiums indirectly by sharing a portion of the administrative and loss adjustment expenses.

Governments may provide incentives or subsidies to encourage individuals to purchase insurance, by partnering with private insurers or setting up national insurance companies (Clarke & Dercon, 2016). The governments of France, Japan, New Zealand, Canada, Greece, Spain, Turkey, China (Taiwan), India and Philippines have all either set up institutions to provide property or agricultural insurance. According to Clarke and Dercon some of these schemes have achieved reasonable balance and help reduce the contingent liability of the government but it is not always so, because some of them have grown insolvent as a result of not being run on an actuarially sound basis (e.g. PROAGRO in Brazil and ANAGSA in Mexico).

Clarke and Dercon (2016) suggest making insurance compulsory as another useful strategy to increase the number of people protected, thereby reducing the governments post-disaster liability. However, such an approach requires the government to ensure that products offer value, because consumers typically have no power to hold insurance companies to account.

These are only a few possibilities. As seen in Table 5, there are a number of options available to governments engaging in these activities depending on their objectives which are elaborated on in section 4.1.

# SECTION 4

## The challenges of affordability and willingness to pay

### 4.1 Measuring the effectiveness of different disaster risk financing methods

Governments often rely on reserves, budget contingencies, budget reallocations and emergency loans as a means of financing post disaster losses, as these tend to be the most affordable option (Ghesquiere & Mahul, 2010). Both the costs and time taken for funds to become available vary by instrument type, as shown in Table 2, where the multiplier represents the ratio between the (opportunity) cost of the financial product (e.g., premium of an insurance product, expected net present value of a contingent debt facility) and the expected pay-out of that financial product:

Instruments	Indicative Costs (Multiplier)	Disbursement (months)	Amount of funds available
Donor support (relief)	0-1	1-6	Uncertain
Donor support (recovery and reconstruction)	0-2	4-9	Uncertain
Budget contingencies	1-2	0-9	Small
Reserves	1-2	0-1	Small
Budget reallocations	1-2	0-1	Small
Contingent debt facility (e.g. CAT DDO)	1-2	0-1	Medium
Domestic Credit (bond issue)	1-2	3-9	Medium
External credit (e.g. emergency loans, bond issue)	1-2	3-6	Large
Parametric insurance	2 & up	1-2	Large
ART (e.g. CAT bonds, weather derivatives)	2 & up	1-2	Large
Traditional (indemnity based) insurance	2 & up	2-6	Large

Source: (Ghesquiere & Mahul, 2010)

**Table 2 A comparison of cost/delivery time of different disaster risk instruments**

While these measurements are indicative, this provides insight into the differences between each arrangement. Depending on the approach used, the impact of disasters on the fiscal balance of many developing countries can be substantial. However, the costs of insurance are only one of the contributing factors that determines which source is most viable. Other factors that impact this decision include (Mechler, 2004):

- the degree of natural hazard exposure;
- low tax revenues and domestic savings and shallow financial markets;
- high indebtedness with little access to external finance;



- few large infrastructural assets and high geographical correlation between those assets;
- concentrated economic activity (e.g. large urban agglomerations) exposed to natural hazards.

The World Bank observes that governments tend to retain the risks from smaller, high frequency events by using instruments such as budget allocations, reserves and contingent credit as these options are the most cost efficient options for low severity events. Risk transfer mechanisms, such as reinsurance and catastrophe bonds, are generally reserved for more severe events (Clarke, et al., 2014). It may be feasible for governments to consider a layered approach in managing their disaster risk – particularly as post disaster credit financing represents the only real possibility for the most extreme losses (such as 1-in-1000 year events), after which the cost of sovereign disaster risk insurance becomes unaffordable (Clarke & Poulter, 2014). However, there is a lack of evidence that measures the definitive success of the respective instruments in terms of their development impact (Hinds, 2013).

However, a recent assessment (de Janvry, et al., 2016) analysing costs versus benefits incurred by Mexico's FONDEN (which uses relatively expensive instruments such as indemnity reinsurance and a Cat bond) concluded a benefit-cost ratio of between 1.52 and 2.89. They also highlight that FONDEN boosts economic growth in a disaster hit region by 2-4% the following year.

Other studies indicate that sometimes sovereign disaster risk insurance may not always be the best approach. One such investigation conducted by Bevan and Adam modelled different financing methods and measured the recovery response from a natural disaster. Basing the scenario on a small, open economy – the analysis concluded that, in the absence of any donor grants, financing recovery by increasing tax revenues was preferable to all alternate insurance arrangements across every scenario (Bevan & Adam, 2016).

With disaster losses likely to increase in future, the benefits of these types of arrangements are expected to increase. As shown in Table 2, relying on ex-post funding such as contingent budget allocation and humanitarian aid can adversely affect the timing and adequacy of relief efforts. Further issues can be encountered at a sub-national level, where the impact of these funding problems is more pronounced for low and middle income earners. The GFDRR suggests that 'this reflects a combination of challenges on the supply side (such as product development, limited delivery channels, lack of technical capacity), challenges on the demand side (such as low insurance education, low awareness on exposure to disaster risks), and a need to strengthen legal and regulatory systems' (GFDRR, 2012). However, even some high-risk developing countries that pro-actively introduce ex-ante insurance measures face significant increases in insurance costs, which could reduce a government's willingness to take out insurance. For instance, following Hurricane Andrew in 1992, the government of Barbados experienced a ten-fold increase in sovereign insurance premiums for insuring its public infrastructure (Cummins & Mahul, 2009). A consequence of these incidences means a number of other countries typically do not transfer their disaster risk exposure, so remain heavily exposed to severe disaster events. GFDRR performed a study of several ASEAN countries (Myanmar, the Philippines, Cambodia, Lao PDR, and Vietnam) where property catastrophe insurance, agricultural insurance, and disaster microinsurance have low penetration rates. In these countries, the annual contribution to disaster recovery represents 0.5% of total public expenditure, escalating to as high as 18% (or more) for any 1 in 200-year event (GFDRR, 2012). In the developed world, there is low uptake (penetration of less than 10%) for one of the world's top two underinsured risks, California earthquakes (Swiss Re, 2015) (The California Earthquake Authority, 2011). This compares to penetration levels of 39% for the other, Japan earthquakes (The World Bank, 2011).

## 4.2 The role of the price of insurance

The underlying hypothesis of this report is that the price of insurance can pose a barrier for take up, and that efforts to reduce insurance premiums can therefore increase take up. There is evidence of a negative price elasticity in agriculture insurance. Table 3 shows the results of several assessments of the relationship between price of insurance and uptake. It indicates that rising premiums lead to a drop in demand, while lowering premiums would see a rise in insurance demand.

Study	Region	Price Elasticity (Crop Index Insurance)
Cai et. al (2011)	China	-0.94
Cole et. al. (2011)	India	-0.66 to -0.88
Karlan et. al (2012)	Ghana	-0.99
Berhane et. al (2012)	Ethiopia	-0.58
Hill et. al (2013)	India	-0.55

Source: (Hill, et al., 2014)

**Table 3 The impact of subsidies on demand**

However, the results also indicated regional differences: price elasticity of -1 would indicate that a decrease in the price by 5% would lead to a rise in uptake by 5%, while price elasticity of -0.5 would mean that a decrease in price by 5% would lead to a rise in uptake by 2.5%. For comparison, the United States Department for Agriculture reported price elasticity to be in the range of -0.64 to -0.86 depending on the type of crop and region (O'Donoghue, 2014).

Overall price of insurance are seen as one factor amongst others determining uptake of insurance. Theory and empirical analyses show that an individual's willingness to pay for insurance is influenced by factors including (i) the price of coverage; (ii) the individual's level of risk aversion; (iii) an individual's income; and (iv) the level of risk perceived (Szpiro, 1988).

The different factors are summarized in Table 4.

Determinants of Insurance Demand	Examples
<b>Macroeconomic factors</b>	<ul style="list-style-type: none"> <li>Income (in particular, per-capita income)</li> <li>Economic stability</li> <li>Inflation rates</li> <li>Developed and stable financial markets</li> <li>Openness to trade</li> </ul>
<b>Political, regulatory and legal factors (including pre-conditions for insurance)</b>	<ul style="list-style-type: none"> <li>Stable legal and institutional frameworks</li> <li>Adequate insurance law</li> <li>Opening distribution channels (e.g. bancassurance)</li> <li>Conducive regulatory environment</li> <li>Property rights</li> <li>Judicial efficiency and transparency</li> <li>Mandatory insurance lines</li> </ul>
<b>Socio-cultural factors</b>	<ul style="list-style-type: none"> <li>Education</li> <li>Financial literacy</li> <li>Religious and cultural attitudes to risk and insurance</li> <li>Perception of other available financing in the event of a loss, such as disaster aid</li> </ul>
<b>Risk factors</b>	<ul style="list-style-type: none"> <li>The nature of exposure, such as the number of cars</li> <li>Natural catastrophe exposure</li> <li>Risk awareness linked with recent catastrophe experience</li> </ul>

Source: (Ranger & Surminski, 2013)

**Table 4 Summary of the evidence on the main determinants of non-life insurance demand**

Thus a lack of demand for insurance can have several different reasons. The update of the Compendium from 2011 to 2016 indicates that low uptake is a key challenge for some insurance schemes: . For instance, the scheme for index weather crop insurance in the Ukraine was discontinued due to limited uptake, and the scheme for agricultural insurance in Venezuela has seen direct written premiums go from US\$1.4mn in 2000 to only US\$0.1mn in 2015. Overall ‘lack of demand’ was referenced as an issue in six schemes, but the relevant information for individual schemes is often not available so this may be an underestimate.

What factors determined this lack of demand remains somewhat unclear and would require more detailed, case-by-case investigations, as the underlying reasons may vary.

There is evidence that, very few (if any) national insurance schemes have successfully managed to extend climate risk insurance to the poor or very poor without initial premium support (Schäfer, et al., 2016). A recent report from a MCII Expert Workshop states that ‘donors and governments should only provide premium support for insurance products that are needs based, adjusted to the local context and embedded into holistic risk management and resilience building strategies’ (Schäfer, et al., 2016).

At sovereign level the price of insurance should be considered alongside other political drivers. An important point to consider is the relevance of the question of the price of insurance for design and implementation of sovereign risk transfer schemes. Recent guidance from the World Bank (World Bank Group, 2014) suggests that any assessment of premium subsidies in the context of sovereign risk transfer needs to start with the key policy objectives and the overall aim of an intervention. This includes decisions about who to protect, what to protect them against, who will pay; and how the funds will reach the beneficiaries. Only after these policy questions are answered can one consider whether or not insurance is an appropriate tool, and whether premium subsidies are appropriate as a way for a range of stakeholders to pay for the cost of protection.

### **4.3 Reducing risk based and cost based elements of premiums**

Creating a more affordable product can be achieved by minimising either the risk based element of the premium or the cost based element of the premium (relating to transaction, administration and capital/reinsurance costs). The first component can be reduced through options such as the introduction of risk reduction contributions (investment in resilience infrastructure, better land-use, building codes etc.).

However, the potential for an absolute premium reduction may be most acute by focusing on the second contributor to the premium in low and middle income countries.

Cummins and Mahul (2009) note that ‘in low- and medium-income countries, premium volumes tend to be very low, administrative costs are relatively high, and [there is a] lack of insurance infrastructure (such as distribution systems and investment alternatives)’. Suarez and Linnerooth-Bayer (2011) add that ‘high start-up and other transaction expenses can greatly limit affordability and constrain insurance penetration’. Finally, the MCII report states that “in developing countries, mark-ups are often particularly high because of a lack of necessary data, insufficient risk assessments, underdeveloped capital markets” which can hinder investment (Schäfer, et al., 2016).

Risk-pooling arrangements with other countries can also help to reduce capital/reinsurance costs (Suarez & Linnerooth-Bayer, 2011). This is particularly important for nations such as

Barbados that have limited ability to cross-subsidise high-risk and low-risk areas within a country. The Pacific Island Countries (PICs) face this issue, whereby the countries are small in size and are located in a close geographic proximity. These factors affect their ability to cross-subsidise sovereign disaster risks between countries and achieve risk diversification over a large territory.

In Africa, a number of high-risk countries were able to join the African Risk Capacity (ARC) – provided they had the operational capacity to utilise an indemnity pay-out. Their participation in the ARC has been reported as generating risk-diversification benefits for the risk pool overall and is projected to support future growth in its early years (GFDRR, 2015). The ARC estimates such risk-pooling will reduce premiums for participants by almost 50%, similar to the premium savings witnessed by CCRIF participants (Africa Regional Development, 2014)

Further innovations have been introduced to enhance product delivery to reduce the cost element of the premium. Some examples include:

- The Turkish Catastrophe Insurance Pool (TCIP) operates a scheme without subsidies where premiums are based on risk-based pricing. Instead, the TCIP seeks to limit costs of insurance by improving distribution (via public-private partnership), adjustments to coverage terms and conditions together with marketing education and awareness programs (UNU, 2016).
- AGROASMEX in Mexico operates a subsidisation program whereby “the federal Government subsidizes 90 per cent of the premiums for those municipalities with high marginalization, and 70 per cent for municipalities with low-to-medium marginalization. The remaining percentage of both is funded by the relevant state government” (IFAD, 2010).
- R4 IFW (Insurance-for-work) programme increases accessibility by providing employment opportunities for the poorest to develop infrastructure that increases their resilience to droughts (Poole, 2014).
- IBLIP (Index Based Livestock Insurance Project) in Mongolia, where a tiered approach to subsidies is intended to target those most in need of the support (UNU, 2016).

There is little evidence available pertaining to the direct impact on these types of initiative. One notable exception is the R4 program, which targeted the low and middle income earners market and managed to increase uptake levels to 34% of targeted households – much higher than most comparable microinsurance schemes (Poole, 2014). There is also some evidence for the TCIP (see section 6.2).

# SECTION 5

## The role of the public sector

### 5.1 Overview of public intervention options

There are many ways in which disaster risk insurance schemes can be subsidised or otherwise supported, ranging from direct premium subsidies to providing financial education to potential purchasers of insurance. Table 5 shows how possible interventions can target the supply of insurance, the demand for insurance, or premium levels, which link supply and demand.

Target Area	Intervention Measure
Supply	Set-up state-owned insurer
	Provide reinsurance
	Provide capital
	Pay operational costs
	Provide product development expertise and technical support
	Promote coinsurance pool
	Link to social safety nets and credit facilities
Premium Levels	Regulate premiums by setting limits or tariffs
	Regulate risk models used
	Data collection, audit, management and financing (can lead to higher premiums)
	Provide risk data to insurers (can also lead to higher premiums)
	Reduce risk levels through better risk management
Demand	Pay premiums in full or part
	Offer vouchers for insurance
	Offer incentives for insurance
	Mandate insurance
	Provide risk data / awareness campaigns
	Financial education
	Promote enabling environment via legal framework and consumer protection

Source: Surminski (yet to be published), (World Bank Group, 2015)

**Table 5 Framework for disaster risk insurance interventions**

Cummins and Mahul (2009) also identify two main types of insurance subsidy:

- Market-enhancing subsidies support the development of risk market infrastructure;
- Social insurance subsidies form part of social safety net or wealth transfer programmes.

The simplest form of subsidy is a direct premium subsidy, which directly reduces the policyholder's financial obligation. Such subsidies may be intended to be temporary, for

example to launch a pilot program such as USAID's involvement with the Ethiopian National Disaster Insurance programme or Oxfam's support of the Disaster Preparedness Program in India (Andhra Pradesh), where 50% of premiums were funded in the first year, in conjunction with other assistance (Surminski & Oramas-Dorta, 2011). Permanent subsidies may be intended to keep the initiative sustainable, such as the R4 Rural Resilience Initiative in Ethiopia, where the UN's World Food Programme (WFP) finances 50% of the annual premium budget (Poole, 2014).

Mahul and Stutley (2010) observe that governments usually justify premium subsidies based on their effects on demand, supply and fiscal balances. They also note that government subsidies of agricultural insurance premiums are usually intended to increase insurance penetration, but that many economists have questioned their economic rationale. Siamwalla and Valdes (1986) conclude that 'any simple across-the-board subsidy of crop insurance [should be] ruled out except perhaps as an infant industry' where 'inadequacy of data and information as the major barrier to the development of a crop insurance industry', suggesting that emergency aid can better reduce adversity from crop losses. An alternate view is taken by Hazell (1992) who denotes 'subsidies are not necessarily ruled out, but they should be set as some fixed percentage of the total premium. There should be no ex-post adjustment of the subsidy each year to reflect the insurers losses'.

The level and method of calculating the premium subsidy varies between programmes, including a straightforward fixed percentage of gross premium as well as arrangements with variable or capped subsidies (ClimateWise, 2012). Beyond this, other programs, such as the R4 IFW program, have been designed to create a means of increasing premium affordability while 'minimizing distortions in the market and mis-targeting of clients' (Hill, et al., 2014).

Reinsurance subsidies can assist developing countries transfer their disaster risk exposure, which reduces the risk-based cost of the gross premium. Private reinsurers often have ample capacity to underwrite many smaller developing countries and benefit from the risk diversification they receive away from developed country disaster insurance (Cummins & Mahul, 2009). However, the effectiveness of reinsurance subsidies may be limited because of the potentially high cost of catastrophe reinsurance premiums, which is mainly driven by the expected loss, the expense load, and the contingency load. In middle- and low-income countries, the expense load tends to be higher than that in developed countries because of higher start-up and administrative costs mentioned earlier (Cummins & Mahul, 2009). These measures may be most effective in markets where the private sector price of catastrophe reinsurance heavily impacts the affordability of premiums (Warner, et al., 2013).

Another form of subsidy is provided by governments that reinsure risks directly, without using private sector reinsurers. For example, under the National Agricultural Insurance in Kazakhstan the government compensates 50% of losses reported by the participating insurance companies and mutual insurance societies (ClimateWise, 2012).

There are other methods that may be more effective than direct premium subsidies at reducing the gross premium without impacting the free market: 'these methods include non-monetary interventions such as the development of public goods and technical assistance that enhance the risk market infrastructure, such as data collection and management systems, catastrophe risk models, and a legal and regulatory framework that reduces start-up costs and entry barriers' (Cummins & Mahul, 2009). Financing technical assistance and helping to subsidise the development and start-up costs of market-mediated risk-transfer mechanisms may also be an important role for donors (Poole, 2014). Examples of technical assistance can be found in the involvement of the International Bank for Reconstruction and Development (IBRD) in the creation of the Caribbean Catastrophe Risk Insurance Facility (CCRIF), as well as in a number of Latin American agricultural schemes (Climate Investment Funds (CIF) and Vivid Economics, 2015).

