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Access to Insurance by Developing Countries Against Climate Related Disasters

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Access to insurance by developing countries against climate related disasters

A working paper prepared for project number “000406009 Facilitating Private Sector Capacity: Access to insurance by developing countries against climate related disasters”.

The report was prepared by Koko Warner, the United Nations University Institute for Environment and Human Security (UNU-EHS); Gordon Woo, Risk Management Solutions (RMS); and Denisa Dmitru (Stellar Re Intermediaries), in cooperation with UNDP colleagues in the Private Sector Division (PSD), Energy & Environment Group (EEG), Poverty Group (PG) as well as the Office of Development Services (ODS), and the Munich Climate Insurance Initiative (MCII).

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The opinions expressed in this report are those of the authors and do not necessarily represent those of UNDP, the United Nations University, or the Munich Climate Insurance Initiative (MCII). Questions and comments are welcome and should be addressed to UNDP (Arun Kashyap), or to the primary authors Koko Warner (warner@ehs.unu.edu), Gordon Woo (gordon.woo@rms.com), and Denisa Dumitru (denisa_dumitru@yahoo.com).

Foreword

This report has examined options for access to insurance against natural disasters by developing countries. Within the overall framework of sustainable human development and Millennium Development Goals, the report analysed the existing approaches, practices and knowledge, and ongoing UNFCCC Conference of the Parties discussions on insurance, risk management and developing adaptive capacity to climate change.

This report contains the following main sections, in accordance with the project's terms of reference:

- A background on climate change, adaptation, and insurance solutions
- A landscape review of experience with climate risk insurance tools at the macro, meso, and micro level
- A landscape review of debt swap as a potential financing tool for insurance mechanisms (i.e. to help pay the premiums for insurance coverage on behalf of developing countries most vulnerable to climate change risks).
- Alternative insurance solutions and a possible business model to link insurance, adaptation, and debt swaps

The report also included a framework for a viable model that has been tested with the insurance/reinsurance companies in both developing and developed countries in pooled catastrophe risk management solutions. Attempts have been made throughout the report to include practical recommendations based on a forward-looking and out of the box approach to address the issue of access to insurance against climate related natural disasters by developing countries. The report was shaped in close consultation with UNDP colleagues in the Private Sector Division (PSD), Energy & Environment Group (EEG), Poverty Group (PG) as well as the Office of Development Services (ODS).

We appreciate the chance we have had to explore this timely issue with the UNDP, the Munich Climate Insurance Initiative (MCII) and many other colleagues listed in the acknowledgements. We hope our findings will be useful as the UNDP explores modalities to help facilitate access to risk reduction and insurance in developing countries to secure development and promote adaptation to climate change.



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Executive Summary

Business Case for a UNDP Insurance Facility

Insured losses from weather-related natural hazards are rising, averaging roughly USUSD 100bn per annum in the last decade. The losses in value and productive capacity in developing countries in dollar terms may be larger still, and the overall impact of weather-related natural hazards on losses in these areas in terms of development, productivity, and the freedom to achieve full social, cultural, and human potential is staggering. The need for risk management tools such as insurance is growing in these areas at a time when climate related and other risks are also rising. The question arises how such approaches could be applied in developing countries—what lessons have been gained from existing experience—and what innovative approaches might be available to help finance insurance activities, as developing countries are unlikely in a position to bear the burden of establishing or paying premiums for insurance approaches in a situation of rising weather-related risks and climatic change.

This report helps answer this question by examining insurance solutions that are already used in developing countries to address weather risks, and assessing the role of insurance in developing countries in the face of climate change. This report explores these issues and presents future directions for the UNDP and its partners to engage at the macro, meso, and micro level in helping guide the design and implementation of insurance solutions for developing countries to help them adapt to climate change.

Insurance is an essential component of a financially secure and stable strategy for coping with the vagaries of natural disasters. Yet, while disaster insurance is widely available in the developed world, it remains still a rarity in developing countries. With the prospect of climate change exacerbating already severe meteorological and hydrological hazards, it is clear that development in countries lacking an adequate catastrophe insurance infrastructure will be strongly set back or even reversed. Indeed, perpetual under-development may be the fate of many hazard-prone countries exposed to a harsher climate.

A prudent development programme planned for a world of deteriorating climate should thus include consideration of an insurance facility. A prerequisite for the affordability of climate disaster insurance is the mitigation of excessive climate risk through practical and effective adaptation measures. Funding for climate adaptation can be contributed from a diverse range of sources, including debt swaps for climate, as well as carbon trading levies, emissions taxes etc.. Risk assessments would need to be undertaken to prioritize the adaptation measures.

Where climate disaster risk falls, or is brought down, within the actuarial bounds of insurability, a UNDP insurance facility would be of enormous value in expediting the practical implementation of disaster insurance schemes in developing countries. In particular, an important function of a UNDP insurance facility would be to assist in the complex and challenging task of aggregating sufficient insurance funds. Supplementary to insurance premiums, climate disaster insurance funds would need bolstering through external contributions from engaged parties in both the public and private sector, prepared to shoulder some of the climate risk. At inter-government level, fund donations might be offered, or, less directly, debt swaps or other relief might be arranged. At corporate level, companies with major commercial ties with specific developing countries would have a self-interest in helping build up insurance funds. At an individual level, fund

contributions may be elicited from the wealthy with close links with a particular developing country, as well as from the general Diaspora spread around the globe.

Advocates of a UNDP insurance facility recognize the necessity and growing urgency of establishing an actuarially sound framework for providing an insurance umbrella for the developing world against the future perils arising from climate change. Those countries which are not adequately covered by disaster insurance are liable to have their economic development stunted in the decades ahead, even more than in past decades of a more benign climate. This stark reality facing the developing world underlies the business case for an insurance facility established under the auspices of UNDP.

1. Introduction

In recent years there have been more and more indicators that climatic change already influences the frequency and intensity of natural catastrophes¹. If the scientific global climate models are accurate, the present problems will be magnified in the near future. These models suggest that we should expect:

- increase in the frequency and severity of heat waves, droughts, bush fires, tropical and extra tropical cyclones, tornados, hailstorms, floods and storm surges in many parts of the world
- new exposures (like hurricanes in the South Atlantic)
- more extensive damage, economic, social, and environmental impacts from weather-related disasters

These increasing hazard-related risks—associated with both climate change and social and economic developments—create a substantial additional burden for sustainable development. These risks demand attention, particularly since the negative impacts of climate change could hinder progress towards achieving the Millennium Development Goals².

More than three-quarters of recent economic losses caused by natural hazards can be attributed to windstorms, floods, droughts and other climate-related hazards³, which appear to be increasing at a greater rate than geophysical disasters⁴. This trend can be largely attributed to changes in land use and increasing concentration of people and capital in vulnerable areas, for example, in coastal regions exposed to windstorms and in fertile river basins exposed to floods⁵. As indicated by the greater increase in weather-related disasters compared to geophysical disasters, climate change also appears to be a factor in increased disaster losses. The Intergovernmental Panel on Climate Change⁶ has predicted that climate change will increase weather variability as well as the intensity and frequency of weather-related extremes. There is also mounting evidence that climate change is contributing to increasing current risks⁷.

In the past quarter-century over 95% of deaths from natural disasters occurred in developing countries, and direct economic losses (averaging USUSD100 billion per annum in the last decade) in relation to national income were more than twice as high in low-income as opposed to high-income countries⁸. These disaster statistics do not (for the most part) reflect long-term indirect losses, which can be very significant, particularly in countries with little capacity to respond and recover⁹. Not only are there considerable differences in the human and economic burden of disasters in developed versus developing countries, but also in insurance cover. In the richest countries about 30% of losses in the period 1980-2004 (totaling about 3.7% of GNP) were

¹ IPCC (2007), Stern (2007)

² Stern (2007)

³ Munich Re (2007)

⁴ UNISDR (2007)

⁵ Mileti (1999)

⁶ IPCC (2007)

⁷ Solomon et al. (2007)

⁸ Munich Re (2007)

⁹ Bayer, J. and R. Mechler (2007)

insured; in low-income countries, only about 1% of losses (amounting to 12.9% of GNP) were insured. Due to the lack of insurance, combined with exhausted tax bases, high levels of indebtedness and limited donor assistance, many highly exposed developing countries cannot raise sufficient capital to replace or repair damaged assets and restore livelihoods following major disasters, exacerbating the impacts of disaster shocks on poverty and development¹⁰.

The decisive question today

The decisive question today is not when we will have the ultimate proof for anthropogenic climate change – a small risk of error certainly will remain for some time – but which strategies we should follow to mitigate and adapt to climate change. Increasingly, a focus among practitioner and policy communities has been on the management of weather-related climate change impacts—often natural hazards—and the potential complementary roles of risk reduction and risk sharing tools including insurance¹¹.

Parties to the UN Framework Convention on Climate Change (UNFCCC) have committed themselves to considering the special needs and concerns of developing countries resulting from the adverse effects of climate change in the area of insurance. The needs of small island developing states (SIDS) are particularly highlighted for attention, due to their unique geographic features and exposure, and unique vulnerability. Article 4.8 of the Convention, Article 3.14 of the Kyoto Protocol, and the Bali Action Plan propose actions, including insurance, to meet the specific needs and concerns of developing countries in adapting to climate change¹². More recently, insurance has been mentioned multiple times (13) in the Bali Action Plan, the pre-negotiating text that was released in the spring of 2009 (26 times) and in the early negotiating text itself (54 times). These mentions include keywords such as “insurance,” “risk sharing,” “risk transfer”, and “microinsurance.” Delegates will decide in the course of autumn 2009 whether and how insurance measures play a role in the Copenhagen Agreed Outcome which will shape approaches to mitigation (the reduction of greenhouse gas emissions) and adaptation (dealing with climate change impacts) beyond 2012 when the current commitment period of the Kyoto Protocol expires.

Many development organizations such as the United Nations Development Programme (UNDP) have explore how insurance might feature in helping countries particularly vulnerable to climate change impacts adapt. Insurance has featured in these discussions. For example, two UNDP brainstorming workshops on *Risk Management for the Developing Countries* at COP8 in New Delhi and on *Insurance for Climate Related Extreme Events for SIDS* at COP9 in Milan¹³ have explored the avenues for bringing risk transfer mechanisms including insurance to developing countries.¹⁴ A central concern, and the focus of this paper, is how to make such measures accessible and affordable to vulnerable developing countries in order to support them in their efforts to reduce risk and adapt to climate change.

