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SYNTHESIS OF KEY FINDINGS FROM COLOMBIA AND SENEGAL

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By Gisela Campillo, Michael Mullan, Lola Vallejo (OECD)

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ABSTRACT

Developing countries are disproportionately affected by the rising trend of losses from climate-related extreme events. These losses are projected to continue to increase in future, driven by climate change and the accumulation of people and assets in high-risk areas. Effective climate change policies are needed to reduce the accumulation of risk, combined with instruments and tools to help retain, share or transfer financial losses if an extreme event occurs. These tools and instruments, collectively known as financial protection, can help people cope with the impacts of climate-related disasters, reduce costs of recovery and reconstruction, and encourage risk reduction. Linking financial protection and climate adaptation in development planning and policy has the potential to increase the resilience of affected communities.

This paper uses case studies of Colombia and Senegal to examine how countries are using financial protection as part of their approaches to managing climate risks. The paper identifies emerging priorities for development co-operation providers in supporting financial protection against climate risks.

JEL Classification: F35, G22, H84, O19, Q54

Keywords: adaptation, climate change, insurance, risk management

RÉSUME

Les pays en développement sont affectés de manière disproportionnée par la hausse des pertes liées aux événements climatiques extrêmes. On s'attend à ce que ces pertes continuent d'augmenter à l'avenir, en raison du changement climatique et de l'accumulation de personnes et des bâtiments dans les zones à haut risque. Des politiques efficaces de réduction des effets du changement climatique sont nécessaires pour maitriser l'accumulation de risques, combinées à des instruments et des outils pour aider à conserver, partager ou transférer les pertes financières en cas d'événement extrême. Ces outils et instruments, appelés collectivement «protection financière», peuvent aider les populations à faire face aux conséquences des catastrophes liées au climat, à réduire les coûts de reconstruction et à encourager la réduction des risques. Lier la protection financière et l'adaptation au changement climatique dans la planification des politiques de développement a le potentiel d'accroître la résilience des communautés affectées.

Sur la base d'études de cas en Colombie et au Sénégal, ce document examine comment les pays utilisent la protection financière dans le cadre de leurs approches de gestion des risques climatiques. Ce document identifie les priorités pour l'appui des apporteurs de coopération pour le développement à la protection financière contre les risques climatiques.

Classification JEL: F35, G22, H84, O19, Q54

Mots clés: adaptation, assurance, changement climatique, gestion des risques

FOREWORD

This working paper on "Financial Protection and Adaptation to Climate Change" has been a product of the joint DAC-EPOC Task Team on Climate Change and Development Co-operation. It was reviewed by the Environment Policy Committee's Working Party on Climate, Investment and Development and the Development Assistance Committee's ENVIRONET.

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For more information on the OECD's work on climate change adaptation, please visit: www.oecd.org/env/cc/adaptation.htm

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ABBREVIATIONS AND ACRONYMS

ANACIM	National Institute of Civil Aviation and Meteorology
ARC	African Risk Capacity
Cat DDO	Catastrophe Deferred Drawdown Option
CCRIF	Caribbean Climate Risk Insurance Facility
CEPS	Research, planning and monitoring committee
CNAAS	National Agricultural Insurance Company
CNSA	National Committee for Food Security
CRS	Creditor Reporting System
CPEIR	Climate Public Expenditure and Institutional Review
CREWS	Climate Risk Early Warning Systems Program
DAC	Development Assistance Committee
DNP	Department of National Planning
ECLAC	Economic Commission for Latin America and the Caribbean
FINAGRO	Fund for Financing the Agricultural Sector
FONDEN	Natural Disaster Fund
GFDRR	Global Facility for Disaster Reduction and Recovery
GNI	Gross National Income
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
LIC	Low Income Country
MHCP	Ministry of Finance and Public Credit
NAIS	National Agricultural Insurance Scheme
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
ODA	Official Development Assistance
PSE	Plan for an Emerging Senegal
PNACC	National Plan for Adaptation to Climate Change
POTs	Territorial Management Plans
SISCLIMA	National Climate Change System

EXECUTIVE SUMMARY

There is a need to implement integrated approaches to managing climate risks, bringing together climate change adaptation with financial protection. Developing countries are disproportionately affected by the rising trend of losses from climate-related extreme events. These losses are projected to continue to increase in future, driven by climate change and the accumulation of people and assets in high-risk areas. Effective climate change policies are needed to reduce the accumulation of risk, combined with instruments and tools to help retain, share or transfer financial losses if an extreme event occurs. These tools and instruments, collectively known as financial protection, can help people cope with the impacts of climate-related disasters, reduce costs of recovery and reconstruction, and encourage risk reduction. Linking financial protection and climate adaptation in development planning and policy has the potential to increase the resilience of affected communities.

Development support providers are increasingly supporting countries' efforts to improve the management of climate-related risks with increased funding and new initiatives. These efforts are being given further impetus by the Paris Agreement on climate change, Sustainable Development Goals and the G7 InsuResilience initiative.

This paper uses case studies of Colombia and Senegal to examine how countries are using financial protection as part of their approaches to managing climate risks. The following recommendations for development co-operation providers have emerged from this analysis:

- Expertise from development co-operation providers in gathering, analysing and interpreting data, and providing platforms to share knowledge and improve the evidence base can help countries to define their financial protection strategies. In Senegal, for example, the creation of a national registry of social protection beneficiaries also provides an opportunity to improve the targeting of financial protection payments.

- Technical support for undertaking assessments of the financial impacts of climate-related disasters can help create an evidence base that generates political will to improve the management of climate-related risks. In Colombia, an analysis of the 2010-2011 La Niña floods provided momentum for creating a new system for Disaster Risk Management. This system included the creation of a domestic Adaptation Fund, strengthened insurance coverage for new road concessions and the creation of a national financial protection strategy.

- Providers can support key agencies, such as the finance ministry, in designing and implementing financial protection tools for climate risks. This includes capacity building, knowledge transfer and advisory services, all of which can act as catalysts for change. In Senegal, for example, capacity development for the planned Civil Protection Agency could facilitate the streamlining of resources, the assessment of gaps, and ultimately lead to a better co-ordinated disaster risk reduction policy.

- Providers should strengthen their in-country co-ordination to avoid duplication of efforts and capitalise on their respective areas of expertise. In Colombia, a long-standing partnership between the finance ministry, the Swiss Development Co-operation agency and the World Bank, with support from other partners, has resulted in a sophisticated financial protection strategy. In Senegal, separate programmes led by OXFAM/World Food Programme and USAID are focusing on small farmers' resilience to drought and have shared meteorological data to contribute to the scaling-up of insurance for poor farmers.

1. Introduction

Financial losses from extreme events are continuing to increase, driven in part by the rising concentration of people and assets in areas exposed to climate-related disasters. Climate change is already starting to change the frequency and severity of some types of extreme events, such as coastal and inland flooding and drought. Developing countries are affected disproportionately by this trend (OECD, 2009). Despite having contributed relatively little to the problem of climate change, developing countries are projected to bear approximately four-fifths of the costs caused by a 2°C increase in average global temperature (World Bank, 2010). Climate change will increase the scale of losses from extreme climate events, but also increase uncertainty about the future. The combination of climate change and rapid socio-economic development means that historical information has become less reliable as a guide to understanding the risks of future extreme events.

Climate change and variability contribute to poverty, reducing incomes and increasing the risks faced by the poor. The impacts of climate change will be uneven, with the IPCC finding: "the majority of severe impacts are projected for urban areas and some rural regions in sub-Saharan Africa and Southeast Asia" (Olsson et al, 2014). Informal settlements in urban areas are often located in risky areas, while the buildings in these settlements are highly vulnerable to extreme events. Meanwhile, agricultural incomes are extremely sensitive to weather patterns; both are affected by changes such as declining precipitation and extreme events such as droughts.

Ambitious mitigation to reduce the severity of climate change is essential. This should be supported by enhanced and co-ordinated action across different policy agendas to address climate-related risks, and reduce their impacts on the most vulnerable groups (G20/OECD, 2012; GIZ, 2015):

- Disaster risk management and climate change adaptation to tackle the impacts of current climate extremes and support the transition to a future climate;

- Financial protection (the use of financial tools to retain, transfer and share risk) to address the financial consequences of risks that materialise.

This paper uses case studies of Colombia and Senegal to explore how financial protection tools can be used as part of an integrated strategy to manage climate-related risks, alongside adaptation and disaster risk management. It summarises the emerging lessons from these countries and draws out initial conclusions on how development co-operation can best support this process. These case studies are based on interviews with government officials and key stakeholders, expert workshops held in each country and desk research. The case studies were guided by the following research questions:

- What are the rationales for and expected outcomes of using climate-related financial protection tools, based on experience in the selected countries and/or regions?

- How are mechanisms for financial protection best placed in a broader set or continuum of adaptation and disaster risk management policies within a developing country?

- Based on experience to date, what does the evidence suggest are the key results, factors driving success and remaining challenges for effective integration of financial protection mechanisms?

- How can financial protection mechanisms influence the incentives of public and private sector actors to implement risk reduction measures?

- What evidence has emerged on the role of donors in developing, financing and implementing these measures?

Box 1. Glossary of Key Terms

Adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects

Disaster risk management is the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.

Financial protection is the use of strategies and tools to manage the financial impact of extreme events, ensuring adequate capacity to manage and reduce the costs of climate risk, thereby reducing the financial burden and economic costs of climate risks and enabling rapid recovery in economic activity

Resilience is the capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

Risk is the combination of the probability of an event and its negative consequences if it occurs.

Vulnerability is the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility (or exposure) to harm and lack of capacity to cope and adapt.

Sources: G20/OECD (2012); IPCC (2014); UNISDR (2009); OECD (2014a).

Even with enhanced adaptation and mitigation efforts, it will not be cost-effective, or even technically feasible, to eliminate climate risk (OECD, 2014b). Financial protection tools – such as insurance or social protection instruments – have the potential to reduce the vulnerability of people, assets and economies to negative shocks. Improving the quality and availability of financial protection tools has benefits both before and after an extreme climate event. Before an adverse event, it can increase productivity, as it provides more security to pursue more profitable, but riskier, opportunities such as purchasing agricultural inputs on credit. After an event, it can help to protect livelihoods by reducing the need to engage in erosive coping strategies, such as selling productive assets or withdrawing children from education (Linnerooth-Bayer and Hochrainer-Stigler, 2014; IPCC, 2012). Box 2 provides evidence of the scale of these *ex-post* benefits at the macroeconomic level.

Adaptation has the potential to reduce the costs of financial protection by reducing exposure and vulnerability to climate-related disaster and slow onset risks. A study examining a number of Caribbean countries found that risk reduction measures could cost-effectively avert up to 90% of projected losses in 2030 under a high climate change scenario (CCRIF, 2010). Meanwhile, considering adaptation in the development of financial protection strategies can make those strategies more effective at managing climate risks in the medium and longer term. This provides an opportunity to leverage the growing volumes of climate finance and avoid duplication of effort.

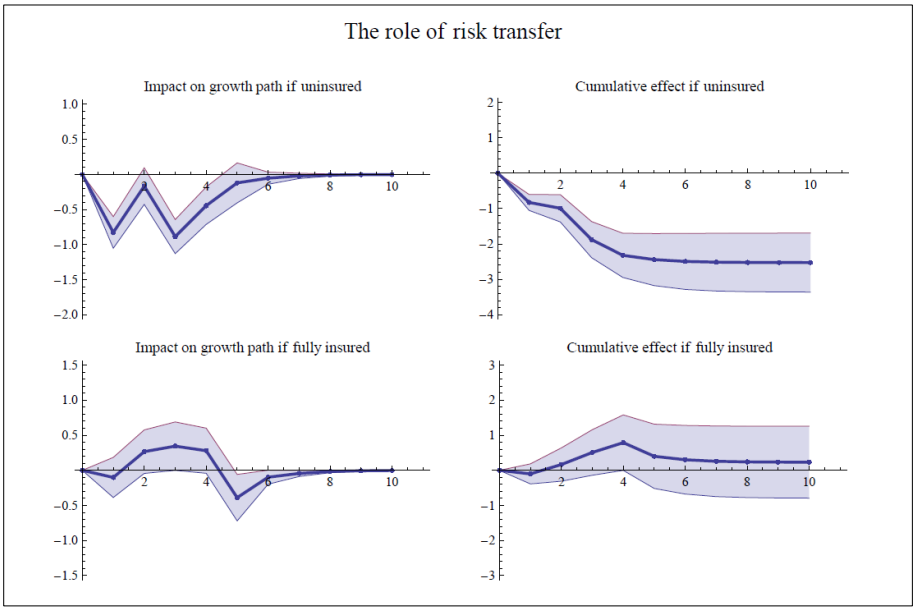
Financial protection measures can support adaptation by encouraging risk reduction, but existing mechanisms are not always designed to do so. At a minimum, financial protection can support adaptation by not distorting incentives, for example by ensuring that insurance premiums are based on the underlying risk. Some initiatives have gone beyond this by integrating financial protection with risk reduction. The R4 Rural Resilience Initiative in Ethiopia aims to strengthen food and income security by allowing those

insured to partially pay their premiums by engaging in risk reduction activities (World Bank, 2013). However, these integrated approaches remain unusual, with a survey of flood insurance mechanisms in developing countries finding that few of them make a link between risk transfer and risk reduction (Surminski and Oramas-Dorta, 2013).

Box 2. Impact of insurance penetration on economic growth

Insurance penetration is strongly linked to GDP per capita. In the period between 2005 and 2014, insurance covered less than 10% of disaster losses in developing countries, but approximately 51% of all losses in high-income countries (OECD, 2015b). Low-income countries have limited insurance uptake due to limited financial markets, lack of familiarity with insurance products and high transaction costs relative to the sums insured. Traditional insurance mechanisms are not well-suited to the needs of the poorest and most vulnerable in managing their exposure to climate risks (Poole, 2014).

Von Peter et al. (2012) analysed a panel dataset covering 203 countries and territories between 1960 and 2011 to identify the impact of natural catastrophes on economic growth. They find that insured events do not affect long-term output (i.e., GDP growth does not diverge significantly from its pre-disaster trend), while uninsured events create a cumulated loss in output over 10 years of 2.3% or more (see below).



Note: The left-side panels show the deviation of real economic growth from its trend due to a typical disaster event for an economy with no private insurance coverage and an economy with full insurance coverage. The right-side panels show the cumulative deviation of GDP from trend over 10 years for each type of economy.

Source: von Peter et al (2012).

Even when financial protection succeeds in encouraging people to reduce risks relating to climate variability, this does not necessarily mean that it is good for adaptation. Climate change means that the risk profile will change over time, but financial protection tends to focus attention on the management of current risks. For example, insurance premiums only reflect current risk exposure. This can be a problem if measures to address current risks increase vulnerability in the longer term. For example, inappropriate reforestation can deplete groundwater supplies (IEG, 2012). The creation of fixed flood defences in some

areas may ultimately increase vulnerability by encouraging development in places that will be unsuitable under a changed climate.

In practice, developing countries are at an early stage in considering how financial protection can be linked with adaptation planning. As an illustration, out of a sample of 18 national adaptation plans or strategies, 10 countries mentioned the use of financial tools to manage exposure to disaster risks[1]. However, all but one of these was narrowly focussed on the use of agricultural insurance rather than financial protection more generally. The two policy agendas tend to be managed by different areas of government, with the environment ministry often leading the work on adaptation and the financial protection strategy being led by the finance ministry. These administrative divides at the national level also extend to the international level, where they are governed by separate processes.

Bilateral and multilateral development agencies are already playing important roles in providing financial resources, capacity building and technical assistance to support financial protection and climate change adaptation. Development co-operation providers have increased their support to climate change adaptation in the past years, reaching almost USD 19 billion in 2014 (OECD, 2016a). They have also contributed to financial protection initiatives, ranging from sovereign risk pools such as the African Risk Capacity (ARC)[2] and the Caribbean Climate Risk Insurance Facility (CCRIF) to mechanisms targeting households, such as the R4 Rural Resilience Initiative. The G7 InsuResilience initiative aims to increase coverage by 400 million people by 2020. This initiative provides financial support for mechanisms including ARC and CCRIF However, despite the progress made to date, development agencies' engagement in financial protection is still in the "early days" (Poole, 2014). There is, therefore, scope for enhanced co-operation to strengthen resilience against climate risks, through better-integrated support for financial protection and climate adaptation.

2. Finance for climate change adaptation and disaster risk management

Analysis of public finance flows provides an indication of the degree of integration between climate change adaptation and disaster risk management. It is not currently possible to track public finance for financial protection.

Development co-operation providers are supporting both disaster risk management and adaptation efforts in developing countries. Data from the OECD Development Assistance Committee's (DAC) Creditor Reporting System (CRS) provides an indication of trends in this support, including the degree of integration between policy agendas. The DAC CRS provides data on all support from DAC members down to the level of individual activities. The Rio Marker on Adaptation identifies activities within that database for which adaptation was either the principal or a significant motivation for undertaking the project or programme. It now also includes activity level data reported by multilateral development banks and climate funds for 2013 and 2014 (MDBs. 2015)[3].