Other interventions that have been used include (ClimateWise, 2012) (Cummins & Mahul, 2009):

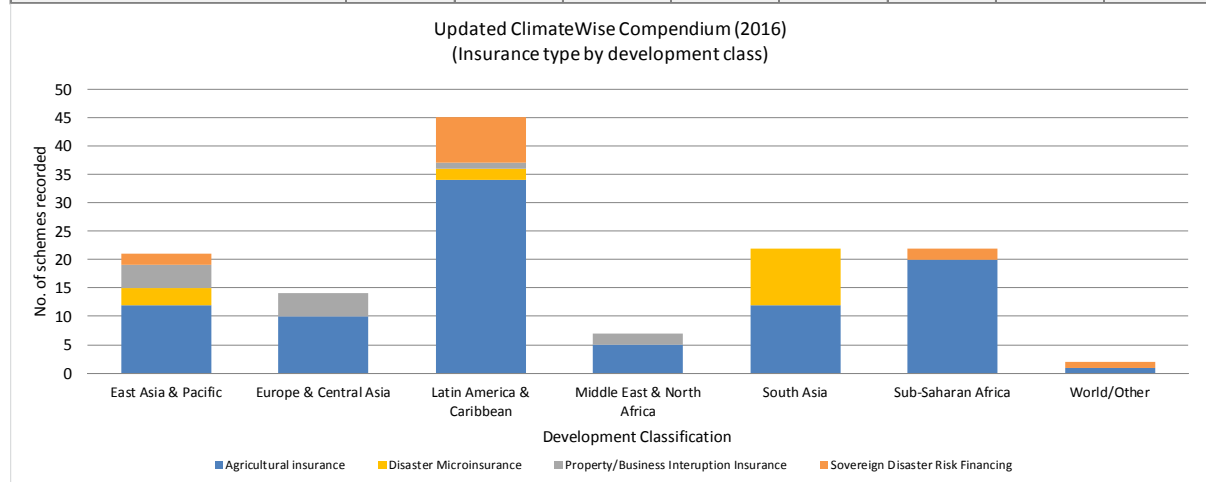
- Funding of technical assistance projects. (e.g. mapping risk, guidance on insurance policies and actuarial pricing methods);
- Financing of scheme feasibility studies;
- Financing the development of tools such as risk and actuarial models (particularly catastrophe risk models);
- Financing the development of new insurance products, and the design and structuring of insurance facilities;
- Funding the provision of education and capacity building;
- Financing the development of infrastructure such as weather station networks;
- Provision of capital support and/or contingent financing;
- Financing operational costs (e.g. insurer's administrative and operating expenses, loss adjustment expenses, etc.);
- Providing guidance to reform laws and regulations to encourage or mandate the purchase of insurance;
- Funding of public awareness campaigns, particularly targeted around payouts (e.g. TCIP).

## 5.2 Regional experience

As shown in Figure 4, disaster insurance schemes are most common in Latin America and the Caribbean, with comparatively few in the Middle East and North Africa, with two schemes covering more than one region. Premium subsidies are also most common in Latin America & the Caribbean, where 20 schemes provide premium subsidies. Experience suggests that most premium subsidies are targeted at agricultural schemes which dominate insurance initiatives.

**Figure 4 A regional breakdown of disaster insurance schemes**

	East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa	South Asia	Sub-Saharan Africa	World/Other	Total
Agricultural insurance	12	10	34	5	12	20	1	94
Disaster Microinsurance	3		2		10			15
Property/Business Interruption Insurance	4	4	1	2				11
Sovereign Disaster Risk Financing	2		8			2	1	13
<b>Total</b>	<b>21</b>	<b>14</b>	<b>45</b>	<b>7</b>	<b>22</b>	<b>22</b>	<b>2</b>	<b>133</b>



Source: (ClimateWise, 2012), compendium updates

The impact of premium subsidies on volume of business is difficult to quantify based on the compendium because information regarding both subsidies and volume of business was available for only 24 (of 135) schemes.

As shown in Table 6, technical assistance is the most common form of assistance. Much of such assistance comes from international benefactors such as the World Bank, GIIF etc. Direct premium subsidies seem to have become more popular in the recent years, with nine schemes (featuring in the original compendium) introducing premium subsidies since 2012. Four schemes that provided subsidies in 2012 were observed to have discontinued operations. Three new schemes introduced since 2012 also provide premium subsidies.

Up to date information was unavailable in the case of other subsidies (e.g. subsidised reinsurance, tax concession etc.)

Types of Subsidy	No. of schemes (2012)	No. of schemes (2016)
Direct premium subsidy	40	48
Technical assistance	63	65
No subsidy/ <b>no information found</b>	80	83

Source: (ClimateWise, 2012), updated compendium. Note that some schemes operate more than one type of subsidy

**Table 6 A Summary of Subsidised Schemes**

An example often quoted as a success is the Pacific catastrophe risk insurance pilot program (PCRIP) that was launched with the assistance of the government of Japan. While the entire premium was funded by the Japanese government in the first year, in the following year, each of the six participating countries contributed 5% of total premium cost. The third year saw five remaining participants further increase their individual contributions to cover



16% of total premium cost (with one member, the Solomon Islands, withdrawing from the program). While these contributions appear marginal, the co-financing program has been described as “an important demonstration of demand for the program and countries’ commitment to participate”. (GFDRR, 2015) The protection had immediate impact, with the government of Tonga receiving \$1.27mn towards recovery following Cyclone Ian in 2014 (The World Bank, 2014) and Tropical Cyclone Pam in 2015 (The World Bank, 2015).

However, evidence suggests premium subsidies need not be necessary for increasing either demand, supply or aiding a fiscal budget. Some initiatives have managed to achieve these objectives without this form of intervention. In the developed world, Argentina, Australia and Germany successfully operate crop and livestock insurance programs with no subsidies. Alternatively, capping premium subsidies in the developing world has proved to be an effective means of reducing the risk of large scale farmers exhausting the annual subsidy budget allocation. Examples of this include Brazil and Chile, as well as the Caribbean (Mahul & Stutley, 2010).

In 2007, a study on agricultural insurance programs estimated that 44% of global premium volumes were funded by upfront premium subsidies. If A&O (Adjustments & all Other Expenses) and claim subsidies are included, this is estimated to be as high as 68% (Mahul & Stutley, 2010). Mahul and Stutley concluded that ‘the public cost of agricultural insurance subsidies represents 50–300 percent of the premiums paid by farmers in the majority of the countries surveyed. Public support to agricultural insurance in many high-income countries (including Italy, Spain, and the United States) represents more than twice the premium paid by farmers. In contrast, in most of the middle- and low-income countries surveyed, public support to agricultural insurance represents 50–150 percent of the premium paid by farmers’. Despite this heavy expenditure, the survey “does not support the argument that premium subsidies are always necessary to induce farmers and livestock breeders to purchase crop and livestock insurance”. This is apparent in Costa Rica, for instance, which operates a national insurance program where smaller and marginal farmers incur a higher premium charge than larger farmers (Mahul & Stutley, 2010).

### 5.3 Interventions and risk reduction

A well designed product that focuses on risk prevention and implemented effectively can lead to an overall reduction of physical risk (Surminski & Oramas-Dorta, 2014). The areas that can link risk reduction and risk transfer, especially in developing countries, include (Surminski & Oramas-Dorta, 2014):

- Risk awareness-raising initiatives; such as the provision of risk-relevant information and knowledge transfer to educate policy-holders and the public about preventive measures;
- Capacity-building; through knowledge transfer and educational elements;
- Explicit incentive structures for risk reduction; such as risk based pricing, where premiums reflect risk such as charging according to local flood risk levels;
- Compulsory risk reduction; such as requiring policy holders to take certain preventive measures as a condition for cover.

The promotion of these kinds of measures were recently discussed in the MCII workshop, where the report concludes that “indirectly reducing premiums through investing in risk reduction measures and an enabling environment has long-term co-benefits for building a comprehensive disaster risk management framework” (Schäfer, et al., 2016). To achieve this, Schäfer et al directed decision makers to:

- Support the set-up and implementation of climate risk insurance schemes in developing countries with measures to reduce premiums indirectly and primarily apply direct premium support to make insurance solutions accessible for the poorest segment of the population (<3.1 USD/day).
- Gear investments into items that reduce premiums indirectly towards the development of risk management frameworks and actively work on linking the insurance products to those frameworks.
- Keep an eye on the costs and benefits of insurance solutions, fostering products that respond to the needs of poor and most vulnerable.

In the context of parametric insurance the link to risk reduction is less obvious, but still relevant. Loss data and therefore the degree of risk management is important when determining the choice of index and level of trigger, which needs to be done with a view of what the need for insurance based on loss data is. The choice of trigger would have implications for the price – suggesting that a country with well-developed risk management processes would require a less costly insurance product as it could choose a trigger with a lower probability: a country that manages drought risk very well they could select a higher trigger of for example 50 days without rainfall, which would be less expensive due to the lower probability as a trigger of 20 days without rainfall. This could be seen as an incentive to manage risk, and it would also help to address the problem of basis risk that parametric insurance faces.

In the context of catastrophe insurance, Kunreuther and Michel-Kerjan (2011) argue against premiums being subsidised because subsidises may result in lower awareness of the true underlying risk amongst policyholders which would result in lower risk reduction measures. But they also mention that risk-based rates are not always affordable and some kind of subsidy can be paid to the low-income policyholders which enable them to purchase insurance at the risk-based rate. Hill et. al. (2014) make a similar argument, suggesting the use of time-sensitive vouchers which provide a discount on the risk based premium rather than lower premiums hidden by subsidies. Kunreuther and Michel-Kerjan (2013) state that vouchers can be funded by the national government, state government and/or insurance policyholders (through a special tax). A voucher-based system has been developed by insurers in Zambia and is currently in use (GIIF, 2015).

Creating the risk reduction link is of significant importance in developing countries with large low and middle income populations who are highly prone to the risks associated with flood (Surminski & Oramas-Dorta, 2014). For instance, it is estimated that, globally, developing markets contain around 800 million residents who are at risk of flood, with 70 million being impacted by an event each year. Many at-risk areas within the developing world are densely populated and heavily reliant on agriculture for their livelihood (Surminski & Oramas-Dorta, 2014). These circumstances can force individuals into high-risk areas, such as flood plains, as a means to generate an income. In our opinion, directly subsidising premiums for these individuals may encourage their risky behaviour and defeats the ultimate purpose of the protection by making the severity of a risk event more pronounced due to global warming.

In the updated Compendium there is no clear indication that existing schemes have introduced risk reduction / mitigation techniques.

## 5.4 Summary of findings

Table 7 summarizes the advantages and disadvantages of different intervention methods, based on recent experiences.

Method	Examples	Advantages	Disadvantages
Direct Premium Subsidies	CCRIF, AGROASMEX, Ethiopian National Disaster Insurance programme, PCRAFI, CADENA.	<ul style="list-style-type: none"> <li>• <b>Increases affordability</b> for low-income policyholders (national schemes)</li> <li>• Reduces national budget strain (sovereign schemes)</li> <li>• <b>Increased penetration</b> in Agricultural scheme (national level) - schemes can reach scale quickly</li> <li>• <b>Useful in infant industries</b> to boost initial demand for new markets to reduce disaster vulnerability with insurance</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Exit strategy required if ongoing</b> – stopping ongoing premium subsidies is challenging</li> <li>• Insurance arrangements can be discontinued if donors withdraw premium support</li> <li>• <b>Distort market price signals</b> giving policyholders the wrong economic incentives</li> <li>• Some forms <b>benefit high-risk policyholders</b> (particularly if percentage based)</li> <li>• Government funded national scheme routinely <b>suffer from inefficiencies and leakages</b>, thus adding to the government's financial burden</li> <li>• Does not focus on risk mitigation</li> </ul>
Insurance for Work programs	R4 Rural Resilience Initiative (Ethiopia)	<ul style="list-style-type: none"> <li>• Similar advantages to direct premium subsidies</li> <li>• Increases affordability while minimizing distortions and mis-targeting</li> <li>• <b>More sustainable</b> than direct premium subsidies</li> <li>• Can potentially lead to <b>risk reduction</b> if labours dedicated to risk mitigation</li> <li>• Visible discounts (e.g. time sensitive vouchers) <b>improve awareness of underlying risk</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>More complex</b> than standard direct premium subsidies, requiring additional implementation/operational capacity</li> <li>• Can significantly impact the implementation costs and ongoing operation costs of running the scheme</li> </ul>
Reinsurance Subsidies	IBLIP Mongolia	<ul style="list-style-type: none"> <li>• Reduces the risk-based cost of the gross premium (disaster risk exposure transferred)</li> <li>• Can allow insurers to <b>charge lower premiums</b> as costs of private market reinsurance covered.</li> </ul>	<ul style="list-style-type: none"> <li>• May be limited due to high cost of catastrophe reinsurance premiums</li> <li>• Countries have limited access, experience and negotiation expertise with international reinsurance, leaving them exposed to reinsurance market cycles</li> <li>• Does not reduce risk of an event</li> </ul>

Method	Examples	Advantages	Disadvantages
Donor Capitalisation	ARC, CCRIF, PCRAFI	<ul style="list-style-type: none"> <li>Can reduce the cost of capital for an insurance scheme and hence <b>reduce premiums</b></li> </ul>	<ul style="list-style-type: none"> <li><b>Overcapitalization</b> can occur, so balance is required between scheme capitalization and underlying premium-structure</li> <li>Likely to only <b>marginally reduce sustainable premium levels</b> as cost of capital is a small part of the overall premium (1-10%)</li> <li>does not address the average expected loss or reduce risk of an event</li> <li>Does not reduce risk of an event</li> </ul>
Technical Assistance	ARC, CCRIF, PCRAFI etc. As of November 2012, World Bank DFRI had co-financed 21 technical assistance projects	<ul style="list-style-type: none"> <li>Can <b>reduce premiums</b> by enhancing a countries' risk data/financial infrastructure</li> <li>Can be <b>easier to phase out</b> over the long term</li> <li><b>superior to direct premium subsidies</b> when risk models remain a key barrier</li> <li>Higher quality risk modelling may also allow for <b>greater risk diversification</b></li> </ul>	<ul style="list-style-type: none"> <li><b>Needs to consider development stage of market.</b> Cannot invest perform a risk assessment without first collecting necessary data</li> <li>can be <b>difficult to measure</b> the magnitude of the value created through the investment</li> <li>Risk diversification benefits are likely to be small</li> <li>Greater understanding of underlying risk may <b>potentially lead to higher premiums</b></li> <li>Does not reduce risk of an event</li> </ul>
Payment of Operational Costs	Disaster Preparedness Program, Andhra Pradesh, India	<ul style="list-style-type: none"> <li>Initial <b>set-up costs can significant</b> so a capital injection can reduce this burden</li> <li>may be <b>more appropriate</b> than address the source of inefficiencies directly</li> <li><b>Flexible Options</b> possible e.g. one-off initial payment to set up costs an insurance scheme versus an ongoing commitment</li> </ul>	<ul style="list-style-type: none"> <li><b>Lack of transparency</b> – generally unclear if/how amounts are utilized</li> <li>Does not reduce risk of an event</li> </ul>
Risk Reduction management /support	R4 Rural Resilience Initiative (Ethiopia)	<ul style="list-style-type: none"> <li><b>long-term co-benefits</b> for building a comprehensive disaster risk management framework</li> <li><b>Reduces premium costs</b> by directly lowering average expected loss</li> </ul>	<ul style="list-style-type: none"> <li>benefits of risk reduction may <b>take time to emerge</b>, thus delaying the impact to reduce the risk-based premium component</li> </ul>

Method	Examples	Advantages	Disadvantages
Cross-subsidization (high/low risk)	Flood Re (UK)	<ul style="list-style-type: none"> <li>• can <b>reduce the premium levels</b> for policyholders in high-risk areas, therefore encouraging their participation to purchase insurance</li> </ul>	<ul style="list-style-type: none"> <li>• Many developing countries/blocs have <b>limited ability to cross-subsidise high-risk and low-risk areas</b> i.e. close geographic proximity</li> <li>• May be deemed <b>unfair</b> by higher-risk policyholders</li> <li>• May discourage policyholders to undertake risk reduction</li> </ul>
Contingent credit	Offered by IBRD & JICA	<ul style="list-style-type: none"> <li>• helps countries <b>retain some risk/self-insure</b> in a cost-effective manner</li> <li>• <b>cheaper</b> than other risk transfer mechanisms</li> <li>• Relaxes post-disaster short-term liquidity pressures</li> </ul>	<ul style="list-style-type: none"> <li>• Borrowed <b>amount may be inadequate</b> if used in isolation</li> <li>• Can leave the country worse-off in extreme circumstances</li> </ul>

Table 7 Options to reduce premium cost through public interventions (based on literature review)

# SECTION 6

## A review of recent experiences with premium subsidies

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### 6.1 Sovereign Level

Countries that are most vulnerable are also the ones least able to afford sovereign insurance owing to economic fragility (Suarez & Linnerooth-Bayer, 2011). Participants of the PCRIP unanimously wished to purchase catastrophe insurance but would have been unable to purchase it without premium subsidies due because a full premium would impose significant strain on their national budgets (Narube, 2015). As described in section 4, the Government of Japan's financial grant helped finance majority of the PCRIP premium payments, but participants contributed approximately 5% of the total premium cost in 2014 and 16% in 2015 (GFDRR, 2015).

The World Bank (2015) suggests that these contributions from the PICs through the PCRIP reflect demand for sovereign insurance in the region. But Narube (2015) observed that it seemed as though the decision to join the PCRIP was influenced heavily by the availability of insurance at a low price or free of charge. This observation was validated by the PICs when it was indicated that they would "seriously evaluate their ongoing participation if premium ceases to be subsidised". In the same consultation report, Narube also mentions that countries believed the operational cost of maintaining the PCRIP (now PCRAFI) would be significant and participants believed they would be unable to pay it from their national budgets. The quest for a more permanent premium support mechanism led to the creation of the Pacific Resilience Program (PREP) using IDA (International Development Association) grants and credits worth \$32.29 million (The World Bank, 2016). The PREP initiative allocated approximately \$8 million for investments in risk reduction and early warning initiatives, and the remaining to "Disaster Risk Financing" activities which include premium support (The World Bank, 2016). The Secretariat of the Pacific Community (2015) welcomed the investment in risk mitigation initiatives which would help preserve life, protect assets and reduce insurance premiums.

A notable exception in the PCRIP was Cook Islands which chose to pay non-subsidised annual premium of \$100,000 through the second and third years of the pilot (GFDRR, 2015). In our opinion, this reflects prioritisation of ex-ante disaster risk mitigation and willingness to incorporate it into the national budget which are both important for the sustainability of sovereign insurance arrangements. An important component of the PREP is aiding participants in building capacity to finance disaster risk through a clear strategy which focuses on insuring public assets and budgeting for risk reduction among other issues (Secretariat of the Pacific Community, 2015).

The benefit of participating in the PCRAFI (made possible through premium subsidies) was clear to Vanuatu when it received a payout of \$1.9mn within two weeks of cyclone Pam. The GFDRR (2015) noted that this quick access to funds helped provide immediate liquidity and finance relief activities.