The focus and scope of this report

The focus of this report is on tools that the United Nations Development Programme (UNDP) might consider to help it pursue its goals of achieving sustainable development for the poor, even in the face of increasing climate change impacts. This paper looks at the potential of risk pooling

¹⁰ Gurenko (2004), Linnerooth-Bayer and Mechler (2007), Barnett et al. (2008)

¹¹ Bayer et al. 2009, Skees, J.R., Barnett, B.J and Murphy, A.G. (2008)

¹² UNFCCC (2007), UNFCCC (2009)

¹³ In cooperation with Foundation for International Environmental Law and Development (FIELD) and Fondazione Eni Enrico Mattei.

¹⁴ An outcome of the latter workshop was the preparation of a paper on Insurance, Climate-Related Events and Risk Management in the Caribbean and Pacific through a collaborative process facilitated by UNDP between private insurance sector consultants and climate change experts in both the Caribbean and Pacific.

and risk transfer solutions to complement a comprehensive risk management strategy to help the poor adapt to climate change.

This paper focuses on models of access to insurance-related approaches to address climate-related natural hazards in developing countries, excluding long-term foreseeable climate risks which may be managed effectively using other tools. An underlying theme running throughout the paper is the logic of focusing first and foremost on development and risk reduction (avoiding losses), and using insurance-related approaches as additional beneficial measures to protect the poor. Further, the report provides an analysis of the existing approaches, practices and knowledge, and ongoing UNFCCC Conference of the Parties discussions on insurance, risk management and developing adaptive capacity to climate change. It will include practical recommendations based on a forward-looking and out of the box approach to address the issue of access to insurance against climate related natural disasters by developing countries.

Report structure

Following Chapter 1 which sets the stage, Chapter 2 reviews experience to date with insurance mechanisms for extreme events, the necessary conditions for insurance-like solutions to work, and some practical examples. The analysis then focuses on a central challenge to implementing insurance-like solutions for poor people and poor countries: how to finance these approaches (Chapter 3). The paper then turns attention to the special characteristics of climate risk insurance approaches. It challenges us to critically re-think models of how the poor access insurance (Chapter 4). Chapter 4 provides options for access to insurance against natural disasters by developing countries and includes a viable demand based business model that has been tested in existing insurance schemes and with the insurance/reinsurance companies in both developing and developed countries. Chapter 5 then explores the general contours of alternative “business models” UNDP might consider for helping develop insurance solutions for the poor, and which promote risk reduction, sustainability, and adaptation to climate change. Chapter 6 concludes the paper with reflections and a suggested road map for taking the next steps forward.

1.1 Climate risks and the insurance sector

Weather-related risks play an important role for the insurance sector. Climate change changes the probability of weather-related extreme events, often increasing the frequency and-or intensity of such events. According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change¹⁵, human induced climate change trends will continue to have a major influence on weather related risks. In general, the weather will become more variable and extreme. Increasing hazard frequency and intensity cycles, probably, associated in part with an underlying climate change trend, increase the potential for losses. The insurance sector will need to quantify this emerging trend where applicable and include the findings into its risk calculations, pricing and underwriting¹⁶.

Global weather related insured loss experience since 1990 shows a clear upwards trend. Reasons for this trend are largely socio-economic: factors like economic growth, increasing population densities and insurance penetrations, value concentrations in coastal areas, and increasing vulnerabilities of insured values contribute to rising weather hazard-related losses worldwide. In the record hurricane year of 2005, insured weather related losses averaged approximately USD 100bn due to major events such as hurricanes Katrina, Rita and Wilma¹⁷. These insured losses stem only from “great disasters,” and may be less than half of the total insured losses worldwide¹⁸.

¹⁵ IPCC 2007

¹⁶ Charpentier 2008

¹⁷ MunichRe 2007

¹⁸ Dlugolecki 2007

Text Box: Risk transfer tools – an introduction

Catastrophe risk financing frameworks must be highly specialized to the type of coverage required and the local risk and social conditions. Broad types of catastrophe risk financing include:

(Traditional) Insurance

Insurance is a contractual transaction that guarantees financial protection against potentially large loss in return for a premium; if the insured experiences a loss, then the insurer pays out a previously agreed amount. Insurance is common across most developed countries and covers many types of 'peril', for example, many homeowners buy fire and theft insurance to protect their property and in some countries car owners are required to purchase automobile liability insurance.

Micro-insurance

Micro-insurance is characterized by low premiums or coverage and is typically targeted at lower income individuals who are unable to afford or access more traditional insurance. Micro-insurance tends to be provided by local insurance companies with some external insurance backstop (e.g. reinsurance). Micro-insurance can cover a broad range of risks; to date, it has tended to cover health and weather risks (including crop and livestock insurance). Weather insurance typically takes the form of a parametric (or index-based) transaction, where payment is made if a chosen weather-index, such as 5-day rainfall amounts, exceeds some threshold. Such initiatives minimize administrative costs and moral hazard and allow companies to offer simple, affordable and transparent risk transfer solutions. One of the largest micro-insurance schemes, the Weather-based Crop Insurance Scheme, was established by the Government of India and currently protects more than 700,000 farmers against drought.

Reserve fund

Catastrophe reserve funds are typically set up by governments, or may be donated, to cover the costs of unexpected losses.

Risk pooling

Risks pools aggregate risks regionally (or nationally) allowing individual risk holders to spread their risk geographically. Through spreading risks, pooling allows participants to gain catastrophe insurance on better terms and access collective reserves in the event of a disaster. An example is the Caribbean Catastrophe Risk Insurance Facility (CCRIF), which allows Caribbean governments to purchase coverage for earthquake and/or hurricane. The CCRIF was able to secure USUSD110 million of reinsurance capacity in addition to its own reserves.

Insurance-linked securities

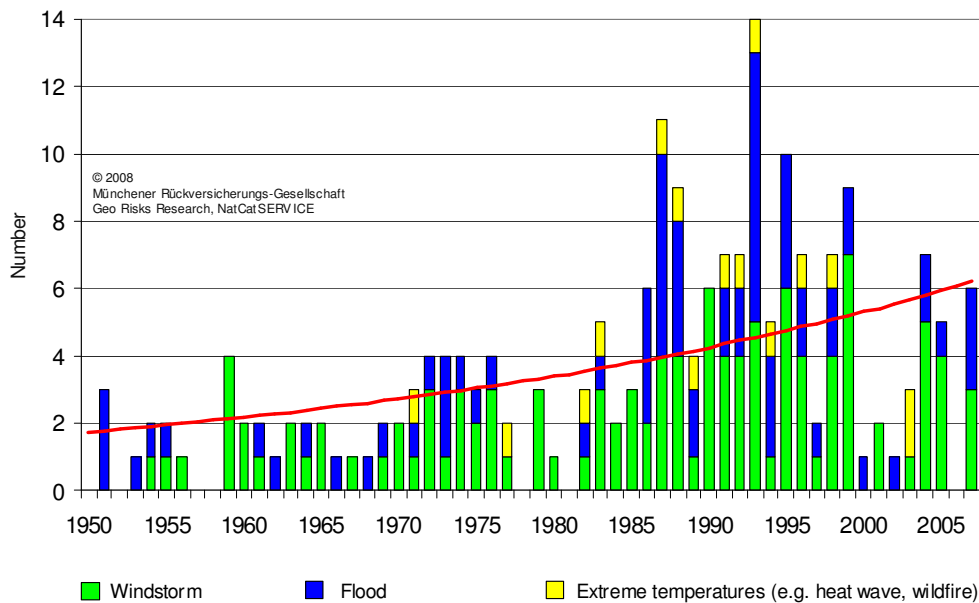
Insurance-linked securities, most commonly catastrophe (cat) bonds, offer an avenue to share risk more broadly with the capital markets. Cat bonds are issued by the risk holder (usually a government or insurance company) and trigger payments on the occurrence of a specified event. This event may be a specified loss or may be a parametric trigger, such as the wind speed at a location. In 2006, the Government of Mexico issued a cat bond (the Cat-Mex bond) that transfers earthquake risk to investors by allowing the government to not repay the bond principal if a major earthquake were to hit Mexico.

Figure 1: Great weather disasters 1950 - 2007

NatCatSERVICE

Great weather disasters 1950 – 2007

Number of events



As at: April 2008

Thus a dual challenge and opportunity arises. First, most of the factors related to increasing losses are not climate related, but societal in origin, thus increasing the need for effective and integrated risk management and risk reduction¹⁹. Risk reduction efforts, if effective, can help maintain insurability as the proportion of risk attributable to climate change rises through time. Second, there is a need and a market niche to develop insurance solutions for areas facing increasingly frequent and intense weather-related hazards²⁰.