There is, however, no equivalent marker to identify expenditure on the management of natural hazards, including those related to climate change. Instead, spending allocated to sectors linked to disaster risk management can provide an indication of trends in levels of support. The CRS sector classifications

[1] The countries were: Bangladesh, Burkina Faso, Brazil, Cambodia, Cameroon, Costa Rica, Ethiopia, India, Indonesia, Jamaica, Kenya, Malawi, Mexico, Nigeria, Peru, Philippines, Vanuatu and Zambia.

[2] The African Risk Capacity (ARC) was established as a Specialized Agency of the African Union to help member states strengthen their capacities to better plan, prepare and respond to the effects of extreme weather events.

[3] There are some differences between the methodologies used to track bilateral and multilateral adaptation finance flows.

chosen for this report are: disaster prevention and preparedness, flood prevention and protection, and reconstruction relief and rehabilitation (collectively, the DRM sectors). These sectors were chosen because they are most likely to capture relevant activities.

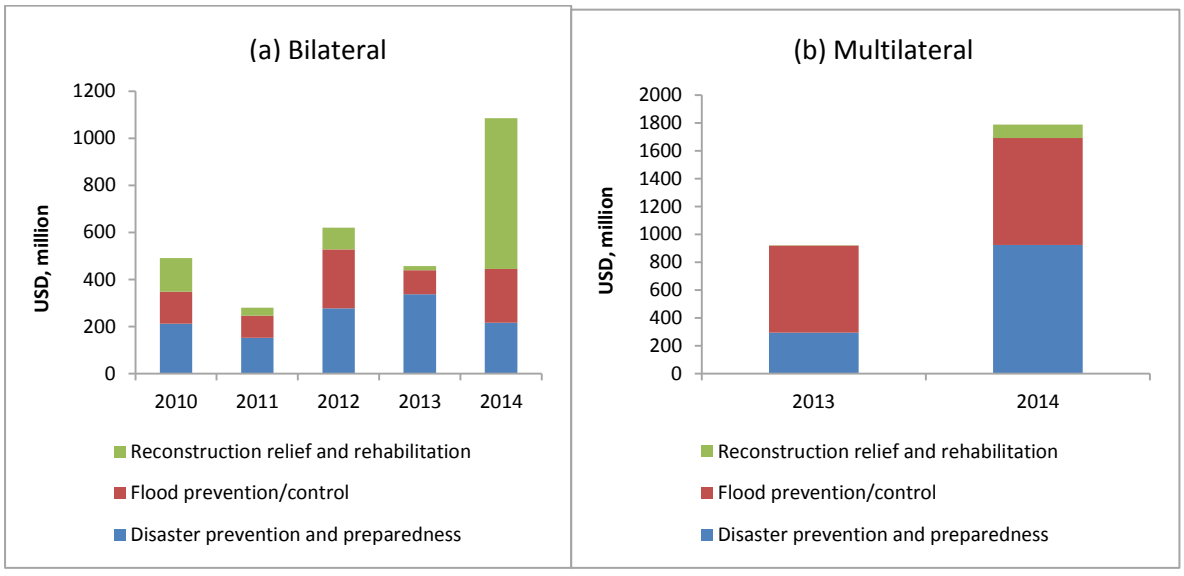
Identifying and delineating relevant finance streams is an evolving challenge. Methodological difficulties and data gaps mean that the estimates below should be treated as indicative, with further research needed to provide a more detailed picture. For example, projects that aim at financing resilience to climate risks may be captured under a range of different sectors, including health, education, or water management, rather than the sectors linked to disaster risk management. Given that activities to help address climate-related risks may fit under different sector codes, a detailed analysis at the activity level would be required to capture all relevant flows.

Integration of adaptation and disaster risk management

The analysis below provides an estimate of resources targeting the DRM sectors that were also designed with an adaptation objective, acknowledging that not all relevant activities might be identified. The methodology used for this purpose analyses the share of finance flowing to the three key disaster risk management sectors (identified above) that are also "marked" as climate change adaptation, from both bilateral and multilateral providers.

There is more overlap between adaptation and DRM expenditure by multilateral donors, than is the case for bilateral donors. On average, bilateral providers have allocated USD 10 billion per year between 2010 and 2014 in adaptation-related ODA commitments, from which USD 580 million per year were directed to the three key disaster risk management sectors (5.7% of the total adaptation-related resources). By comparison, multilateral providers have provided an average of USD 5 billion per year between 2013 and 2014 for adaptation, of which USD 1.35 billion per year (24%) supported the same key sectors. While adaptation-related disaster risk prevention and preparedness resources from bilateral providers slightly decreased between 2013 and 2014, they increased for flood prevention and control, and more so for reconstruction, relief and rehabilitation. For multilaterals, amounts increased between the two years (see Figure 1).

Figure 1. Bilateral (a) and multilateral (b) adaptation-related development finance for key selected sectors



Source: authors based on OECD DAC CRS.

Table 1 shows the degree of integration of adaptation-related finance in the DRM sectors for bilateral flows. Although the results are very heterogeneous among the providers, flood protection and control is the most integrated, with 93% of projects marked as adaptation-related between 2010 and 2014. Of all finance flowing to disaster prevention and preparedness, 37% was marked as adaptation-related while for reconstruction relief and rehabilitation, 23%[4] was marked as adaptation. For bilateral providers 66% of the resources are provided in form of grants and 34% in form of loans. For multilateral providers 96% of the adaptation-related resources in the key sectors are in form of loans and only 4% are provided as grants. Bilateral and multilateral providers are heavily concentrated, with Japan being the most active by providing over 52% of the resources, followed by the EU institutions and Germany. Among the multilateral providers, the World Bank Group is dominant, accounting for 89% of the resource flows.

Table 1. Bilateral adaptation-related ODA as a share of total ODA flowing to key sectors

Key sectors	2010	2011	2012	2013	2014	Average
Disaster prevention and preparedness	42%	30%	35%	42%	34%	37%
Flood prevention/control	85%	83%	97%	96%	97%	93%
Reconstruction relief and rehabilitation	15%	4%	16%	3%	52%	23%

Source: derived from OECD DAC CRS.

This analysis of adaptation-related finance in the DRM sectors only provides a general indication of the degree of integration of climate change adaptation and disaster risk management development finance flows. To provide an in depth-analysis, the project-level data of activities recorded in the DAC CRS for Colombia and Senegal were examined to identify adaptation expenditure linked to disaster resilience objectives. Specifically, a keyword search was undertaken to identify relevant activities within the whole set of adaptation finance, across all sectors. The keywords were: risk, resilience, catastrophes, insurance, and disaster. The results of this search are discussed in their respective case studies.

Limited evidence on domestic resource flows

Domestic resources will be essential for managing the risks that arise from climate change, but few countries track these finance flows. All countries were requested to provide information on their expenditure on disaster risk management within their Hyogo Framework progress reports. However, few have done so, while the lack of a common methodology means that results are not comparable between countries. There is even less data available on domestic expenditure on adaptation, although some country studies have shed light on this issue. For example, a Climate Public Expenditure and Institutional Review (CPEIR) of Bangladesh found that 4% of government spending was linked to climate adaptation in 2014 (UNDP, n.d.).

Kellet et al (2014) examines efforts in disaster risk reduction finance across five countries (Indonesia, the Philippines, Mexico, South Africa and Costa Rica). Based on this, and a literature review, it concludes that very little comparable evidence can be found and more research is needed in this area. Examples where data are available include the Philippines where standalone projects totalling USD 800 million were recorded and Indonesia with USD 900 million of recorded projects.

[4] The degree of integration for multilateral flows is not relevant, as the climate component does not allow for a similar comparison of full amounts of adaptation-related projects vs. non adaptation-related projects.

3. Overview of financial protection tools

In addition to the support for adaptation and disaster risk management described above, development co-operation providers are helping to improve the range and quality of financial protection tools. Table 2 maps the range of tools currently available to their potential users. This section provides context for the case studies by providing an introduction to the range of tools available, their characteristics and emerging insights on their use.

Table 2. Selected financial protection tools by type and potential user

	Potential users of financial protection tools		
Tool	National or sovereign level	Private sector - commercial activities (i.e. commercial operations, insurable property owners or business)	Households and informal economy
Savings or reserve funds	✓	✓	✓
Insurance mechanisms	✓	✓	✓
Catastrophe bonds	✓		
Post-disaster credit / Contingent credit	✓		
Ex-ante social protection			✓
Humanitarian relief and compensation payments			✓
Remittances			✓

Source: Adapted from (G20/OECD, 2012).

These tools work most effectively as part of integrated strategies to reduce risks, which combine appropriate mixes of financial protection tools (GFDRR, 2014a). For example, social protection programmes for poor households create liabilities for the government, which can then be offset using tools such as sovereign insurance (World Bank, 2016b). In that example, the existence of social protection programmes enables the benefits of improved management of sovereign financial liabilities to flow to the households who need them most.

Providers, in collaboration with governments, private sector insurers and farmers', among others, have an essential role to play in supporting the development of individual tools, as well as the development of overall strategies. At the project level, modalities have included technical assistance and direct financial support to cover setup costs and thereby improve affordability. Providers can also indirectly facilitate these mechanisms through support for reforms to strengthen the regulatory and policy environment, improve provision of weather data, or expand access to financial services. At the strategic level, donors' technical support, financial resources and convening power can support integrated approaches to managing climate risks.

Financial protection against climate risks for national governments

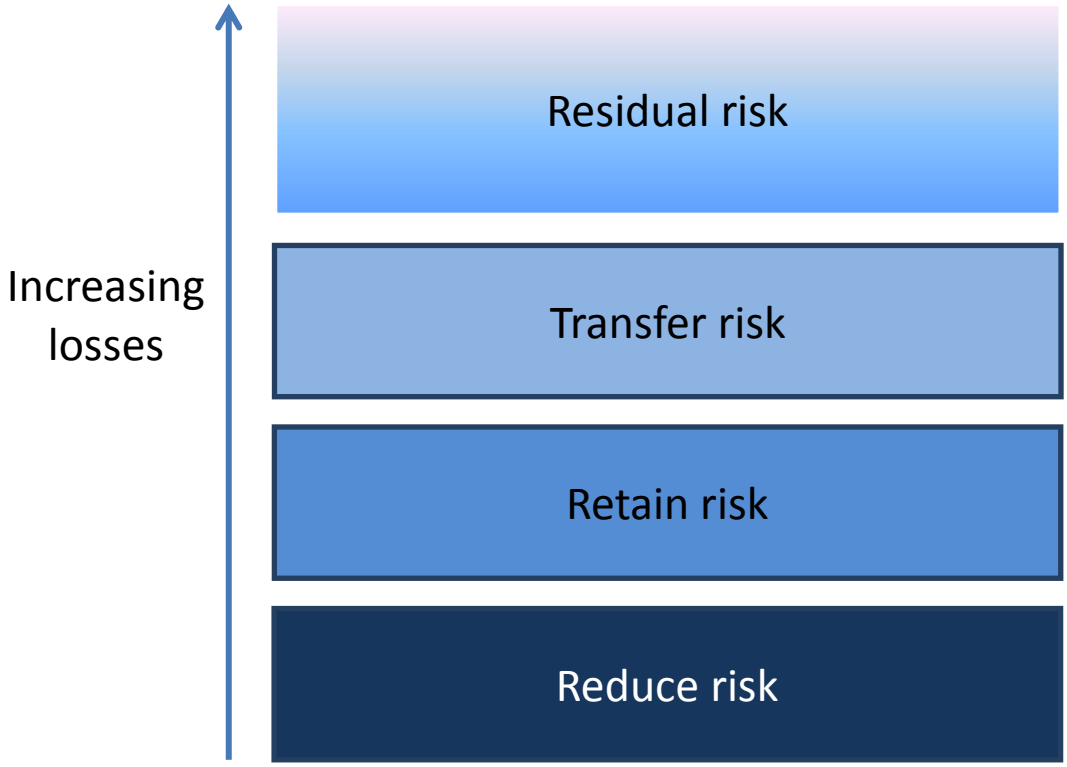
Financial protection at the sovereign level is based on the principle of risk layering, with different combinations of tools used depending on the potential size of losses. Risk reduction is used to prevent the occurrence of very frequently occurring events. As the scale of losses increases, risks are retained and then

transferred. The largest, least frequent events cannot be fully managed ex ante. Instead, they are met through ex post mechanisms such as budget reallocation, tax increases and international humanitarian relief (OECD/G20, 2012). The layering principle is illustrated in Figure 2 below.

Strategies for financial protection can help to assess and manage climate risks, reducing the need for unplanned, emergency funding that may arrive late or in insufficient quantity. An illustration of the limits of emergency funding is provided by Becerra et al. (2012). They find that the average flow of ODA to affected countries increases by 18% after a disaster, but this increase only covers on average 3% of total estimated damages from that disaster.

Contingency funds, or dedicated budgets for disasters, are a commonly used mechanism for retaining risks. They are best suited for the financial management of frequently occurring, but low-impact events (Mechler, 2005). This is important given that these events can have large cumulative impacts on people's livelihoods, even if they are small when viewed in isolation. Countries that have adopted contingency funds for climate risks have also taken measures to insulate the resources from political pressure for reallocation. These include moving the fund out of the main budget, with the provision of a clear legal framework for how those funds can be used (Phaup & Kirschner, 2010). For example, the budget allocated to Mexico's FONDEN operates as a separate trust. When losses exceed the allocated budget, the additional costs can be met from ex post measures (e.g. additional taxes, budget reallocation) or through the other financial protection instruments described below.

Figure 2. Risk layering



Source: Adapted from OECD/G20 (2012).

Development co-operation providers have pioneered the use of prearranged credit lines to provide rapid access to funding following an extreme event. This is a form of risk retention, as the credit has to be repaid. Contingent credit lines can be arranged in advance, maintained for a small fee and then made available when a specific event occurs (such as a national declaration of a state of emergency). Examples include the World Bank's Catastrophe Deferred Drawdown Option (Cat DDO), IADB's Contingent Credit Facility for Natural Disaster Emergencies and JICA'S SECURE programme (GFDRR, 2014a). One of the main benefits of these credit lines is that resources are available almost immediately following the triggering event and are usually provided at more favourable terms than commercial loans. They can also serve as an incentive for improved planning, as countries are required to have a risk management plan in place as a condition for eligibility. Even credit lines that are small relative to the scale of potential losses from disasters can help to cover immediate costs, while longer-term arrangements are made. Pre-existing credit lines to manage disaster risks have been used in countries including Colombia, Costa Rica, Guatemala, the Philippines and the Seychelles. However, they are only suitable for countries with sufficient fiscal space to take on additional debt. As such, they may not be suitable for low income countries.

Risk transfer instruments, such as insurance, can provide a valuable tool for managing the consequences of less-frequent but larger events. These are particularly relevant in developing countries, where the government's assets and revenues tend to be limited and concentrated, and where losses can be much larger in proportion to GDP. The use of formal risk transfer arrangements also increases transparency, as the covered liabilities become visible as budgetary outlays. Provided that premiums are linked to the underlying risks, the benefits of investments in risk reduction also become visible. Lastly, there is the potential to benefit from the third-party's expertise in risk management.

Insurance of public sector assets, such as buildings, is mandatory in many developing countries, although this does not necessarily translate into adequate or effective cover. Beyond the insurance of specific assets, sovereign-level instruments can provide resources to manage a broader range of risks. Governments can purchase reinsurance from international markets to address the consequences of extreme events. For example, the Costa Rican government combines self-insurance of public assets with a reinsurance contract to cover the risk of unlikely, but high cost events (Ghesquiere and Mahul, 2010). Insurance can be provided on the basis of actual losses (indemnity) or if a specified event occurs (parametric insurance). Parametric insurance is quicker to disburse and avoids moral hazard, but has the downside that the payment received may not be closely correlated with the losses incurred.

Countries can also diversify their exposure to extreme events through risk pooling. The pool takes on the risk profile of the region, combining individual risks into a calculable risk for the group. This enables governments affected by a disaster to rapidly access finance that will enable them to start recovery efforts (Linerooth-Bayer and Hochrainer-Stigler, 2014). Risk pools can be designed to encourage investment in risk reduction and ensure their own financial sustainability. The use of a parametric trigger avoids the risk of moral hazard because the payment received does not depend on the size of the loss. Current risk pools have proactive mechanisms in place to develop capacity for risk management by the pool's members. Reinsurance is used to manage the possibility that the pool is exhausted because too many countries are eligible for payments in one year.

Catastrophe bonds transfer risks to capital markets, providing an alternative or complement to the use of reinsurance. These bonds are generally issued by companies, but are slowly expanding to sovereign issuers. In essence, these bonds pay investors an above market return, but if a pre-defined event (e.g. measured by a parametric threshold such wind speed or rainfall) occurs the investor will lose either the interest, or the interest and the principal from the bond (Suarez and Linnerooth-Bayer, 2011). The implementation of catastrophe bonds requires sophisticated capacity and good data, which limits their application to higher-income countries. In 2012, Mexico launched a USD 315 million catastrophe bond

that provides coverage against earthquakes and hurricanes, building on the success of the 2009 MultiCat Mexico transaction. The Pacific Alliance (Chile, Mexico, Colombia and Peru) countries are currently developing a catastrophe bond, initially for earthquake risk but with the potential to extend coverage to other hazards.

Financial protection against climate risks for the private sector

Financial protection tools can help businesses to manage their exposure to climate risks, including damage to buildings and business disruption. Agricultural insurance is a particularly important tool in the context of climate change. The specific challenges faced by smallholders and subsistence farmers are addressed in the following section on households.