However, any government decision to take out insurance needs to be seen in a wider political context: while the price of insurance is relevant, this is also a question of political

choice – who to protect, how to protect them and how to determine government priorities. Reducing the premium costs of sovereign risk insurance can support the case for risk transfer within a government, but there could also be other factors overriding any economic considerations. This also explains why across many countries including in the developed world there is still a significant underspend on ex-ante measures such as insurance compared to post-disaster payment (Kellett & Caravani, 2013). There are many reasons for this underinvestment including a limited understanding of risks and impacts, greater political buy-in for more visible post-disaster support initiatives, and the ready availability of international post-disaster assistance (Wilkinson, 2012) (World Bank, 2013).

Through a stakeholder assessment survey, CCRIF discovered that about 61% of the participating countries would likely discontinue coverage in the event of fiscal constraint (CCRIF, 2015). In that situation, demand would likely falter if no premium subsidies are provided, leaving countries as vulnerable as they were without insurance. An example of discontinued arrangements date back to 2006 when the WFP supported the Ethiopian government by insuring it for \$7mn against drought using a \$930,000 grant from USAID. However, the contract did not pay out and was not renewed the following year (Suarez & Linnerooth-Bayer, 2011), presumably due to lack of premium support.

Smaller countries have limited access, experience and negotiation expertise with international reinsurance, leaving them exposed to reinsurance market cycles. As mentioned in section 4, the ten-fold premium increase for the government of Barbados after Hurricane Andrew in 1992 is evidence of this vulnerability (Mahul & Cummins, 2009). Both risk pooling and premium subsidies may help stabilise premium and maintain insurance demand from the more vulnerable nations.

As a member of the CCRIF, Haiti received full premium support from the IDA in 2007 and 2008. Premium for the following season was supported by the IDA and Government of Canada. Support from the Government of Canada continued until 2012 after which the premiums have been financed entirely by the CDB (Caribbean Development Bank, 2016). The benefit of this subsidy was clear when the CCRIF announced a payout of \$28mn to Haiti in the aftermath of the severe hurricane Matthew (Artemis News, 2016). A payout of \$975,000 was also announced for Barbados.

However, even with premium subsidies, countries may be underinsured. For example - the Haiti earthquake of 2010 triggered a full payout of \$7.75mn from CCRIF but the losses borne by the public sector exceeded \$2bn. Smith (2015) indicates that an adequate risk cover would be approximately 20-25% of public sector exposure and the cover held by most participants in CCRIF is 'inadequate'. He also suggests the use of premium subsidies to address the issue of costs of insurance and fiscal constraints on the demand side. The willingness of the CDB to convert a rebate of \$1.285mn on Haiti's premium in 2014 (Caribbean Development Bank, 2014) into additional disaster risk cover may be evidence to support both these arguments.

## 6.2 National Schemes

Direct premium subsidies are the most common form of subsidy for agricultural insurance programmes, making up around two thirds of public intervention measures (Mahul & Stutley, 2010). However, Warner et al argue that the use of subsidies should be treated with caution: they claim that once subsidies are introduced into a market, it is politically difficult for governments to remove or reduce them, and they have a potential to distort the market and provide adverse incentives (Warner, et al., 2013). Cummins and Mahul suggest that premium subsidies can be more effective than comparable social programmes at promoting disaster risk protection, but also highlight several limitations (Cummins & Mahul, 2009):

- they distort the market price signal and thus give policyholders the wrong economic incentives;
- they tend to benefit high-risk policyholders to the detriment of low-risk policyholders; and
- they are almost impossible to phase out in the long term.

The impacts of these limitations are covered in greater detail in section 6.3.

Premium subsidies can affect market dynamics if they are not extended to all programmes in operation. For example, in 2007 the Indian government introduced a subsidy arrangement in order to promote national crop weather insurance. Initially, the 50% subsidy was only approved for the Agricultural Insurance Company of India, thus making other insurers uncompetitive. In 2009 the subsidy program was broadened to several other private sector providers, increasing the overall burden on the government budget (Stutley, 2012).

[Note: these all refer to governments subsidising insurance in their specific jurisdictions. We consider that the same problems are likely to apply to other parties, such as aid donors, and to subsidies to governments.]

Untargeted subsidies tend to benefit richer households disproportionately compared to poor households because uptake among the latter remains low. Evidence that shows that the purchase of agricultural microinsurance products is higher among wealthier households (Cole, et al., 2009) (Ben-Shahar & Logue, 2015). In India, the average land-holding of those buying weather-indexed insurance is 3.50 hectares compared to the overall average of 2.35 hectares (Gine, et al., 2008)

Hill et. al. (2014) suggest targeting as compared to universal subsidies, because targeted subsidies can be designed to increase affordability for the ones who cannot purchase insurance otherwise. Hill et. al. also suggest that self-selection (e.g. where individuals need to perform some task to be eligible for subsidies) is the most efficient method of targeting compared to other methods such as geographical or categorical targeting are less useful. However, Mahul and Stutley (2010) argue that despite being a regressive public investment, universal subsidies may be better than a means-tested system which would entail larger expenses and also the risks of mis-targeting and fraud as individuals try to qualify for these benefits.

Generous premium subsidies along with high export prices fuelled demand for agricultural insurance in Brazil where agriculture insurance accounted for 50% of rural insurance business in 2009 compared to only 10% in 2005 (The World Bank, 2014). Due to fiscal constraints, the government decided to reduce insurance subsidies by 23% in 2010 and crop insurance generated only 40% of rural business that year. While demand for insurance products remained strong at \$56 million in 2013, a small budget allocation meant that only about half of that was subsidised and serviced (The World Bank, 2014). This fall in demand can be attributed either to genuine affordability issues or to farmers firmly believing that premiums must be subsidised by the government. In our opinion, the second is more likely given that the average size of farmlands insured under the project was 120 hectares which is far larger than what a marginal farmer would operate on.

By providing generous premium subsidies countries like China and India have managed to achieve significant progress in agricultural insurance penetration. China became the world's second largest agricultural insurance market in 2008 and India managed to insure over 33 million farmers (24% of operational farmland) in 2013 (Mahul & Stutley, 2010). But Mahul and Stutley conclude from the significant uptake of non-subsidised insurance in different



countries that premium subsidies are not a prerequisite for farmers and herders to purchase insurance.

For example, ACRE, R4 and IBLIP insured roughly 227,000 farmers and herders in 2013 without any direct premium subsidies (Greatrex, et al., 2015). This would mean that farmers are willing to pay reasonable premiums for protection against specific risks (e.g. drought) which are known to them, but failure to recognise such risks is an issue in developing nations (Gurenko, et al., 2006).

It is worth noting the use of well-timed premium subsidies in stimulating demand, for example the Kilimo Salama (now ACRE Africa) index based weather insurance product was purchased by only 200 farmers in 2009. Kenya experienced major droughts in 2009 and the sponsor of the project (Syngenta Foundation) decided to subsidise premiums by 50% in 2010. The strong memory of the drought along with a new incentive to buy insurance resulted in over 11,000 farmers purchasing the product in 2010 (Stutley, 2012).

In the aftermath of the devastating Marmara earthquake in 1999, the government of Turkey created the TCIP and made earthquake insurance compulsory for tax-payers. The TCIP invested heavily in promoting insurance awareness but the strongest demonstration of the benefit of insurance was the quick payment of losses amounting to \$6m in its early years, after which demand picked up. Risk based premiums were charged and no subsidies were used. The price of insurance was kept low by making insurance compulsory, thereby ensuring risk diversification, and through exclusions of expenses such as debris removal. The TCIP issued 7.2 million policies in 2015 compared to 159,000 policies in 2000 (Gurenko, et al., 2006).

However, Turkey may be an exception to the rule. Clarke and Dercon (2016) mention that efforts by governments and donors to develop unsubsidised markets for disaster insurance have generally not been very successful, especially in poorer countries.

### **6.3 A reflection on the broader impacts of premium subsidies**

The World Bank provides Emergency Reconstruction Loans and it has become increasingly clear that the availability of such ERLs has created a moral hazard among disaster-prone countries that tend to invest less in ex-ante catastrophe risk management (Gurenko, et al., 2006). This overdependence on post-disaster funding has resulted in a staggering increase in emergency funding, almost quadrupling over the last decade. This results in a 'Samaritan's dilemma' for donors who are unable to withhold ex-post assistance if ex-ante mitigation measures have not been implemented (Gurenko, et al., 2006).

As noted in section 4.2, direct insurance subsidies may be introduced in order to correct market imperfections temporarily, but may be difficult to phase out in the long term (Mahul & Stutley, 2010). In Europe and the United States, many agricultural premium subsidies were originally designed to be temporary, but continue to be financed today (Mahul & Stutley, 2010). While governments justify this intervention as a method of substituting post-disaster relief for ex-ante crop insurance. Mahul and Stutley (2010) point out that government-subsidised multi-peril crop insurance programs have a poor financial track record and often suffer from inefficiencies and leakages, thus adding to the government's financial burden.

Subsidies are often targeted at addressing market inefficiencies such as high costs, poor insurance awareness or underinvestment by the private sector. Where this is the case, governments may find it beneficial to address these failures using alternative measures before resorting to premium subsidies, because premium subsidies may generate

unsustainable costs in inefficient markets as was exemplified by the PROAGRO (Brazil) and ANAGSA (Mexico) schemes which suffered insolvency (Hill, et al., 2014).

For national level schemes, when subsidies are aimed at promoting demand through increased affordability, Hill et. al (2014) advise donors that short-term premium support through subsidies are worthwhile only when governments have a plan in place to raise revenues to take over these subsidies in the long-run. Without such provisions, any demand generated using subsidies may be temporary – as was seen in the case of the PCRIP, when participants stated that they would discontinue coverage if subsidies were not continued (Narube, 2015) .

At their best, subsidies help households receive protection through microinsurance that they would not otherwise have (Hill, et al., 2014). For example, Mexico's CADENA scheme is designed to protect farmers against adverse weather and the national and state governments collectively provide a full premium subsidy. A recent paper concluded that the program resulted in an increased per capita income of 6,000-8,000 pesos in a municipality that received insurance payout, compared to those that did not (de Janvry, et al., 2016).

However, at their worst, subsidies undermine efficiencies and incentives within the insurance industry, encourage overinvestment in risky, and sometimes environmentally damaging, agricultural activities as the premium no longer reflects the true risk borne by the insured (Hill, et al., 2014). Premium subsidies can help build demand for crop insurance, but extensive and ill-targeted use of subsidies can crowd out private investment (WFP-IFAD, 2011).

Premium subsidies can distort price signals, especially in cases where higher premiums result in higher subsidies (e.g. India NAIS where premiums paid by farmers are capped) (Mahul & Stutley, 2010), which can lead to large gaps between the premium paid and the expected loss, potentially creating a perverse incentive to over-develop and insure high risk crops. These distorted price signals can cause overinvestment in less productive avenues, for example subsidised insurance may encourage small farmers to stay in business instead of switching to another more suitable occupation, whereas non-subsidised insurance would drive them out of business. We consider it to then become a case of promoting national food security against the opportunity cost of subsidising these farmers in business. Capped premiums may exacerbate adverse selection (Mahul & Stutley, 2010).

An alternative approach commonly used are premium subsidies calculated as a percentage of the insurance premium.

Where the insurance price is reflective of the risk a percentage subsidy would maintain a degree of risk-signalling through the price, but this could also mean that those exposed to higher risk would benefit most from the insurance subsidy – as a 10% premium reduction through the subsidy would amount to a subsidy of \$20 if the insurance premium is \$200, and \$10 if the insurance premium is \$100. However, this effect would also depend on the design of the policy, as high deductibles for those at high risk would mean that the insurance policy offers less cover for high risks.

Overall subsidised premiums can help increase uptake of a product in the initial years and allow individuals with no experience with insurance to test and witness its benefits. This creates the externality of information – neighbours witness pay-out and the financial protection lent by the insurance product and this in turn creates demand but also creates the risk that individuals adopt a wait-and-watch strategy (Dupas, 2011). However, the benefits of this externality are greater in the case of products that cover idiosyncratic shocks (such as life and health insurance) which allow individuals to learn quickly from their neighbour's experience. The learning process tends to be slower in the case of products such as index

insurance wherein the payout depends on less frequent and mutually experienced events (Clarke & Wren-Lewis, 2013).

Clarke and Wren-Lewis (2016) state that a key issue is that governments and donors face problems committing to ex-ante disaster risk financing solutions. An example is the 'Samaritan's dilemma' donors face, when at-risk countries deliberately under-protect themselves knowing that governments or donors will come to their rescue. Other problems include governments being unable to effectively allocate disaster relief, or donors who cannot credibly commit as to who will take on which risks (Clarke & Wren-Lewis, 2016). Clarke and Wren-Lewis continue to say that insurance subsidies are effective in:

- Reducing 'Samaritans dilemma' because insurance reduces the need for discretionary aid;
- Reducing aid-misallocation by directly subsidising the recipient.

# SECTION 7

## Economic assessment of premium subsidies in comparison to other intervention options for sovereign risk pools

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### 7.1 Overview of approach, assessment dimensions and interventions considered

Using the above evidence as a foundation, this section provides a new in-depth analysis of the impact of premium subsidies and five other interventions to support sovereign disaster risk insurance schemes. The analysis is predominantly qualitative, based on the literature, practical examples and economic fundamentals, supplemented with a quantitative model, developed by the GAD, to highlight the different actuarial effects of two intervention options (capital provision and subsidies on premium levels). We also highlight a further quantitative assessment model that has been developed by Munich Re (see section 7.5).

The six different interventions are primarily assessed qualitatively, with a focus on the following four assessment criteria:

- The effect on premium levels;
- Moral hazard and behavioural impacts;
- The likelihood of a scheme becoming financially independent;
- Incentive effects for insurer.

Each assessment dimension is described in detail below, with a summary of the performance of the six interventions for each dimension, before the full assessment is presented in Table 12.

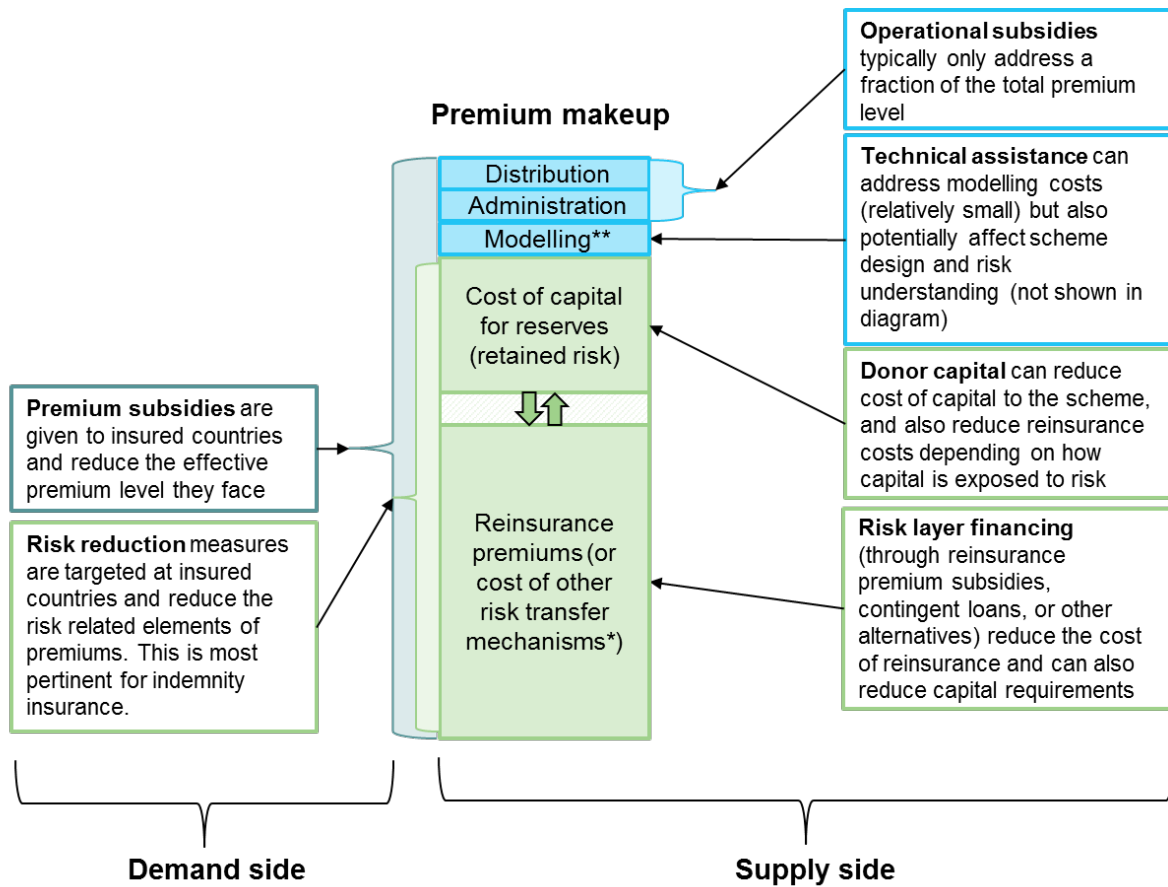
The interventions considered in this analysis are donor capitalisation (including donor financing of risk layers), payment of reinsurance costs, technical assistance, payment of operational costs, direct premium subsidies, and the reduction of risk levels through risk management or adaptation support. Figure 5 summarises the six interventions and their primary impacts on premium levels.

The premium makeup in Figure 5 is stylized, but considered indicative for a typical sovereign insurance risk pool. The key features to note are

- *Risk, or expected loss, is the main driver of premium levels.* The risk can be underwritten in two principal ways, either using the risk pools' own reserves, or through reinsurance. The insurer can choose between these two options, and it is important to note that free or subsidised provision of capital or reinsurance premiums can influence this decision and might lead towards a suboptimal design.
- *Operational costs including distributional and administrative costs are relatively small and hence subsidies to cover these costs only have a limited effect on the overall premium level.*

- *Technical and modelling costs* are typically not large, but high quality technical assistance can have significant benefits through the improvement of risk understanding or scheme design (not captured in Figure 5).

**Figure 5 Overview of intervention options for sovereign risk pools**



## 7.2 Relevant characteristics of the six intervention options

The following discussion of the different options builds on Table 7 in the literature review, provides examples to build an intuition for each intervention, and draws out key features and issues.

### 7.2.1 Donor capitalisation of the risk pool

Donors can directly provide capital to a scheme, this may be in the form of a grant, a guarantee, in return for equity, or contingent on certain triggers. Donor provided capital reduces the cost of capital that the insurance provider faces, and the resulting savings can be used to lower premium levels. There are two main uses for donor capital:

- Typically, the main use of donor capital is to finance a risk layer. In other words, the provided capital is exposed to risk, reducing the need to purchase reinsurance, which reduces the premiums the risk pool needs to charge countries.
- Furthermore, particularly at the inception of a scheme, the flexibility to use capital for a variety of measures may be useful; indeed, all sovereign risk pools have received some degree of capital at their inception to aid with start-up costs.