Growing need in emerging markets for insurance tools to manage climate risks

According to the UNFCCC²¹, the estimated global adaptation cost per year by 2030 will amount to USD 49-171 billion, from which USD 28-67 billion will be required in developing countries²². The United Nations Framework on Climate Change Convention (UNFCCC) and the Kyoto Protocol established several funds to finance concrete adaptation projects and programmes in developing countries. Currently available adaptation funds from UNFCCC and the Kyoto Protocol will amount to roughly a few hundred million US dollars per year - clearly not enough to fully finance all adaptation needs. If funding remains at current levels, it will not be sufficient to address future costs

¹⁹ Ward et al. 2008, Maynard 2008

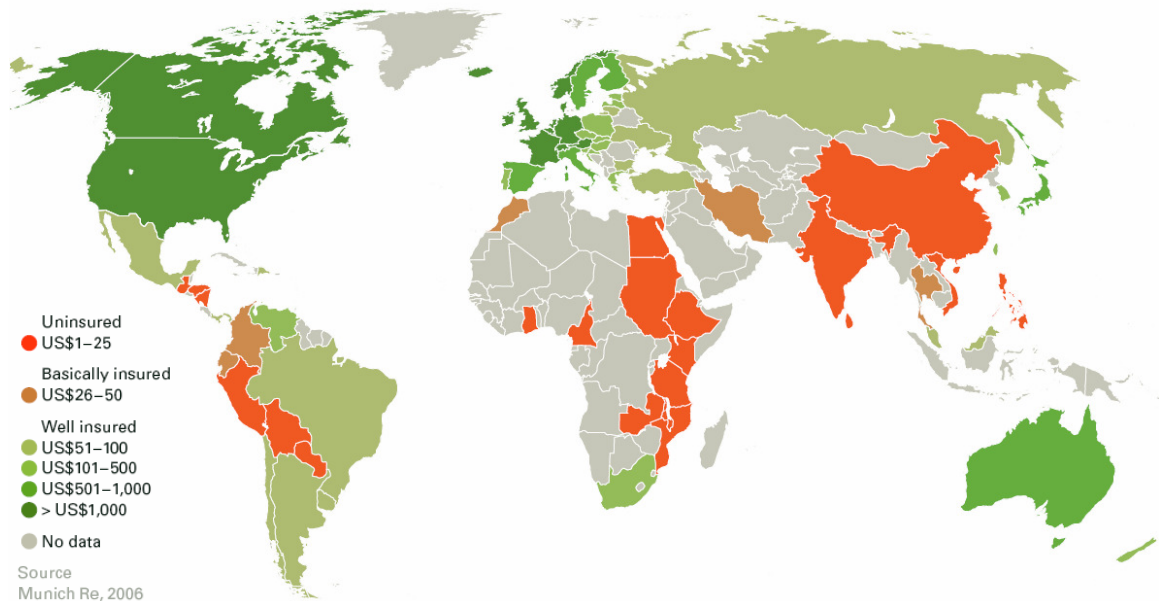
²⁰ Dlugolecki et al. 2009, Mills 2007

²¹ UNFCCC 2007

²² Smith 2007

The traditional model of access to insurance is built on one party paying a premium in exchange for the right to transfer pre-defined risks to another party that receives the premium. Because these premiums often come at a high opportunity cost for poor households and low income developing countries, insurance has often remained beyond the reach of most. Figure 2 shows the relatively low penetration of insurance in developing countries, relative to developed countries.

Figure 2: Property insurance premiums (non-life including health) per person and per year

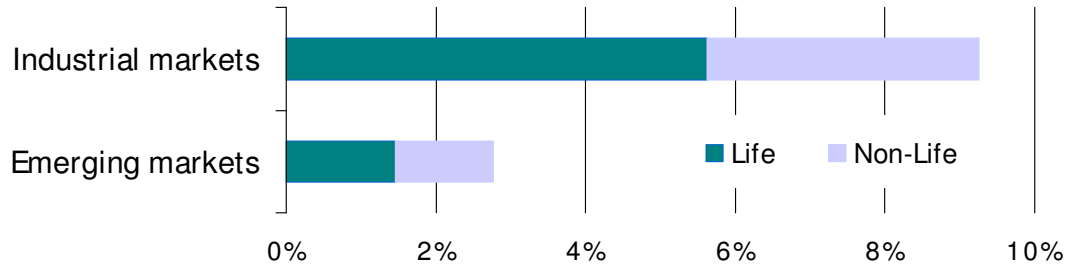


surprising that the insurance coverage in developing countries of Africa, Asia and Latin America is far less than in North America, Europe, Japan and Australia. In fact, financial losses due to disasters have significantly less coverage in Asia (4.88%) than in the USA (50.69%) and Europe (30.46%)²³.

Developing countries will be most severely impacted by climate change. At the same time, developing countries often lack the required financial infrastructure, such as banking and insurance systems which help governments, middle-income, and low-income clients like small farmers to financially cope with disasters. This is reflected in the latest numbers of the current global density for non-life insurance. Current insurance penetration in terms of premiums in % of GDP amounts to roughly 4% in industrial markets, where as in emerging markets it amounts to less than 2% (see Figure 3).

²³ Unofficial estimates note that the US and Japan alone accounted for roughly 40% of world insurance (measured in terms of insurance premiums), which is much higher than their 7% share of the global population. Emerging markets accounted for over 85% of the world's population but generated only around 10% of premiums. Other estimates suggest that only about 1% of households and businesses in low-income countries and only 3% in middle-income countries have catastrophe insurance coverage, compared with 30% in high-income countries (Data drawn from www.ifsl.org.uk and Munich Re).

Figure 3: Insurance penetration 2007 (premiums in % of GNP)

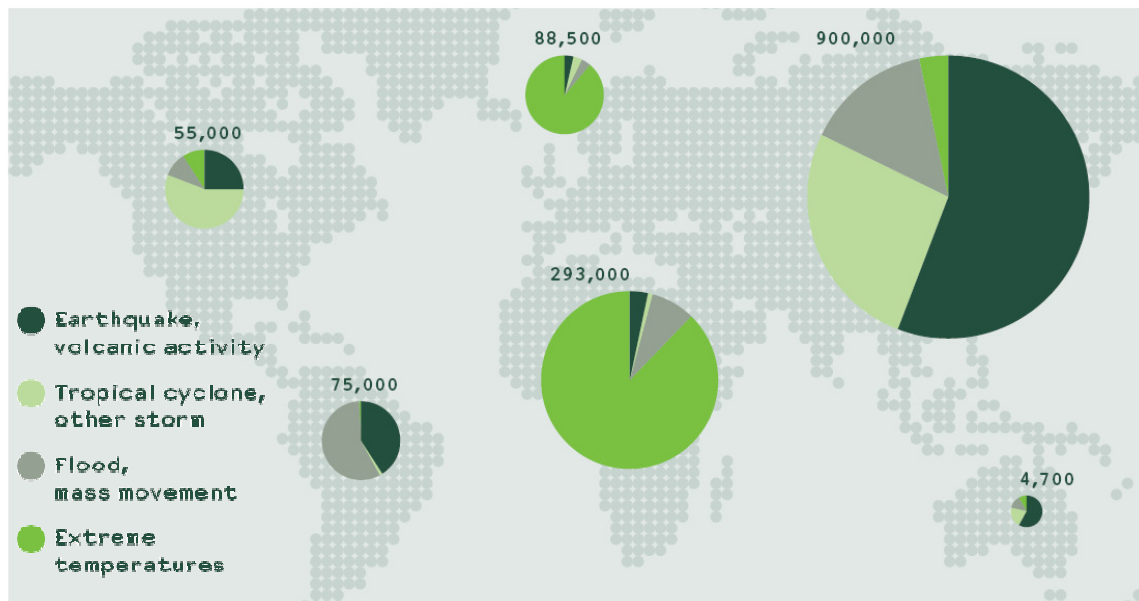


Source: Swiss Re, sigma No 2/2009

Losses from natural disasters are typically absorbed by individuals, corporations and insurers. In case of low insurance penetration (e.g. in emerging markets) insurers only absorb a fraction of the losses. As a consequence, there is a considerable gap between economic and insured losses. In addition, disasters often result in a decline in output growth, a loss of capital and durable goods, lower tax revenues, government deficits, increasing indebtedness, higher inflation and currency movements

Expressed in losses this means that in 2008, natural catastrophes and man-made disasters claimed more than 240,500 human lives worldwide and caused total losses of approximately USD 52.4bn, third in record after 2005 and 2004 the years of series of hurricanes. Issues such as poor data, inadequate or missing regulatory frameworks, high claims adjustment costs, moral hazard and the lack of financial means to pay a premium all make the implementation of traditional insurance concepts difficult. Figure 4 in contrast the high relative losses in developing countries, in terms of numbers of fatalities alone.

Figure 4: Natural Disasters 1980 to 2007, number of fatalities (Source: Nathaz SERVICE 2008, Courtesy of Munich Re Foundation)



Until recently it has appeared difficult to relieve this imbalance. However, the emergence of a range of private sector and public sector tools such as microinsurance, and the international fight against climate change now provide an opportunity to change the model of access to insurance

for developing countries. The next section discusses four guiding principles for designing insurance-related approaches in the context of climate change and sustainable development.

Insurance coverage is disproportionately higher in the industrialized world, while scientific indicators point towards the heaviest burden of climate change impacts to be felt in developing countries, where often the poor and most vulnerable and exposed to risks²⁴. It is anticipated that access to insurance by developing countries would possibly create greater investments opportunities and would positively influence the credit rating of the appropriate country.

Today insurance covers only around 3 percent of disaster losses in developing countries, compared to 40 percent in the industrialized countries.²⁵ The figure below indicates that some of the world's most populous developing countries have almost no insurance coverage, or no data is available in these countries. In developing countries, insurance is most common in the commercial and industrial sectors and higher income groups. In the non-life industry, the bulk of premium volumes come from the motor sector, with property insurance a relatively low proportion (e.g. 20 percent in India). The penetration of agricultural insurance in developing countries is also low despite its economic importance, with premiums accounting for only 0.01 percent of GDP.²⁶ Catastrophe insurance has particularly limited availability. In addition, insurance has low penetration among lower income groups, due to its general lack of affordability.

Insurance sector information does indicate, however, that there is potential for growth, and many new markets are emerging. Premium volumes are now growing rapidly in the emerging market economies: 7.5 percent per annum for life insurance and 6 percent per annum for non-life. In 2005, annual premiums per capita in emerging markets were approximately USD46 and USD30 USD per capita for life and non-life insurance, respectively (compared to USD1900 and USD1400 USD per capita in developed countries).

Micro-level insurance programmes

At the community and household level, **micro-insurance** aims to improve the affordability of insurance for lower-income groups. Micro-insurance that covers life and health risks is becoming more widely established, and in this sense may support adaptation by helping the poor deal with the increase in other risks that climate change will bring (e.g., changes in disease and pest patterns)²⁷.

The use of micro-insurance to cover losses caused by severe natural hazard events is only just emerging. Experts acknowledge that development of risk transfer schemes for the poor face a number of challenges including a lack of reliable information for pricing risk, affordability, accessibility, low levels of awareness, and sustainability of the schemes themselves²⁸. These fundamental obstacles to expanding micro-insurance must be addressed if it is to become a useful disaster reduction tool in poor and vulnerable communities. This in turn means that disaster reduction needs to become a core aspect of development strategies. Yet if proven viable, and if micro-insurance schemes are able to be scaled up, these tools could become an important part of a comprehensive climate risk management strategy including risk reduction, disaster preparedness, and risk transfer.