In the absence of financial risk management measures, farmers manage their exposure to climate and market risk by limiting the use of purchased inputs and diversifying production to include crops that are less climate-sensitive (World Bank, 2016). In principle, the availability of insurance should provide more efficient means of managing these risks. For example, insured farmers may use more credit for agricultural inputs (such as fertiliser or improved seeds), as they are more confident about being able to repay the loan in the event of unfavourable growing conditions. They can also maximise average output by specialising in their most productive crop.

However, the uptake of commercial, indemnity-based (i.e. payouts are made on the basis of actual losses incurred) agricultural insurance is very low in developing countries. In general, only the largest farms purchase cover. In Peru, for example, only 0.7% of cultivated land is covered by commercial insurance (GIZ, 2016). In contrast, 43% of German agricultural land is covered by commercial insurance on an unsubsidised basis (Diez-Caneja et al, 2009). The underlying reason for low penetration in developing countries is that the comparatively small size of insured sums and proportionately high administration costs for processing claims. A further constraint is that the potential for moral hazard means that some risks, such as pest damage, are not insurable (Hazell, 1992).

Index-linked insurance is increasingly being used to overcome these challenges and expand coverage to small and medium-sized farms. The largest of these is the India's National Agricultural Insurance Scheme (NAIS), which provides coverage to 25 million farmers (Mahul et al., 2012). In addition to this large-scale programme, there are a large number of smaller initiatives. The IFC's Global Index Insurance Facility, largely focussed on agricultural insurance, has supported insurance for 600 000 people. These programmes have provided valuable insights, but total coverage remains limited.

A continuing challenge with index-linked insurance has been basis risk, which is the possibility that the payments received by the policyholder do not match the losses that they have incurred. This can be desirable, if it rewards farmers who have undertaken measures to reduce risks. However, in general, the existence of basis risk makes the insurance less attractive, because potential customers are less certain that their losses will be covered. Pilot programmes can be used to address the two underlying causes of basis risk: weaknesses in product design and insufficiently detailed weather data (IFC, n.d.). Careful design of the index can help to calibrate payments to potential losses. Technological innovation, in particular the use of remote sensing, has potential to provide geographically detailed information in the absence of weather stations (Hochrainer-Stigler et al, 2014).

Development co-operation providers are increasingly focussing on supporting the basic financial market infrastructure for insurance rather than providing subsidies. Improvements in the market infrastructure can then help to expand coverage and bring down the cost of insurance. Methods include data collection, regulatory reforms and client education and outreach (GFDRR, 2011a). Subsidies can help to increase coverage, but even heavily subsidised programmes can struggle to achieve scale. Moreover, the

payment of subsidises can distort production decisions and create significant costs for governments and donors. Any subsidies need to be carefully design and complemented with other types of support.

Financial protection against climate risks for poorer households and the informal sector

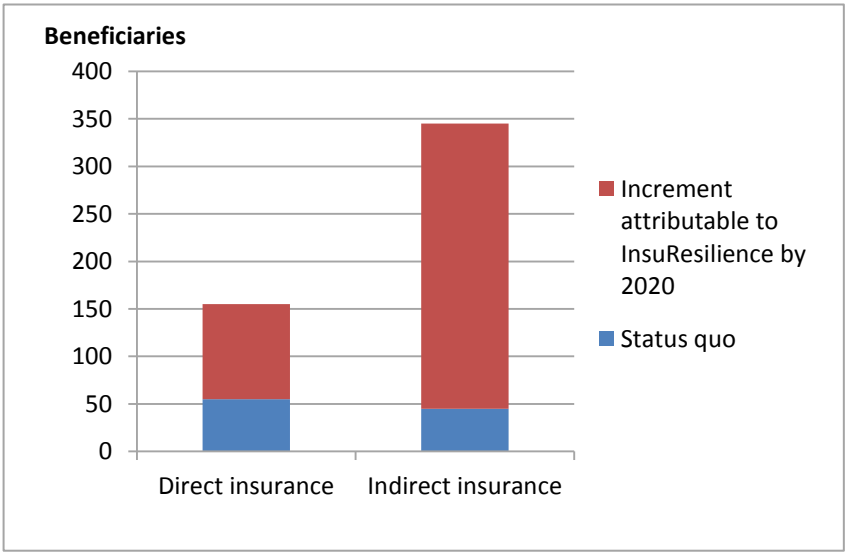
Poor households often have limited ability to reduce their vulnerability to climate risks. For example, they may lack the resources to invest in risk-reduction measures, such as raising their dwellings to reduce flood risk. Even in good years, this vulnerability slows the advance towards higher income, which is a key determinant of adaptive capacity. In bad years, the lack of mechanisms to address extreme events can lead to a negative cycle, as households are forced into taking measures that ultimately erode their earning potential. Governments, with the support of donors, can support resilience by improving the variety, quality and suitability of instruments available for managing climate risks. A major international initiative on this is detailed in Box 3. Social protection is particularly important tool for supporting poorer household's capacity to manage the financial consequences of extreme events (World Bank 2016b).

Micro-insurance has been developed to meet the needs of households by offering coverage for small amounts of losses at low premiums. Providers of micro-insurance aim to keep costs down through innovations in the cover offered, the delivery channels used or the use of technology (e.g. mobile payments). Pilots of index-based micro-insurance providing low-income households with financial coverage for climate risks have been carried out in Bolivia, Malawi, India, Mongolia, Sudan, and Ethiopia, among others (Surminski and Oramas-Dorta, 2013).

Box 3. The G7 InsuResilience Initiative

The G7 Climate Risk Insurance Initiative (InsuResilience) was launched at the G7 summit in Elmau in June 2015, highlighting the importance of financial risk transfer concepts, particularly for emerging and developing countries. The initiative aims to increase coverage of both direct and indirect insurance for climate risks for over 400 million people in developing countries by 2020. At COP22 in November 2016, the G7 countries increased their commitment to USD 550 million (up from the USD 420 million announced at COP21) of public funds. This funding is enabling the delivery of a rapid action package, which includes support for ARC, CCRIF and the rollout of a Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI).

In the short term, InsuResilience focusses on expanding and capitalizing existing indirect insurance facilities and initiatives such as the African Risk Capacity (ARC), the Pacific Catastrophe Risk Assessment & Financing Initiative (PCRAFI) and the Caribbean and Central American Catastrophe Risk Insurance Facility (CCRIF). The initiative plans on expanding its coverage of countries and products over time. In the medium to long term, the focus will shift to providing direct insurance and working closely with the private sector. GIZ and KfW, under the mandate of BMZ, are playing a leading role in promoting this initiative, in close collaboration with Munich Re. GIZ is establishing a secretariat to accelerate the implementation of the Initiative, under the framework of their program on Disaster Risk Reduction and Adaptation to Climate Change.



Source: GIZ (2016), Climate Risk Insurance Initiative for strengthening resilience of poor people in vulnerable countries (progress report), http://library.wur.nl/WebQuery/adaptationfutures2016?referaat=%22PR8.9%22.

Experience gained from implementing insurance programmes to date has revealed some significant challenges in expanding coverage (Wolfrom and Yokoi-Arai, 2015; Surminski and Oramas-Dorta, 2013; Surminski et al, 2015):

- Coverage of insurance for climate risks remains low among developing countries and, particularly, vulnerable groups within those countries.
- Affordability remains a challenge for particularly vulnerable groups of people, with the expansion of coverage being constrained by the availability of domestic and external public funding.

- Micro-insurance for climate risks has yet to demonstrate commercial viability, with extension of coverage dependent upon availability of external resources.
- Reducing basis risk[5] remains a challenge with index-linked products, particularly where weather data is patchy or incomplete.
- Links with proactive risk reduction remain weak in many insurance mechanisms in developing countries.
- Pilot programmes often have to address the lack of basic market infrastructure for insurance, such as data to help set premiums, payment systems and raising awareness about the value of insurance.

Insurance is only one potential element of a risk management strategy. Social protection measures encompass a range of mechanisms that transfer income or assets to the poor, including cash transfers, asset transfers, public works schemes and input subsidies (Bene et al., 2014). In contrast to insurance, eligibility for social protection is based on need, rather than the payment of a premium. Social protection programmes can work in concert with insurance provision: for example, in Kenya, there is a layered system for farmers, which provides social protection for the most vulnerable farmers, subsidised premiums for poorer farmers and unsubsidised insurance for those with higher incomes (World Bank, 2015).

Sufficient, targeted and scalable social protection can help poor and vulnerable households to manage their exposure to climate risks without having to engage in erosive coping strategies (Davies et al, 2009). It can strengthen resilience over time by improving households' adaptive capacity and preventing them from falling into poverty. Heltberg et al (2009) emphasise the value of having mechanisms in place to quickly adjust coverage of existing mechanisms, so that the assistance can flow to the people and areas affected. This can be achieved through the development of socio-economic registers, which allow recipients to be readily identified following a disaster. Works programmes can use self-targeting, where the payment of a below-market wage restricts participation to those otherwise unable to find employment (World Bank, 2016b).

More generally, development interventions to support financial inclusion have the potential to reinforce people's ability to manage climate risks. Savings, borrowing and remittances are widely used strategies for managing exposure. For example, when Agrawala and Carraro (2010) analysed micro-finance portfolios in Bangladesh, they found that 70% of the borrowing was related to climate change adaptation. Meanwhile, mobile payment mechanisms have been found to reduce transaction costs, and also support households' ability to share risks (CGAP, 2014).

4. Colombia case study

The 2010-2011 La Niña floods led to significant reforms to the management of natural hazards in Colombia. The floods caused damages of USD 6 billion and affected 3.2 million people nationally, while some regions experienced losses equivalent to 15% of their GDP (ECLAC, 2012). It resulted in strengthened efforts to reduce the drivers of risk, improve financial management and adapt to climate change.

Although this event was extreme, it occurred against a backdrop of rising recorded losses over time and growth in the underlying drivers of vulnerability. Colombia's geography leaves it highly exposed to

[5] Basis risk exists when the insurance payout received by the policyholder does not reflect the actual losses that they have suffered. This is likely to occur when there is a weak correlation between the chosen index (e.g. precipitation in a given area) and losses (e.g. loss of agricultural output by the policy holder).

climate-related hazards, including floods and landslides. This is compounded by deep-seated socio-economic challenges, including high income inequality: in 2013, average GDP per capita was just over USD 8 000, but 6% of the population were living on less than USD 1.90 (PPP) per day (World Bank, 2016a). Armed conflict has weakened state capacities in some regions, and driven people from rural areas to informal urban settlements in risk prone areas. In addition, environmental degradation, including persistent, large scale deforestation is contributing to the severity of extreme events, increasing their impacts on people and infrastructure.

Shortcomings in the design and implementation of land-use planning instruments rendered them ineffective in stemming the accumulation of vulnerability. The World Bank (2012a) estimates that 12% of the population live in areas that are highly exposed to flood risk. Meanwhile, there has been a lack of resources for investment in risk reduction, particularly in small, remote or less developed municipalities. Other major policy challenges have included capacity constraints, the pressure of accommodating displaced populations and misalignments between administrative boundaries and natural borders.

The weather in Colombia is heavily influenced by the La Niña / El Niño cycle. During a La Niña event, increased rainfall is mainly associated with floods and landslides, which in turn can lead to crop failure, livestock losses, food shortages, increased vector-borne diseases, respiratory diseases, and food and water borne diseases. El Niño by contrast creates a water deficit, which in conditions of vulnerability can be translated into drought, reduced access to potable water, increased food and water-borne diseases, diarrheal diseases, land degradation and desertification, food shortages, and forest fires (Bello, 2011).

Climate change is projected to affect weather trends in Colombia. Based on historical weather data, IDEAM has identified the following broad trends arising from climate change from this cycle (DNP, 2012; IDEAM, 2012; IDEAM, 2015): rising temperatures, increased precipitation and shrinking glaciers. In the future, temperatures are projected to continue increasing. Precipitation will decrease in the Caribbean and Andean regions and increase in the central and northern Pacific region. One study suggests that the likelihood of extreme El Niño events will increase in the future due to climate change (Cai et al, 2014).

Many studies have been conducted on the economic and social impacts of climate change in Colombia, predominantly on an ad hoc basis. The most influential at the national level has been a joint study on the *Economic Impacts of Climate Change in Colombia* (DNP-BID, 2014). This was developed by the Economic Commission for Latin America and the Caribbean (ECLAC), Colombia's Department of National Planning (DNP) and the Inter-American Development Bank (IADB). This examined some of the most climate-sensitive sectors (including agriculture, fisheries, forestry and transport), which combined accounted for 4.3% of Colombia's GDP in 2005-2012. The impacts of climate change in these sectors were projected to reduce Colombia's total GDP by an average of 0.5% per year. In addition to these studies, a national vulnerability analysis, including detail at the departmental scale, is being produced as part of the 3rd National Communication to the UNFCCC. This is intended to improve consistency and set a benchmark for more detailed studies.

Although these general trends have been identified, Colombia currently lacks the historical data needed to comprehensively understand and manage climate risks. Coverage of weather data is uneven, with the best coverage being available in the Andean and Caribbean regions, which is where the bulk of people and assets are located. A study by the state Fund for Financing the Agricultural Sector (FINAGRO, 2015a) found that only two of Colombia's 32 departments have sufficient meteorological and hydrological data coverage (more than 1 station for every 100km^2 of territory) to offer catastrophe insurance for agriculture. The government is increasing coverage of weather stations, assisted in part by investments through the Colombian Adaptation Fund. This should help to improve coverage in currently underserved areas. This will not be a quick fix, however, as several decades of historical weather data are required to identify the underlying trends in climate. In the meantime, improved coverage could yield near-

term benefits such as facilitating the introduction of index-based insurance and the development of early-warning systems.

In addition to gaps in the available weather data, there is also incomplete data on the impacts of extreme events. The national system for recording information on disasters (SIGPAD) has been reinforced with support from the World Bank, but has yet to achieve complete sectoral and geographical coverage. A particular challenge lies with recording of data on smaller but more frequent events, with relevant information either not recorded or not consolidated into the system. These smaller events are predominantly related to landslides and flooding. Although their individual impacts may appear small, the cumulative impact is substantial. The current data cover the period between 1970 and 2010 and estimate almost USD 3 billion in losses.[6] Primary research, such as analysing newspaper archives, is being used to provide a more complete picture of historical trends, including the most recent La Niña events. A common proxy for the estimation of losses has been to use data from the housing sector, where the majority of losses are reported.

Institutional and policy framework

The overall framework for managing climate risks is provided by Colombia's National Development Plans, the National Adaptation Plan and the National Risk Management Plan. The National Development Plans are used to set priorities and guide the allocation of resources for each presidential term. The Plans are developed by the National Planning Department, working together with each sector, and then implemented as laws. Although there is an increased emphasis on integration in these documents, the institutional arrangements for managing climate risks are not closely linked in practice.

Colombia's approach to climate change is coordinated through the National Climate Change System (SISCLIMA). This was proposed in 2011 and operated in an ad-hoc way prior to being formally approved by decree in February 2016. This system includes a set of institutional mechanisms for strengthening coordination between sectors at the national level, in addition to the regional level. Some of the key elements that were in operation even prior to formal approval include the committees on financial management and international affairs, which have been facilitating coordination between the relevant ministries. At the regional level, the ministry of environment has a coordination mechanism to bring together relevant actors. The new formal structure incorporates these elements, but is intended to be streamlined and made more operational compared to that proposed in the 2011 document.

Colombia has taken an unusual route in the development of its national adaptation plan, which is known as the PNACC. Instead of having a single document that sets out a top-down approach, the PNACC is conceived as a toolbox to support local and sectoral adaptation actions (DNP et al, 2012). The toolbox consists of the general principles for adaptation, combined with technical guidance. This reflects the vital importance of territorial land planning tools, such as the Territorial Management Plans (POTs), in reducing vulnerability. Nonetheless, having produced the toolbox, the Colombian government is now producing a single overview document that will set out its overall national approach to adaptation.

In addition, the government is currently exploring whether to introduce a climate change law. At present, the system is based on the SISCLIMA decree and the government programmes set out in the national development plans. Implementation relies heavily upon voluntary initiatives, supported by the toolbox provided by the PNACC. The motivation for introducing legislation would be to provide a legislative basis for adaptation actions, potentially including economic instruments or regulatory reforms. It would also help to increase the clarity and perceived permanence of the system.

[6] USD 2006.

Disaster risk management has a more established legal basis in Colombia than adaptation. The Law 1523 of 2012 provides the current framework, which establishes that risk management is the responsibility of all actors in society. It contributed to the National System for Disaster Risk Management (SNGRD in Spanish), which brings together relevant actors to understand, reduce and address the impacts of disasters. It includes a legal requirement for central and local government to assess the risks of disasters under their remit. This framework is designed to address some of the underlying drivers of risk discussed in the previous section. In particular, there is now a requirement that disaster risk management be mainstreamed into development, territorial (POTs), coastal (POMIUAC) and water basin management plans (POMCAs). This requirement applies to municipalities, which are responsible for developing POTs, and the regional level, which covers POMCAs and POMIUACs. The requirement for disaster risk to be considered in development plans is particularly significant, as these plans affect spending decisions. Moreover, departments and municipalities with a population larger than 250 000 inhabitants must have a risk management entity. However, the implementation of these requirements remains limited.