For the purposes of this report, when discussing donor capitalisation the focus is on capital provision intended to serve as reserve capital, exposed to a layer of risk and used to pay out claims. For example, a donor may guarantee to pay out claims for damages between 100 and 300 per cent of annual premium revenue. To ensure capital is used for this purpose, the capital can be made contingent on a parametric trigger, as was done for the TCIP scheme in Turkey. In this case, the World Bank's capital provision to the TCIP came in the form of \$100 million uncommitted contingent loan (Vivid Economics, 2015). The loan was agreed to pay for

- the first \$17 million of claims, to the extent that accumulated premiums were insufficient for this;
- 40 per cent of the claims beyond the \$17 million threshold; and
- 100 per cent of claims, up to 82.5 million, that could not be met either by the TCIP itself or reinsurers.

The contingent loan allowed the TCIP to obtain significantly lower reinsurance premiums. Within six years of its inception, the TCIP had accumulated enough reserves itself to become self-sufficient.

DFID provides an example an alternative mechanism for capital provision. It has provided ARC with £30 million, potentially rising to £90 million, of equity capital. This capital was used by ARC to fund setup costs, and partially exposed to risk to reduce reinsurance costs. The capital is provided for a 20 year investment period, after which ARC will repay the investment (DFID, 2014).

## 7.2.2 Payment of reinsurance costs

Paying the reinsurance costs of an insurance scheme has broadly the same effect on premium levels as donor capitalisation<sup>3</sup>, as it effectively reduces the costs of underwriting risk to an insurance pool. Put differently, both donor capital provision and donor payment of reinsurance costs reduce the cost of financing risk layers for the insurance pool. The difference is that donor capitalisation directly uses donor capital to finance risk layers, whereas payment of reinsurance costs uses donor funds to pay private reinsurance, through reinsurance premiums, to finance a risk layer.

Donor funding of reinsurance premiums is rare, with only three examples in the ClimateWise Compendium (ClimateWise, 2012). In particular, none of the sovereign risk pools receive donor funding for reinsurance costs. Where subsidies for commercial reinsurance premiums are provided, they are typically provided in combination with donor capital to finance a particular risk layer. For example, the World Bank provided a one-time subsidy for the reinsurance costs of the first year of the TCIP in Turkey (Gurenko, et al., 2006). The other two examples from the Compendium are:

- The Romanian government provided initial reinsurance support for the national property disaster insurance scheme, PAID. It did so both by partially subsidising reinsurance premiums to commercial reinsurers, and by directly financing the top risk layer by acting as a lender of last resort (ClimateWise, 2012).
- The Beijing Municipal Government subsidises reinsurance premiums for local agricultural insurers providing agricultural insurance to around 400,000 businesses around Beijing. Reinsurance providers insure losses between 160 and 300 per cent of annual premiums. The government itself provides reinsurance by guaranteeing losses above 300 percent of annual premiums (Swiss Re, 2011).

<sup>3</sup> Assuming the capital provided is exposed to risk

It should be noted that in contrast to the financing of a risk layer using donor capital, which crowds out commercial reinsurance, providing reinsurance subsidies directly subsidises commercial reinsurance. Furthermore, the provision of reinsurance subsidies can incentivise insurance schemes to structure their scheme differently: schemes will be incentivised to reduce the amount of risk retained/their capital reserves in favour of purchasing reinsurance. However, in practice the risks that this may have led to a distorted capital structure may have been reduced by donor involvement in the structuring of reinsurance.

### 7.2.3 Technical assistance

As described in section 5.1, technical assistance can come in a number of forms. In the context of sovereign risk pools, there are three main categories that might have a direct effect on premium levels: assistance with risk modelling; assistance with scheme design, risk layering and insurance brokering; and managerial and operational assistance.

- *Assistance with (re)insurance brokering* can potentially yield significant benefits, as insured countries are unlikely to possess the necessary experience to effectively structure a scheme or obtain the best available reinsurance premiums.
- Similarly, donors' past experience and expertise on best practise regarding the design of risk pools, including risk layering, can bring valuable *operational efficiencies*, allowing for reductions in premium levels.
- The provision of technical assistance can *reduce the cost of risk modelling and data collection* to an insurer which can be directly passed on in the form of lower premium levels. Higher quality risk modelling may also allow for greater diversification of risk which would reduce premium levels. However, higher quality risk modelling could also result in a changed understanding of the risk level, potentially leading to higher premiums.

Multilateral development banks have supported numerous disaster risk insurance schemes with technical assistance. Typically, technical assistance is provided as grant expert resource, a well-known example of grant resource support for technical assistance includes the CCRIF, which was set up under the technical leadership of the World Bank. The World Bank also provided approximately \$600,000 annually in the early years of CCRIF to support 'broad mandate' technical assistance (World Bank, 2011); the funding was used for a variety of purposes, such as hiring external consultants to run workshops for member countries on DRM. The IFC's Global Index Insurance Facility (GIIF) has supported over a dozen of index insurance schemes around the world with technical assistance.

### 7.2.4 Payment of operational costs

Donors can provide a recurring subsidy to insurance providers to cover operational costs. Although the operational costs of sovereign disaster insurance schemes are typically relatively low compared to the cost of underwriting risk, any reduction in the operational cost can be directly subtracted from premium levels.

In practice, no subsidies to sovereign insurance schemes have explicitly been labelled as operational subsidies.

### 7.2.5 Direct premium subsidies

The previously discussed interventions are all focused on the supply side in the sense that they involve the provision of financial resources to the insurer in order to meet or reduce the costs the insurer would otherwise face. In contrast, direct premium subsidies provide financial resources to the purchasers of insurance, i.e. they are a demand side intervention,

and as a consequence are **the only intervention which, in principle, can reduce the price of insurance to zero for the insured.**

The subsidies can cover both the mark-up part (operational costs, highlighted in blue in Figure 5) and the risk based part of insurance premiums (highlighted in green in Figure 5). As described in section 6 of the literature review, insurance premium subsidies can come in various forms, with two key distinctions being:

- *Targeted or not:* Subsidies can either be targeted at a particular recipient, for example the Caribbean Development Bank pays the annual CCRIF premium for Haiti (Caribbean Development Bank, 2016), or can be generally given to the premium pool, for example the UN's World Food Programme (WFP) finances 50% of the annual premium budget of the R4 scheme (Poole, 2014).
- *Fixed subsidy, fixed premium, relative subsidy:* Subsidies can set at a fixed level per insured, as a percentage of the sustainable premium level, or to cap the premium level at a defined level as in the NAIS scheme in India, where the government pays any premium above the cap.

In the context of sovereign disaster risk pools, a number of countries in the CCRIF and PCRAFI have received premium subsidies (including Haiti, as discussed above), either in the form of concessional finance or grant support which is then used by the country to pay the premium. Whilst no country in ARC currently receives premium subsidies, premium levels are thought to be a barrier to entry and subsidies are under consideration. Further premium subsidy considerations, are discussed in more detail in Section 7.5.

### 7.2.6 Reducing risk levels through risk management/adaptation support

Donors can provide funding (and technical assistance) to directly reduce the risk level faced by the insured. By reducing risk, the expected loss should decrease and the premiums necessary to underwrite the scheme can decrease. With respect to sovereign disaster risk pools, the majority of risk reduction potential can be gained through cooperation with governments. For example, donor attention could focus on the implementation and enforcement of improved building codes, or improved urban drainage systems to reduce flooding risk.

The seminal example of this type of intervention is the R4 scheme, discussed in section 4.3, while examples at a sovereign level include the World Bank's support for Mexico's general disaster risk management. However, there are generally only a few examples of insurance schemes directly including risk reduction measures.

## 7.3 Results of the impact assessment

The six different interventions are primarily assessed qualitatively, with a focus on the following three assessment criteria:

- The effect on premium levels;
- Moral hazard and behavioural impacts;
- The likelihood of a scheme becoming financially independent.

In addition to the three core criteria, one further dimension is considered:

- Incentive effects for sovereign risk pool.



Each assessment dimension is described in detail below, with a summary of the performance of the six interventions for each dimension, before the full assessment is presented in Table 12.

The key insights from the actuarial analysis in Box 1 are jointly presented with the qualitative assessment in Table 12. To provide a different perspective, an alternative quantitative analysis is presented in section 7.5.

### 7.3.1 Effect on premiums

To provide a robust framing of the discussion of the effect of different interventions on premiums, a quantitative model is presented which analyses the effect on premium levels of a marginal £1 of donor capital versus a £1 premium subsidy. The quantitative model, provided by the Government Actuary's Department (GAD), is described in Box 1 and provides, through a hypothetical example, helpful insight into supply side trade-offs between capital provision and direct premium subsidies, and retaining and reinsuring risks.

#### Box 1 Quantitative Analysis

This box has been prepared by the Government Actuary's Department (GAD) at the request of the Department for International Development (DFID). The purpose of this box is to present the results of an actuarial analysis for a hypothetical sovereign risk pool. The analysis compares the relative potential of premium subsidies and capital injections in terms of their potential to reduce the expected cumulative discounted premium to be paid by members of the pool. This analysis does not represent policy advice. It may not be relevant under different policy objectives, and other stakeholders may have other views. There may be additional factors to consider when comparing premium subsidies and capital injections.

This findings in this box are based on circumstances and assumptions for a hypothetical pool, but the analysis could be adapted and applied to specific programmes to inform programme-specific decisions.

Specifically, this box presents the results of a stylised analysis of how much a £1 capital injection or a £1 premium subsidy for a hypothetical sovereign risk pool would reduce the expected cumulative discounted premium to be paid by members. Given that there is both a risk and a time dimension to premium reductions, we use the expected cumulative present value of the premium reduction to members of the pool, where we discount future premium reductions using a subjective donor discount factor.

To conduct the analysis we make the following assumptions:

- An annual effective donor discount rate of 10%. This assumption implies that the donor values a premium reduction of £100 today as much as a premium reduction of £110 in a year's time.
- An annual effective investment return on the capital base in the pool of 1%.

- A premium multiple that the pool pays for reinsurance at the margin, around the reinsurance deductible, of 1.3. A premium multiple is the cost of a reinsurance premium relative to the annual average loss covered by the reinsurance. By assuming a constant premium multiple over time, we are implicitly ignoring the potential that reinsurance could become more or less expensive in future, which would increase or decrease the value of capital injections into the pool.
- For an additional £1 of capital injection, the pool exposes a fixed amount of £0.25 per year, until the full £1 has been disbursed. We assume that above this the pool fully reinsures, which is a reasonable first order approximation of how existing sovereign disaster risk pools currently operate.
- The probability that the reinsurance cover purchased by the pool will trigger is 20%. We therefore assume that the reinsurance purchased by the pool will trigger on average every 5 years.

We also make the simplifying assumption that the portfolio of the pool is fixed over time. We assume that putting an extra £1 into either premium subsidy or capital doesn't change the portfolio of the pool immediately or in future years - it isn't sufficient to induce any of the members to increase or decrease their insurance purchase. For programme-specific analysis this assumption may need to be relaxed, and it may be appropriate to make assumptions about how premium subsidies or capital injections would change both the size and composition of the risk pool, which could influence both the degree of diversification within the pool and the ability of the pool to spread fixed costs across a larger premium base, therefore providing better value to members. However for the hypothetical analysis in this box we retain the assumption, as it allows for clean, tractable analysis.

Under these assumptions:

- The expected cumulative discounted premium reduction from a £1 premium subsidy is £1. £1 of donor funding spent on premium subsidy today reduces the premium to be paid by the policyholder countries today by £1, and doesn't reduce the premium in future years at all.
- The expected cumulative discounted premium reduction from a £1 additional capital injection is £0.59. In our framework a capital injection is essentially a multi-year commitment to allow capital to be used to retain risk until it is exhausted. It allows the pool to retain more risk, and on average this will reduce reinsurance costs and reduce the premium that needs to be paid by pool members. However, under the above assumptions these premium reductions are spread over many years in the future, and are discounted using the 10% discount rate.

So under the baseline assumptions the expected cumulative discounted premium reduction would be 69% higher from a premium subsidy than from an additional capital injection. A benefit of £1 is 69% higher than a benefit of £0.59.

This result is context-dependent, with changes in assumptions significantly changing the relative cost effectiveness. This finding, that for these specific assumptions a marginal premium subsidy is more cost-effective than a marginal capital contribution should not be

overgeneralised. There are situations in which capital injections would be more cost effective than premium subsidies.

The assumptions used here are hypothetical, although are within a range that we consider could reasonably apply for a sovereign disaster risk pool. If any donor was to be choosing between premium subsidies or capital injections for a specific program, we strongly recommend that this analysis is updated using programme-specific assumptions. In other words, the hypothetical results provided in this box for illustration should not be used for programme-specific decision-making.

For example, the following changes in assumptions would reduce this 69% difference in cost-effectiveness to 0%. Each of these changes in assumption in isolation would increase the expected cumulative discounted premium reduction from a £1 additional capital injection from £0.59 to £1, the same reduction as could be achieved from a £1 premium reduction:

- A reduction in the annual discount rate from 10% to 3.3%: Reducing the discount rate would make future premium reductions more valuable, which improves the value proposition of capital injections.
- An increase in the multiple for reinsurance for 1-in-5 year events from 1.3 to 2.2: If the cost of reinsurance increased substantially, the value of retaining risk through capital would be higher. An increase in the cost of reinsurance as significant as this cannot be ruled out in future.
- A decrease in the capital base of the pool or an increase in the pool's portfolio so that reinsurance would trigger with a probability of 59%: If the capital of the pool depleted significantly or the portfolio size increased substantially, this would increase the value of additional capital injections into the pool.

The analysis in this box is not applicable to the question of whether to establish a sovereign disaster risk pool, only to the question of the tradeoff between premium subsidies and capital injections to existing pools.

The analysis assumes that a sovereign risk pool has already been established with some capital, and compares the value for money of an additional £1 of donor grant or concessional loan if used to subsidise premiums with the same support provided to increase the capital base of the pool. As such it is not directly applicable to the question of whether sovereign risk pools should be established, but only to the tradeoff between premium subsidies and capital injections to existing pools. There are many reasons to set up a regional sovereign disaster insurance pool which are not considered in the above analysis, including: reducing the cost of insurance through diversification; sharing knowledge and good practice between countries; offering a shared vehicle to increase understanding of risk; and as an engine to reinforce political momentum for financial resilience.

Source: Government Actuary's Department, 2016

A further important differentiating factor between the interventions is the degree to which the targeted cost features in premiums. For example, subsidising operating costs is unlikely to

have a large effect on premium levels for sovereign risk pools as operating costs are relatively small compared to the average yearly expected loss.

Table 8 shows the different expected impacts of the different interventions. Direct premium subsidies are expected to have a larger impact, per £ of resource, than donor capitalisation for the reasons described in Box 1. Paying reinsurance costs is a form of financing a layer of risks. The impact is broadly equivalent to donor capitalisation (and hence likely to have a smaller effect than premium subsidies). It is difficult to generalise the impact of technical assistance but this effect will often be small, as the direct costs that would otherwise be borne by the pool, such as risk modelling, are likely to be quite small, and while the results of the technical assistance will make the pool work more effectively, it will not fundamentally alter its underlying economics. Operating costs are a small component of total costs and so paying them will have only a small impact on premium levels. Risk reduction measures can play an important role but cannot alter the expected frequency of disaster, a key driver of premium levels.

	Direct premium subsidies	Donor capitalisation of risk pool	Payment of reinsurance costs	Technical assistance	Payment of operational costs	Risk reduction
Effect on premiums	Large effect	Medium effect	Medium effect	Small effect (but can vary significantly)	Small effect	Small effect

**Table 8 Summary of assessment: effect on premiums**

### 7.3.2 Moral hazard and behavioural impacts

Generally, any insurance provision is likely to create some moral hazard as the insured party's incentive to avoid risk is reduced, since any potential loss resulting from risk behaviour is partially mitigated by the insurance pay out. In the context of disaster risk insurance, interventions affecting premium levels can induce moral hazard through two conceptually different channels:

1. 'Levels' effect: In any intervention, if premium levels go down, moral hazard will become a bigger problem as the insured bears less of the cost of their risk. Kunreuther and Michel-Kerjan (2011) argue that in disaster risk insurance this is partly due to premium subsidies 'hiding' the true risk of a disaster. Ensuring the insured countries are well educated about risk levels could mitigate this effect somewhat.
2. 'Marginal' effect: If an intervention removes the link between risk and premium levels, the risk of moral hazard increases significantly as the insured faces a significantly smaller incentive to reduce their risk levels.

The degree to which an intervention induces moral hazard through either of these channels is assessed in Table 9. Given the logic above, it shows that the intervention options that are most effective at reducing premium levels, especially premium subsidies, are also those that will tend to carry the greatest moral hazard risks. It should be noted however, that the corollary of this is that the donors providing the subsidy now effectively face a higher premium than they did previously and will have a higher incentive to reduce risks. In addition, risk reduction measures, by encouraging or requiring less risky behaviour, can reduce moral hazard relative to the no-intervention baseline. As such, these measures could also be used in combination with premium subsidies (or other interventions that increase moral hazard risk) to offset the increased risk. The degree to which different interventions can effectively be made contingent on certain actions is discussed in Table 12 and relevant past examples are given.

Furthermore, although moral hazard is a commonly considered market failure in the context of insurance, its effect in the context of sovereign risk pools may be relatively small for two reasons.

- First, existing sovereign disaster risk pools are all based on a parametric trigger or index and any new pools will likely also be based on an index since parametric triggers allow for fast disbursement of funds, a key benefit of sovereign disaster insurance. As opposed to traditional indemnity insurance, index insurance significantly reduces moral hazard, as the size of payouts are not related to the insured's behaviour (because the payout is not directly related to the damage suffered by the insured). However, there may still be a residual concern that, for behavioural reasons, governments benefitting from insurance may be less inclined to undertake disaster preparedness activities.
- Second, most sovereign disaster risk insurance schemes offer pay-outs in the order of \$1-20 million (CCRIF, 2016) (ARC, 2015) (World Bank, 2014). National damages are however likely to far exceed this relatively minor sum. Sovereign disaster risk insurance's primary goal is to provide short term liquidity for immediate disaster response. The small amount of coverage compared to disaster damages suggests it is unlikely to radically change behaviour of governments in all areas *except* the immediate disaster response functions. That is, in the knowledge that insurance will provide emergency liquidity, governments may be less inclined to scrutinise its own emergency funding sources and plans.

	Direct premium subsidies	Donor capitalisation	Payment of reinsurance costs	Technical assistance	Payment of operational costs	Risk reduction
<b>Risk of moral hazard</b>	Medium risk, but options to mitigate; significantly lower with parametric insurance	Low risk	Low risk	Low risk	Low risk	Reduced risk (of moral hazard)

**Table 9 Summary of assessment: moral hazard**

### 7.3.3 Likelihood of scheme becoming financially independent/independent from donors

This dimension assesses the likelihood that a scheme can achieve financial sustainability, defined as being independent of donor assistance. This assessment is complicated by the fact that different interventions have been applied to insurance schemes in different contexts. For example, since premium subsidies can in principle affect premium levels to the greatest degree, they are often applied in situations where the gap between the ability of the insured to pay and the actuarial price of insurance is the greatest. Such schemes may never be able to rely just on premium income for their financial sustainability.