²⁴ IPCC 2007, UNDP 2007

²⁵ Hoeppe and Gurenko 2006

²⁶ Swiss Re 2007

²⁷ A major milestone in documenting lessons learned and best practices in using microinsurance in developing countries to address weather-related risks include Churchill (2008). Related to but not limited to microinsurance is the recent work by Hellmuth et al. (2009) on the use of index insurance in the context of development and disaster management.

²⁸ Skees et al. 2005, Hellmuth et al. 2009

Text Box: Indexed based insurance in Bolivia

The Fundación PROFIN has developed an index-based insurance scheme in four provinces in the North and Central Altiplano regions of Bolivia. The scheme combines incentives for proactive risk reduction and an insurance index mechanism. In this scheme the trigger is based on the production levels of reference plots of farmland in areas which are geographically similar in terms of temperature, precipitation, humidity, and type of soil.

A group of farmers identify a peer who is considered to use the best available methods. That farmer serves as a technical assistance agent to help other farmers reduce their risks and improve their yields. The system encourages other farmers to match the reference farmers in implementing risk reduction efforts to reduce the effects of drought, excess rains, hailstorms and frost. The reference farmer's land becomes the reference plot, the yields from which serve as an indicator of whether production levels have been adversely affected by environmental factors (triggering an insurance payout), or by other factors within the farmer's control. The objective becomes to perform or out-perform the reference plot by improving agricultural practices and reducing risk of damage from weather hazards.

Source: Warner et al. 2009b

Text box: The Mongolian Index-Based Livestock Insurance Programme

The World Bank and other organizations have been actively involved in Mongolia developing programmes for sustainable livelihoods that emphasise pastoral risk management including early warning systems and risk preparedness actions, access to supplementary feed and grazing reserves, coordination of pasture-land use, and conflict management. These measures were combined with efforts to extend the outreach of micro-finance services to herders, and community-prioritized investments in basic infrastructure. The index-based micro-insurance coverage helps to reduce the administrative costs of insurance, making it more affordable. Micro-insurance and complementary interventions in a wider risk management framework in Mongolia are helping to reduce herders' vulnerability to climate and non-climate hazards.

Source: Warner et al. 2009b

Meso-level insurance programmes

Insurance tools can be used by governments to ensure the provision of critical services in the case of a shock. A well-known meso-level example is that of the World Food Programme (WFP) in Ethiopia. WFP issued a novel weather-index insurance scheme to assure sufficient funds to the Ethiopian government to protect the livelihoods of Ethiopia's vulnerable drought-exposed populations²⁹. This insurance instrument holds promise for supporting institutions that have traditionally provided humanitarian assistance³⁰. Another example is found in Malawi where a combination of sufficient weather stations and start-up assistance from the World Bank and WFP helped start a pilot weather insurance project. The insurance pilot bundles loans and insurance for nearly 1000 smallholder farmers enabling them to buy affordable index-based drought insurance. The insurance is linked to loans and both improves the credit-worthiness of participating farmers and enables them to increase their farm productivity³¹.

²⁹ Oxfam America, Private Sector Team (2009)

³⁰ Hess, 2006

³¹ Suarez, et al., 2007; Hess and Syroka, 2005

Macro-level insurance programmes

In spite of currently low coverage rates in developing countries, several schemes have been implemented in recent years that show potential for further growth. The Caribbean Island States recently formed the world's first multi-country catastrophe insurance pool, reinsured in the capital markets, to provide governments with immediate liquidity in the aftermath of hurricanes or earthquakes³². The World Bank and other institutions are exploring the possibility of extending the benefits of similar pooled risk transfer solutions to other regions, such as Asia and Southeastern Europe³³.

1.2 Does insurance help developing countries reduce risk today?

This part of the chapter briefly examines the question whether insurance helps developing countries manage the risks they face currently, followed by a brief examination of the types of insurance available in developing countries. The final part of this chapter briefly examines the current discussion on insurance in the context of the climate negotiations.

Countries worldwide are looking for ways to manage risks, especially those related to or made worse by climate change. Insurance is widely used by individuals and organizations across most industrialized countries as one of a package of measures to manage risks (some examples are provided in section three). The use of insurance is now also expanding in developing countries, particularly in emerging economies, and many wonder whether insurance could help developing countries reduce the risks of extreme events, which have such devastating impacts on national economies, human welfare, and the development process. This section examines potential risk reduction benefits and the current role of insurance in developing countries.

Potential risk reduction benefits for developing countries

Insurance can provide tangible and intangible benefits that reduce risks and that are of particular importance for developing countries³⁴. These benefits include:

Building resilience

With little or no access to formal insurance mechanisms for disasters, the poor are forced to self insure, depleting their savings when disaster strikes. Mechanisms like social safety nets, risk sharing or pooling programmes, and insurance tools could help smooth household incomes when shocks occur. This smoothing effect can help low-income households avoid sacrificing longer-term investments in health, education, and livelihood assets when natural hazards occur³⁵.

Providing timely financial liquidity

Insurance does not directly prevent or reduce the risk of damage or loss; however, the financial liquidity provided by insurance in the case of a disaster can reduce some of the indirect effects of damage, such as human suffering and set-backs to development³⁶. Insurance solutions help reduce the burden on the public purse to restore public and private infrastructure and services following a natural hazard event. With well-designed insurance solutions in place, a government can promote risk reduction and maintain its development priorities even in the face of disaster.

Helping to reduce longer-term indirect losses

Related to the above argument, it is sometimes pointed out that insurance helps reduce longer-term indirect losses. Prompt payouts facilitate more rapid reconstruction of key infrastructure upon which macro economies depend (such as bridges, roads, ports), as well as helping communities and households recover quickly and avoid longer-term consequences that can

³² Ghesquiere, (2006)

³³ ISDR (2009) Global Assessment Report

³⁴ Warner et al. (2009b)

³⁵ Morduch (2005)

³⁶ Warner et al. (2007)

accompany disasters—including homelessness and livelihood loss, sickness and increasing poverty.

As compelling as these benefits sound, does current experience in developing countries confirm that insurance spawns risk reduction there? The following subsection examines the limited (but growing) role of insurance tools in developing countries today, with a few examples of programmes where risk reduction and insurance go hand in hand.

1.3 Can insurance-related tools help vulnerable countries adapt to climate change?

Insurance-related mechanisms, it is hoped, have the potential to dampen the negative effects of global warming and minimize the financial risks of an increasing number of natural catastrophes. As the frequency and scope of losses due to major natural catastrophes, especially tropical storms, continues to increase, there is a growing need to explore other options for managing and transferring risks associated with climate change. Market insurance and risk transfer solutions - climate insurance - can be part of the solution in enabling disaster-prone countries to successfully manage the new climate risks on the horizon.

Parties to the UN Framework Convention on Climate Change (UNFCCC) have committed themselves to considering the special needs and concerns of developing countries resulting from the adverse effects of climate change in the area of insurance. Article 4.8 of UNFCCC and Article 3.14 of the Kyoto Protocol propose actions, including insurance, to meet the specific needs and concerns of developing countries in adapting to Climate Change and the Bali Action Plan (BAP) similarly provides a point of departure for more detailed negotiations on a climate risk insurance mechanism. There is a growing interest within the global community on the vital role of insurance and related mechanisms in assisting developing countries adapt to climate change.

The recent Bali Action Plan specifically calls for “consideration of risk sharing and transfer mechanisms, such as insurance” as a means to address loss and damage in developing countries particularly vulnerable to climate change (Decision -/CP.13, Bali Action Plan). There is a growing sense among Non-Annex 1 countries and some Annex 1 countries that insurance should be coupled with preventative measures to minimize the adverse impacts of disasters and expenditure on relief and recovery. Any design of an insurance mechanism within the post-2012 framework will likely have both an insurance pillar, and a risk reduction pillar.

The Action Plan strengthens the mandate to consider insurance instruments as set out by Article 4.8 of the UN Framework Convention on Climate Change (UNFCCC) and Article 3.14 of the Kyoto Protocol. Some progress has been made since Bali; however, if insurance instruments are to be included in the post-2012 deal in Copenhagen, the role of risk-pooling and risk-transfer systems in an adaptation regime must be firmly established. Although numerous proposals have been put forward, the precise role for insurance instruments in an adaptation regime is under active discussion.

Text Box: Climate Risk Insurance Proposals in the Climate Negotiations

If insurance instruments are to be included in the post-2012 negotiations in Copenhagen, the potential role of risk-pooling and risk-transfer systems in an adaptation regime must be firmly established. In response the mention of insurance in the Convention, the KP, and the BAP¹, numerous proposals have been put forward mentioning insurance, most recently by Barbados and the Cook Islands on behalf of the 40+ countries of the Alliance of Small Island States (AOSIS), Switzerland, Mexico, some countries of the European Union and further ideas from Bangladesh (for the LDCs), China, India, Argentina, the Philippines, Malaysia, Saudi Arabia and other countries. Additionally the UNFCCC has organized several workshops and expert meetings to address insurance and will continue to do so.

To complement proposals by Parties with an insurance element, observer organizations such as the Munich Climate Insurance Initiative, UNEP FI, ClimateWise, the Climate Group, and key IGOs like IFC and the World Bank Group tend to balance public sector approaches with opportunities for private sector participation in adaptation. NGOs and NGO groupings contribute additional ideas about adaptation, sometimes mentioning private sector roles.

Some of the most specific suggestions regarding financial risk transfer mechanisms, including insurance, have come from the Munich Climate Insurance Initiative (MCII). MCII submitted a proposal to delegates at the Accra Climate Talks in August, 2008 about the role for insurance instruments in an adaptation regime. MCII is developing proposals for insurance solutions such as public-private collaboration on climate risk insurance, and tools such as a climate insurance pool which has gained attention from technical experts from the insurance sector and by delegates from Parties in the climate negotiations.

Source: Warner and Spiegel (2009)

In summary, this section has raised one of the central questions posed about insurance in the context of climate change:

- What are the benefits of insurance for developing countries in managing risks from (climate-related) natural hazards?
- Does current experience in developing countries substantiate claims that insurance can promote risk reduction?

The answer to both of these questions is that current experience in developing countries remains promising but limited. Insurance is growing rapidly in these countries, but it is not clear whether all programmes spontaneously achieve the benefits of reaching the most vulnerable, building resilience and reducing indirect and longer-term losses. A handful of examples have been presented in this section which do indicate that it is possible to design programmes that aim at risk reduction and development, and use insurance tools as one of a set of measures to work towards that aim.