Following the 2010-11 floods, the Finance Ministry (MHCP) issued a Disaster Risk Finance and Insurance (DRFI) policy strategy in 2013, which established a guiding framework for implementing a three-pronged approach to managing the fiscal consequences of natural disasters. The elements of this are:

1. Improving the evidence base on the fiscal consequences of natural disasters

2. Developing a comprehensive strategy for the financial management of natural disasters

3. Insuring public assets against catastrophic risks

These elements have been supplemented by capacity building at the central and sub-national level. Additionally, a long-term operative plan will support implementation of the DRFI policy strategy.

The national development plan and the Law 1523 of 2012 make the connection explicit between relevant policy areas, but in practice the coordination among the institutions and the sharing of data could be improved. The environment ministry and finance ministries are starting to explore how financial protection can facilitate and support the adaptation process. This will entail better integrating the relevant institutions, developing shared conceptual understandings and concretely examining the implications of specific policies for adaptation. The development of the adaptation strategy for the finance sector would provide an opportunity to move this agenda forward. Meanwhile, the long-term operative plan for the Disaster Risk Financing and Insurance strategy also provides an opportunity to better coordinate with adaptation policies.

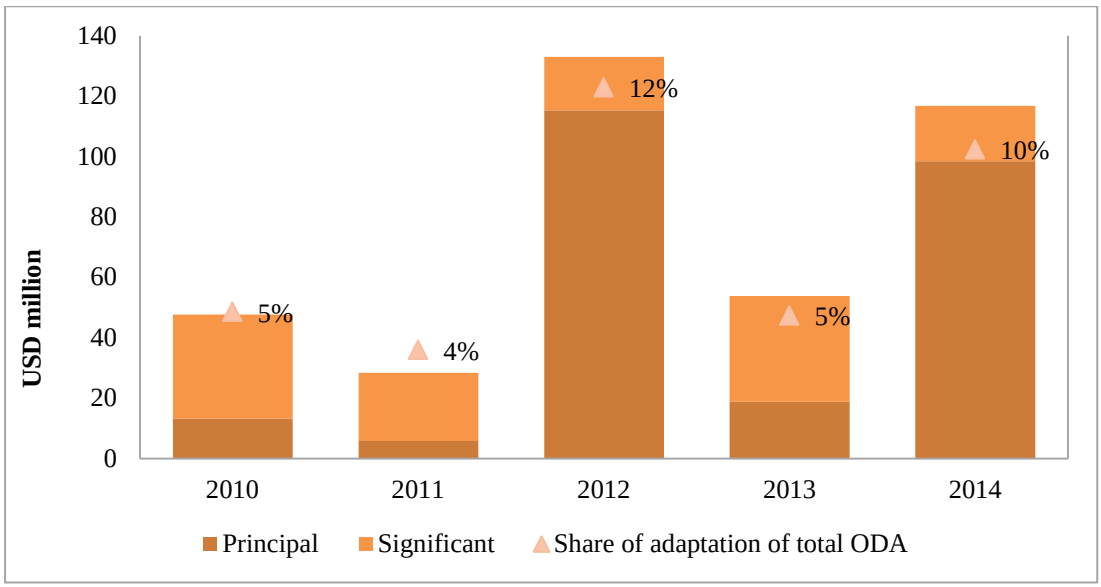
Finance for climate change adaptation and disaster risk management

Analysis of finance flows can shed light on overall trends and the degree of integration between relevant policy agendas, but there are significant data limitations and methodological challenges in doing so. This section aims at providing an overview of finance targeting the management of climate risks using available data both from the Colombian government for domestic flows and from the DAC CRS for international flows from development co-operation providers.

International financial resources for adaptation and disaster risk management

The amount of bilateral Official Development Assistance (ODA) directed to adaptation in Colombia increased from 2010 to 2014, when it reached USD 117 million (see Figure 3). The share of ODA marked as principally adaptation, implying activities designed with the primary objective of contributing to the adaptation to climate change in the country, has shown great variability, with principal activities accounting for 84% of the total in 2014 but only 20% of bilateral adaptation-related ODA in 2011.

Figure 3. Adaptation related ODA of DAC members in Colombia (2010-2014)



Source: Authors with data from DAC CRS.

The largest bilateral provider of funding is France, followed by Spain, the United States and Switzerland (OECD-DAC CRS 2016). The largest multilateral providers, according to the OECD DAC's CRS are the Inter-American development Bank (IDB) and the international Adaptation Fund established under the UNFCCC. However, very few projects have been reported as targeting adaptation in Colombia from multilateral sources since 2013. Notably, the World Bank's Development Policy Loan linked to natural disasters is not included, although this is likely to support climate adaptation by addressing the underlying drivers of exposure to climate risks.

A keyword search of project descriptions[7] provides an indication of how much of the finance committed to adaptation was directly linked to disaster risk management and might not be contained in the three disaster-related sectors[8]. The detailed word search shows that USD 6.9 million of activities between 2010 and 2014 were targeting adaptation and financial protection objectives from bilateral sources. For multilateral providers, the activity level search showed that the three projects were included in the key sectors (USD 89 million). However, some potentially relevant projects were not marked as adaptation (including the Cat DDO and associated measures), which suggests that examination of all development finance flows may identify some additional projects.

Use of domestic resources to fund disaster risk management and adaptation measures: national and subnational level

Overall, public spending on climate change (including mitigation) and DRM was approximately USD 660 million in 2013, growing from approximately USD 490 million in 2011. This rise can be explained by the increase in risk prevention activities implemented by municipalities in 2013. From this

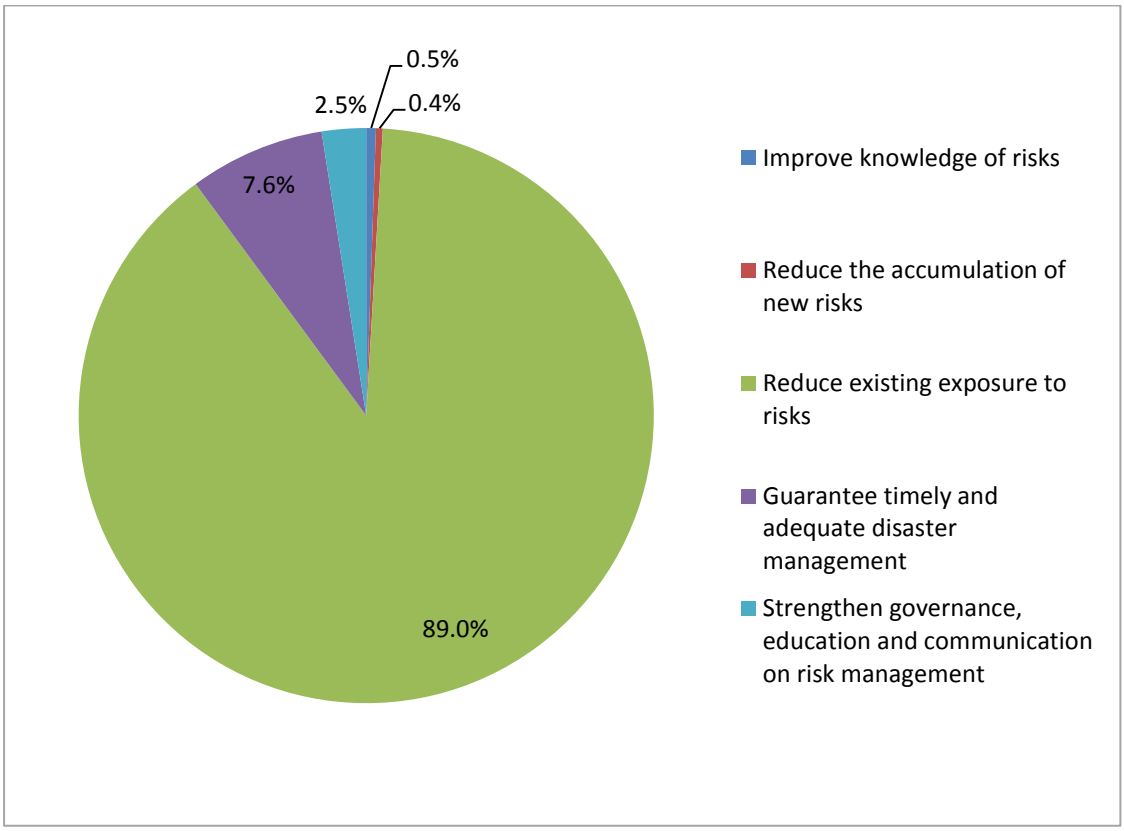
[7] Development finance data for Colombia were examined in depth by performing a detailed activity-level keyword search across the activities marked with the adaptation marker. The keywords used were "disaster risk", "resilience", "insurance", "flood", "natural disaster| both in Spanish and English.

[8] These sectors are: Disaster prevention and preparedness, flood prevention and protection, and reconstruction relief and rehabilitation

amount, 58% was dedicated to adaptation. The main actors in financing climate change-related investments are the municipalities (43%), followed by the Environmental Regional Authorities. The national budget accounts for only 12% of total expenditure in this area. In terms of sectoral investments, the largest categories receiving public resources for climate change investments were environment and sustainable development (66%), risk management (30%) (including only adaptation-related investments and not regular DRM projects or reconstruction projects), mining and energy (0.12%), housing (0.55%) and agriculture and pasture (4%). For the territories, there are several possible uses of the potentially allocable resources for purposes of environmental conservation and climate change. These resources include those for drinking water and basic sanitation, as well as freely allocable resources.

Investment in disaster risk management primarily takes place at the national and regional levels. In the period 2006 – 2014, planned investment in disaster risk management at national level amounted to USD 7 billion, which represented 1% of total national government investment (Government of Colombia, 2015). From this amount, 2% was targeted to knowledge activities, 9% for risk reduction and 90% for risk management. Municipalities spent USD 10 billion in this area albeit over a longer time period (2002 to 2014), while departments invested a further USD 1 billion.

Figure 4. Allocation of national disaster risk management budget across strategic objectives



Source: adapted from UNGRD (2015).

During this time, a La Niña event in 2010-2011 led to reforms of the disaster financing system, including the creation of the domestic Adaptation Fund in 2010. This was established to identify, develop and manage projects in the areas affected by La Niña. However, the Fund has subsequently been given a stronger emphasis on prevention and will serve as a source of public funding for designing and

implementing DRM and adaptation projects. This will strengthen the National System for Disaster Risk Management and environmental policies and climate change management.

The National Disaster Risk Management Plan has a budget of USD 3.5 billion for the period from 2015-2025, with approximately 87% dedicated to risk reduction activities of current risks. These activities include financial protection and inclusion of climate change adaptation into territorial and sectorial planning (see Figure 4). During the interviews conducted for this case study, it was stressed by several stakeholders that most of the resources are directed towards reaction, leaving too little for prevention activities and resilience building projects.

Financial protection instruments being used in Colombia

Colombia uses a wide spectrum of tools to manage its financial exposure to climate-related risks. Some of these support households directly, while others can indirectly support households' resilience by supporting the ability of businesses and the public sector to manage risk. Table 3 shows the range of instruments being implemented in Colombia.

Table 3. Spectrum of financial protection measures

Financial protection tool	Level of risk coverage		
	National or sovereign level	Private sector	Households and informal economy
Insurance mechanisms	Insurance of public assets: 4G roads insurance and insurance of public assets	Climate-sensitive insurance	Limited uptake on insurance products Low level of insurance penetration
Catastrophe bonds	CAT BOND/Pacific Alliance initiative		
Post-disaster credit / Contingent credit	World Bank Cat DDO/Adaptation Fund		
Savings or reserve funds	National Fund for DRM/Adaptation Fund		
Ex-ante social safety nets			
Humanitarian relief and compensation payments			Government support for disaster losses: emergency assistance

Sovereign level

Colombia's Disaster Risk Financing and Insurance strategy aims to ensure that the government has the option of responding promptly to losses, while maintaining macroeconomic stability and fiscal balance. Analysis by the finance ministry shows that the average direct exposure to natural hazards, including earthquakes, is USD 490 million per year (World Bank, 2012a). However, there is significant tail risk, with the costs of a 1 in 100 year event estimated at USD 3 billion under current climate conditions (1.2% of GDP) (World Bank, 2012a). Separate analysis by ECLAC shows that climate change could result in

impacts on the scale of the 2010-2011 flooding becoming a regular event, but this has yet to be incorporated into the modelling of financial exposure.

The financial consequences of extreme events are managed by the finance ministry as part of its remit of managing contingent liabilities[9]. This type of institutional structure is recommended by the OECD's Recommendation on Disaster Financing Strategies, as the finance ministry has oversight and influence over spending decisions across government ministries. This system is underpinned by the legal requirement for public entities to account for their exposure to contingent risks (MHCP, 2012). Previously, the focus had been on the management of explicit liabilities, which are those resulting from legal requirements or contractual provisions, such as debt guarantees. However, it is being expanded to cover the management of implicit "passive" liabilities, such as losses from natural catastrophes.

The financial protection strategy is focussed on the management of potential central government financial liabilities. The management of local government liabilities does not fall directly under this system, but some aspects are addressed in the national law for disaster risk management (Government of Colombia, 2012). There is, however, no policy for managing the financial consequences of extreme events for households or businesses, for example by encouraging the use of insurance. However, some of the measures in this strategy – such as improving data availability – may have ancillary benefits beyond the central government. Additionally, the insurance guidelines generated for central government are being communicated to local governments.

Strengthening data on the potential fiscal consequences of disasters is viewed as a prerequisite for their effective management. A major gap that this strategy intends to fill is the lack of data on assets owned by the government, their exposure to disaster risk and the existence of insurance coverage. There is currently a pilot programme using a web-based system to create and maintain a comprehensive inventory of public assets, insurance policies and incurred claims.

The other aspect of improving the evidence base is to improve understanding of the costs of previous events, and use modelling to examine how these could evolve in future. This is important for developing the strategy, raising awareness of the potential risks that it will be managing and increasing the feasibility of specific instruments. In general, poor information on risk equates to expensive premiums or coverage not being available. Insurers, or other third parties, will be wary about assuming uncertain risks. As a consequence, improvements in data can lead to cheaper premiums.

A remaining challenge for this strategy is to strengthen the links between risk reduction and financial protection, building on progress to date. The World Bank has supported an integrated approach to this issue through its technical and financial support. The first contingent credit (USD 150 million) was packaged with a broader set of measures (USD 260 million) aiming to strengthen the management of disaster risks. These risk reduction measures included:

- Supporting the development of 688 municipal risk reduction plans
- Technical support to underpin the production of 15 POMCAs and 25 POTs
- Assistance with the development of risk maps and support for disaster information

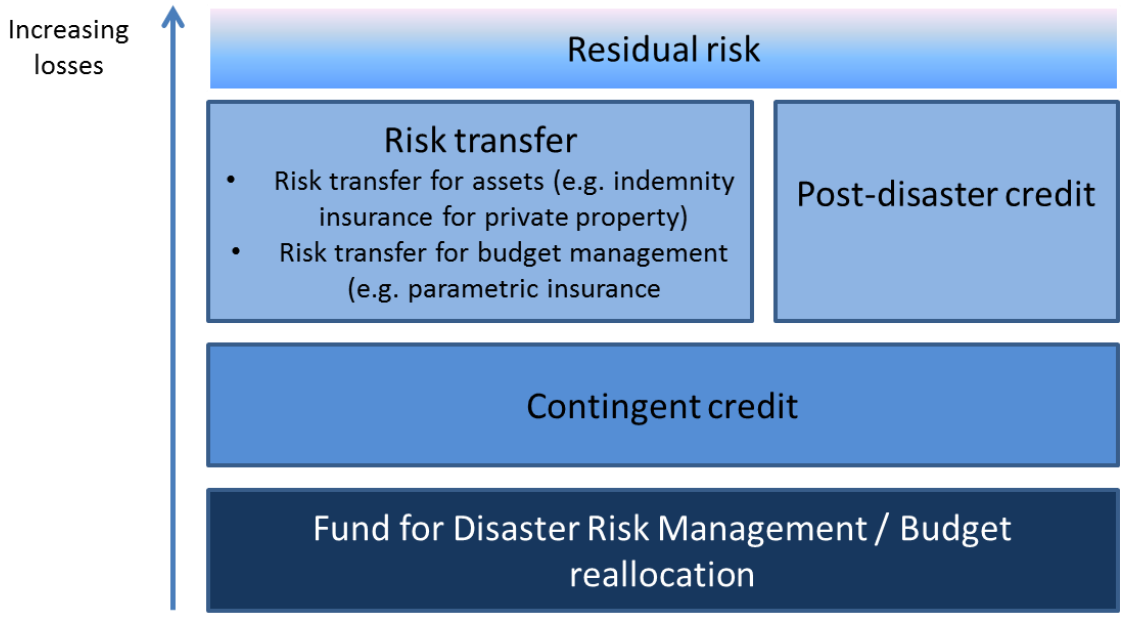
Law 1523 of 2012 requires the three government levels (national, departmental and municipal) in the country to formulate, implement and evaluate Disaster Risk Management Plans to orient, prioritise and focus initiatives and investments to diminish vulnerability in territories against natural disasters.

[9] Contingent fiscal liabilities are expenses that would be incurred by the government if a certain event occurs.