Ideally the assessment would be based on practical experience, however given the small number of risk pools examples are scarce. Where there are no clear examples in sovereign or other disaster risk insurance, the discussion is based on stakeholder opinion and well established practices in other sectors.

A key distinguishing factor between different interventions is whether they primarily cover setup, or running costs of a scheme. Interventions that cover fixed set up costs can often be structured to avoid further intervention with ongoing premium incomes to cover costs without further recourse to donors. Indeed, if sufficient surplus is generated then the upfront provision from donors can sometimes be returned. By contrast, interventions that provide ongoing support can only lead to financial independence through gradual phase down of that support over time. For this reason, donor capitalisation is considered to offer the most likely pathway to financial independence; with technical assistance and risk reduction measures likely to support financial independence through, for example, increasing understanding of the actuarially fair level of premiums or a reduction of the need for large payouts.

Although not assessed in this report, it is worth noting that low income countries tend to be financially dependent on donor financing for disaster risk through the humanitarian system. Providing insurance, even if it creates financial dependence in the context of the insurance scheme, may lower financial dependence in the humanitarian context.

	Direct premium subsidies	Donor capitalisation	Payment of reinsurance costs	Technical assistance	Payment of operational costs	Risk reduction
Likelihood of scheme becoming financially independent	Medium likelihood	High likelihood	Medium likelihood	High likelihood	Medium likelihood	High likelihood

**Table 10 Summary of assessment: financial independence**

### 7.3.4 Incentive effects for sovereign risk pools

In this dimension, the incentives for the risk pool resulting from different interventions are examined. We distinguish between two main, potentially perverse, incentives:

- *Incentive to write premiums for new countries.* This principally involves the incentive for the pool to contract new clients (countries), which may skew the risk distribution in a risk pool.
- *Incentive to optimally structure the pool.* Supply side interventions such as capital grants or the provision of reinsurance premiums may incentivise a pool to underwrite risk using a suboptimal structure.

Both incentives are discussed for the relevant interventions. Overall interventions which involve large financial transfers are most likely to have these effects: while an advantage of direct premium subsidies is that they can be targeted at particular countries, they can also lead to a distorted risk pool. By contrast, donor capitalisation and payment of reinsurance costs are more likely to have potential distortionary impacts on the supply side: support to one of these may lead to a sub-optimal structure as, for example, a pool may choose to reinsure most of its risk if its reinsurance premiums are subsidised, whereas some risk retention would have resulted in overall lower costs. Technical assistance and risk reduction are unlikely to have large incentive effects, while payment of operational costs is unlikely to be sufficiently material to have a large incentive effect.

	Direct premium subsidies	Donor capitalisation	Payment of reinsurance costs	Technical assistance	Payment of operational costs	Risk reduction
Incentive effects	Potentially include high risk countries in pool	Potential supply side distortions	Potential supply side distortions	Limited	Limited	limited

**Table 11 Summary of assessment: incentive effects**

## 7.4 Results of the quantitative impact assessment

The key insights from the actuarial analysis are jointly presented with the qualitative assessment in Table 12.

	<b>Direct premium subsidies</b>	<b>Donor capitalisation</b>	<b>Payment of reinsurance costs</b>	<b>Technical assistance</b>	<b>Payment of operational costs</b>	<b>Risk reduction</b>
<b>Effect on premiums</b>	<p>At the margin, direct premium subsidies have a 100% effect on premium reduction (£1 subsidy reduces premiums by £1). Growth of a scheme can reduce premium levels for all participants as risk is more diversified and economies of scale are achieved in operational costs. For example, ARC estimates its risk pooling has reduced premiums by about 50% compared to countries insuring individually (Africa Regional Development, 2014). For sovereign schemes, premium subsidies have been instrumental in the recruitment of countries. It is well documented that many countries currently participating in risk pools would not participate in disaster insurance schemes without subsidy (Narube, 2015). For example, CCRIF discovered that about 61% of the participating countries would likely discontinue coverage in the event of fiscal constraint (CCRIF, 2015).</p>	<p>If donors care mostly about immediate impact (high discount rate) then at the margin, this may be less effective than premium subsidies. However, under different assumptions donor capitalisation can be more effective. Growth of a scheme can reduce premium levels for all as risk is more diversified and economies of scale are achieved in operational costs. However, while capital injections can reduce premium levels, there is no direct evidence linking the provision of capital to new countries joining sovereign insurance schemes.</p>	<p>Growth of a scheme can reduce premium levels for all as risk is more diversified and economies of scale are achieved in operational costs. Although reinsurance subsidies can reduce premium levels, there is no direct evidence linking the provision of reinsurance subsidies to new countries joining sovereign insurance schemes.</p>	<p>Covering costs of model development etc. is, in some sense, equivalent to providing a capital grant of size equal to the TA costs. Improved risk modelling, product design and brokerage can significantly reduce premiums. For example, parametric triggers can significantly reduce operating costs. However, in some cases improved modelling may expose higher risk levels, requiring higher premiums (note, this still represents an improvement as the low premiums would have otherwise led to unpayable claims).</p>	<p>The marginal effect is equivalent to that of direct premium subsidies; however, the size of subsidies is limited. Operational costs result in a direct mark-up above actuarially fair premiums. These costs can be particularly high in developing countries due to relatively high distribution costs and administration costs. However, for sovereign disaster insurance schemes, the operational costs tend to be relatively low compared to premium levels, which are mostly driven by expected loss. For example, in 2014 the CCRIF's total operating expenses were \$700k compared to a total premium income of approximately \$19m (around 3.6% of premium income).</p>	<p>Physically reducing risk levels can be effective in reducing the premiums insurers need to charge to households because risk reduction measures reduce the damage incurred during a loss event. However, in a sovereign setting premiums are mostly used to fund immediate disaster response needs and pay outs are far smaller than total damages (see section 6.1). Premiums are typically index based and pay outs determined against the index, hence the only actuarial factor determining premiums is the probability of a disaster occurring. Hence risk reduction measures, whilst valuable in their own right, are unlikely to significantly affect premium levels at a sovereign scale.</p>



	<b>Direct premium subsidies</b>	<b>Donor capitalisation</b>	<b>Payment of reinsurance costs</b>	<b>Technical assistance</b>	<b>Payment of operational costs</b>	<b>Risk reduction</b>
<b>Moral hazard and behavioural impact</b>	Moral hazard will likely increase due to a reduction in premium levels. Particularly if premium subsidies distort the relationship between premium and risk levels, by for example introducing a 'cap' on premiums as in the NAIS in India, the insured no longer have any incentive to reduce their risk levels. However, in the case of sovereign insurance, this can however be effectively mitigated by making the subsidies conditional on the country taking action on risk reduction, such as preparing disaster response plans.	A reduction in premium levels as a result of a capital grants can increase moral hazard somewhat. However, capital grants maintain the relationship between risk and premium levels, mitigating this risk. In contrast to premium subsidies, capital grants cannot be made conditional on the behaviour of insured countries (or individuals) and hence this intervention does not provide a tool to reduce moral hazard.	Moral hazard would increase somewhat as a result of lower premiums. However, the premiums would still directly reflect risk levels and hence moral hazard should not be excessive. It is difficult to directly link reinsurance subsidies to the behaviour of an individual country or client and hence this intervention does not provide a tool to reduce moral hazard.	This does not create any risk of moral hazard or other perverse incentives. In fact, assistance with product design, by for example including deductibles, may help mitigate moral hazard.	Moral hazard would increase somewhat as a result of lower premiums. However, the premiums would still directly reflect risk levels and hence moral hazard should not be excessive. Operational costs cannot be directly linked with the behaviour of individual countries and thus cannot be used as a tool to reduce risk taking behaviour.	This intervention likely reduces moral hazard by raising risk awareness and implementing risk reduction measures.
<b>Likelihood of scheme becoming financially independent</b>	For sovereign schemes, gradual tapering of premium subsidies is possible. In, for example, the PCRAFI the participating countries have been increasing the proportion of the premium paid (ARC, 2015). However, premium subsidies are typically used to cover risk related elements of premiums. Risk levels themselves are unlikely to change significantly and hence to reduce or taper	The provision of capital grants is typically intended as a onetime intervention (or if there are several tranches of capital, the disbursement is clearly defined). Schemes are encouraged, at the margin, to only support countries which are not likely to undermine the risk pool, encouraging financial sustainability and independence. If grant capital is used as the only intervention,	Similar to capital provision, payment of reinsurance costs incentives insurers, at the margin, to only support countries with acceptable risk profiles (assuming a fixed amount of reinsurance is purchased). A key difference between capital provision and	Technical assistance is most acutely necessary at the onset of a scheme. However, it is likely useful for a prolonged period to ensure good practise is embedded and improved risk understanding is	Operational costs can decrease appreciably as a scheme becomes more established. For example, in 2007 CCRIF's operating expenses were \$1.4 million. By 2014 total operating expenses had halved, whilst the number of members grew. However, operating costs are typically relatively small for sovereign insurance	These interventions can, in theory, improve the financial independence of schemes by reducing expected loss. This would drive down premium requirements hence making a scheme less dependent on donor assistance. However, in the context of sovereign disaster insurance this direct effect is likely to be small as

	<b>Direct premium subsidies</b>	<b>Donor capitalisation</b>	<b>Payment of reinsurance costs</b>	<b>Technical assistance</b>	<b>Payment of operational costs</b>	<b>Risk reduction</b>
	premiums, the ability and willingness of the insured party to afford premiums has to increase.	schemes will be (assuming the scheme is technically sound) financially sustainable from the onset as the provision of capital effectively only covers setup costs, not running costs. In the case of repayable loans, schemes will typically have to repay the loan after a pre agreed period (20 years in the case of ARC).	reinsurance subsidies is that reinsurance provision is a running commitment, potentially making it difficult to taper off.	integrated into the risk model. In the long run, however, technical assistance can be tapered off as a risk pool builds internal capacity. The CCRIF, for example, became an independent company in 2014, seven years after its creation.	schemes are hence not critical for financial sustainability.	damages from disasters are far larger than pay outs. The pay outs are intended to be used for the initial emergency response, which are unlikely to decrease significantly. However, improved national disaster response and disaster risk management can potentially reduce the need for emergency liquidity from insurance, reducing the necessary pay out for countries and hence reducing the expected loss an insurance scheme needs to cover, making it more sustainable.
<b>Incentive effects for insurer</b>	Guaranteed premium subsidies, for example all premiums above a cap will be subsidised, will incentivise insurers to find clients, regardless of their risk level, creating a potentially unbalanced risk pool, as donors can step in to pay the actuarially required premium levels. This effect is reduced but still present for the most	Insurers would still set premiums at actuarially fair levels. However, this may lead to underutilisation of the capital injection. For example, ARC is seen as being overcapitalized, premiums are set based on average expected loss (to ensure the scheme is sustainable), which has prohibited a number of potential countries from	Reinsurance subsidies, like capital provision, does not incentivise risk pools to actively recruit new countries. It does however potentially create supply side distortions by reducing the incentive for risk	The provision of technical assistance is unlikely to change incentives for insurers, unless improved risk modelling or understanding changes the perceived marginal revenue available from writing additional	Payment of operational costs can reduce incentives for insurers to improve efficiency. In order to mitigate this, operational subsidies can be made conditional on the attainment of certain performance targets.	These measures are unlikely to create particular incentives for insurers.

	<b>Direct premium subsidies</b>	<b>Donor capitalisation</b>	<b>Payment of reinsurance costs</b>	<b>Technical assistance</b>	<b>Payment of operational costs</b>	<b>Risk reduction</b>
	common form of premium subsidies (% of total premium). This is a demand side measure and does not create incentives for insurers to restructure the supply side.	joining, leaving the underlying capital 'unused'. Capital provision potentially create supply side distortions if a pool becomes overly reliant on its own reserves to underwrite risk.	pools to expose its own capital to risk.	insurance contracts.		

**Table 12 Qualitative Analysis of intervention options**

## 7.5 Alternative quantitative assessment

The following presents an alternative quantitative approach to compare the effectiveness of premium subsidies and capital provision by Munich Re. This analysis suggests that a mix of capital and subsidy provision may provide optimal value for money when designing an insurance scheme. It is worth noting that this conclusion does not contradict the analysis provided by GAD.

### Box 2 Box

#### *Premium subsidies versus capital injections: An argument in terms of value for money*

The Premium Subsidy Value for Money model builds on the value for money of a risk transfer scheme defined as the Benefits divided by the Costs. The model analyses which combination of premium subsidies and capital injection lead to the lowest Costs and the highest Benefits, thus maximizing the Value for Money (VfM). Benefits are defined as the claims that are paid by a risk transfer scheme in addition to the “savings” that these claims trigger by acting as “crisis containment mechanisms” through the provision of immediate liquidity. Claims will act as “crisis containment mechanisms” to varying degrees:

For a pandemic outbreak which grows at an exponential rate, for example, the value of receiving funds very early to contain the outbreak could be equally “exponential”. For a drought and threatening food crisis, the benefits of early intervention are also substantial if, for example, the loss of productive assets can be avoided and major macroeconomic repercussions can be mitigated. For a natural disaster such as Typhoon or EQ, immediate liquidity for medical aid, food assistance, shelter and debris removal will also mitigate longer term economic disruption and consequences.

The “savings” could also be viewed as the total cost of the disaster had it not been mitigated by early intervention financed by claims and the total cost of the disaster with an early intervention action. However, total cost should comprise both material and economic losses (reduction of production, consumption and savings). Costs are defined as the present value of foregone investment income in addition to the present value of premiums paid. It is assumed here that if capital is injected into a risk transfer scheme, the investment income that this capital would have otherwise generated is “lost”, thus representing a cost. In terms of the present value of premiums paid, it is assumed that a 50% premium subsidy would incentivise equal premium investments from the respective counterparties. The Costs are consequently defined as the present value of premium subsidies plus the present value of “local” premium investments plus the present value of foregone investment income.

It is equally assumed that the risk transfer scheme incurs administrative expenses and purchases reinsurance with the excess funds that are not used for administrative expenses and the “expected claims” payments for the portfolio. The final part of the equation is the volume constraint which will be imposed by the capital.

The key outcomes of the modelling are:

1. Assuming abundant premium investment, the VfM will be constrained by the available capital.

2. Assuming abundant capital injections, the VfM cannot be optimized without sufficient premium investment.
3. Depending on parameterization, an optimal combination of premium investment and capital injections yielding the highest VfM can be determined.
4. Depending on parameterization, VfM will be further increased by using an existing risk carrier, thus eliminating the need for capital injections, and allocating all funds to premium subsidies.

# SECTION 8

## Premium subsidy implementation considerations

In this section we provide a discussion of more detailed considerations regarding the design of premium subsidies to reduce their potentially negative impacts.

As evidenced in Section 6, premium subsidies can be implemented in a wide variety of ways. Table 13 summarises the different types and their advantages and disadvantages:

Type of Premium Subsidy	Examples	Advantages	Disadvantages
<b>No direct subsidy</b>	Sovereign – Cook Islands (PCRIP), many CCRIF members National Scheme – TCIP, IBLIP (Mongolia), ACRE (Africa)	<ul style="list-style-type: none"> <li>• Risk-based pricing ensures financial sustainability. ACRE, IBLIP and R4 have achieved respectable scale despite no direct subsidies.</li> <li>• Risk-based pricing promotes awareness of the risk</li> </ul>	<ul style="list-style-type: none"> <li>• Large fractions of the target market may be unable to afford it, as a result insurance penetration may grow slowly</li> <li>• Low insurance penetration means the government must retain contingent liability of providing support to disaster-hit individuals and regions</li> </ul>
<b>Full subsidy</b>	Sovereign – Haiti, PCRIP (2013 only) National – CADENA, FONDEN, Kenya Livestock Insurance Program	<ul style="list-style-type: none"> <li>• Useful when the risk-based premium is too expensive for potential customer (e.g. Haiti)</li> <li>• Encourages countries to ‘test’ insurance. The availability of insurance at no or little cost encouraged countries to join PCRIP</li> </ul>	<ul style="list-style-type: none"> <li>• Can distort market signals and promote overinvestment in risky avenues</li> </ul>
<b>Partial subsidy</b>	Sovereign – PCRAFI (through PREP) National Scheme: <ul style="list-style-type: none"> <li>• Percentage of premium – Most popular type of subsidy used in USA, Canada, Japan, India, China, Brazil etc.</li> <li>• Cap on subsidy (to reduce mis-allocation) – Chile, Brazil and other</li> </ul>	<ul style="list-style-type: none"> <li>• For households, reduced costs of insurance can lead to higher insurance penetration and reduces contingent liability of the government (e.g. India and China have witnessed huge demand after the introduction of generous subsidies)</li> <li>• Visible benefits (e.g. through time-sensitive</li> </ul>	<ul style="list-style-type: none"> <li>• Demand may not be sustained if subsidy is reduced or removed (e.g. Fall in rural crop insurance business in Brazil after the government reduced subsidy expenditure)</li> <li>• Poor targeting can provide an unfair benefit to richer or riskier customers</li> <li>• Heavily subsidised or capped premiums can produce negative</li> </ul>

Type of Premium Subsidy	Examples	Advantages	Disadvantages
	Latin American countries	discount vouchers) promote risk awareness	effects similar to a full subsidy <ul style="list-style-type: none"> <li>• ‘Hidden’ subsidies result in poor risk awareness amongst customers</li> <li>• Difficult to reduce/remove, thereby adding to governments financial burden</li> </ul>
<b>Declining subsidy</b>	Sovereign – PCRIP (2014-2015), ARC* National scheme – No example found	<ul style="list-style-type: none"> <li>• No immediate strain on public (or personal) finances.</li> <li>• ARC requires members to make budgetary provisions to be eligible for subsidies. This ensures that demand is sustained.</li> </ul>	<ul style="list-style-type: none"> <li>• Demand may fall in times of financial difficulty. CCRIF mentions that about 61% of members stated they would withdraw when faced with fiscal constraints.</li> </ul>
<b>One-time subsidy</b>	Sovereign – USAID subsidy of Ethiopia insurance premium in 2006 National Scheme – Kilimo Salama pilot (now ACRE)	<ul style="list-style-type: none"> <li>• Demand may not be sustained after withdrawal of subsidy (e.g. discontinuation of cover by Ethiopia)</li> </ul>	<ul style="list-style-type: none"> <li>• A well-timed subsidy can significantly increase demand as seen in the Kilimo Salama pilot project</li> </ul>
<b>Other</b>	Sovereign – PREP  National – R4 Initiative (Insurance for Work)	<ul style="list-style-type: none"> <li>• PREP was created using IDA credits and grants to provide long-term premium support and risk mitigation assistance to PICs</li> <li>• R4 Initiative practices ‘self-selection’ the most effective method of targeting low-income individuals</li> <li>• Reports suggest R4 customers ‘graduate’ from paying via labour to paying cash over time</li> </ul>	<ul style="list-style-type: none"> <li>• <i>No disadvantages were discovered</i>, possibly because the PREP was only introduced recently and the R4 initiative is hugely considered as successful</li> </ul>
	Market based cross-subsidisation Note: CCRIF has adopted a practice of risk based premiums which are not cross-subsidised	<ul style="list-style-type: none"> <li>• Free market mechanism – no intervention required</li> <li>• can reduce costs of insurers as insurers compete on price to retain or capture market share</li> </ul>	<ul style="list-style-type: none"> <li>• Good risks are required to pay higher premiums which are used to subsidise poorer risks (e.g. UK Flood Insurance prior to the introduction of Flood Re)</li> </ul>

Table 13 Different Type of Premium Subsidies (based on literature review)

From this we can derive a number of premium subsidy design considerations which can mitigate the often mentioned concerns around premium subsidies, including moral hazard and the fostering of financial dependence. We argue that if correctly designed and implemented premium subsidies can be used as a tool to encourage wider risk reduction and capacity building benefits:

**Make premium subsidies conditional on minimal DRM requirements.** These conditions could be similar to the minimal contingency planning required to join ARC. ARC requires countries to submit plans for spending any pay outs they receive, with mandated requirements on what the pay-out can be spent on and the speed it must be spent with (ARC, 2016). The contingency plans are independently verified and their implementation monitored. The potential benefit of an annual premium subsidy is that, unlike in ARC, it allows for the application of potential penalties (partial subsidy withdrawal) if the provided contingency plans are not followed.