In light of the limited current experience in developing countries, this paper now turns its attention to options to make sustainable development, disaster risk reduction and insurance work together, using examples from current experience mostly from industrialized countries.

2. Insurance and climate change

Insurance instruments that provide financial security against droughts, floods, typhoons and other weather extremes have recently emerged as an opportunity for developing countries to mitigate the adverse impacts of climate change on their economies and populations. This opportunity arises from a number of recent innovations - technological advances make it possible to model and price low-probability risks; index-based insurance contracts have proven to provide a viable alternative to indemnity insurance which traditionally has been plagued by the adverse selection and moral hazard problems; while the development of the Insurance Linked Securities and weather risk markets has opened new windows for non-traditional weather risk transfer arrangements. However, despite all these advancements, availability and affordability of suitable weather risk insurance or risk transfer products, particular in developing countries, remains a major problem.

In this context, it is of paramount importance for the international development community to encourage the development of innovative risk transfer instruments that can reduce economic and human losses from the growing weather extremes and variability in developing countries. Moreover, well-designed insurance instruments can provide powerful incentives for disaster risk reduction as part of a global adaptation to climate change. Figure 5 provides examples of insurance at the macro and meso level that have been used to address weather-related extreme events in developing countries (courtesy of Munich Re Foundation).

Figure 5 (Source: MRF 2008)

Examples of insurance at the macro and meso level						
	Country	Risk event	Contract structure	Index measure	Target user	Status
Macro level	Mexico FONDEN Fondo por Desastres Naturales	Natural disasters impacting small farmers, primarily droughts	Index insurance	Rainfall, wind speed, temperature	State governments for US disaster relief	Began in 2001; available in 26 of 32 states; 28% of dryland cropland is covered
	Mexico FONDEN Fondo por Desastres Naturales	Major earthquakes	Cat. bond and index insurance	Richter Scale readings	Mexican government	Began in 2006; Cat. bond provides up to US\$ 160m; index provides additional funding up to US\$ 290m
	Caribbean CCRIF Caribbean Catastrophe Risk Insurance Facility	Hurricanes and earthquakes	Index insurance with risk pooling for reinsurance coverage	Indexed data from NOAA and USGS	Caribbean country governments	Implemented in 2007; won "Transaction of the Year" in London
Meso level	Malawi	Droughts	Index insurance linked to lending	Rainfall	Groundnut farmers who are members of NASFAM	Began in 2005; 2,500 policies sold in 2006
	Ethiopia	Droughts	Index insurance	Rainfall	WFP, five operations in Ethiopia	In 2006, US\$ 7m insured. Policy not renewed for 2007
	Mongolia	Large livestock losses due to severe weather	Index insurance with direct sales to herders	Area livestock mortality rate	Nomadic herders	Completed in 2007; offered in three provinces; 14% of eligible herders are participating

Parties to the UN Framework Convention on Climate Change (UNFCCC) have committed themselves to considering the special needs and concerns of developing countries resulting from the adverse effects of climate change in the area of insurance. Article 4.8 of UNFCCC and Article

3.14 of the Kyoto Protocol propose actions, including insurance, to meet the specific needs and concerns of developing countries in adapting to climate change. The Bali Action Plan (BAP) similarly provides for more detailed negotiations on a climate risk insurance mechanism. There is a growing interest within the global community on the vital role of insurance and related mechanisms in assisting developing countries adapt to climate change. Yet, despite the growing recognition of insurance as an adaptation tool, until today it remains a loose concept with little consensus around key definitions, objectives or the mode of implementation. Furthermore, the positive role that can be played by insurance and other market-based risk transfer mechanisms in the process of adaptation to climate change is often misconceived. The purpose of this paper to provide a conceptual framework, along with concrete illustrations, that will aid the UNFCCC process in incorporating market-based insurance mechanisms in the arsenal of proposed global climate adaptation tools.

2.1 Defining the role of insurance in adaptation to climate change

One of the key objectives of this report is to define the role insurance can play in helping households, businesses, and countries better adapt to the main known manifestations of climate change such as:

- increases in weather variability;
- new extreme values of temperatures, precipitation or wind speed in certain regions;
- new risk exposures (like hurricanes in the South Atlantic or in the Persian Gulf);
- increased frequency and severity of weather related disasters.

The adverse economic effects of the above mentioned weather patterns can be severe, particularly for countries whose economies and populations' livelihood largely depend on weather. This includes countries where agricultural exports account for a sizeable part of national GDP or with industries with considerable risk exposure to weather such as agro food processors, power utilities, skiing and summer resorts, airports, etc.)

While insurance cannot prevent climate change from happening, it can become an effective adaptation tool that for a small premium can considerably reduce the adverse financial implications of climate change for businesses, individuals, and often whole countries. However, if insurance were to become a cost-effective adaptation strategy, insurance buyers (as well as government sponsors of insurance programmes) must be well aware of its limitations and main principles of insurability. These can then be effectively applied not only in assessing the viability of existing insurance products but also for evaluating the financial sustainability of government backed insurance programmes dealing with weather related risks. Hence we begin this report by formulating the main evaluation criteria for both private and government-owned insurance product lines. These criteria are then applied to analyze the financial sustainability and technical merits of all products referenced in this paper.

Assessing the viability of insurance products

In general, in our view to be viable an insurance product must meet the following criteria five criteria:

1. insurability;
2. customization;
3. affordability
4. sustainability;
5. market complementarity (for government-backed products)

While the above described criteria are universal for all insurance products, in the case of climate change related risks, the ability of an insurer or (a risk underwriting entity) to meet them is particularly challenging. A brief discussion of each of the above mentioned key criteria follows.

Insurability of weather related risks

Traditionally, insurance has been defined as a form of financial risk management primarily used to hedge against the risk of a contingent loss by means of risk transfer from one entity to another in exchange for a premium. However, an insurance arrangement between two parties is feasible only when all of the following insurability conditions can be met:

- (i) a writer of an insurance contract can assess the probability of an insured event, e.g. has adequate information about the risk, which allows to properly underwrite and price the risk;
- (ii) an insurer can limit or prevent the ability of insured to influence the insured outcome to their own advantage (also known as moral hazard);
- (iii) the exact timing of the insured outcome is unknown, e.g. the event is random;
- (iv) all or most of insured risks do not occur at the same time, e.g. the risk is diversifiable;
- (v) insured loss events are relatively rare, which makes insurance coverage affordable.

As can be seen from Table 1, not all of above mentioned climate events meet fully our definition of insurability. For instance, such risks as *sea level rise*, *shifts in climate zone* or *temperature rise* are clearly beyond the scope of insurability as they are continuous systematic (rather than random) events that have to be dealt with through mitigation, compensation and economic adaptation strategies.

Although *flash floods* and *drought* also do not meet fully all insurability criteria because of their frequent nature and the moral hazard which is difficult to control, they can still be insured through public-private partnerships or introduction of high deductibles or innovative parametric products which allow to cutoff more frequent loss events and reduce moral hazard.

Table 1. Insurability of climate related risks

Insurability criteria	Climate related risks						
	Storm surge flooding	Flash flooding	Drought	Wind storm	Sea level rise	Climate zone shift	Temperature rise
Probability assessment	Yes	Limited	Limited	Yes	Limited	Limited	Limited
Control over moral hazard*	Yes	Limited	Limited	Yes	Limited	Limited	Limited
Extent of randomness	High	Moderate	Moderate	High	Low	Low	Low
Diversification potential	High	Moderate	Moderate	High	Low	Low	Low
Frequency of insured events	Low	High	High	Low	Continuous	Continuous	Continuous

Notes: *The estimate assumes the use of traditional indemnity type insurance products.

Therefore, from now on our discussion of insurance in the context of adaptation to climate change will refer to only four insurable climate risks, of which only two risks (storm surge flooding and wind storm) are insurable without any reservations:

- storm surge flooding
- flash flooding (restricted)
- drought (restricted)
- wind storm

Customization

For insurance products to be in demand, they have to address the unique risk exposures faced by the insured. Different customer groups have different risk exposures and hence require different insurance products to address their needs effectively. For instance, a comparison of catastrophe risk exposures for homeowners and SMEs, makes it clear that the scope of coverage for these two customer segments should be different. In the case of homeowners, key risk exposures are likely to include (in order of priority) damage or property loss, damage or loss of contents, loss of dwelling usage and living expenses related to it, and loss of rental income. The case of SMEs is somewhat different as business are likely to be most sensitive to loss of earnings due to business interruption, as well as loss of business equipment and premises, which often are business owners' only assets. One can also demonstrate that in general the risk retention capability of SMEs is higher than those of homeowners, which dictates different level of deductibles for these customer groups.

Besides being useful in limiting the customers' specific risk exposures, the concept of customization also covers the potential of insurance products to be replicated on a large scale to appeal to a larger customer base required for risk diversification purposes. Reaching the right combination of product-customization and replicability often presents one of key challenges to be addressed by insurers.

Affordability

Affordability is the key feature of any successful insurance product. Products that are priced well above the means of the targeted consumer group are doomed to fail. Yet, affordability should not be equated with under-pricing of risk or government premium subsidies. Government-sponsored catastrophe insurance programmes should strive to offer affordably priced products by first minimizing the costs involved in their underwriting, distribution and servicing, as well as through capital optimization and effective use of reinsurance. The other cost reducing option is to adjust the scope and the terms of coverage, reduce the overall sum insured, as well as raise deductibles to fit the affordability constraints of the selected customer group.

Sustainability

All catastrophe insurance products and insurance entities underwriting them should be designed with a view of ensuring their long-term financial sustainability. This means that these programmes should:

- (i) receive enough premium to meet their operational costs, pay claims, cover reinsurance costs, and build reserves;
- (ii) have a level of claims paying capacity and risk diversification sufficient to ensure for a high survivability rate, e.g. 99.5% or higher.

It is also important to ensure that the incentives of insured and insurers are aligned through a meaningful risk-sharing arrangement. For instance, the insured could be provided with financial incentives to reduce their vulnerability to weather related natural disasters over time, either through a reduced price of coverage or a lower level of deductibles.

It is also essential to build-in a provision for the withdrawal of government financial support at a later stage to ensure the products long-term financial sustainability.