Departments and municipalities are also required to create Disaster Risk Management Funds to finance and implement disaster risk management processes (knowledge reduction and management of disaster risks). Currently, 91% of departments have formulated plans and 78% of municipalities have created plans. All of the departments and 64% of the municipalities have created disaster risk management funds. The legislation does not, however, define the size of these funds.

The financial protection strategy is comprehensive, ranging from frequent low-severity events to rare but high impact events. It consists of a layered approach to managing the financial consequences of natural disasters, which is consistent with good practice in this area (G20/OECD, 2012). The underlying principle is for the government to retain smaller and more frequent losses. Losses from rarer, but larger events are transferred to the private sector or international partners. Very extreme events are not cost-effective to transfer, so they would have to be absorbed through ex-post measures. In practice, however, the system is more nuanced than this, as the characteristics of each tranche (e.g. data required, risks covered and speed of payment) also need to be considered. These layers are shown in Figure 5.

Figure 5. Multi-layer risk financing strategy for natural disasters



Source: Ministry of Finance (2013).

These layers are now being put in place, with the aim of creating a portfolio of instruments that matches both the scale of losses, and the timing of disbursements relative to needs (response, recovery, and reconstruction phases), taking into account a cost benefit evaluation. The resources from these layers are brought together into a single account, called "Colombia Humanitaria". This subaccount included resources from different budgets, such as the national budget, the liquidity obtained from the Cat DDO, department and municipal budgets, as well as external donations from cooperation agencies (MHCP, 2012).

The base layer of the system is provided by the National Fund for Disaster Risk Management, created by Law 1523 in 2012. The resources for this fund are provided from general taxation. The majority of its USD 166 million annual funding is for addressing the consequences of disasters, but 9% is being allocated to risk reduction (UNGRD, 2015). Since June 2015, the fund has been part of the National System of

Disaster Risk Management and it now may structure and execute comprehensive projects for risk reduction and adaptation to climate change. This is intended to strengthen the disaster risk management system and help reduce fiscal vulnerability of the state.

Colombia has arranged a series of contingent credits with the World Bank. The risk ultimately remains with the government, but this instrument provides greater flexibility and immediate access to resources in the aftermath of a disaster. This helps to avoid the need for disruptive, emergency budget reassignments. The first Cat DDO (Catastrophe Deferred Drawdown Option) was approved in 2008 for USD 150 million, replacing a previous contingent credit. The essence of this instrument is that the Colombian government could rapidly borrow up to that ceiling following the declaration of a national natural disaster. This occurred at the end of 2010, when the full value of the Cat DDO was accessed to address immediate needs following the floods. In a subsequent evaluation, the World Bank (2012b) noted that one of the Cat DDO's benefits was that it helped to reassure financial markets and the population that the situation was under control. Following the positive experience with the first Cat DDO, the Colombian government has subscribed to a new Cat DDO for USD 250 million in 2012. This instrument is currently active until 2018, but can be extended up to a maximum of 15 years.

The Cat DDO directly contributes to the management of current climate variability, but also makes an indirect contribution to longer-term climate change adaptation. This is because countries are required to adopt measures to reduce disaster risk as a condition of having access to this loan and these measures will have long-term benefits. In Colombia, a key benefit should arise from the measures to redirect development away from high risk areas, which will lead to long term benefits. The Cat DDO is also accompanied by improvements in data collection, which should assist with planning over the time horizons relevant for climate change.

Insurance of public assets and PPPs

Public bodies are legally required to insure their assets against catastrophe risk, with the aim of reducing the government's exposure to disaster risks and supporting fiscal management. However, an insurance diagnosis for 23 public entities at central level showed that implementation of this requirement could be improved. It has been implemented in a decentralised manner, without guidelines, with each public body responsible for meeting its own requirements. As a consequence, there was no central oversight of the coverage and adequacy of insurance policies, meaning that the government's total fiscal exposure was unclear (World Bank, 2012a). Furthermore, the piecemeal purchase of insurance coverage prevented the government from benefitting from economies of scale and risk diversification in the public sector estate.

Initial steps have been taken to improve the transparency and quality of public sector insurance in the public estate. A pilot web platform managed by the Federation of Insurance Companies (FASECOLDA) has been created to collect systematic data on the availability of public sector assets, insurance policies and claims, but this is still at an early stage. In the meantime, the finance ministry has negotiated access to the insurance companies' datasets, albeit under restrictive conditions that were agreed to safeguard commercial sensitivity. The other step taken to improve coverage has been the gradual development of standardised insurance contracts for public assets, with standard guidance being produced to inform the development of insurance contracts.

Insurance arrangements for Public Private Partnerships (PPPs) are being strengthened. With each successive set of transport concessions, the aim has been to shift more of the risks to the operators on the basis that they are best placed to manage those risks. This was given further urgency when the 2010-2011 floods revealed weaknesses in the previous allocation of risks between parties. Risks that had been contractually allocated to the concessionaires were ultimately assumed by the government, because the

scale of the losses and the need to build back better meant that it was no longer commercially viable to continue with the contract. Concessionaires have to hold sufficient insurance to cover their expected Probable Maximum Loss. The insurance policies are renewed every five years, with the risk of future premium increases being held by the concessionaire.

Catastrophe bond

Colombia is working with the other Pacific Alliance countries (Mexico, Peru and Chile) to develop a catastrophe bond. This will initially be for earthquake risk, but with a view to covering other hazards in the future. However, the finance ministry is currently analysing the business case for transferring (instead of retaining) weather risks via this bond, given the high exposure of Colombia to hydro-meteorological hazards. The projected frequency of covered events will be critical, as this instrument is best suited to manage infrequently occurring events.

Private sector

The role of the private sector's participation in adaptation and risk reduction activities is multiple: it is both a provider of financial protection and a potential beneficiary. The private sector is also supporting the development of innovative technologies to improve early warning systems, data quality and data usage for risk reduction purposes.

Experience with insurance has been mixed: a major focus has been on improving the transfer of risks from the government to the insurance industry. However, experience in the agricultural sector has illustrated the difficulty of transferring risks from the private sector to insurers. The Colombian Government included the goal of implementing risk management instruments (market and climate risk) under the Agricultural Policy pillar of the National Development Plan. The agriculture ministry has introduced a series of instruments and strategies, both in risk prevention and mitigation as well as in risk transfer (MINAGRO, 2016). The ministry, recognising the importance of protecting farmers from the impacts of climate change, subsidises premium costs up to 80%, depending on the size of the producer. Coverage has increased from 30 000 hectares in 2009 to 187 000 hectares in 2015. However, this still only represents 3% of the total agricultural land area. The insurance (Seguro Agropecuario) covers natural risks such as excess or deficit rainfall, high winds, floods, frost, hailstorms, landslides and avalanches; and biological risks such as pests or diseases.

The insurance product, as well as the incentive for rural capitalisation that fosters sustainable and resilience investments for farmers (Incentivo a la Capitalizacion Rural, ICR) is part of an integral strategy to reduce, prevent and manage the impacts of natural disaster risk. This includes an Agriculture Risk Information System, which is jointly managed by the agriculture ministry, the Rural Agriculture Planning Unit (UPRA) and the Agricultural Financing Fund (FINAGRO), as well as technical support programmes to provide financial education to farmers. Outputs include short-term forecasts on climate and guidance on what crops are most suitable for different types of land, as well as a pilot project for an early warning agroclimatic system. UPRA is also developing maps to help target production subsidies to the most suitable crops in certain areas. It is also providing guidance to farmers to help them make better-informed decisions about managing climate risks.

Household level

Colombia is not strongly equipped with mechanisms for the financial protection of households against natural disasters. For example, uptake of insurance of private assets is slow, and limited to higher income households. Analysis by FASECOLDA showed that only 7% of the asset losses from the 2010-2011 La Niña were covered by insurance (OECD, 2014). There are several reasons for that: (i) lack of awareness

about financial protection mechanisms; (ii) lack of products targeted to the most vulnerable populations, who are usually the most impacted by disasters; and (iii) a perception that the government will "take care" of the disaster, paying for the recovery and relocation costs. This perception arises from the Colombian constitution, which sets out a number of areas in which the government is obliged to provide compensation.

The Program "Familias en Accion" is a conditional cash transfer programme that enables vulnerable households to receive direct cash transfers to spend on education and health services. The programme is designed to break the poverty cycle and improve vulnerable populations' resilience, empowering women to be the ones taking the decisions and leading the provision of care in the household. The potential links with disaster risk reduction activities are strong. However, there has not been any experience in adjusting the resources of the programme to extend to resilience building activities in the context of extreme climatic events.

5. Senegal case study

Senegal's ecosystems, economy and society are highly vulnerable to climate change. The main climate hazards posing a threat to the country are: increasing temperatures and erratic precipitation causing drought, higher incidence of pluvial flooding and related health epidemics. Senegal is also vulnerable to sea-level rise, coastal flooding and coastal erosion. Approximately one-fifth of Senegal's coastline is highly vulnerable to flooding. Coastal storms and other extreme events from the sea damage people's livelihoods. These hazards, particularly droughts and flooding, are already causing repeated losses and decreasing people's resilience, especially for the most vulnerable.

Senegal suffers from the effects of both two much and too little water. Droughts have been occurring sporadically for several decades in Senegal, with eight severe droughts having occurred since 1977. The drought in 2011 led to a decrease in grain production of 20% and groundnut production of 31%, exposing around 800 000 people to food insecurity. Most of those affected depended on agriculture for their subsistence. Droughts have been a key driver for migration from rural to urban areas (GFDRR, 2010). At the same time, floods are a frequent occurrence in Senegal, and have affected around 400 000 to 600 000 people per year on average between 1980 and 2008 (GFDRR, 2014b). These floods are caused by heavy rains making rivers overflow or accumulating on impermeable surfaces and causing damages in urban areas such as Dakar and Kaolack. Storm surges also lead to salt-water intrusion into agricultural lands, particularly in the Saloum Delta near the river Gambia.

Urban flooding is a particular challenge in Senegal, as the effects of uncontrolled urban growth are exacerbated by the lack of a functional storm water drainage system. There is widespread non-compliance with the urban planning and development master plan. The long dry period from 1980 to 1990 favoured the installation of a part of the growing population in low-level areas that were vulnerable to flooding. This development reduced the soil infiltration potential, leading to increased flood risk in the main Senegalese cities. In 2014, around 76% of urban areas were classified as unplanned settlements (GFDRR, 2014b). In 2009, torrential rainfalls caused USD 82 million of losses nationwide, predominantly in the Dakar region (GFDRR, 2014b).

Senegal's adaptive capacity is limited by high poverty levels. Senegal is classified as a Low Income Country (LIC), and its GNI per capita has been stable at around USD 1 000 since 2010 (World Bank, 2016a).[10] In 2010, 57% of people in rural areas were recorded as living below the national poverty line compared to 33% in urban areas (World Bank, 2016a). The economic structure of Senegal is heavily dependent on rain fed agriculture and fisheries, both heavily affected by climate change and natural

[10] *http://data.worldbank.org/country/senegal*.

disasters. Agriculture supports the livelihoods of 60% of the Senegalese and employs three quarters of the workforce, with family farms representing 95% of the sector's activity (MEDD, 2016). Fisheries are the second most important source of employment and livelihoods in Senegal, but fish stocks are already affected by overfishing (UNDP, 2004).

Current and projected impacts of climate change, including on physical conditions

Climate change has affected precipitation and temperature in Senegal. Sahelian rainfall is characterised by high variability on inter-annual and inter-decadal timescales, which can make long-term trends difficult to identify. Nonetheless, Senegal has experienced a statistically significant decrease of 10 to 15 mm per decade in wet season rainfall between 1960 and 2006, with the 500 mm isohyet[11] moving about 100 km to the south (GFDRR, 2011). Mean temperatures in Senegal have risen by 0.9°C since 1960 (*ibid*) and mean rainfall volume has decreased by 30% since 1950 (MEDD, 2016).

Future climate change is projected to lead to a hotter, drier climate. Mean annual temperatures are projected to increase by 1.1 to 3.1°C by the 2060s, and 1.7 to 4.9°C by the 2090s, with warming projected to be faster in the interior than in those areas closer to the coast (McSweeney et al., 2008). Different models project a wide range of changes in the mean annual rainfall averaged over the country, from -41 to +48% by the 2090s, but the majority of models show decreases and it is likely that a greater proportion of precipitation will occur in heavy rainfall events (*ibid*). Projected increases in sea level will put pressure on coastal areas, especially in the southern region and in Cape Verde. Senegal's 700 km coastline is already retreating at a rate of 1-2 meters every year due to sea-level rise and increased intensity of storms and waves. If the sea level rises by one meter by 2100, between 55 and 85 km^2 of beaches would disappear and around 6 000 km^2 of low-lying areas would be exposed to coastal flooding, notably the estuaries (GFDRR, 2011). A projected increase in coastal urbanisation (+15% over 2005-2030) could worsen this situation, with 75% of Senegal's coastline being at high risk of erosion by 2080 (Egis Eau, 2013).

Development co-operation providers have supported several climate vulnerability studies of Senegal. Studies have focused on coastal areas (World Bank, 2013), food security (Funk et al., 2012) and eastern Senegal (USAID, 2014). These found that low-input rain fed agriculture will be hit hardest by climate change, with yields in the 2080s decreasing by nearly 50% for sorghum and millet. The yield of high-input rain fed agriculture will decrease more moderately, between 2-3% in the 2020s up to 15-40% in the 2080s depending on the type of crop (GFDRR, 2011). The impact of climate change on cattle is missing from many studies, despite its importance for the animal sector (IFPRI, 2014). Rising sea levels may also increase saline intrusion of groundwater basins and affect the quality of water supplies (IED Afrique, 2015).

Insufficient mapping of current and projected risks, particularly regarding flooding and coastal erosion is an obstacle to disaster risk and adaptation planning. The environment ministry has announced its intention to address this issue following the destruction of 200 houses by coastal storms around Dakar in 2015. The ministry will host the Observation Mission of the West African Coastline within its Ecological Monitoring Centre (CSE). The observatory is supported by the International Union for Conservation of Nature and the West African Economic and Monetary Union, and will involve eleven of the Union's member countries. The scope of the mission has yet to be defined, but the Global Fund for Disaster Risk Reduction has identified a number of areas where further analysis would be valuable: higher-resolution segmentation of the coastline, including improved elevation and sea-level measurements, coastal geomorphology and understanding of sediment loads (GFDRR, 2011). The data and research gathered by this institution would complement the existing sources of climate information in Senegal: the National

[11] The isohyet is an imaginary line that connects points on a map with equal rainfall at a certain time or for a certain period.

Agency of Civil Aviation and Meteorology (ANACIM), and the CSE. Both of these institutes currently focus on agrometeorological information, monitoring rainfall, vegetation cover, wildfires, hydrological and agricultural data, using satellite imagery and field observations.

Data on the impacts of natural catastrophes are not routinely collected by the Senegalese administration, but are instead estimated through ad-hoc projects funded by development providers. For example, the Global Facility for Disaster Reduction and Recovery (GFDRR) assessed the human and economic impact of the 2009 urban floods. This lack of systematic collection makes it more difficult to qualify the economic attractiveness of alternatives to the "business as usual" management of disaster risk.

Institutional and policy framework

Senegal's management of climate-related risks is covered by three ministries. The environment ministry is in charge of planning for climate adaptation and accessing international climate funds through the accredited Ecological Monitoring Centre, the interior ministry is responsible for disaster risk management and the finance ministry coordinates the country's participation in insurance mechanisms at the national and local level. Sectoral adaptation policies are also implemented by the relevant ministries, such as the Ministry for Agriculture and Rural Equipment, Fisheries, Livestock and Farming, or dedicated agencies such as the National Council for Food Security and the Commission for Food Security (CSA).

The institutional structure at the national level contains several advisory bodies, but their respective mandates and roles are not always clearly defined. The field of risk and disaster management, for instance, formally has four advisory bodies established under the authority of the prime minister or interior ministry: the High Commission of Civil Protection, the National Platform for Reduction of Major Disaster Risks, a National Unit for Flood Prevention and a National Committee on Flood Prevention, Supervision and Monitoring (Political Champions Group, 2013; GFDRR, 2014). Despite the creation of coordinating groups such as the National Committee for Climate Adaptation or the Research, Planning and Monitoring Committee, the different policy areas operate largely in isolation from one another, with different governance and funding frameworks. The creation of a presidential council to tackle the impacts of floods in 2012 added an additional layer of complexity to the management of disaster risk (Government of Senegal, 2013).

Adaptation and disaster risk management are integrated into economic development planning, including dedicated objectives in Senegal's medium-term strategic plan for development and its accompanying Priority Action Plan, adopted in 2012. The Plan for an Emerging Senegal (PSE), aims to shift the country from a developing economy to an emerging one by 2035, while the Priority Action Plan for 2014-2018 provides an implementation framework for 190 urgent measures, which were selected from the 451 identified in the PSE.[12] Objectives for catastrophe prevention and climate resilience activities include: developing national and regional contingency plans, establishing an early warning system on natural hazards, as well as an insurance mechanism and an emergency intervention fund. However, the implementation of these activities is delayed due to insufficient funding being available.