**Preserve a link to risk level to minimise moral hazard and support risk reduction.** By explicitly maintaining a link between premium levels and risk levels, insurance can create an incentive for those taking out insurance to reduce their risk profile. This is applicable in the context of indemnity insurance, less so for parametric products. However, there are possibilities to still use parametric products in a way that encourages governments to take greater action in risk reduction: The PCRAFI pool provides a potential blueprint for this: it offers member countries a menu of different products, which allows countries to insure different risk layers, with correspondingly different premiums. Furthermore, it provided country governments with interactive Excel tools to explore how the different options would impact their disaster budget and what the premiums would be (GFDRR; World Bank, 2015) . Such an approach may be effective even for countries who may require a (near) full premium subsidy, as is the case for the majority of the PCRAFI countries. Furthermore, even in a parametric insurance setting the degree of risk management is important when determining the choice of index and the level of trigger, which in turn will influence the technical price of insurance. So if a country manages drought risk very well they could select a higher trigger point, which would be less expensive due to the lower probability as a trigger point attached to a high probability outcome.

**Provide a relative subsidy adjusted to the needs of the insured.** Subsidies should not be universally available to all participants in a risk pool. Instead, premium subsidies are best targeted at specific countries. Indeed, the ability to target premium subsidies is one their main benefits compared to supply side measures. Historically, premium subsidies in a sovereign risk pool context have historically been targeted in a somewhat ad hoc manner, based on perceived need. They have focussed on small island nations with small government budgets and where disasters can result in damages equivalent to a significant percentage of GDP. Reasonable criteria could be codified in terms of expected disaster losses and their relation to government budget or GDP.

**Instead of annual ad hoc provision, future subsidy levels can be planned.** A primary motivation for the provision of premium subsidies is to alleviate short term government budget constraints, particular for small low income countries. This however implies that premium subsidies can be phased out, and subsidies should only be provided with a clear phase out schedule in place. For example, ARC advocates for a subsidy schedule of 75% in year one, 50% in year two, 25% in year three, and 0% by year 4 (ARC, 2015). However, there may also be cases where premium subsidies are deemed necessary for long term. For example, Haiti has received a full premium subsidy for all 7 years during which it has been a member of the CCRIF. This may be justified if the opportunity cost of very limited government funds is considered particularly high.



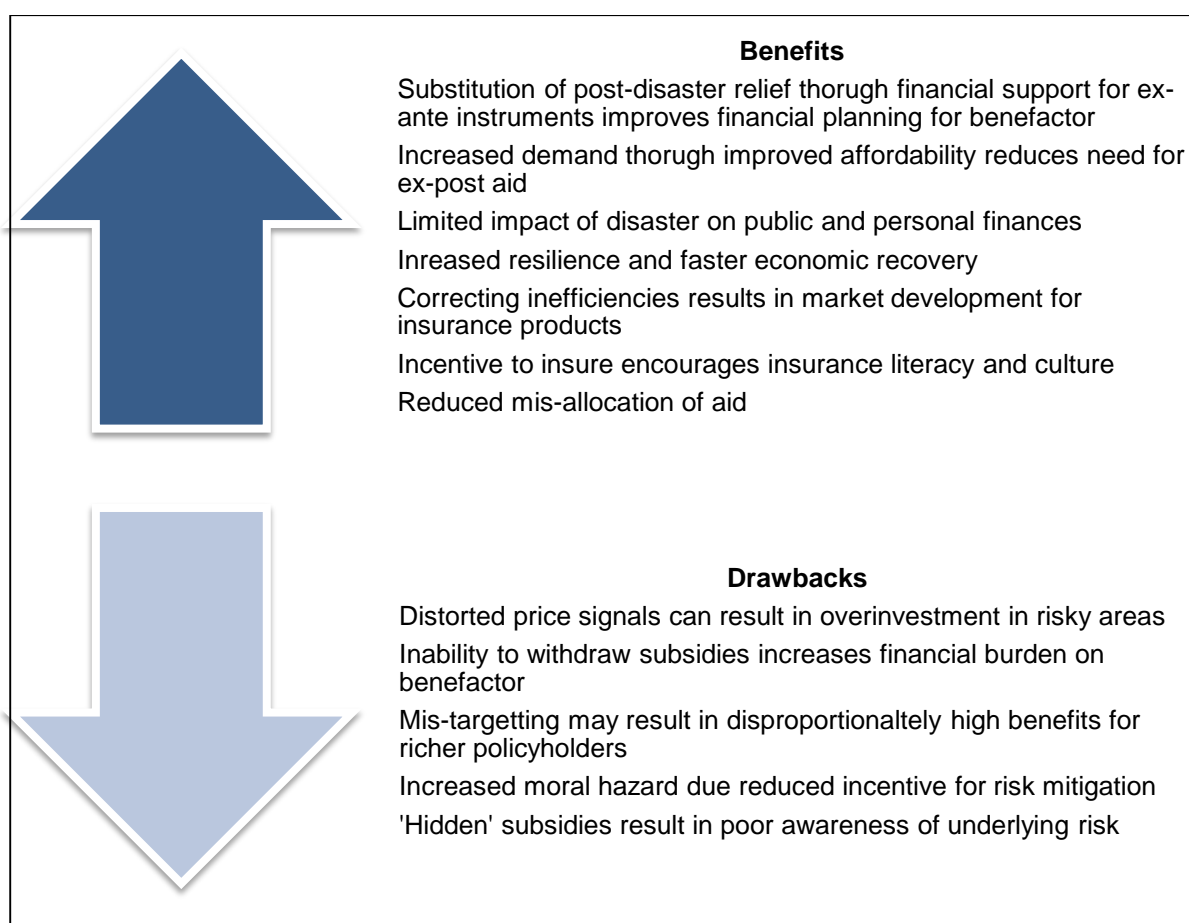
# SECTION 9

## Discussion of key findings

This report summarizes the latest evidence on publicly funded premium subsidies as a way to increase disaster risk insurance take up amongst governments (sovereign level) and individuals.

The literature and emerging experience from a wide variety of insurance schemes, including sovereign, agricultural and property insurance, **suggest that premium subsidies offer benefits but can also bring drawbacks**, as indicated in Figure 6.

**Figure 6 Summary of impact (benefits and drawbacks) of premium subsidies)**



**Furthermore, the evidence suggests that premium subsidies are relatively common in developing countries.** The Compendium suggests that 40% (2011) and 33% (2016) of current disaster risk transfer schemes using some form of premium subsidy to reduce cost of insurance and premium levels. This approach appears particularly common in agricultural insurance, and geographically in Latin America and the Caribbean. Interestingly many of the schemes that operated premium subsidies also used other forms of financial support (2016 Compendium). The evidence emerging from the field illustrates how premium subsidies are

used, but also highlights lack of information about funding sources and the structure of subsidies. This would need further investigation with those running the insurance scheme.

**Overall we notice that there is very limited analytical evidence** of the performance of different intervention options over time – mainly because many disaster risk insurance schemes have not been in operation over a long enough period.

## 9.2 Findings for sovereign risk pools

**Focusing on premium subsidies for sovereign risk pools**, our economic assessment concludes that in a context in which it has been agreed insurance is a suitable mechanism for helping to address climate risks, premium subsidies, as a demand side measure, are likely to be more effective than other interventions at addressing demand side issues such as fiscal constraints:

- Compared to capital grants, or other supply-side interventions, **premium subsidies are not limited to targeting a specific element of premium makeup and, £ for £, are likely to lead to the largest fall in premiums.**

They are particularly attractive in allowing support to be targeted towards the poorest countries. By contrast, the supply side measures considered in this report, which typically support the entire risk pool, implying premium support is provided to countries who do not necessarily require it.

The economic assessment also suggests that key concerns surrounding premium subsidies can be effectively mitigated in the context of sovereign risk pools. Compared to other interventions, there is a risk that premium subsidies encourage moral hazard or ongoing subsidy dependence. However, these concerns may be overstated in the context of sovereign risk pools and may also be mitigated by 'smart' subsidy design.

To address moral hazard, **subsidies can and should be made conditional on risk reduction activities** and there needs to be a credible mechanism for withdrawing subsidies if these activities are not adopted. The fact that sovereign schemes only pay out a relatively small proportion of total losses and are linked to parametric triggers further reduces moral hazard concerns.

**Declining subsidy profiles should be identified upfront** if the barrier to insurance take-up is thought to be short term budget constraints.

**However, the interventions considered are not perfect substitutes, and there are many instances where other interventions may be more effective than premium subsidies** in supporting a scheme. All existing sovereign risk insurance pools have received significant support in the form of technical assistance (mostly surrounding risk modelling and insurance brokerage) and capital provision. Supply side assistance such as this is typically necessary and effective to setup and support a risk pool. However, if the, narrowly defined, goal is how to effectively reduce premium levels for one or more specific (prospective) member countries, then other interventions are unlikely to be as effective as premium subsidies.

## 9.3 Findings for general disaster insurance

**Our stakeholder discussions indicated that the selection of an intervention mechanism such as premium subsidies should not be separated from the overarching questions of aim, purpose and effect of risk transfer.**

**Firstly, it is important to consider any form of intervention in the wider policy and country context.** The report describes a significant number of possible public interventions, some of which are potentially better suited and more cost effective in tackling the identified barriers to insurance development. If and how premium subsidies offer the most advantageous public intervention depends on the goal, and the underlying barriers and challenges for insurance. While affordability is often cited as a key barrier to disaster risk insurance, a broader review of the literature identifies a range of potential barriers to the development of private insurance markets for disaster risk insurance beyond affordability. Furthermore, it is important to note that whilst affordability is a potential barrier for households, it may not be the appropriate framing for considering the level of premiums for sovereign schemes, where political and fiscal constraints are more relevant.

**In order to assess whether premium subsidies are a valid tool to support the proposed insurance scheme, the barriers to the development of disaster insurance in that context must be identified and prioritised.** As premium subsidies are a simple concept, it is tempting to identify them as a solution to any number of barriers that may limit take-up. However, implementing subsidies may be inappropriate if they do not address the underlying barriers to insurance penetration. Premium subsidies should only be considered if the demand side barriers where premium subsidies can be effective are the key obstacles to insurance roll out. In particular, for schemes where supply side barriers such as lack of data or lack of technical capacity are the key barriers, premium subsidies are unlikely to be the appropriate intervention.

**Importantly, a public intervention should be considered in the context of possible cost-effective solutions that the engagement with the private sector could offer,** for example by avoiding costly in-house capacity building for modelling or structuring and instead focusing on those areas where no external expertise exists. An example is the in-country engagement of ARC, which has become an essential component of developing capacity and technical understanding.

One aspect that requires further investigation is the timing of intervention and duration of impact, e.g. a premium subsidy has a direct, but time-limited impact, while technical support is indirect, but with possibly wider implications beyond an insurance scheme.

## References

- Africa Regional Development, 2014. *African Risk Capacity - Business Case*, s.l.: Internal DFID document.
- Anon., n.d. s.l.: s.n.
- ARC, 2015. *ARC's Agenda for Action on Climate Resilience*, s.l.: s.n.
- ARC, 2015. *Drought Triggers ARC Insurance Payout In Sahel Ahead Of Humanitarian Aid*. [Online]  
Available at: [http://www.africanriskcapacity.org/documents/350251/844579/PI\\_Press+Release+Sa-hel+Payouts+ EN 22012015 vFinal CR.pdf](http://www.africanriskcapacity.org/documents/350251/844579/PI_Press+Release+Sa-hel+Payouts+ EN 22012015 vFinal CR.pdf)  
[Accessed 24 10 2016].
- ARC, 2016. *Contingency Planning*. [Online]  
Available at: <http://www.africanriskcapacity.org/en/issues/contingency-planning>  
[Accessed 25 10 2016].
- Arrow, K. & Lind, R., 1970. *Uncertainty and the Evaluation of Public Investment Decisions*, s.l.: The American Economic Review.
- Artemis News, 2012. *MultiCat Mexico Ltd. (Series 2012-1)*. [Online]  
Available at: [http://www.artemis.bm/deal\\_directory/multicat-mexico-ltd-series-2012-1/](http://www.artemis.bm/deal_directory/multicat-mexico-ltd-series-2012-1/)  
[Accessed 16 September 2016].
- Artemis News, 2016. *CCRIF adds \$8m to hurricane Matthew payouts for excess rainfall*. [Online]  
Available at: <http://www.artemis.bm/blog/2016/10/13/ccrif-adds-8m-to-hurricane-matthew-payouts-for-excess-rainfall/>  
[Accessed 13 October 2016].
- Artemis News, 2016. *Demand continues to affect secondary cat bond pricing in June*. [Online]  
Available at: <http://www.artemis.bm/blog/2016/07/26/demand-continues-to-affect-secondary-cat-bond-pricing-in-june/>  
[Accessed 16 September 2016].
- Ben-Shahar, O. & Logue, K., 2015. The Unintended Effects of Government-Subsidised Weather Insurance. *Regulation*, Issue Fall 2015, pp. 24-29.
- Berhane, G. et al., 2012. *Financial innovations for social and climate resilience*, s.l.: Report prepared for the World Bank.
- Bevan, D. & Adam, C., 2016. *Financing the Reconstruction of Public Capital after a Natural Disaster*, s.l.: The World Bank Group.
- Blagojevic, M., 2016. *Building Financial Resilience to Flood in Serbia*. Paris, GFDRR.
- Cai, J., de Janvry, A. & Sadoulet, E., 2011. *Social networks and the decision to insure: Evidence from randomized*, s.l.: University of California.
- Caribbean Development Bank, 2014. *Support to Haiti to Meet Commitment to Caribbean Catastrophe Risk Insurance Facility for the 2014-15 Hurricane Season*, s.l.: s.n.
- Caribbean Development Bank, 2016. *CDB approves USD3.5 million grant to pay Haiti's catastrophe risk insurance*. [Online]  
Available at: <http://www.caribank.org/news/cdb-approves-usd3-5-million-grant-pay-haitis-catastrophe-risk-insurance>  
[Accessed 14 September 2016].
- CCRIF, 2015. *Strategic Plan 2015-18*, s.l.: s.n.

- CCRIF, 2016. *CCRIF TO PAY ADDITIONAL US\$8 MILLION TO MEMBER GOVERNMENTS AFFECTED BY HURRICANE MATTHEW*. [Online] Available at: <http://www.ccrif.org/news/ccrif-pay-additional-us8-million-member-governments-affected-hurricane-matthew> [Accessed 24 10 2016].
- Clarke, D. et al., 2014. *Overview of Operational Framework (Impact Appraisal for Sovereign Disaster Risk Financing and Insurance Project: Phase 1)*, s.l.: DFID; The World Bank Group; GFDRR.
- Clarke, D. & Dercon, S., 2016. *Dull Disasters? How Planning Ahead Will Make a Difference*, s.l.: s.n.
- Clarke, D. & Mahul, O., 2011. *Disaster Risk Financing and Contingent Credit: A Dynamic Analysis*, s.l.: The World Bank (Policy Research Working Paper 5693).
- Clarke, D. & Poulter, R., 2014. *A Methodology for Calculating the Opportunity Cost of Layered Sovereign DRFI Strategies (Impact Appraisal for Sovereign Disaster Risk Financing and Insurance Project: Phase 1)*, s.l.: UKAid; The World Bank Group; DRFI Program; GFDRR.
- Clarke, D. & Wren-Lewis, L., 2013. *Learning from Lemons: The Role of Government in Index Insurance for Individuals*, s.l.: s.n.
- Clarke, D. & Wren-Lewis, L., 2016. *Solving Commitment Problems in Disaster Risk Finance*, s.l.: The World Bank (Policy Research Working Paper 7720).
- Climate Investment Funds (CIF) and Vivid Economics, 2015. *Building an evidence base on the role of insurance-based mechanisms in promoting climate resilience*, s.l.: s.n.
- ClimateWise, 2012. *The ClimateWise Compendium of Disaster Risk Transfer Initiatives in the Developing World*, Cambridge: ClimateWise.
- Cole, S. et al., 2009. *Barriers to Household Risk Management: Evidence from India*, s.l.: Federal Reserve Bank of New York (Staff Reports).
- Cole, S. et al., 2014. *NCBI*. [Online] Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3995033/#> [Accessed 18 September 2016].
- Cole, S., Gine, X. & Vickery, J., 2011. *How Does Risk Management Influence Production Decisions? Evidence from a Field Experiment*, s.l.: Harvard Business School (Working Paper 13-080).
- Cummins, J. D. & Mahul, O., 2009. *Catastrophe Risk Financing in Developing Countries: Principles for Public Intervention*. Washington DC: World Bank.
- de Janvry, A., del Valle, A. & Sadoulet, E., 2016. *Insuring Growth: The Impact of Disaster Funds on Economic Reconstruction in Mexico*, s.l.: The World Bank.
- de Janvry, A., Ritchie, E. R. & Sadoulet, E., 2016. *Weather index insurance and shock coping: Evidence from Mexico's CADENA program*, s.l.: World Bank.
- DFID, 2014. *African Risk Capacity Business Case*, s.l.: s.n.
- Dupas, P., 2011. Health Behaviour in Developing Countries. *Annual Review of Economics*, Volume 3, pp. 425-449.
- Emanuel, E., 2015. *CCRIF SPC Livelihood Microinsurance Project*. [Online] [Accessed 16 September 2016].
- GFDRR; World Bank, 2015. *From Design to Implementation*, s.l.: s.n.
- GFDRR, 2008. *Damage, Loss and Needs Assessment: Tropical Storm and Floods, Hadramout and Al-Mahara, Republic of Yemen*, s.l.: GFDRR.
- GFDRR, 2012. *Advancing Disaster Risk Financing and Insurance in ASEAN Member States: Framework and Options for Implementation*, s.l.: The World Bank.