The financial viability of insurance products and eventually of the insurer also depends on rigorous risk underwriting, accurate actuarial pricing and prudent risk management of insured risks.

Market complementarity

Donor supported insurance products for climate change should be designed with the view of avoiding causing damage to the nascent private insurance markets for such products. One of the

main criteria of market complementarity is the extent to which the new product competes on price with the existing similar private insurance/reinsurance market products and services. Adherence to this principle will help minimize the distortion to the existing market, and will serve as a catalyst for the market's growth and development. For instance, while the growing donor support for index-based (parametric) insurance products in developing countries provided an important catalytic effect for market development, any future attempts to subsidize parametric products should be discouraged as they threaten to undermine the nascent new risk markets as well as the already existing traditional insurance products.

At the implementation stage, government-supported catastrophe insurance programmes should take full advantage of the existing market-based insurance infrastructure, such as distribution systems, premium collection, loss settlement, management, IT and reinsurance. If there are government premium subsidies involved they should be targeted to the poorest segments of the market to avoid crowding out private insurers.

In cases of a capital subsidy, it is essential that it does not disproportionately benefit individual market players at the expense of others. Ideally, capital subsidies should be granted to industry administered pools (rather than individual private insurers) that provide insurance products not offered by individual private insurers.

In this Section we have developed 5 main criteria for comparing and analyzing different financial and insurance products that can address the risk of climate change. These are (i) insurability; (ii) affordability; (iii) financial sustainability; (iv) the level of customization and, (v) market complementarity. In the following Sections we will apply these criteria to review a range of government and private sector (climate change related) insurance products to determine their key strengths and weaknesses, identify the main impediments to the expansion of weather risk transfer insurance and capital market products, and discuss the role to be played by the governments and international donors.

2.2. Review of selective government weather risk insurance programmes

The main objective of this Section is to review and compare two different government backed weather risk insurance programmes – one in the US, and one in the Caribbean. While the presented insurance programmes are very different in terms of their design, by applying the analytical framework developed in Section I we attempt to discern their essential operating features and rate them on five major counts – insurability, affordability, sustainability, product customization and market complementarity.

United States Federal National Flood Insurance Programme (NFIP)

Created by the US Congress with the National Flood Insurance Act of 1968, the programme aims to enable property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. The programme was meant to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. However, from the outset the programme failed to introduce actuarially sound pricing for its policies. Although, over time NFIP has made great strides to address this problem, even today, about 25 percent of properties insured under the programme do not pay actuarial rates for their coverage. In 2007, the programme had 5.5 million policies in force in five flood-prone states which generated USD2.3 billion in premium and resulted in over USD1 trillion in overall risk exposure. Over one third of that premium has been paid to 88 private insurers participating in the programme in the form of distribution and claim settlement fees. The programme never has had any reinsurance, instead relying on its ability to borrow up to USD1.5 billion from the US Treasury. The losses caused by the 2005 KWR hurricanes cost FEMA over USD20 billion, which in the absence of access to the federal liquidity facility, would have left the programme in a state of insolvency.

Yet, reliance on the government debt facility (instead of reinsurance and capital markets) for most of its claim paying capacity does not seem to be sustainable. With over USD18 billion in debt from the 2005 hurricanes, the programme's annual interest alone came to USD0.8 billion, leaving it with little chance to restore its solvency and build reserves to prepare for another large event. To restore the programme back to its solvency, the new Flood Insurance Reform and Modernization Act of 2007 forgave the NFIP's current debt and enabled it to raise premium rates. However, at the same time, the newly enacted legislation added wind coverage in addition to flood coverage in the NFIP's policy, which despite the increased scope for raising the premium rates will dramatically increase the programme's exposure to catastrophe risk in the future.

Characteristics of the NFIP

Insurability. The flood coverage offered by NFIP does not differentiate between flooding (caused by heavy rainfall, rapid thawing or glacial melt) and that caused by storm surge as a result of offshore winds pushing water ahead of the storm. Both types of flood have limited insurability in high risk areas prone to frequent flooding that are at or below sea/river level and are unprotected by adequate man-made flood defenses. Yet, insuring uninsurable properties (e.g. located in high risk flood zones) could be very risky. For instance, according to the NFIP statistics, the highest amount of aggregate claim payments per policy over the last 30 years falls on the St. Bernard Parish in Louisiana, which at the end of 2008 was USD171,635 per policy in-force (compared to the national average of USD6079). To put it differently, while in 2008, the aggregate premium contributed by the Parish over the last 30 years accounted for only 0.2% of total NFIP premium, its contribution to an aggregate national 30 year loss was 6.5%.

By continuing to provide flood coverage to properties in high-risk areas at a fixed uniform premium rate, not only does the NFIP assume a higher level of risk exposure but also discourages active mitigation efforts by owners of these highly flood-prone properties. It must be mentioned however that the NFIP supports the Community Rating System (CRS) which is a voluntary incentive programme that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are reduced for communities participating in the programme to reflect the reduced flood risk resulting from the community actions.

Customization. The NFIP offers rather versatile property coverage aimed at meeting the flood insurance needs of millions of homeowners and businesses. This, for instance, includes coverage for personal homes, up to USD250,000, and for personal property, up to USD100,000. The programme also allows choosing different levels of deductibles. The only obvious deficiency with coverage is the maximum insured limit that cannot be increased for more expensive properties.

Affordability. While the premiums vary depending on the amount of coverage, type of coverage and the level of deductible chosen, overall they do not appear cheap when compared with the average rates on FLEXA policies, on average being at least 5 times the premium rate of the homeowners policy (insuring predominantly against fire) for similar insured limits. There are only two types of premium ratings available.

Sustainability. Despite the increased scope for raising premium levels in the latest NFIP legislation, the future financial sustainability of the programme still remains a major concern. In the absence of the US Treasury's backing the programme will be financially unsustainable due to the lack of actuarially sound pricing of the risk (there are only two risk ratings!), and the full risk retention by the programme with no attempts to control its accumulations either through differentiated pricing or risk transfer to commercial reinsurers.

Market complementarity. Before 1968, the federal government's flood initiatives consisted of disaster relief to victims in the event of a flood, or flood control projects such as dams, levees and seawalls. While well-intentioned, this approach did little to ease the financial burden of most flood victims. Worse, the public couldn't buy flood coverage from most insurance companies, which regarded floods as too costly to insure.

In 1968, the Federal Government established the flood insurance programme in response to market failure to provide flood insurance to homeowners across the United States. Since then

however, the programme has assumed a full monopoly on the residential flood market in the US by under-pricing coverage offered in high risk areas and effectively crowding out any competition from the private sector.

Caribbean Catastrophe Risk Insurance Facility (CCRIF)

Established in the spring of 2007, the CCRIF enables CARICOM governments to purchase coverage akin to business interruption insurance, thus providing governments with access to immediate liquidity in the aftermath of a major earthquake or hurricane. Because of the speed at which a claim payment will be processed (using an indexed approach)³⁷, the instrument is designed to finance the immediate post-disaster recovery needs, giving the affected government time to mobilize additional resources for longer-term reconstruction activities³⁸.

Insurability. The CCRIF insures the risks of earthquake and tropical wind with a return period of about 20 years or longer, which makes these risks fully insurable. The availability of inexpensive reinsurance capacity from the global reinsurance market for the third year in a row provides the ultimate proof of these risks insurability.

Product customization As a risk aggregator, the Facility provides insurance coverage to participating countries at a significantly lower rate than individual states could obtain on their own, by enabling participating countries to pool their individual risks into a single, better-diversified portfolio. The Facility retains some of this risk through a buffer of reserve funds established with the assistance of donor partners. The risks that cannot be retained by the Facility are transferred to the international reinsurance market.

To ensure quick uncontested payments, insurance coverage relies on parametric techniques where payouts are calculated based on the estimated impact of adverse natural events on budgets of countries participating in the programme. The estimated budgetary impacts are derived from probabilistic catastrophic risk models developed specifically for the Facility. To avoid cross-subsidies among countries, participating countries pay premium commensurate with their unique risk exposure and receive compensation proportional to the losses from the predefined events depending on the level of coverage agreed upon in the insurance contract.

Sustainability The Facility is registered and operates as an independent legal entity acting as intermediary between the participating countries and the international financial markets. It is supervised by the Board of Directors comprised of representatives of the participating Donors and the Client countries. Should the insured losses exceed the claim paying capacity the Facility will pro-rate payouts to all affected countries.

To increase the long-term financial sustainability of the programme, the initial USD47 million donor contribution to the capital of the Facility is priced into the cost of country coverage, which enables the Facility to use surplus for building the reserves. To illustrate, only 42 percent of the facility's premium income is currently spent on reinsurance, with the rest going into reserves. Today, the Facility has a claims paying capacity sufficient to survive a 1-in-1000-year event, with most of this coming from the international reinsurance market. By the end of 2008, sixteen Caribbean countries have participated in the CCRIF. This high level of enrollment allowed the CCRIF to efficiently diversify its risk portfolio and thus access reinsurance on better terms.

Affordability. The programme enables the small countries of the Caribbean to buy catastrophe insurance coverage on pricing terms which are by far superior to those offered in the market place. This competitive pricing is achieved mainly by the ability of the pool to diversify and retain a considerable part of the lower level (more frequent less severe) risk before transferring it to the reinsurance market. There is a considerable price advantage in retaining the lower risk layers as those typically produce almost certain frequent losses which are easy to predict but hard to diversify through a risk transfer to reinsurance market. The affordability of the insurance coverage

³⁷ UNDESA (2007)

³⁸ Caribbean Catastrophe Risk Insurance Facility (2008)

from the CCRIF is further ensured by the availability of the World Bank financing for premium payment to the poorest countries of the region.

Market complementarity. From the inception, the Facility has been striving to avoid competing with the private insurance and reinsurance market. This has been achieved by designing and offering a highly innovative parametric insurance coverage for countries that was not available from the private market. To ensure professional management and full adherence by the Facility to market practices, all functions of its day-to-day operations have been subcontracted to specialized private insurance providers. Such extensive use of private sector services also achieved high cost efficiencies, which is illustrated by the programme general operating expenditures not exceeding 5 percent of its premium volume.