Policy framework for climate change adaptation

The main planning document for adaptation is Senegal's National Adaptation Programme of Action (NAPA), which was published in 2006. It provided the first comprehensive analysis of the country's vulnerabilities to climate change and defined short-term priorities for adaptation, namely coastal zones, water infrastructure and agriculture. It prioritises adaptation measures by taking into account their

[12] Under the optimistic scenario, 59% of the PSE is financed through contributions from the state, development partners and the private sector, while 31% of the PSE Priority Action Plan costs are in a funding gap.

contribution to poverty reduction, cost-efficiency and potential contribution to other international conventions. However, implementation remains a challenge with only 1 of the 14 priority adaptation projects currently being implemented. The NAPA includes a comprehensive process for monitoring and evaluation, but there is no public record of this having been implemented.

A National Adaptation Plan (NAP) is currently under preparation. The NAP process was established under the Cancun Adaptation Framework of the UNFCCC. NAPs are a mean of identifying medium- and long-term adaptation needs and developing and implementing strategies and programmes to address those needs. One of the key features of this process in Senegal is that it involves the stakeholders contributing to implementation, such as development co-operation providers, from the outset. The NAP will consist of a series of strategic sectoral plans for long-term adaptation, which is intended to ensure coordinated multi-sectoral approaches. Development co-operation providers are supporting the development of Senegal's NAP. For instance, USAID has been assisting with the elaboration of the sectoral NAP for fisheries since 2014.

The Directorate of Environment and Classified Establishments has been supported since 2011 by the National Committee for Climate Adaptation, a cross-ministerial consultative institution designed to raise awareness about climate adaptation. Regional Adaptation Committees were created in 2012 with support from UNDP to fulfil this role at the local level, in alignment with the government's desire to increase local ownership of environmental issues. Communities acquired a major role in the implementation of environmental policies and natural resource management, aided by the administrative reorganisation of local communities according to eco-geographical zones in the 2014 Third Decentralisation Act (MEDD, 2016). In practice, however, local democratically elected bodies, including rural councils and water user associations, are dominated in many communities by rural hierarchies based on family lineage, religion, and political party membership (USAID, 2010).

Policy framework for disaster risk management and integration with climate adaptation

The Senegalese government does not yet have a comprehensive strategy for disaster risk management, and there is therefore little integration with national climate adaptation policies. A range of actors implement activities to prevent natural catastrophes or reduce their negative social and economic impact. The occurrence of natural disasters tends to result in the creation of new institutions or coordinating groups, rather than reforms to existing ones (Government of Senegal, 2013). There is an increasing focus on risk prevention, as opposed to emergency measures, evidenced by the adoption of the Ten-Year Flood Management Plan in 2012 (GFDRR, 2014).

The Civil Protection Department is the main authority responsible for risk prevention and the protection of civilians, goods and the environment. The department's role is to coordinate protection activities with the fire brigade and other ministries. This includes collaboration with the Ministry of Urbanism and Land-Use Planning, which is in charge of implementing risk reduction projects. On flood management, the department shares the responsibility with the Ministry of Reconstruction and Planning of Floodable Areas, which was created to administer the USD 1.4 billion Ten-Year Flood Management Program (PDGI) over 2012-2022. The Department also coordinates the two early warning systems in place for food security and river levels: the National Committee for Food Security is responsible for the former and the Directorate of Forward-looking Management of Water Resources for the latter.

Renewed plans to streamline disaster risk reduction activities are expected to result in the creation of a National Agency for Civil Protection[13]. This would replace the National Platform for Catastrophe Risk

[13] *www.interieur.gouv.sn/le-ministere/programmes-et-projets/projet-de-gestion-des-risques-et-catastrophes-et-dadaptation-au-changement-climatique-grc-acc/.*

Reduction, which is established in the interior ministry in 2008. The Platform was intended to be the anchoring institution for the application of the Hyogo Convention (Government of Senegal, 2008), but it has never been active.. The National Agency is planned to include an Operational Centre for Inter-ministerial Crisis Management, with a centralised database covering all of Senegal's risks, a multi-risk monitoring and early warning system. This will use data from the Ecological Monitoring Centre (including flooding, bush fires and coastal flooding risks), and a geographical information system (GIS). The planned creation of a national school of Civil Protection should further contribute to Senegal's capacity for disaster risk reduction. Progress has, however, been slow and much more is needed to develop capacity and shift to a more preventive approach, instead of the traditional focus on emergency relief.

Finance for climate change adaptation and disaster risk management

Senegal has received support from a variety of development co-operation providers to invest in activities to manage climate risks. This has resulted in many stand-alone projects that face challenges in ensuring their sustainability and achieving scale. Insufficient donor coordination has also resulted in duplication of efforts and gaps in implementation.

The section provides estimates of public international and domestic finance targeting the management of climate risks. It is based on available data from the OECD DAC CRS, which captures bilateral and multilateral development finance, and existing sources of information on national investment as available. The aim of this section is to provide an overview of how the financing of these activities is tracked and how this has changed between 2010 and 2014.

At the national level, Senegal uses the triennial Public Investment Programs for budget planning, with the current programme covering the 2014-2016 period. The development plan (PSE) also includes budget estimates for activities to prevent natural disasters and combat climate change. The country has traditionally focused resources on emergency relief and rehabilitation after disasters, rather than prevention. This is slowly changing, as shown by the inclusion of objectives on adaptation and disaster risk management in the PSE and the Intended Nationally Determined Contribution (INDC).

Senegal's INDC estimates that USD 14.5 billion will be required for the implementation of adaptation policies (Table 4) (Government of Senegal, 2015). The INDC identifies flooding, livestock farming, fisheries and biodiversity as priority areas, and presents cost estimates for the implantation of adaptation measures in each sector to 2035. Approximately one-eighth of the total cost is expected to be covered by national funding (USD 1.8 billion), with the remainder coming from external sources, such as development partners.

The National Climate Fund was created in 2015 to scale-up domestic resources and channel external ones to climate projects. This fund is based within the environment ministry. The Ministry of Economics, Finance and Planning and the CSE participate in the administration of the Fund (DCF, 2015; République du Sénégal and UNDP, n.d). The fund is designed to take advantage of possible international partnerships and funding agreements created by the Green Climate Fund. It also aims at improving the efficiency of international aid in environmental programmes. The National Climate Fund raises around USD 60 million per year (DCF, 2015**)**.

Table 4. Cost of adaptation actions in Senegal 2016-2035 (million USD)

Sectors	National commitments	External funding	Total
Biodiversity	22	194	216
Coastal areas	400	6,646	7,046
Water Resources	550	1,654	2,204
Fisheries	40	280	320
Agriculture	400	1,200	1,600
Livestock farming	200	616	816
Flooding	160	1,976	2,136
Health	60	160	220
TOTAL	**1,832**	**12,726**	**14,558**

Source: Senegal INDC (2015).

International financial resources for adaptation and disaster risk management

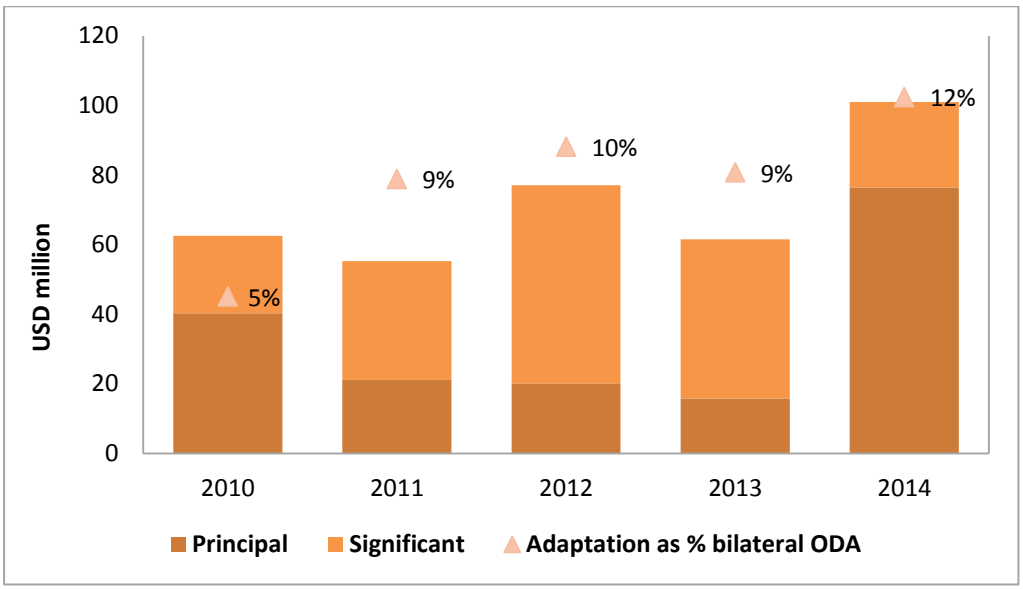
Development co-operation providers are supporting both adaptation and disaster risk management efforts in Senegal. This section uses data on resource flows to provide an overview of trends in these policy areas.

There is no specific marker for the broader management of climate risks, beyond the one for adaptation-related activities. It is possible to identify expenditure in some relevant sectors, but this does not capture all potentially relevant activities. The most relevant of these sectors are: disaster prevention and preparedness, flood prevention/control and reconstruction, relief and rehabilitation. These are referred to as the "key sectors". Emergency response activities have not been included in the analysis as they were considered to be less relevant to building resilience against climate risks.

A significant proportion of the ODA to Senegal targets climate change adaptation objectives (Figure 6). The amounts have been relatively stable between 2010 and 2013, but 2014 marked a record year, with adaptation-related ODA reaching USD 100 million[14], or 12% of the total bilateral ODA (up from 5% in 2010). The total resources add up to USD 357 million over the five-year period analysed.

[14]All Figures in this report are in 2013 constant USD.

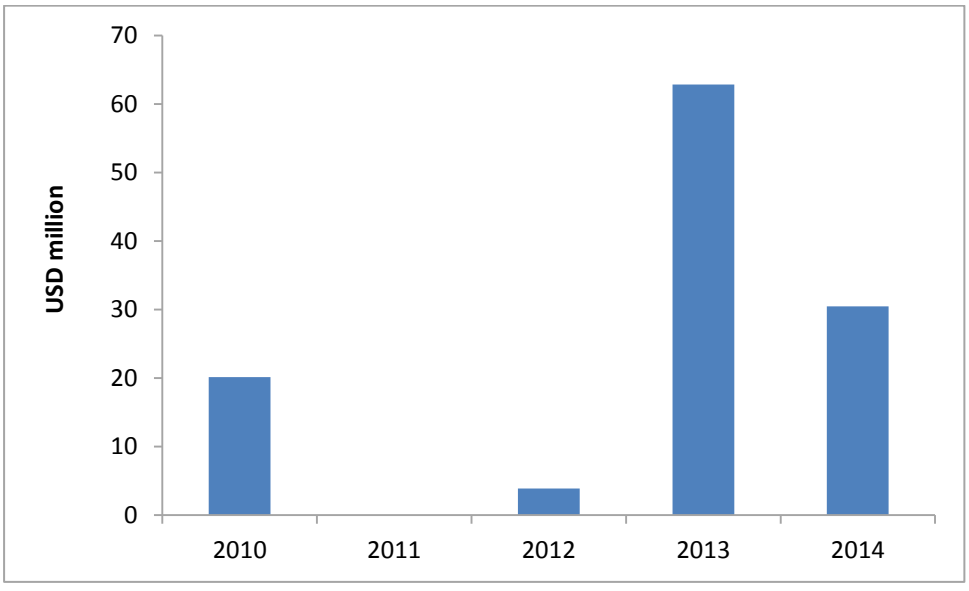
Figure 6. Adaptation-related ODA of DAC members in Senegal (2010-2014)



Source: OECD DAC Creditor Reporting System.

The development co-operation providers providing the most resources marked as adaptation are the United States, France, Germany, Italy, the African Development Fund and the Islamic Development Bank. Multilateral agencies reporting to the CRS using the climate-component approach identified almost USD 117 million between 2010 and 2014 for adaptation-related activities in Senegal (Figure 7).

Figure 7. Multilateral adaptation-related flows (2010-2014)



Source: OECD DAC Creditor Reporting System.

In Senegal, approximately USD 11 million from bilateral donors was targeted towards adaptation activities that also supported disaster risk management, as identified by the keyword search. This compares

to USD 7.5 million of adaptation-related ODA in the key sectors. For multilateral providers, the keyword search identified USD 46 million in resources, compared to the USD 15 million captured in the key sectors. The largest providers of adaptation-related flows to the key sectors have been the Islamic Development Bank (USD 11 million) and the Nordic Development Fund (USD 3.8 million). This confirms that some relevant projects are not in the key sectors and might be lost in the analysis if not checked on an activity level basis. More broadly, there is a need for further research as many of the projects financing resilience might be under-reported, due to their cross-cutting nature.

A useful feature of donor support in Senegal is the active community of development partners meeting regularly around common areas of interest, within the framework of the Partnership of Technical and Financial partners in Senegal (http://ptfsenegal.org/). This partnership aims to improve coherence between projects and to contribute to the complementarity of activities, as shown by several joint projects, such as the USAID/WFP/OXFAM engagement. Canada and USAID intend to work together to expand the Naatal Mbay insurance scheme in the country.

Use of domestic resources for disaster risk management and adaptation measures at the national and subnational level

Senegal does not have a national tracking system for climate change adaptation and/or disaster risk management expenditures. However, there are several planning documents and activity reports that provide relevant information on this topic. The PSE estimates the financing gap for disaster risk and climate resilience projects to be USD 67 million, of which around half (USD 28 million) is anticipated to be met from external contributions. [15]

Senegal's Hyogo Framework for Action Assessment Report (Government of Senegal, 2015b) estimated that USD 164 million per year was allocated to hazard-proofing sectoral investments (e.g. transport, agriculture, and infrastructure). The majority of activities targeted at disaster risk reduction and prevention are not systematically accounted for in the national budget. Instead, they are financed using a series of contingent mechanisms, funds and donor financing. The Hyogo report highlights an exception: the Ministry of Reconstruction and Planning of Floodable Areas has successfully executed the emergency phase (2013) of the ten-year plan to fight against floods with an estimated budget of USD 135 000. The government activated the National Relief Organisation Plan (ORSEC) following the 2009 floods, which has also brought in funds from other donors including USD 4 million from the World Bank (GFDRR, 2014).

The government's budget provisions for disaster risk management includes both direct funding to the Directorate of Civil Protection through the interior ministry's budget and the use of special funds, including (Republique du Senegal, 2012; World Bank & GFDRR, 2012):

- The National Solidarity Fund, under the General Delegation for Social Protection and National Solidarity.
- The Special Fund for Fighting against Flooding, under the Ministry of Water and Sanitation.
- The Guarantee Fund for Agricultural Projects.
- The Calamity Fund for Agricultural Projects.

[15] Exchange rate as of July 2016.

However, these funds are not specifically targeted at disaster-related expenditure and tend to be insufficient to cover the costs of a catastrophe. Often, the assistance needed after an extreme event are larger than expected and there is a need to reallocate budget that has been assigned to other purposes, such as prevention. The cost-effectiveness of setting aside ex-ante budget allocations for disaster risk management is dependent on the countries needs and the projected impacts of disasters. Analysis by the World Bank & GFDRR (2012) suggests that the procedure to access these funds is not fully transparent.

Financial protection instruments being used in Senegal

There is a growing range of tools to cover the financial impacts of droughts at the national and household level in Senegal. These have developed largely as independent initiatives, rather than as part of a comprehensive strategy on financial protection. Other climate hazards, particularly flooding, have received less attention to date, although existing mechanisms are looking to expand their hazard coverage. Table 5 presents an overview of relevant financial protection tools, which are explored in more depth in the following sections.

Table 5. Spectrum of financial protection measures in Senegal

Financial protection tool	Level of risk coverage		
	National	Private sector	Household and informal economy
Insurance mechanisms	African Risk Capacity	National Company of Agricultural Insurance (CNAAS) products	Microinsurance initiatives (WFP R4 initiative, private insurers)
Catastrophe bonds	-	-	-
Post-disaster credit/ Disaster credit	-	-	-
Savings or reserve funds	Bonus Fund, Guarantee Fund, Calamity Fund	-	Household Savings
Ex-ante social protection	-	-	National Programme of Family Security Grants (PNSBF) ; Adaptive Safety Net program
Humanitarian relief and compensation payments	Emergency Funds from donors (USAID, UNOCHA)	-	-
Remittances	-	-	-

The coverage of these different instruments is increasing steadily, but they still only meet the needs of a relatively small part of the population. Reaching the populations most vulnerable to climate impacts, including the 60% of people reliant upon rain fed agriculture for subsistence, will be one of the key challenges for the future development of these tools. Better coordination between existing initiatives, and more resources could play an important part in increasing coverage. The creation of a national certified registry could assist with targeting and coordinating beneficiaries of agricultural insurance and social protection, and facilitating faster disbursement of funds.

Sovereign level

The African Risk Capacity (ARC) facility is the primary risk transfer instrument used by Senegal. The ARC is a Specialised Agency of the African Union providing parametric weather insurance coverage to African governments. Senegal joined ARC in 2012 under the supervision of the Directorate for Civil Protection. The payment of a USD 3.1-3.6 million yearly premium makes Senegal eligible for a payout of up to USD 30 million for emergency relief if the policy is triggered (Republic of Senegal, 2013). The current policy covers the risk of drought, but ARC is planning and designing the Extreme Climate Facility to include other natural hazards such as flooding. Development co-operation providers played an important part in Senegal's participation to ARC, with JICA paying for the first year's premium as the government's annual budget was already fully allocated. The government's commitment was increased when this first premium secured a USD 16.5 million payout following the 2014 drought, two-thirds of which were to be used for in-kind food distribution and the rest to subsidise livestock feed. The implementation of relief activities is under the responsibility of the CSA.