- GFDRR, 2013. *Post Disaster Needs Assessment*. [Online]  
Available at: <https://www.gfdr.org/post-disaster-needs-assessments>  
[Accessed 14 September 2016].
- GFDRR, 2014. *Financial Protection Against Natural Disasters: An Operational Framework for Disaster Risk Financing and Insurance*, s.l.: The World Bank.
- GFDRR, 2015. *Pacific Catastrophe Risk Insurance Pilot - From Design to Implementation*, s.l.: The World Bank.
- GFDRR, 2015. *Supporting Resilient Recovery of Vanuatu after Cyclone Pam*, s.l.: GFDRR.
- Ghesquiere, F. & Mahul, O., 2010. *Financial Protection of the State against Natural Disaster*, s.l.: World Bank Policy Research Working Paper.
- GIIF, 2015. *Achievements in ACP Countries by Global Index Insurance Facility*, s.l.: s.n.
- Gine, X., Townsend, R. & Vickery, J., 2008. *Patterns of Rainfall Insurance Participation in Rural India*, s.l.: The World Bank.
- Greatrex, H. et al., 2015. *Scaling up Index Insurance for Smallholder Farmers: Recent Evidence and Insights*, s.l.: CGIAR.
- Gurenko, E., Lester, R., Mahul, O. & Gonulal, S. O., 2006. *Earthquake Insurance in Turkey*, s.l.: The World Bank.
- Hallegatte, S., 2011. *How economic growth and rational decisions can make disaster losses grow faster than wealth*, Washington, DC: World Bank.
- Hallegatte, S., 2014. *The indirect cost of natural disasters and an economic definition of macroeconomic resilience*, s.l.: s.n.
- Hazell, P. B., 1992. The Appropriate Role of Agricultural Insurance in Developing Countries. *Journal of International Development*, 4(6), pp. 567-581.
- Hill, R. V., Gajate-Garrido, G., Phily, C. & Dalal, A., 2014. *Using subsidies for inclusive insurance: Lessons from agriculture and health*, s.l.: s.n.
- Hill, R. V., Robles, M. & Ceballos, F., 2013. *Demand for Weather Hedges in India: An Empirical Exploration of Theoretical Predictions*, s.l.: IFPRI.
- Hinds, R., 2013. *Sovereign Insurance and Risk Finance Schemes for Disaster Management (GSDRC Helpdesk Research Report No. 903)*, Birmingham, UK: University of Birmingham.
- Hudson, P., Wouter, B. W. J., Feyen, L. & Aerts, J. C. J. H., 2016. Incentivising flood risk adaptation through risk based insurance premiums: Trade-offs between affordability and risk reduction. *Ecological Economics*, Volume 125, pp. 1-13.
- IFAD, 2010. *The Potential for Scale and Sustainability in Weather Index Insurance for Agriculture and Rural Livelihoods*, Rome: IFAD.
- Johns, J. & Fox, M., 2010. *Most countries fail to deliver on Haiti aid pledges*. [Online]  
Available at: <http://edition.cnn.com/2010/WORLD/americas/07/14/haiti.donations/>  
[Accessed 14 September 2016].
- Karlan, D., Osei, R., Osei-Akoto, I. & Udry, C., 2012. *Agricultural decisions after relaxing credit and risk constraints*, s.l.: ILO (Research Paper No. 23).
- Kellett, J. & Caravani, A., 2013. *Financing Disaster Risk Reduction: A 20 year story of international aid*, London and Washington DC: Global Facility for Disaster Reduction and Recovery (GFDRR) and the Overseas Development Institute (ODI).
- Kunreuther, H. & Michel-Kerjan, E., 2011. *A tWar with the Weather: managing large-scale risks in a new era of catastrophes*, s.l.: MIT Press.
- Kunreuther, H. & Michel-Kerjan, E., 2013. Managing Catastrophic Risks Through Redesigned Insurance: Challenges and Opportunities. In: G. Dionne, ed. *Handbook of Insurance (Second Edition)*. s.l.:Springer, pp. 517-546.

- Lane, M., 2004. *The Viability and Likely Pricing of "Cat Bonds" for Developing Countries*, s.l.: s.n.
- Linnerooth-Bayer, J. & Mechler, R., 2004. *Financing Disaster Risks in Developing and Emerging-Economy Countries*. Paris, Paper presented at OECD Conference "Catastrophic Risks and Insurance".
- Linnerooth-Bayer, J. & Mechler, R., 2009. *Insurance against Losses from Natural Disasters in Developing Countries*, s.l.: DESA Working Paper No. 85.
- Linnerooth-Bayer, J., Mechler, R. & Pflug, G., 2005. *Refocussing Disaster Aid*, s.l.: Science 309:1044–1046.
- Lloyds, 2011. *Lloyds Global Underinsurance Report*, s.l.: Lloyds.
- Mahul, O. & Cummins, J. D., 2009. *Catastrophe Risk Financing in Developing Countries*, s.l.: The World Bank.
- Mahul, O. & Stutley, C. J., 2010. *Government Support to Agricultural Insurance: Challenges and options for developing countries*. Washington DC: The World Bank.
- Mathewson, S. B., Causgrove, P., Krutov, A. & Frankowiak, S., 2011. *The National Flood Insurance Program: Past, Present... and Future..* s.l.: American Academy of Actuaries Flood Insurance Subcommittee.
- Mechler, R., 2004. *Natural disaster risk management and financing disaster losses in developing countries (Vol. 1)*, Karlsruhe: Verlag Versicherungswirtschaft.
- Mechler, R. et al., 2014. Managing natural disaster risk from climate extremes. *Nature Climate Change*, Volume 4, pp. 235-237.
- Mechler, R. et al., 2010. *Assessing the Financial Vulnerability to Climate-Related Natural Hazards*, s.l.: The World Bank.
- Munich Re, 2013. *GEO Risk Research, NatCatService*, Munich: s.n.
- Narube, S., 2015. *Pacific Catastrophe Risk Insurance Pilot (PCRIP): Establishment of a Management Entity*, s.l.: Secretariat of the Pacific Community.
- Narube, S., 2015. *PCRIP Consultation Report*, s.l.: Secretariat of Pacific Community.
- O'Donoghue, E. J., 2014. *The Effects of Premium Subsidies on Demand for Crop Insurance*, s.l.: USDA.
- Poole, L., 2014. *A Calculated Risk: How Donors Should Engage with Risk Financing and Transfer Mechanisms*, s.l.: OECD Publishing.
- Ranger, N. & Surminski, S., 2013. A preliminary assessment of the impact of climate change on non-life insurance demand in the BRICS economies. *International Journal of Disaster Risk Reduction*, 3(1), pp. 14-30.
- Schäfer, L., Kreft, S. & Zissener, M., 2016. *Key Messages: Implications of premium support on increasing the affordability of climate risk insurance solutions*, s.l.: MCII.
- Secretariat of the Pacific Community, 2015. *Pacific Resilience Program (PREP) - Regional Environmental and Social Management Framework (ESMF)*, s.l.: s.n.
- Siamwalla, A. & Valdes, A., 1986. *Should crop insurance be subsidized?*. s.l.:s.n.
- Smith, W., 2015. *Welcome and Opening Remarks*. Barbados, Caribbean Development Bank.
- Stutley, C., 2012. *Promoting Food Security in a Volatile Climate: The role of agricultural insurance*. Berlin, Financial Sector Symposium, Insurance for Development.
- Suarez, P. & Linnerooth-Bayer, J., 2011. *Insurance-related instruments for disaster risk reduction*, s.l.: UNISDR.
- Surminski, S., Bouwer, L. M. & Linnerooth-Bayer, J., 2016. How insurance can support climate resilience. *Nature Climate Change*, Volume 6, pp. 333-334.
- Surminski, S. & Oramas-Dorta, D., 2011. *Building effective and sustainable risk transfer initiatives in low- and middle-income economies: what can we learn from existing*

- insurance schemes?*, London: Centre for Climate Change Economics and Policy and Grantham Research Institute on Climate Change and the Environment.
- Surminski, S. & Oramas-Dorta, D., 2014. Flood insurance schemes and climate adaptation in developing countries. *International Journal of Disaster Risk Reduction*, Volume 7, pp. 154-164.
- Swiss Re, 2011. *Beijing makes breakthrough move in agricultural reinsurance*. [Online] Available at: [http://www.swissre.com/rethinking/food\\_security/beijing\\_makes\\_breakthrough\\_move\\_in\\_agricultural\\_reinsurance.html](http://www.swissre.com/rethinking/food_security/beijing_makes_breakthrough_move_in_agricultural_reinsurance.html) [Accessed 21 11 2016].
- Swiss Re, 2015. *Underinsurance of property risk: closing the gap*, s.l.: Swiss Re.
- Swiss Re, 2016. *Closing the Gap*, s.l.: Swiss Re.
- Szpiro, G., 1988. Insurance, risk aversion and the demand for insurance. *Studies in Banking and Finance*, 6(1), pp. 1-125.
- The California Earthquake Authority, 2011. *AFFORDABLE & AVAILABLE EARTHQUAKE INSURANCE: Underscoring the Need for Risk-Transfer Diversification*, s.l.: The California Earthquake Authority.
- The World Bank Treasury, 2011. *Insuring Against Natural Disaster Risk in Mexico*, s.l.: s.n.
- The World Bank, 2011. *KNOWLEDGE NOTE 6-2: CLUSTER 6: The economics of disaster risk, risk management, and risk financing: Earthquake Risk Insurance*, s.l.: The World Bank.
- The World Bank, 2014. *Coping with losses: Options for Disaster Risk Financing in Brazil*, s.l.: The World Bank.
- The World Bank, 2014. *Tonga to Receive US \$1.27 Million Payout for Cyclone Response*. [Online] Available at: <http://www.worldbank.org/en/news/press-release/2014/01/23/tonga-to-receive-payout-for-cyclone-response> [Accessed 15 September 2016].
- The World Bank, 2015. *World Bank Group Offers Support to Aid Vanuatu's Recovery*. [Online] Available at: <http://www.worldbank.org/en/news/press-release/2015/03/30/world-bank-group-offers-support-to-aid-vanuatu-recovery> [Accessed 15 September 2016].
- The World Bank, 2016. *Pacific Islands Prepare for a More Disaster Resilient Future*. [Online] Available at: <http://www.worldbank.org/en/news/press-release/2015/06/19/pacific-islands-prepare-for-a-more-disaster-resilient-future> [Accessed 13 October 2016].
- The World Bank, 2016. *Pacific Resilience Program (P147839)*, s.l.: The World Bank.
- The World Bank, 2016. *Progress Report on Mainstreaming Disaster Risk Management In World Bank Operations*, s.l.: The World Bank.
- UNU, 2016. *Forthcoming*, s.l.: United Nations.
- Vivid Economics, 2015. *Building an evidence base on the role of insurance-based mechanisms in promoting climate resilience*, s.l.: s.n.
- Warner, K. et al., 2013. *Innovative Insurance Solutions for Climate Change: How to integrate climate risk insurance into a comprehensive climate risk management approach*, Bonn: United Nations University Institute for Environment and Human Security (UNU-EHS).
- WFP-IFAD, 2011. *Weather Index-based Insurance in Agricultural Development - A Technical Guide*, s.l.: IFAD.



- Wilkinson, E., 2012. *Transforming disaster risk management: a political economy approach*, London: Overseas Development Institute.
- World Bank Group, 2014. *Financial Protection Against Natural Disasters: An Operational Framework for Disaster Risk Financing and Insurance*, Washington, DC: World Bank.
- World Bank Group, 2015. *Kenya Toward a National Crop and Livestock Insurance Program : Background Report*, Washington, DC: World Bank.
- World Bank, 2011. *Reducing Financial Vulnerability to Natural Disasters in the Caribbean: A Review of CCRIF's Operation Afters Its Third Season*, s.l.: s.n.
- World Bank, 2013. *Building Resilience : Integrating Climate and Disaster Risk into Development*, Washington DC: World Bank.
- World Bank, 2014. *Tonga to Receive US \$1.27 Million Payout for Cyclone Response*.  
[Online]  
Available at: <http://www.worldbank.org/en/news/press-release/2014/01/23/tonga-to-receive-payout-for-cyclone-response>  
[Accessed 24 10 2016].

## Appendix A Summary responses to ToR specific questions

Question	Literature Review and Compendium evidence	Analytical evidence
<p><b>Is affordability a dominant issue in reducing demand for insurance in developing countries, particularly at the meso and sovereign scales?</b></p>	<p>Overall yes, but inconclusive evidence for meso and sovereign level, indicating that a case-by-case assessment is needed:</p> <ul style="list-style-type: none"> <li>• For sovereign risk pools affordability is not a suitable perspective due to the political behaviour that influences decision to take out insurance</li> <li>• Affordability is widely seen as key factor when establishing value for money of insurance schemes, together with timing of pay-outs, for example when comparing insurance to ex-post aid.</li> <li>• Evidence for impact on insurance demand at sovereign and meso levels remains inconclusive.</li> <li>• Some high-risk developing countries face significant affordability challenges, as highlighted by the Pacific Island Countries</li> <li>• But there are cases where governments are willing and able to pay risk-based premiums,</li> </ul>	<p>Not investigated, but analysis makes the assumption that high premiums are a barrier for take-up of insurance.</p>
<p><b>How prominent are premium subsidies in current and past insurance schemes?</b></p>	<ul style="list-style-type: none"> <li>• 40% (2011) and 33% (2016) of current disaster risk transfer schemes use some form of premium subsidy to reduce cost of insurance and premium levels</li> <li>• Most prominent for developing countries in Latin America &amp; the Caribbean</li> <li>• Developed and developing countries commonly subsidise crop and other insurance. 70% of the subsidized schemes were agricultural insurance.</li> <li>• Most common form of subsidy was direct premium subsidies: A total of 12 schemes provide direct premium subsidies (9 at meso and 3 at sovereign level). However, only 2 meso schemes operated in 'low income' countries.</li> <li>• It can be inferred that poorer nations are less likely to subsidise meso-level insurance (due to fiscal fragility), which may in turn lead to lower demand due to affordability issues</li> <li>• Many of the 44 schemes that operated premium subsidies also used other subsidies (2016 Compendium)</li> </ul>	<p>Builds on existing evidence for the use of premium subsidies in a range of countries.</p>

Question	Literature Review and Compendium evidence	Analytical evidence
	<ul style="list-style-type: none"> <li>4 schemes provided only “other support” which is usually aimed at correcting market inefficiencies (e.g. government reinsurance due to lack of availability or high price of private reinsurance) (2016 Compendium)</li> </ul>	
<b>What structures do they take?</b>	<ul style="list-style-type: none"> <li>Subsidies may be universal or targeted. While universal subsidies are regressive public policy, unlike targeted subsidies they do not carry the risk of mis-targeting.</li> <li>32 of the 44 schemes providing premium subsidies were aimed at individuals. While a few were financed through donors (e.g. GIFF grants), most of them were financed by governments. (2016 Compendium)</li> <li>Another option is a tiered approach to subsidies so that they target low/middle income earners.</li> <li>Premium subsidies can be direct and in full or part, or indirect through reinsurance premium subsidies.</li> <li>They can be applied with a time limit, or phasing-out over time, or on a continuous basis.</li> </ul>	
<b>How were they targeted and what was their rationale?</b>	<ul style="list-style-type: none"> <li>Universal subsidies are available to all. To avoid abuse, they may be capped. Alternatively, subsidies can be targeted on the basis of location, category (e.g. age), means-testing or self-selection (e.g. insurance for work). Targeted subsidies aim to promote equity by making insurance affordable to the most vulnerable sections</li> <li>Governments provide premium support with the intention of limiting the post-disaster ‘contingent liability’ by substituting it with ex-ante premium subsidies</li> </ul>	
<b>Is there evidence that premium subsidies increase demand for insurance?</b>	<ul style="list-style-type: none"> <li>National agricultural insurance subsidies have helped to increase demand - China, India, Brazil and other nations have seen significant increases in demand after the introduction of generous subsidies. However, government schemes often suffer from leakages and inefficiencies and may achieve low volumes if designed/administered poorly.</li> <li>For sovereign insurance evidence suggests that premium subsidies increase uptake particularly for countries that would otherwise not be able to afford it (e.g. Haiti).</li> </ul>	<ul style="list-style-type: none"> <li>Growth of a scheme can reduce premium levels for all participants as risk is more diversified and economies of scale are achieved in operational costs. For example, ARC estimates its risk pooling has reduced premiums by about 50% compared to countries insuring individually (Africa Regional Development, 2014)</li> <li>For sovereign schemes, premium subsidies have been instrumental in the recruitment of countries. It is well documented that many countries currently participating in risk pools would not participate in</li> </ul>

Question	Literature Review and Compendium evidence	Analytical evidence
	<ul style="list-style-type: none"> <li>In the Compendium demand and subsidy data was available for only 24 schemes. In all schemes except one, the volume of business has grown. (Compendium 2016)</li> <li>However, the literature review is a more reliable source in studying the relationship between premium subsidies and demand. This is because comparisons in the Compendium are being drawn over long periods of time (almost a decade in some cases). So it is possible that demand may have increased due to reasons other than subsidies (e.g. increase in insurance awareness)</li> </ul>	<p>disaster insurance schemes without subsidy (Narube, 2015). For example, CCRIF discovered that about 61% of the participating countries would likely discontinue coverage in the event of fiscal constraint (CCRIF, 2015).</p>
<b>Is this demand sustained over time? What is the elasticity?</b>	<ul style="list-style-type: none"> <li>Limited evidence from Compendium – but can generate unsustainable costs for the government, and cutting subsidies may reduce demand (as seen in Brazil)</li> <li>Sovereign Insurance – Price elasticity may be reasonably high (e.g. 61% of CCRIF members have indicated that they would discontinue cover in the case of financial difficulty)</li> <li>National Schemes – shows negative, but greatly differing price elasticities for developing countries.</li> </ul>	<p>Time dynamics are not specifically analysed, but in principle the analytical results hold for any time period. The price elasticity of demand is difficult to quantify in the sovereign insurance context, as the decision making is politically driven and is not specifically analysed.</p>
<b>Apart from premium subsidies, what other options are available to governments to improve affordability by reducing premium costs?</b>	<p>A range of interventions can influence premium levels – aimed at supply, risk-level or demand side (see Table 5), for example:</p> <ul style="list-style-type: none"> <li>Insurance for Work (e.g. R4 IFW program)</li> <li>Improving efficiency of insurance delivery (e.g. TCIP)</li> <li>The different measures observed in the Compendium are covered in Table 7 (Options to reduce premium cost)</li> </ul>	<p>Analysis considers</p> <ul style="list-style-type: none"> <li>Donor capitalization</li> <li>Payment of reinsurance costs</li> <li>Technical assistance</li> <li>Payment of operational costs</li> <li>Risk reduction</li> </ul>
<b>What are their advantages and disadvantages?</b>	<p>See Table 7 (Options to reduce premium cost)</p> <p>The increases in CCRIF and ARC membership suggest that sovereign risk pooling has proven effective in increasing uptake (premium savings being a primary reason).</p>	<p>See Table 7 (Options to reduce premium cost)</p>
<b>Beyond reducing premium costs, what other approaches exist to increase</b>	<ul style="list-style-type: none"> <li>Examples include use of time-sensitive vouchers, mandate compulsory insurance/risk reduction, financial education/risk-awareness campaigns</li> <li>Risk pooling has helped maintain insurance demand from the more vulnerable nations (e.g. PCRIP, ARC)</li> </ul>	<ul style="list-style-type: none"> <li>Donor capitalization: Growth of a scheme can reduce premium levels for all as risk is more diversified and economies of scale are achieved in operational costs. However, while capital injections can reduce premium levels, there is no direct evidence linking</li> </ul>