Citizens Property and Casualty Insurance Corporation (CPCIC)

The CPCIC is the Florida State homeowners' insurance program. Created by the Florida Legislature in 2002, it offers all peril property coverage to Floridians without private insurance options. At the end of 2007, the CPCIC had over 1.4 million policies in force with the underlying total risk exposure of more than \$434 billion and \$2 billion of reserves to pay claims. The program offers catastrophe insurance coverage to both homeowners and businesses against the risk of wind and other catastrophic perils at a fraction (about 30%) of its actuarial cost. The program does not place any reinsurance to reduce its peak risk exposures, instead relying on the financial backing of the state in case of a major catastrophic event. However, the risk exposure assumed by the state under the program appears to be simply unsustainable in the long-run due to the increasing concentration of values in the disaster prone parts of the state and the growing frequency and severity of hurricanes hitting its coastline. The 2005 storms cost the private reinsurance industry \$39 billion in Florida. The next storm of that size will leave the claims incurred by the CPCIC to Florida taxpayers instead of global reinsurers. The problem with the program is best summarized by the Florida state Representative Dennis Ross: *"The total current debt of the state is \$22 billion. This debt accumulated during the course of Florida's more than 100-year history as a state and could, literally, double overnight with one storm."*³⁹

Insurability. The original objective of the CPIC was to provide only hurricane coverage not available otherwise from the commercial insurance market. In the fall of 2008, the program however extended its coverage to include the risk of hail. Both of these are insurable perils and coverage for them can be found in the commercial market.

Customization. The program offers 5 types catastrophe coverage for the state homeowners and businesses which could be customized by choosing a certain level of deductibles and insured limit. These include Personal Residential Multi-peril (PR-M), Personal Residential Wind (Hurricane) Only (PR-W), Commercial Residential Multi-peril (CR-M), Commercial Residential Wind (Hurricane) Only (CR-W), Commercial Non-Residential Wind (Hurricane) Only (CNR-W). Such a wide selection of insurance coverage makes the program highly appealing to a large customer base while addressing the specific needs of homeowners and businesses.

Sustainability. The ability of the program to stay in business in the long-run is predicated upon its access to financial assistance from the state of Florida, which acts as a de-factor reinsurer of the CPCIC. Due to the considerable risk under-pricing, the program is unable to afford commercial reinsurance and hence has to retain all the catastrophe risk written in the state of Florida.

Affordability. By providing catastrophe insurance coverage at a 50-60% discount to the premium rate charged by the market, the program clearly meets the affordability criteria. For homes that comply with the Florida construction code and with the mitigation features, the coverage could be even more affordable as the CPCIC offers premium discounts up to 45% for hurricane mitigation features.

³⁹ See Wall Street Journal "Hurricane Jeb," September 21, 2007.
(<http://www.opinionjournal.com/editorial/feature.html?id=110010632>)

Market complementarity. Unfortunately, the program does not score well on this point, as the program undermines the development of the private market for catastrophe insurance in the state by providing deeply subsidized coverage to the consumers. Although it is true that the private insurance market does not offer hurricane coverage in the state, this problem is mainly due to the existing regulatory cap on the maximum premium rates that can be charged by private insurers.

Summary. In this Section we applied the analytical framework developed earlier in assessing the operations and overall financial sustainability of two well-known government sponsored catastrophe insurance programmes underwriting the risk of weather related natural disasters such as floods and tropical wind. In brief, two out of three programmes do not meet the minimum sustainability requirements as they provide insurance coverage below the technical cost of risk and make no efforts to control their accumulations or buy reinsurance protection. In fact, risk under-pricing and the lack of adequate risk management can be named among the main reasons for the eventual demise of government sponsored insurance and reinsurance programmes.

2.3. Major Barriers to the Growth of Weather Insurance and Risk Hedging Markets

The successful development of weather risk hedging and insurance markets is strongly influenced by three factors, which are (i) the availability of good quality weather data; (ii) affordability of insurance cover; and (iii) government post-disaster subsidies. A brief review of these factors follows.

Availability of weather risk data

Weather risk insurance or other risk hedging products are contingent upon the availability of reliable, easily accessible and affordable weather data⁴⁰. If weather risk data produced by the National Meteorological Services (NMS) were to meet the minimum quality standards set out by the weather risk and insurance markets, then the production process leading to it can be schematically illustrated in Figure 1 below.

As can be seen from Figure I, there are three main groups of factors that enable NMSs in more advanced countries to successfully meet the weather data needs of the market. These include: (i) economic incentives to develop new products and services that currently do exist within NMSs in SEE countries; (ii) the hardware and software components, and (iii) the human and institutional dimensions of weather data generation. Each of these market enabling factors is reviewed below.

The role of economic incentives for NMSs

According to a survey of NMSs recently carried out in South East Europe⁴¹, currently these organizations have no incentives to seek new clients or provide more and better services to the existing ones as all additional revenues from sales of weather data and services must be transferred to the government. For NMSs to become modern and dynamic organizations, the existing system of incentives must be changed. For instance, one can think of a system where NMSs still remain their public sector identity by continuing to provide a minimum range of weather data products and services on a free-of-charge basis, while offering additional more custom-tailored services to the private sector users for a reasonable fee.

⁴⁰ See Annex I for a detailed description of the data requirements for weather risk hedging contracts.

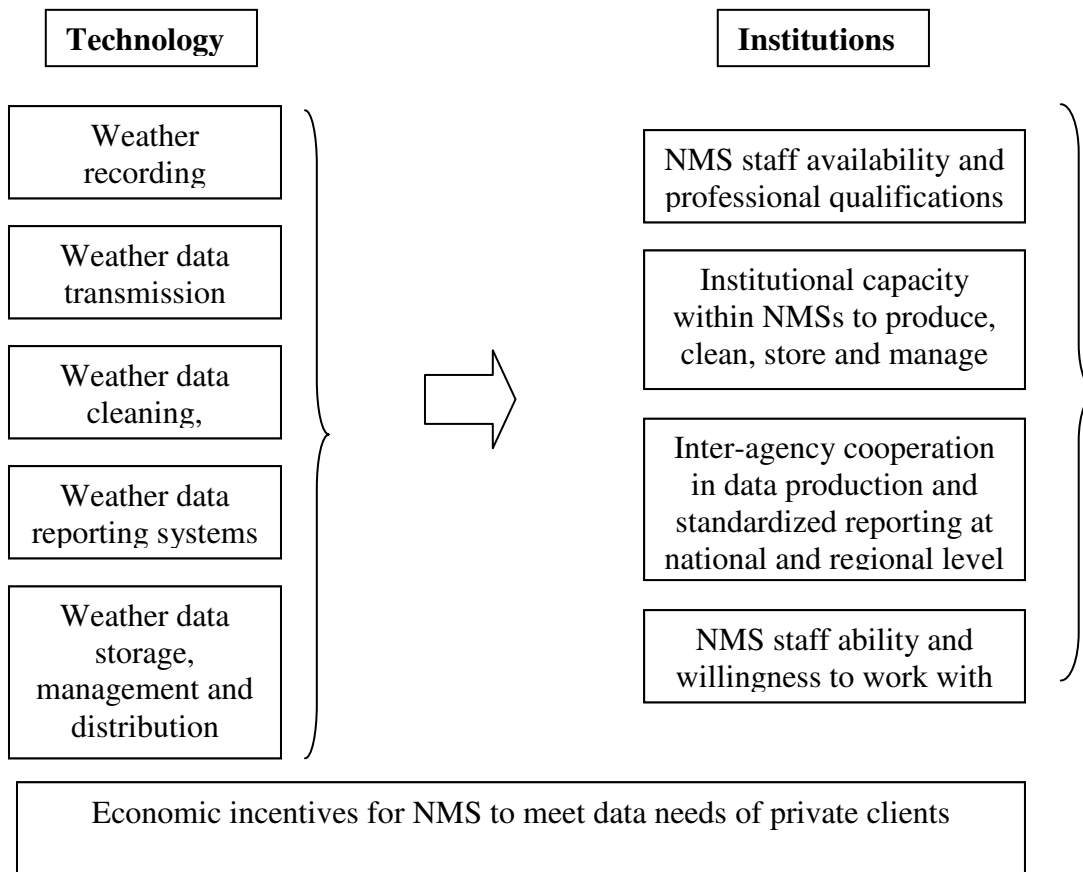
⁴¹ See “Strengthening of the NMHSs in the Southeast Europe: Meteorological and Hydrological Information Sharing – Status Needs, Capacity Building” by Bengt Tammelin, World Bank/ISDR, 2008.

The hardware and software component of weather data manufacturing

Weather stations. Similar to traditional manufacturing, weather data generation process requires right “hardware” and equipment in the first place. In the absence of modern, well maintained and frequently placed weather stations across the country’s territory, one could hardly expect to obtain reliable and practically useful land surface observations. Hence, one of the key priorities of the weather risk market development should be to enable developing countries to improve the density of weather stations coverage and improve the quality of weather measurements by investing in the acquisition of modern and reliable weather measuring equipment.

Data transmission systems. Once a weather station has made a weather sampling (measurement), the information must be either directly reported to end-users or transmitted to the central weather data processing facility for further cleaning and enhancement. Transmission of recorded weather data can be either manual or automatic, with the later approach becoming more and more common practice among advanced NMSs. Although the economic rationale for replacing manual with automatic weather data transmission equipment may be somewhat less obvious in countries with relatively low wages, the key advantage of automating the weather reporting process lies in considerably improved reliability and quality of the produced weather data as even the best trained human observes can often make mistakes. If NMSs in developing countries were to develop themselves into modern national institutions whose products are in demand by different segments of economy installation of automated weather data reporting systems should be viewed as a priority.

Figure 6: Key technological and institutional components of weather data production process



Data cleaning and enhancement systems. Once the weather data have been transmitted by weather stations to the central data processing facility, they must undergo a thorough cleaning, enhancement and verification processes to ensure their quality and reliability. This implies investments in modern software programmes and computer equipment that can help automate most the work which is currently done manually by NMS staff in developing countries. Such an investment in data processing technologies will result in the immediate improvements of data quality and will help reduce the staff headcount and hence increase the salaries for the remaining staff. The additional benefits of such an investment will include improved reliability of produced data, ability of NMSs to dramatically increase the range of weather data products offered to their clients, including highly customized weather data products and services. In the end, all these improvements are likely to result in considerably increased external revenues of NMSs due to additional weather data sales to external clients.