ARC aims to minimise the time of response to a drought: payouts are meant to be spent by governments in the first 120 days following a disaster to capitalise on the advantages of early intervention. An ARC cost-benefit analysis estimated that the economic benefits of getting aid to households in the critical three months after harvest could result in benefits of nearly USD 1 300 per household assisted in terms of protected economic gains (Republic of Senegal, 2013). These benefits include the protection of nutritional intake and avoiding the need to sell productive assets.

ARC also mandates the preparation of an Implementation Plan prior to the disbursement of the payout. This preparation allowed Senegal to adjust its resource allocation mechanism to benefit the most vulnerable populations. An independent review of the Final Implementation Plan commissioned by ARC (Kimetrica, 2014) identified a lack of clarity on how many livestock owners would be targeted by the livestock feed subsidy and the risk that this subsidy would only be available to relatively wealthy farmers owning more than ten cattle. Subsequently, Senegal changed the monitoring of the revolving fund receiving revenue from feed sales as well as the requirements relating to the number of cattle (DfID, 2015).

However, prior to disbursing the payout, both ARC and an independent review of the final contingency plans expressed concerns regarding the lack of clarity regarding the targeting of payouts and whether those that were most affected by the droughts would receive support (DfID, 2015). In the case of food distribution, for example, the plan details the number of projected beneficiaries per department of intervention (between 4 000 and 70 000), and mentions that beneficiaries will be selected using "targeting criteria", without detailing precisely what those may look like. Distribution of food is projected to involve many actors: it is led by the Executive Secretariat of the National Food Security Council, which will establish a national food and distribution supervisory committee and several regional and departmental technical committees. These will work in collaboration with decentralized administrative authorities (governors, prefects and sub-prefects) and Food Security Monitoring and Livelihoods Agents. Village or neighbourhood assemblies will help to identify the most vulnerable households. The CSA is responsible for acquiring and delivering food at the localities (ARC, 2014).

The first payout under ARC in Senegal, following the 2014 drought, revealed implementation challenges. Underestimation of the logistical difficulties in distributing food to those affected by drought, and the complicated process for disbursing the payout within the country have both been cited as the main causes of this delay. Senegal is among the first countries participating to ARC to receive a payout, and has received the largest compensation by far.[16] These challenges provide an opportunity for other ARC member states to learn from the country's experience. For instance, ARC currently gives the compensation

[16] In 2015, ARC paid out USD 16.5 million to Senegal, USD 6.3 million to Mauritania and USD 3.5 million to Niger.

payout to the finance ministry in Senegal, following previously agreed arrangements. But officials within the Insurance Department and ARC noted the ministry's budgetary processes were not well suited to meeting the demands of rapid disaster relief. For this reason, the finance ministry considering accrediting an alternative institution to receive ARC payouts and speed-up its use, as was done by Mauritania with a commercial bank.

According to the Finance Ministry, the current maximum amount for payouts, capped at USD 30 million, is insufficient to cover Senegal's needs. The Ministry estimated the costs of the 2014 drought at USD 57 million, which was almost double the payout. To further increase the reach of ARC, development co-operation providers could support Senegal to subscribe to a second insurance policy and better insure its potential losses, as has been done with Kenya. ARC is also encouraging UN agencies and NGOs to participate in its new Replica Fund and match country policies to double their coverage in case of crisis. Participating in the Replica Fund might be another opportunity for development co-operation providers to support the scaling-up of ARC.

Private sector

Private sector property insurance consists mostly of flood cover for commercial and industrial assets (World Bank & GFDRR, 2012; Political Champions Group, 2013). However, the penetration of this product in the market is very low, mainly for two reasons: the lack of general insurance market development and weak property rights, particularly in rural areas where customary law continues to prevail (USAID, 2010). The exact percentage of registered privately owned land is unknown, but rates of land ownership are estimated to be growing albeit from a low base (Durand-Lasserve and Ndiaye 2008; Monkam 2009).

Household level

Financial protection at the household level has focused on the agricultural sector. One of the underlying issues is the lack of land-use planning and insufficiency of property rights. In 1987, the government adopted a policy of systematic regularization of informal settlements and planned to provide upgradeable, 50-year rights of occupancy to 41 000 households. But this policy lacked the financial and human resources support necessary for implementation, and only about 1 600 plots had been regularized under the program as of 2007 (*ibid*). Flood micro-insurance in urban areas, especially Dakar, linked with credit, could represent a viable alternative and improve coverage of low-income households (Political Champions Group, 2013), providing compliance and enforcement of the existing land-use planning regulations can be successfully addressed.

Another underlying challenge is that access to finance in Senegal remains very limited. Products such as credit, saving opportunities, transaction facilities and insurance do not reach a large part of the population (PRISE, 2015). Only 43% of the population has access to credit, and only 0.24% uses mobile banking to pay bills (PRISE, 2015). This lack of access to financial markets increases considerably the risk of low-income populations falling into poverty traps, in particular after a weather-related disaster. Therefore, better access to finance, as a way to cope with greater risk and to escape poverty, could be an important instrument for adapting to climate change. This is an area where further research is needed to ensure access to finance meets the needs of the most vulnerable populations.

Most of the ex-ante mechanisms[17] for financial protection of households focus on the agricultural sector, given the sector's vulnerability to drought and the large proportion of the population relying on it for subsistence. The first mechanism put in place in the late 1990s, the Calamity Fund, provided disaster

[17] For more the ex-post use of national budget for emergency situations, see section 3.2.

relief to borrowing farmers primarily by waiving loans from the National Bank for Agricultural Credit (CNCAS). Together with the Guarantee Fund[18] and the Bonus Fund[19], the Calamity Fund received USD 99 million from the government between 1998 and 2005 (Political Champions Group, 2013). Between 2005 and 2012, the funds were budgeted but never disbursed, until 2013 when an extra USD 6 million was allocated to them. However, these funds have been criticised for the lack of transparency in the allocation and the delays in implementation (WB/GFDRR/DFID, 2013). The government is instead relying increasingly on insurance mechanisms for the agricultural sector.

The Ministry of Finance has been considering the development of agricultural insurance since 1996, culminating in the creation of the National Agricultural Insurance Company (CNAAS) in 2008, a Public Private Partnership underwriting crop and livestock insurance, both traditional and index-based. The CNAAS is 50% owned by private insurance companies, 37.5% by the government, and the remainder by farmers' organisations. Since it does not require a verified auditor to assess the insurance claim but only weather stations recordings, index-insurance should have lower transaction costs.

The CNAAS focusses on index insurance for small farmers, for which the Government provides a 50% premium subsidy, and has about 20 000 policyholders. This number includes small neighbouring farmers united through Groups of Economic Interest, who pool their assets to reach the critical size for subscribing to insurance. While this represents an impressive increase from the 1 285 policies sold in its first year of operation (2011), the CNAAS' coverage is still minimal at the national level.

Development co-operation providers are boosting the CNAAS's coverage by funding regional pilot projects such as Feed the Future Senegal's Naatal Mbay (USAID) and R4 (World Food Programme/Oxfam) which target the most vulnerable farmers and encourage them to insure themselves through Groups of Economic Interest. They are also indirectly supporting the expansion of this type of micro-insurance programme to new areas through their investment in weather stations. The World Bank has also supported the regional insurance industry body, the Conference of Inter-American Insurance Markets to provide a legal and regulatory framework for micro-insurance and agricultural index-based insurance (CIMA Book 7).

The uptake of adaptive practices at the household level, and the degree of confidence in insurance mechanisms, relies upon the development of reliable climate information services tailored to farmers, herders and fishermen's needs. USAID and the World Meteorological Organisation's Global Framework for Climate Services (GFCS) are partnering in Senegal to fund the dissemination of climate predictive information for risk management. GFCS also supported ANACIM to develop a National Action Plan on Climate Services outlining their needs in terms of equipment and capacity building to better coordinate financial and in-kind support from donors. Reliable climate information services benefit the development of programmes for resilient livelihoods. These include USAID's Feed the Future projects, the Consultative Group on International Agricultural Research (CGIAR) research programme on Climate Change, Agriculture and Food Security (CCAFS) and the R4 rural initiative (Box 4).

CNAAS suggests its index micro-insurance products could increase their coverage if banking institutions required their loan customers to buy insurance, as opposed to only recommending it as they do today. The institution also cites the high cost for low-income farmers (despite the subsidy), the negative perception of insurance and the logistical costs of creating rural networks for product distribution as limiting its development (World Bank & GFDRR, 2012). The development of individual index insurance

[18] The Guarantee Fund reduces lending risk by compensating the CNCAS for up to 75% of agriculture (50% of livestock) loan default.

[19] The Bonus Fund subsidizes lending rates by compensating CNCAS for the difference between market rate and the mandated 7.5% charged to borrowers.

is also strongly limited by the lack of weather stations infrastructure. Another area for development is to increase the coordination with the pan-African Risk Capacity providing index-based agricultural insurance at the sovereign level.

Box 4. R4 Rural Initiative in Senegal

The R4 Rural Initiative was initiated in 2011 by the UN World Food Programme and Oxfam America, initially with Senegal and Ethiopia. Building on the Horn of Africa Risk Transfer for Adaptation (HARITA) Initiative, started in 2009 by Oxfam America in Ethiopia, R4 aims to improve the resilience of vulnerable households living in rural areas against climate volatility and weather-related catastrophes.

This programme integrates four risk management strategies:

- Improved resource management through asset creation (risk reduction): Assets built through risk reduction activities promote resilience by steadily decreasing vulnerability to disaster risks over time.
- Insurance (risk transfer): Farmers can access agricultural index-based insurance by paying with their labour through Insurance-for-Assets (IfA) schemes. When a drought hits, compensation for weather-related losses reduces the need for farmers to sell productive assets and stimulates faster recovery.
- Livelihoods diversification and microcredit (prudent risk taking): Insurance facilitates access to credit at better rates by serving as collateral. Households can invest in riskier but more remunerative enterprises, as well as in seeds, fertilizers and new technologies to increase their agricultural productivity.
- Savings (risk reserves): Participants establish small-scale savings, which are used to build 'risk reserves'. Savings help build a stronger financial base for investing – but also act as a buffer against short-term needs and idiosyncratic shocks, such as illness and death.

To ensure long-term sustainability, R4 contributes to the creation of rural financial markets, by building local capacity and gradually transitioning farmers to pay for insurance in cash. In 2015, more than 3 500 farmers were covered by insurance, out of which more than 3 000 received a total payout of USD 81 000, as a result of the major dry spells recorded at the beginning of the rainy season.

Subscriptions to R4's insurance product represent more than half of the CNASS' index insurance portfolio.

Source: WFP & Oxfam America (2014).

Beyond agricultural micro-insurance, USAID is pioneering a micro-insurance scheme for fishers through its programme Collaborative Management for a Sustainable Fisheries Future in Senegal (COMFISH). Currently in its test phase, the scheme enrols fishers to volunteer in a collaborative surveillance programme through Local Councils for Artisanal Fisheries, as a means to both fight illegal fishing and protect lives and assets through mobile-phone-based early warning systems. This pilot also offers insurance coverage for each of the fishers' outings at sea which, like the agricultural projects previously described, operates in partnership with the CNAAS and ANACIM.

At the national level, the development by the Directorate of Social Protection of a unified registry of poor and vulnerable households (known as the RNU) provides an opportunity to streamline the agricultural insurance and social protection systems. The registry compiles information about beneficiaries of all social programs under one system, and has been extended to support the next round of cash transfer program of the National Family Security Grant. The government plans to use this registry to channel ARC payouts to beneficiaries, which could greatly increase their transparency.

6. Lessons learnt and conclusions: key enablers of action and implications for development co-operation providers

The two case studies present two contrasting experiences in climate-resilient disaster risk management: Colombia, an upper middle income country, has long experience of vulnerability to climate-related natural hazards, compounded by long-running internal conflict. Senegal, a low income country, suffers the consequences from both urban floods and severe droughts that hinder the security of its urban population and have dramatic economic consequences for rural population and the agricultural production, a key economic sector.

Support from donors has made a substantial contribution to Colombia's and Senegal's efforts to strengthen the management of climate-related disasters. In particular, financial and technical expertise has facilitated the development of instruments to share, transfer and finance disaster risk. In both case studies, the main instruments focused on the management of risks at the sovereign level, while tools to target the most vulnerable households have not yet achieved widespread coverage.

The use of financial protection tools to manage exposure to climate risks requires strong co-ordination across relevant sectors, and at different levels of governance. Raising awareness both at the government level and among the population is a prerequisite for scaling-up interventions. This needs to be accompanied with the development of sufficient technical capacity and data for evidence-based decision-making. Yet, major gaps remain at present, both in Colombia and Senegal. Addressing these gaps will require concerted efforts to strengthen capacity, in particular through improved data availability and analysis, strong leadership and clear allocation of responsibilities.

Reliable data are needed for effective management of climate risks

Reliable, detailed data are important for adaptation and financial protection, but there are significant gaps in coverage in both case study countries. In particular, historical data on past losses from extreme events is incomplete. This makes it difficult to target efforts to manage risks, as well as model the potential scale of losses from future events. Under-recording of disaster losses is not confined to the two case study countries. Globally, disaster losses are estimated to be at least 50% higher than reported figures (UNISDR, 2013). In general, high impact, low frequency events are better recorded than low impact, high frequency events. Although both countries have specialised agencies working to provide accurate climate data, better coverage of climate and weather data remains essential to support risk management.

Investment in improved data collection and analysis is important for the management of current climate variability, but it can also make an important long-term contribution to climate change adaptation. Colombia has varied microclimates, but the coverage of weather stations is uneven. The lack of climate data for some of these microclimates makes it difficult to understand past trends, generate weather forecasts and project the impacts of climate change. The coverage of the Amazonian region is limited, but the government is taking steps to improve data collection, including through investment from the Colombian Adaptation Fund. This will over time provide valuable input to the development of index-based insurance and early warning systems. It takes several decades of historical data to understand local weather patterns.

The value of translating data into usable information is demonstrated by early warning systems, which are an essential, cost-effective component of integrated approaches to the management of the risks from climate change. Early warning systems are effective in reducing the mortality rate from extreme events, and also have the potential to reduce asset losses (Rogers and Tsirkunov, 2010). Bilateral donors are supporting the uptake of these measures through initiatives such as the Climate Risk Early Warning Systems Program (CREWS), which aims to support up to 80 countries in developing early warning

systems. This is supported by a number of countries, including: Canada, France, Luxembourg and Australia.

Better data on countries' economic vulnerability to climate-related disasters can help identify what measures are required for different sectors, regions and segments of the population. Efforts to strengthen data collection are part of a package accompanying Colombia's USD 250 million contingent credit from the World Bank. Historical data are being reconstructed using different sources of information such as newspaper archives to better understand the history of damages and costs. This was essential in informing the Colombian government on the applicability of tools for managing the consequences of future climate events. There are also efforts to strengthen the recording of current disaster losses, which will reduce the need to reconstruct missing data in the future.

Senegal is bringing together data from a number of different sources to create a centralised multi-risk database, including data on inland flooding, wild fires and coastal flood risk. Existing information is limited to weather data and climate projections, which were produced with the support of development providers. The recording of financial losses is restricted to assessments undertaken following large events such as the 2009 floods in Dakar. Losses from smaller, but more frequent events are not systematically recorded.

Improved data on vulnerable populations can also assist with the management of climate risks. In Senegal, the creation of a national registry of social protection beneficiaries helps to target and pay social protection. The registry has facilitated the development of mobile payments for social protection, with approximately 30 000 households now receiving cash transfers from the government via their mobile phones.

Strengthening capacity and building leadership at national and subnational levels

Strong capacity is required to understand and manage the risks posed by climate change. Given the cross-cutting nature of climate change, one key aspect is the institutional co-ordination between the relevant policy areas, and the allocation of responsibilities across the government agencies at the national and subnational level. Traditionally, responsibility for designing and implementing climate change adaptation policies lies with the ministry of environment, while the responsibility regarding disaster risk management and financial protection is spread across several agencies (finance ministry, agency for civil protection, among others). As a result, the financial protection, disaster risk management and climate change community often operate in different silos, governed by different agencies, budgets and timelines. Stronger co-ordination among stakeholders has the potential to avoid duplication of efforts, improve the targeting of scarce resources and fill knowledge gaps.

In Colombia, the leadership of the finance ministry's risk management unit has been essential for the development of the financial protection strategy. The financial strategy, developed with strong support from the World Bank and the Swiss Development Co-operation agency, has resulted in the signing of a credit line with a catastrophe drawdown option (Cat DDO), a planned risk pooling facility with Pacific Alliance Countries and mandatory insurance for road concessions. The finance ministry is a strong actor and can ensure co-ordination within the sectoral ministries as well as with subnational governments (OECD, 2015; GFDRR, 2014).