Question	Literature Review and Compendium evidence	Analytical evidence
<p><b>demand for and uptake of insurance and how successful are these when compared to premium cost reductions?</b></p>		<p>the provision of capital to new countries joining sovereign insurance schemes.</p> <ul style="list-style-type: none"> <li>• Payment of reinsurance costs: Growth of a scheme can reduce premium levels for all as risk is more diversified and economies of scale are achieved in operational costs. Although reinsurance subsidies can reduce premium levels, there is no direct evidence linking the provision of reinsurance subsidies to new countries joining sovereign insurance schemes.</li> <li>• Technical assistance: Covering costs of model development etc. is, in some sense, equivalent to providing a capital grant of size equal to the TA costs. Improved risk modelling, product design and brokerage can significantly reduce premiums. For example, parametric triggers can significantly reduce operating costs. However, in some cases improved modelling may expose higher risk levels, requiring higher premiums (note, this still represents an improvement as the low premiums would have otherwise led to unpayable claims).</li> </ul>
<p><b>What is the evidence on their relative cost-effectiveness?</b></p>	<p>Limited evidence on cost-effectiveness</p>	<ul style="list-style-type: none"> <li>• Payment of operational costs: Operational costs result in a direct mark-up above actuarially fair premiums. These costs can be particularly high in developing countries due to relatively high distribution costs and administration costs. However, for sovereign disaster insurance schemes, the operational costs tend to be relatively low compared to premium levels, which are mostly driven by expected loss. For example, in 2014 the CCRIF's total operating expenses were \$700k compared to a total premium income of approximately \$19m (around 3.6% of premium income).</li> <li>• Risk Reduction: Physically reducing risk levels can be effective in reducing the premiums insurers need to charge to households because risk reduction measures reduce the damage incurred during a loss</li> </ul>

Question	Literature Review and Compendium evidence	Analytical evidence
		<p>event. However, in a sovereign setting premiums are mostly used to fund immediate disaster response needs and pay outs are far smaller than total damages (see section 6.1). Premiums are typically index based and pay outs determined against the index, hence the only actuarial factor determining premiums is the probability of a disaster occurring. Hence risk reduction measures, whilst valuable in their own right, are unlikely to significantly affect premium levels at a sovereign scale.</p>
<p><b>What is the evidence on the relative benefits of different approaches to designing premium subsidies (including their duration) and the impacts of withdrawal of subsidies?</b></p>	<ul style="list-style-type: none"> <li>• R4 Insurance for Work increased uptake to 34% (much higher than other micro-schemes)</li> <li>• Several other issues are highlighted in Table 13 (Different Type of Premium Subsidies).</li> </ul>	<p>One aspect that requires further investigation is the timing of intervention and duration of impact, e.g. a premium subsidy has a direct, but time-limited impact, while technical support is indirect, but with possibly wider implications beyond an insurance scheme.</p>
<p><b>If premium subsidies are used, can the potential negative impacts be reduced?</b></p>	<p>The potential negative effects are indicated in Table 13. They can be mitigated through:</p> <ul style="list-style-type: none"> <li>• Encouraging recipients to incorporate insurance as part of a wider disaster management strategy</li> <li>• Efficient methods of targeting such as self-selection to avoid abuse by the richer customers</li> <li>• Use of innovations such as 'time-sensitive discount vouchers' to promote risk awareness</li> <li>• Ensuring financial sustainability through declining subsidies or other mechanisms</li> <li>• Investing in correct market inefficiencies before resorting to subsidies to minimise distortions</li> </ul>	<p>Proposes four ways of designing premium subsidies to reduce unintended consequences:</p> <ul style="list-style-type: none"> <li>• Make premium subsidies conditional on minimal DRM requirements;</li> <li>• Preserve a link to risk level to minimise moral hazard;</li> <li>• Provide a relative subsidy adjusted to the needs of the insured;</li> <li>• Provide a relative subsidy adjusted to the needs of the insured;</li> <li>• Instead of annual ad hoc provision, future subsidy levels can be planned.</li> </ul>

## Appendix B Methodology applied for the Compendium update 2016

As part of this project, we have updated the Compendium of disaster risk initiatives which was compiled in 2012 (ClimateWise, 2012). This section describes how we went about the update, and its results. We took the following approach:

- Initial investigations were performed by revisiting the web resources and published documents previously used to compile the compendium document. Any updates from this search were recorded.
- Beyond this, we used standard online search techniques to identify the relevant literature available on the progress of the schemes including the latest academia, press releases, company announcements and reports relating to the each of the respective schemes.
- We used information from the literature review and online search to identify new schemes for inclusion.
- Information provided by other members of the consortium or gained from stakeholder interviews has been included, where possible.
- We focused particularly on schemes receiving subsidies (direct or otherwise).

We updated the “Key Words” section of the Compendium, to enable effective filtering of schemes using current information, and added a new column to this section to indicate whether the scheme operates premium subsidies.

We did not alter any of the existing textual information in the Compendium, so that it is possible to compare the 2012 status with the current status. We have noted our updates as follows:

- All additions are prefixed with “\*\*Update 2016\*\*” and are in red, to aid identification.
- For schemes where no further information has been located, the “Current Status” has been updated to include “\*\*Update 2016\*\*: No additional information found”.
- We investigated any schemes that had been discontinued in 2012 to see if any reason for the closure could be found. Any such information was included as an update
- The source documents for any new information have been included under “2016 updates”.
- If there was a lack of new information, but no indication on the closure of a scheme was found, we did not assume that the schemes had closed, but instead recorded that no updated information was found.
- Specific provider/administrator updates are published only occasionally. All updates record the specific year the information relates to.
- Information was unavailable for many schemes, which underlines the importance of engaging with insurers, donors and NGOs to gather further information and provide a more accurate picture.

We encountered a number of difficulties during the updating process, including:

- No comprehensive studies on the overall landscape of disaster risk insurance have been published since the original Compendium was created in 2012. The regional reports that are available lack the necessary depth.
- A number of the resources originally noted under "Information sources (articles, reports, etc.)", "Web pages/ web documents" and "Web sites and contacts for further information" are often blank or relate to generic government or company websites and not specific schemes

- There were some instances where translation of foreign documents prevented further analysis.

Given the limitations in the publicly available information, we recommend that the information in the updated Compendium is reviewed by the schemes themselves to ensure it is accurate.



## Appendix C Results of the Compendium update 2016

We identified 12 schemes that were not included in the original version of the Compendium, and for which sufficient information was available for them to be added as part of the update:

- Mozambique Index-based Agricultural Insurance (IAM)
- Rwandan Index-based Agricultural Insurance
- Zambian Index-based Agricultural Insurance
- Senegal - Drought Index-Insurance Pilot for Groundnut Farmers
- Earthquake Index Insurance - Indonesia
- Index-based Crop Insurance Project (Sri Lanka) - Sanasa Insurance Co. (SICIL)
- Mutuelle Agricole Marocaine d'Assurance (MAMDA)
- Uruguay – Livestock index insurance
- Agriculture and Climate Risk Enterprise (ACRE) - Kilimo Salama
- R4 Rural Resilience Initiative
- Colombia – Insurance of public buildings
- African Risk Capacity

Seven of these were started before 2013. Seven are in Sub-Saharan Africa, with one in each of the East Asia & Pacific; South Asia; Middle East and North Africa; and Latin America and the Caribbean.

The following themes emerged as a result of the update:

- None of the existing discontinued schemes showed any indication of being restarted, or of being replaced.
- Some schemes had been merged into another structure (e.g. Index weather crop insurance in Kenya became a part of ACRE, Africa)
- None of the existing schemes had expanded to incorporate new perils, income groups (development classification), adaptation/risk-reduction activities or extent of risk covered
- Some of the existing schemes had expanded into new regions and countries. Often, this change was coupled with a new scheme name to reflect the change
- A key challenge that was noted for the schemes that have remained operational was a limited uptake/demand, which may indicate a lack of awareness or affordability issues.
- Information on the volume of insurance was the most commonly available information. Many of the schemes that did not experience uptake/demand issues showed signs of growth.
- Many schemes indicated some form of subsidies (particularly for agricultural insurance). It was not often possible to ascertain the funding source for these subsidies
- No information was found on risk reduction/mitigation techniques being introduced by existing schemes

## Appendix D Terms of Reference

### Terms of Reference: Understanding the role of publicly funded premium subsidies in disaster risk insurance in developing countries.

1<sup>st</sup> August 2016

Developing countries and the insurance industry have often called for development agencies to subsidise premiums for disaster risk insurance, in order to increase the uptake of these instruments in managing disaster risks. This project aims to synthesise, further develop and assess the evidence base on premium subsidies to inform development policy and practice.

#### **Scope of work**

Direct premium subsidies are one approach to reducing premium costs. They are common in both developed and developing countries for insurance schemes that target poorer or more vulnerable people who may otherwise not be able to afford insurance. They are often paid for by the public sector to increase access to insurance for those at most risk. By 'direct' premium subsidies here we mean, for example, a government paying 10% of premiums, or fixing insurance premiums at a reduced rate. The project particularly concerns sovereign and meso-level insurance (and related risk financing instruments) but is also interested in micro-insurance and others.

In this project, DFID would like to assess the evidence for and against direct premium subsidies as a mechanism for increasing demand for disaster risk insurance in developing countries, and compare this with other mechanisms for increasing demand aim. Evidence will be gathered through literature review and new analyses of past insurance schemes in developed and developing regions.

The main questions for this project are:

1. Is affordability is a dominant issue in reducing demand for insurance in developing countries, particularly at the meso and sovereign scales?
2. How prominent are premium subsidies in current and past insurance schemes (developed and developing countries), what structures do these take, how were they targeted and what was their rationale?
3. Is there evidence that premium subsidies increase demand for insurance, and is this demand sustained over time? Under what circumstances and by how much (what is the elasticity)? Is demand sustained even when subsidies are removed?<sup>4</sup>
4. What other approaches have been used by governments previously to reduce premium costs and increase affordability?
5. What are the advantages and disadvantages of publicly funded direct premium subsidies versus other approaches to reducing premium costs, for example subsidised capital or reinsurance (or others)? What evidence is available to support this analysis?
6. Beyond reducing premium costs, what other approaches exist to increase demand for and uptake of insurance and how successful are these when compared to premium cost reductions? What is the evidence on their relative cost-effectiveness?
7. What is the evidence on the relative benefits of different approaches to designing premium subsidies (including their duration) and the impacts of withdrawal of subsidies?

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<sup>4</sup> What happens to this demand if/when subsidies are reduced or removed? Is there a certain duration that is needed to ensure recipients build up their awareness of the value of insurance such that they are willing to allocate their own scarce resources to funding premiums? To what extent is this driven by affordability, experience of a disaster/payout etc?

8. If premium subsidies are used, can the potential negative impacts (e.g. loss of behavioural incentives) be reduced?

The main questions of the project concern insurance-related instruments in developing countries, but the project may involve analyses of developed country insurance schemes where this can be informative.

### **Background**

DFID's disaster risk insurance initiatives share the following objectives:

- A. Building capacity to plan for and manage disaster risks
- B. Accelerating disaster response and economic recovery, ensuring the most efficient and effective use of public funds, whether national public funds or international aid.
- C. Building financial infrastructure for quantifying and pricing risks.
- D. Creating a commercial market and/or correcting information and market structure failures for disaster risk financing solutions.

Direct premium subsidies are often proposed as an approach to increasing demand for insurance in developing countries through increasing affordability. But, direct premium subsidies are not the only way of reducing the costs of premiums. Cummins and Mahul [2] discusses "market-enhancing insurance subsidies", such as technical assistance, public goods (e.g. data and models) and regulatory reforms, and "social insurance premium subsidies" (including direct premium subsidies), where the public sector pays a proportion of the premium cost. DFID's programme typically involve a combination of technical assistance and seed funding (capital and reserves).

Much of the evidence to-date on direct premium subsidies comes from the developed world or from micro-insurance programmes which are often single-country pilots operating at the individual farmer/ householder level. Beyond affordability, there are a number of possible arguments for premium subsidies:

1. There are incentives for countries to under-invest in insurance. Where foreign aid is expected after a disaster, there is less incentive for countries to invest in pre-disaster measures. Subsidies can in principle counter-balance this so that an efficient amount of insurance is bought.
2. There is an efficiency and effectiveness argument for donors to make part-payment for risk finance insofar as this will substitute for their de facto liability for foreign aid and is a more efficient way of donors providing assistance than "traditional" response modalities.
3. Where disasters create externalities beyond the country insured (e.g. pandemics), it may be efficient for a donor to subsidise premiums
4. An advantage of premium subsidy is that it can be targeted at certain disaster severities (e.g. the most severe disasters), whereas subsidised financing (e.g. as in ARC) cannot easily be targeted.

Note that arguments 1-3 are neutral between premium subsidy and other forms of subsidy.

Other evidence suggests that direct premium subsidies may in practice only exacerbate the failures and assure that efficiencies in fixing underlying problems will be slowed. For example, experience in the US agricultural sector in the 1980s and 90s suggests that subsidies can create moral hazard and adverse selection. Cummins and Mahul [2] describe that premium subsidies can distort price signals and crowd out the private sector.

### **Methodology**

The applicant will provide an outline methodology for the study as part of the bid. It is envisaged that the methodology will include:

- Comprehensive literature review on disaster risk insurance subsidies in general and premium subsidies in particular, addressing the eight main questions.
- Synthesis of a database of existing insurance and related disaster risk financing schemes in developing countries with data on the role of public versus private sector, premium subsidies and other pertinent characteristics. The project should build upon the existing LSE-ClimateWise database (link below). The database need not be completely comprehensive, but should include major schemes and those that are instructive in answering the questions of this study (including developed country schemes as instructive).
- To assess the nature of unaffordability - provide evidence on the relative costs of insurance in developed vs. developing countries (focus on sovereign and meso-scale insurance, for similar types), and breaking down the drivers for any differential in costs (e.g. lack of diversification, start-up costs etc.).
- Interviews with key instructive insurance schemes to better understand their policies on premium subsidies and other relevant design factors, the rationales for these and their perspectives (and evidence) on how these affected insurance demand and uptake and overall success of the scheme.
- Interviews (and/or small workshop) with a small number of development partners involved in insurance in developing countries, including DFID, World Bank and BMZ, to understand their policies, perspectives and experience on the issues of this project.
- Interviews with other key stakeholders and experts, possibly including Ministries of Finance or disaster risk management, experts in the insurance industry or academia etc.
- Working with a small number of insurance schemes to generate quantitative analyses of the relative impact of different designs of interventions on premium costs (e.g. capital, reinsurance etc.), and quantitative and qualitative analyses of the likely costs (direct and opportunity) and benefits of providing premium subsidies. *N.B. Africa Risk Capacity had already expressed an interest in being involved in the study.*
- Based on the above, mapping of evidence on premium subsidies according to ability to address DFID objectives (A-D above). The mapping should analyse sovereign, private sector and other forms of insurance separately.

The work is expected to be largely desk-based but will involve interviews. Travel expenses can be included in the proposal but are expected to be well justified and minimal as applicants should use telephone, videoconference etc where possible.

The successful applicants will initially produce an inception report outlining the methodology (including identifying which insurance schemes will be the focus of the analyses and proposed interviewees), which will be agreed with DFID.

### **Outputs/Deliverables and Timeline**

The expected outputs will be agreed in the inception phase but are expected to include:

Type	Specifications	Deadline
Kick-Off Meeting	Discussion on the scope of work	22 <sup>nd</sup> August
Inception Report	Outline proposed methodologies and initial findings from the literature review	2 <sup>nd</sup> September
Interim Report	Approx. 30 pages, including: - Complete literature review with introduction to premium subsidies, introduction to the role	19 <sup>th</sup> September

	of the public vs. private sector in enabling insurance and increasing demand, uptake. - Theoretical framework for analysing and comparing approaches to reducing costs - Results from initial data collection and analyses (inc. draft insurance database).	
Insurance database	Updated database of characteristics of insurance in developing countries	30 <sup>th</sup> September
Draft Final Report	Approx. 30 pages (+ annexes if needed) Complete report of the project including full record of analyses and conclusions	7 <sup>th</sup> October
Final Report	Finalised report, enhanced based on DFID and peer review comments.	28 <sup>th</sup> October
Policy Brief	One or more short briefing papers on the findings of the project - 4 pages	4 <sup>th</sup> November
Presentation	Presentation of findings to DFID (or alternatively a workshop if appropriate).	4 <sup>th</sup> November
Launch	Launch of the insurance database	4 <sup>th</sup> November

The team will be expected to remain in regular contact with DFID and will meet following each milestone to discuss feedback, approve outputs and confirm plans for the next set of activities and milestones.

### **References:**

The project should draw upon, amongst others, the following resources:

- [1] LSE/ClimateWise compendium database of insurance in developing countries (Oramas-Dorta, Ranger and Surminski, 2012): <http://www.cisl.cam.ac.uk/business-action/sustainable-finance/climatewise/pdfs/climatewise-compendium-of-disaster-risk-transfer.xlsm>
- [2] Catastrophe Risk Financing in Developing Countries: Principles for Public Intervention (Cummins and Mahul, 2009)
- [3] Government Support to Agricultural Insurance: Challenges and Options for Developing Countries (Mahul and Stutley, 2010)

### **The Successful Team:**

We envisage that the research team will include the following characteristics and expertise:

- Excellent awareness of the disaster risk financing and insurance landscape, including existing links with key experts and stakeholders.
- Experience in research or other analyses related to policy and/or implementation of disaster risk financing and insurance in developing countries. It is desirable to have track record of publication in this area and recognised technical expertise in insurance analyses.
- Desirable to have a track record of analyses/publication on issues concerning one or more of the following: insurance demand; premium subsidies; insurance financing structures; role of the public sector.
- Recognised ability to provide an objective view in this area.
- Track record of excellent communication of complex policy issues.

**Contact:**

The main contact will be Nicola Ranger of the Department for International Development (DFID)

**Costs**

It is anticipated that the work will require around 45 days' input.

## Appendix E Stakeholder Engagement details

The stakeholder consultation took place throughout the research period. We had eight semi-structured interviews with two insurance representatives, one broker, two donor agency officials, one NGO expert and two academics. Additional phone conversation and discussions at conferences as well as email exchanges were conducted with representatives of other relevant organizations. Below is a list of all stakeholders that we engaged with:

- Allianz
- Munich Re
- MCII
- Swiss Re
- RMS
- BMZ
- ARC
- CCRIF
- Flood Re
- IVM / Amsterdam University
- World Bank
- Centre for Global Development