At the subnational level, capacity is often limited due to reduced budgets and limited staff numbers. In Colombia, the majority of resources flowing to disaster risk management are channelled at the subnational level, but the availability of ex-ante funding and budget allocations are limited. As a result, subnational governments are often forced to reallocate funds for emergencies form other sources, or to obtain humanitarian aid from the national government and external partners in case of a large disaster. The city of

Bogota has emerged as a leader in the management of disaster risks, recognising the burden that disasters pose in its finances and the well-being of the large urban population. Since 2012, it has integrated climate change adaptation and disaster risk management into the same institute. Bogota has also created a dedicated fund to finance knowledge, prevention and management activities as part of the Strategic Plan for Disaster Risk Management and also the Climate Change Plan. The city invested resources with support from the World Bank to develop studies that helped to identify high-risk areas and prioritise key actions to reduce vulnerability, and consequently developed a portfolio of financial protection options.

In Senegal, donors including Japan, the World Bank and the Global Facility for Disaster Risk Reduction (GFDRR) have been active in supporting national level efforts to manage disaster risks. They are jointly supporting the strengthening of the Civil Protection Agency and the improvement of the Platform for Disaster Risk Reduction Civil Protection Agency. However, the implementation of these plans is still facing challenges, due in part to capacity constraints. The participation of actors from the adaptation community in the platform would be beneficial for streamlining knowledge on climate impacts and improving integration at the sectoral level.

Urban areas in Senegal, including Dakar and Kaolack, are vulnerable to recurring floods exacerbated by unplanned development. The Municipal Development Agency is taking the lead in improving the management of urban floods. The Agency embarked in an ambitious project to improve the management of storm water and adapt to climate change (PROGEP project). This project included capacity building, investment in protective infrastructure, and the engagement of affected communities in risk reduction efforts. Donors provided technical and financial support for the post disaster needs assessment (PDNA) after the floods in 2009, which resulted in the adoption of the 10-year flood management plan and provided the foundation for PROGEP's implementation. However, challenges remain including: inadequate enforcement of land use planning legislation; social conflicts linked to resettlement; and negative health impacts caused by floods. Maintaining robust and reliable data on floods and having the capacity to interpret them have been signalled as areas where support would be welcome.

Development co-operation providers can play a vital role in strengthening the capacity of national and subnational governments by: (i) supporting the creation or strengthening of data collection and analysis on climate risks, vulnerability, economic impacts of disasters and past and projected losses; and (ii) building capacity in government ministries and relevant agencies to assess climate-related risks and define a suitable financial strategy.

Financial protection against climate-related risks: what works, when and for whom?

Financial protection tools have different sets of benefits and limitations (Table 6) and the appropriate set will depend upon countries' circumstances. In Colombia, the focus of development co-operation efforts to date has been on improving the management of risks held by the public sector. In contrast, in Senegal providers have focussed particularly on extending coverage to farmers and poor households. The approach taken in Senegal is partly due to capacity constraints at the national level, leading providers to choose pilot initiatives jointly managed by the government, CSOs, producer organisations and the beneficiary communities.

Table 6. Benefits and limitations of selected financial protection tools

Tool	Scope	Benefits	Limitations
Insurance mechanisms	National Private sector Households	Immediate transfer of risk to third party Premiums may reflect underlying risk Potential for bringing in private-sector expertise in risk management	Cost of premiums, including transaction costs Delays in receiving payments Requires developed financial infrastructure and data
Catastrophe bonds	National	Minimal counter-party risk Immediate transfer of risk to third party	Cost of interest payments Basis risk for parametric products Fixed costs and technical capacity requirements
Post-disaster credit / Contingent credit	National	Speed of payment Low costs in absence of extreme event	Only suitable for countries that can take on further debt Holding fees for beneficiaries
Savings or reserve funds	National Private sector Households	Immediate disbursement Funds still available even if no disaster occurs Lower cost than insurance, if risk neutral May be the only available instrument	Opportunity cost of holding funds in reserve Takes time to build up sufficient levels of reserves Pressure to use funds for other purposes
Ex-ante social protection	Households	Suitable for poor and vulnerable people as no upfront costs for beneficiaries Predictability	Fiscal liability for government Potential delays in expanding coverage following an extreme event
Humanitarian relief and compensation payments	Private sector Households	No upfront costs for beneficiaries May be only instruments available	Uncertainty about payments received Delays in reaching beneficiaries Payments may not reflect losses

Source: Adapted from (G20/OECD, 2012).

Financial protection has to be part of a broader disaster risk management package including risk assessment and risk reduction. The two case study countries are using financial protection tools as part of a comprehensive disaster risk management and adaptation strategy. An emerging lesson is that it is particularly important to ensure that the allocation of risks is clearly understood prior to the occurrence of an extreme event, thereby helping to allocate responsibilities and budgets to implement a comprehensive strategy. The decision on which climate-related risks will be reduced, shared, transferred or retained will depend on a careful evaluation of the impacts and the social and economic needs of the country.

In Colombia, significant flooding in 2010-2011 catalysed political will and policy reforms to strengthen the management of climate-related risks and other natural hazards. In particular, it resulted in the development of a financial strategy against natural disasters. Colombia's strategy is focused on protecting the sovereign level from the fiscal impact of natural disasters by combining risk reduction with financial protection. The government has developed financial protection tools for large, infrequent events

via contingent finance from the World Bank. They have also improved data and strengthened insurance of public assets. Remaining challenges include the management of low intensity, high frequency events. At the household level, the majority of the population relies on the assistance of the Government, including humanitarian assistance, to recover from an event.

Senegal's government has acceded to the ARC regional sovereign risk insurance facility with support from bilateral providers. For participating countries, the Facility provides rapid liquidity in case a drought hits, as the funds are disbursed within the first 3 months after the declaration of the emergency. As such, it is benefitting from risk transfer mechanisms, transferring part of the risk to the private sector, and pooling resources with other countries in a similar situation regarding climate-related risks. ARC also supports risk reduction through the provision of technical capacity, and over time is intended to strengthen adaptive capacity by keeping development on track in the face of climate variability.

Agricultural insurance is a financial protection tool that exists in both Colombia and Senegal, however uptake remains low. Underlying causes are (i) limited availability of tailored financial protection tools; (ii) transaction costs; and (iii) limited availability of data, making insurance products relatively expensive.

The private sector has important roles in relation to financial protection as a source of finance, expertise and potential beneficiary. Nonetheless, the development of the private market financial protection products in developing countries is still insufficient to tackle the scale of the challenge. Where private markets are less developed, like in Senegal, public support and co-ordination with the private sector can encourage the expansion of insurance coverage.

Proactive support for risk reduction

Both Senegal and Colombia have demonstrated the potential for well-designed financial protection instruments to strengthen incentives for risk reduction. In Colombia, one of the central tools being used for financial protection, the Cat DDO (contingent credit line) inherently provides an incentive for risk reduction, as the loan would have to be repaid. Moreover, the implementation of the Cat DDO is bundled with a larger set of measures that will proactively reduce risks from climate change. In particular, efforts to strengthen capacity at the municipal level should help to reveal where risks are concentrated and provide an incentive for those risks to be reduced. Other elements of the financial protection strategy also support risk reduction: for example, improving insurance of public assets and PPP infrastructure also serves to encourage risk reduction because risk exposure is reflected in insurance premiums. This improves on the prior situation where risks were implicitly borne by the government, which reduced concessionaires' incentive to engage in risk reduction.

There has been less of a link made between financial protection and risk reduction for farmers and households in Colombia. Uptake of insurance remains very low: despite premium subsidies of up to 80%, only 3% of agricultural land is currently insured. The underlying challenges include lack of awareness and the expectation that government compensation will be provided if a disaster occurs. The government provides emergency assistance after a disaster hits, but the incentives for prevention and the tools to assist the most vulnerable are not yet there. The Colombian Adaptation Fund has shifted from a focus on emergency response and reconstruction to an increasing emphasis on prevention, which provides an opportunity for communities to build back better and, more generally, to reduce their vulnerability to future events.

In Senegal, the ARC mechanism inherently provides an incentive for risk reduction, as payments are dependent upon the occurrence of a predefined weather threshold being crossed, rather than the actual losses incurred. This has been accompanied with measures to support understanding of risk exposure through the Africa RiskView programme. The R4 programme provided an integrated set of measures to

support risk reduction, as well as providing financial protection against extreme events via index-based insurance mechanisms at the household level. The challenge now is to scale up coverage at the household level, as only a fraction of the population is currently able to benefit.

Social protection can help improve households' adaptive capacity

Social protection schemes, and other non-market mechanisms, are vital for reaching the most vulnerable populations who are not able to afford insurance coverage. Coverage of insurance for climate risks remains low among developing countries and, particularly, vulnerable groups within those countries (Surminski, 2015). Technological innovation, and the prospect of achieving economies of scale, may help to address this issue, but uptake is likely to remain contingent on the availability of subsidies. As a consequence, the expansion of coverage is constrained by the availability of public funding (domestic or external). The relative cost-effectiveness of using public funds to subsidise insurance should be compared with alternative approaches, given the likely cost and potential for market distortions.

In Senegal, the World Bank is working with the government to develop an adaptive social protection programme that aims at enhancing the transparency of social protection systems in the country, and addressing the critical conditions of families in the face of continuous drought. The programme evolved with support from the UK to adjust the existing social protection system so it can be rapidly scaled-up in response to regular crises. Poor households have few other options for managing these risks beyond resorting to coping mechanisms such as selling assets, using savings and reducing their expenditures. Rapid social protection payments have the potential to reduce the need for erosive coping strategies. Development co-operation partners can provide their expertise to expand traditional cash transfer programmes to take into account climate change impacts and tailor them to build resilience. In Colombia, no specific programme exists to improve the resilience of poor households towards climate impacts.

Improve co-ordination among development co-operation providers to scale up action

Bilateral and multilateral finance flowing to adaptation is growing, and is likely to increase following the Paris Agreement. However, finance targeting the management of climate risks related to disasters in Colombia and Senegal is relatively low (around 1% of total ODA received, according to analysis of OECD DAC CRS data). Colombia has benefitted from a long standing partnership with the World Bank. Senegal has received support from both Japan and the World Bank to improve its disaster risk management and adaptation links. A key lesson from this has been the importance of sustained and co-ordinated engagement on this topic by donors, given the long term need to build awareness, strengthen institutions and build capacity In Senegal, a roundtable of donors targeting different sectors has provided a practical approach for co-ordinating efforts and finding common objectives to pursue.

Collaboration with development co-operation agencies enabled the implementation of innovative financial protection mechanisms against disaster risk in both case study countries. The development of Colombia's financial protection strategy benefitted from financial support and technical expertise from the World Bank and Swiss Development Co-operation. This was designed to facilitate continued engagement in the country, thereby helping to ensure longer term impact. In Senegal, the R4 initiative has provided farmers with access to insurance, as well as supporting risk reduction practices. Financial support from Japan, and the UK enabled Senegal to join the African Risk Capacity. Low rainfall meant that Senegal was eligible for a payout in the first year, which prompted the decision to subscribe again the following year using domestic funds.

Improve support for financial protection in national development and adaptation planning

Financial protection tools and adaptation are not yet an integral part of national development or adaptation planning in developing countries, with a few exceptions. In Colombia, the leadership of the finance ministry in developing the strategy for public management of natural disasters resulted in the inclusion of financial protection tools in the country's national development plan. This included efforts to reduce fiscal risk to natural disasters by addressing drivers of risk (particularly land use management) and protecting the most vulnerable population. The involvement of the World Bank and SDC helped to elevate the role of financial protection in the country's political agenda. Financial protection is not yet a major component of Colombia's national adaptation strategy, but there is scope for inclusion in the financial sector's adaptation plan.

The situation is similar in Senegal, with financial protection being integrated with the development plan but not with the adaptation plan. The country's NAPA does not directly include financial protection, although it does mention the potential for expanding microcredit. This reflects the fact that NAPAs are intended to identify priority projects for implementation rather than taking the more strategic role envisaged for NAPs. The NAP is currently being developed. However, financial protection is included in their economic development strategy and implementation plan. Their *Priority Action Plan* includes measures to improve disaster risk management and strengthen financial protection.

Monitoring and evaluation for continuous learning

Monitoring and evaluation is essential for managing exposure to climate risks, but it is at an early stage in many countries. It is needed for two purposes: firstly, it supports continuous learning, identifying effective approaches and helping to identify where changes are needed. Secondly, it helps to ensure that resources in support of this agenda are used in a cost-effective manner. OECD (2015b) emphasises that the approach used needs to be pragmatic, reflecting data availability and domestic capacity.

Colombia and Senegal are developing systems for monitoring and evaluation as part of their national adaptation processes. Although neither currently has a system in place, elements of the four tools from OECD (2015b) are emerging: risk and vulnerability assessments; indicators to monitor progress; in-depth evaluations of significant projects and national audits and expenditure tracking.

Both countries have produced vulnerability assessments, but neither of these assessments can be used to directly measure progress. Senegal's vulnerability assessment, which was developed to inform its NAPA, was a predominantly qualitative analysis, so does not provide a baseline for assessing changes over time. However, it could be used to identify vulnerabilities for future monitoring. There are no plans to update this national assessment, but more detailed coastal risk assessment will be undertaken through the creation of the Observation Mission of the West African Coastline. More recent studies have been commissioned by third parties, including USAID (2014) and the World Food Program (2012), but this has been on an ad-hoc basis. Colombia is currently finalising an updated, detailed vulnerability assessment. This includes a mixture of qualitative and quantitative analysis. If national vulnerability assessments were repeated on a regular basis, and with a consistent methodology, this could support adaptation planning by providing indications of how vulnerability is evolving.

Indicators for monitoring climate and disaster risk and vulnerabilities can help to monitor progress over time, but major data gaps remain. As mentioned above, data on the incidence of climate-related losses from extreme events remains sparse, particularly in relation to smaller but more frequent events. Improvements in data quality would provide a clearer indication of progress in reducing vulnerability, as well as supporting the expansion of financial protection. Besides recorded losses, the data collected to monitor progress towards the achievement of the SDGs will also be helpful for assessing trends in

underlying drivers of vulnerability, such as poverty and other forms of social disadvantage. Given the spatially-specific nature of adaptation, it will be particularly helpful to have geographically-disaggregated data.

Evaluations of large, or innovative, programmes can support learning about effective adaptation approaches. This was illustrated in Colombia by an in-depth evaluation of their system for disaster risk management by the World Bank (2012). The lessons gained from this provided the foundation for subsequent reforms to address the underlying drivers of vulnerability, such as unplanned development. The R4 resilience initiative in Senegal has benefitted directly from the lessons learnt during the development of the HARITA programme in Ethiopia. On-going evaluation by WFP and OXFAM (2015) is helping to identify progress to date and remaining areas for improvement. Annual progress reports on the African Risk Capacity programme have been undertaken by DFID and made available on their website. Proactive dissemination of this learning will help to ensure that the lessons from this project can inform other programmes.

The final tool, expenditure tracking and audits, have demonstrated some interesting results in Colombia, but are not being undertaken systematically in either case study country. The Colombian national audit institution (*Controlaria General*) undertook an evaluation of their national adaptation programme in 2014, which informed the subsequent development of that programme. Colombia has also developed analysis of the "costs of inaction", through estimation of its contingent liabilities and analysis of the potential costs arising from climate change. This was influential in motivating action to tackle this agenda. However, there are currently limited data on the extent to which resources are being invested to manage climate-related risks.

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ANNEX 1. WORK OF OECD ON ADAPTATION AND DEVELOPMENT

The DAC-EPOC Task Team has the unique ability to convene adaptation practitioners from development agencies and environment ministries, while also engaging with partner countries and other civil society partners, to share experience and promote mutual learning about what constitutes good practice. At the international level, following UNFCCC decisions, partner countries are actively preparing National Adaptation Plans (NAPs). Partner countries are mobilising resources, building capacity and institutional processes to adapt, including at local level. The Task Team supports these efforts by fostering exchange and providing policy recommendations to both DAC members and partner countries.

Main policy guidance products of the Task Team include:

- The OECD Policy Guidance on *Integrating Climate Change Adaptation into Development Co-operation* (2009) provides overarching general principles that the Task Team has supplemented with a range of follow-on activities, including: A practice-oriented training based on the OECD Policy Guidance.

- An examination of the use of risk screening tools, summarised in the working paper Harmonising Climate Risk Management: Adaptation Screening and Assessment Tools for Development Co-operation.

- The study of monitoring and evaluation in development co-operation practice, which buildings on the Task Team's 2011 survey of practice in member countries Monitoring and Evaluation for Adaptation: Lessons from Development Co-operation Agencies.

A new OECD Working Paper explores methodological approaches to monitor and evaluate climate change adaptation initiatives at the project and programme level. It focuses on three M&E challenges of relevance for adaptation and examines what lessons can be learned from other areas of development practice: i) assessing attribution, ii) establishing baselines and targets, and iii) dealing with long time horizons.

The most recent output of the Task Team is the publication on National Climate Change Adaptation: Emerging Practices in Monitoring and Evaluation. This report examines the approaches used in developing and OECD countries to identify emerging lessons. It proposes four tools that countries can use for their own assessment frameworks: 1) climate change risk and vulnerability assessments, 2) indicators to monitor progress on adaptation priorities, 3) project and programme evaluations to identify effective adaptation approaches, and 4) national audits and climate expenditure reviews.