Production of meta-data. The produced weather data (both original and “cleaned”) must be then adjusted for changes in the location or type of instrumentation used in the past to form historic data series. A clear and well documented description of the factors that may have influenced the data at any point in the past (the “metadata”) must be compiled and made available to market participants.

Development of on-line access to weather data. What is also essential is how easily the data produced and stored by NMSs can be made available to end users. Hence, investment in developing historic weather databases that can be accessed on-line by the subscribers in real time should also be viewed as a priority.

The human and institutional components of weather data generation

Staff. Availability of qualified staff is among the key prerequisites for the production of reliable good quality weather data. In most developing countries, NMSs appear to face genuine problems with attracting new talent and retaining the existing well qualified staff. Among the main challenges are low salaries, obsolete and inefficient work processes that result in staff overloads and leave no time for exploring new ideas and developing new products. While investment in automation of many existing work processes is likely to free up staff for more interesting tasks, it is also expected to considerably reduce the staff headcount for less technically challenging jobs (like weather observers) and therefore increase the pool of financial resources available for raising the wages of the remaining qualified personnel.

Hence, the development community should consider assisting NMSs with modernizing their staff structures (with corresponding changes in the pay scales) to enable these organizations to carry out new more knowledge and technology intensive tasks.

Inter-agency and inter-regional cooperation. Often, the quality of weather data and users ability to interpret them suffers from the lack of inter-agency cooperation in individual countries and regionally. Yet, if one were to draw meaningful conclusions about regional climate patterns and even about weather, which is a more locally confined phenomena, in a region comprised of many small countries, access to historic data produced by weather stations located in different bordering countries becomes crucial. This brings to the fore the importance of standard weather data reporting protocols (e.g. the type of data reported, time of reporting, measurement and data enhancement methodologies, etc.) across different NMSs in all developing countries as well as the ease of access to these data for external users. To meet these data reporting and data integration requirements, intra-country and inter-regional coordination among different NMSs becomes essential.

NMSs interface with the private sector. The ability of NMSs to produce weather data and other products and services that will be in demand among private sector users to a large extent

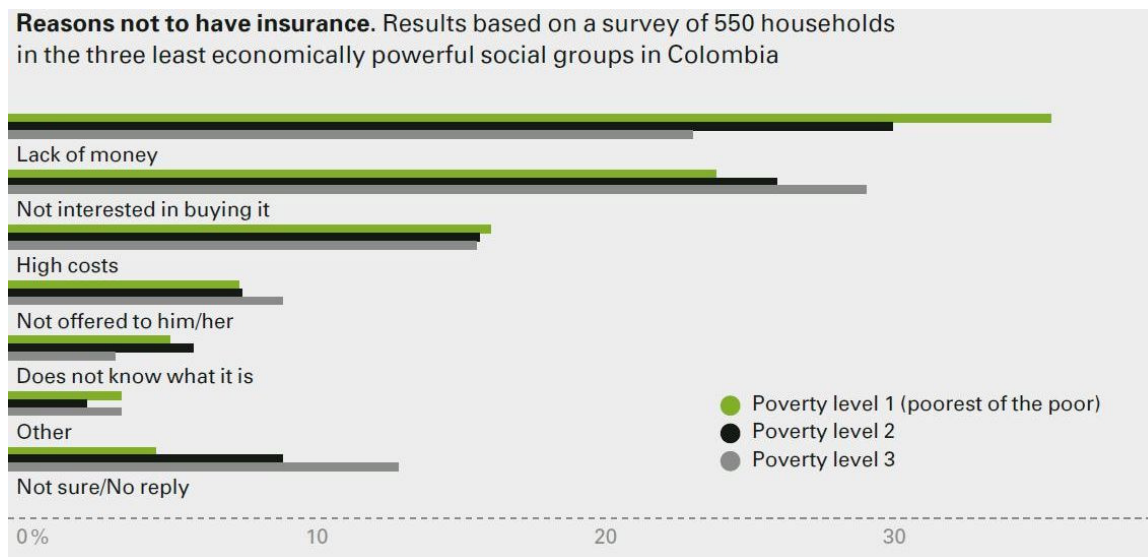
depends on personal skills, training, internal organization and incentives of people working there. In this context, as part of the NMSs institutional reform, international development organizations may consider supporting the creation of special divisions within NMSs that will cater exclusively to the weather data needs of private clients. Acting as an internal interface between the private end-users and NMSs such departments can then provide constant feedback to their organizations about the quality and the type of weather data sought by the market. To be effective, these special divisions of NMSs must be staffed with dynamic and well qualified personnel and have the right economic incentives to perform at their best.

Hence, for the weather risk market to develop in developing countries to the level where it can provide the low cost custom-tailored weather risk hedging products for local businesses, a considerable investment will be required by the international community in the modernization of NMSs, development of seasonal forecasting capabilities as well as the creation of public-private partnerships between NMSs on the one hand and specialized data vendors and weather risk consultants on the other.

Affordability issues and ways to overcome them

Affordability of insurance products is yet another major impediment to the rapid development of the private weather insurance market. The provision of insurance services in developing countries has generated great interest, yet it is important to also consider the barriers to the effective implementation of risk reduction and risk sharing. Figure 7 provides insights of some of the kinds of barriers noted by low-income clients of microinsurance in Columbia (courtesy of Munich Re Foundation). Over 30% of the low-income respondents consider affordability the most important factor in whether or not to buy insurance. Interest—likely linked with awareness of risk exposure and the availability of risk management options to the poor—also affect whether insurance solutions are taken up in developing countries.

Figure 7 (Source: MRF 2008 and FASECOLDA 2008)



Although microfinance has shown that the poor are bankable, the critical question is whether they are insurable as well. Given that up to 45 percent of premium income in the formal insurance industry is used for costs other than paying claims (e.g. agent commission, operational costs, policy taxes, etc.), large-scale success of insurance products for the poor (“micro-insurance”) requires substantial cost reduction through innovation. Products and procedures must be simplified and customised for clients with irregular income streams. Special intermediaries are

needed between the formal sector and the target group, who can deal with moral hazard, design and price appropriate products, and supplement it with education on risk management at the household and enterprise levels. In addition, education and clear communication of insurance products is essential, and particularly so for new weather-indexed products. The BASIX experience in India shows that targeting the right customer segment early on in the process of product marketing and doing it in a cost efficient way can be crucial for the future commercial viability of the programme. The challenge of keeping the product affordable is compounded by the difficulty of managing the highly correlated and technically complex weather risk.

The specific cost challenges faced by climate risk insurers include (i) the need for specialised actuarial capacity; (ii) shortage of reliable statistical data; (iii) time and effort to make potential clients appreciate the benefits of insurance; and (iv) high product distribution costs given large number of clients can pay only small premiums for a limited coverage.

MFIs providing insurance for weather related risks run the risk of insolvency as long as they tend to operate in limited areas and cannot diversify their lending risks. But they can use weather-indexed insurance to protect their lending portfolio (e.g. BASIX). They can also potentially make use of alternative risk transfer instruments like catastrophe bonds or but the relatively small size of their portfolios may make them unaffordable.

The above mentioned problems of weather risk market development are not unique for developing countries. The existing experience suggests that due to the high transaction costs and relatively small volumes of business, stand-alone insurance operations are simply not cost effective to cater to individual farmers and small businesses⁴². Instead, the delivery models tested in developing countries for insurance include micro-lenders, specialized insurance agents, as well as self-help, mutual, or cooperative models. For instance, by bundling lending products with weather insurance the MFIs can considerably reduce the loan default rate for its loan portfolio. Case studies (SEWA, BASIX) also show that insurance is more effectively sold to the poor as part of other services (credit, farmers' cooperatives, agricultural input supply), rather than as a stand alone product. In India, DHAN Foundation helps SHGs in dealing with insurance companies, while Spandana provides insurance directly to the target groups.

“Disaster subsidies”

Indiscriminate post-disaster government aid to homeowners and farmers affected by weather related disasters remains one of the main impediments to the development of weather risk markets world-wide. While timely government aid to victims of disasters is often instrumental to the successful economic and social recovery, it is essential that such assistance does not create widespread expectations of government assistance in the future and hence dampen economic incentives for buying private insurance.

The adverse implications of government interventions can be quite pronounced also in cases when catastrophe insurance is provided at heavily subsidized rates that do not reflect the true cost of risk. This may lead to the withdrawal of private insurers and reinsurers from the distorted market, which, on the one hand, leaves government-sponsored insurance programmes with more demand for its insurance coverage and, on the other hand, saddles them with considerably increased risk exposure that cannot be transferred to the reinsurance market due to insufficient underlying premium. As a result, over time government catastrophe insurers may find themselves in a situation where their catastrophe risk exposure grows well ahead of their claims paying capacity, which puts them on a sure path to insolvency or a need for a government bailout in case of a large catastrophic event.

Besides post-disaster aid, governments commonly provide heavily subsidized weather risk insurance of their own. The main problem with heavily and indiscriminately subsidized insurance

⁴² Patt, A. Peterson, N, Carter, M., Velez, M, Hess, U., Pfaff, A. and Suarez, P. (2008)

premium rates is that in the absence of price signals about the level of their risk, homeowners and businesses have no reason to invest in mitigation to reduce their vulnerability or undertake any other risk prevention measures. As a result, more properties are built in disaster prone areas and very little is done about reducing the physical vulnerability of dwellings to catastrophe events. Over time this leads to further increases in government catastrophe exposure, until it becomes fiscally unsustainable. To deal with this extra fiscal burden government would then have to raise taxes or issue more debt or ... simply pass on the unfunded loss back to insured businesses and individuals.

The Section reviewed the extent to which weather risk markets are affected by the availability of weather risk data from the National Meteorological Services; the eventual cost of weather risk insurance products as well as the government policy on post-disaster subsidies. We have established that one of the key preconditions for the growth of the market is the upgrading of national meteorological services in developing countries, which currently make it difficult to collect weather data in the format required by the market. One of the key findings of the Section is the importance of establishing a transparent and well-articulated government policy on providing post-disaster subsidies to manage people's expectations with regard to the amount of state post-disaster aid. By articulating the availability and the expected size of the government assistance to individuals affected by weather related disasters, the government will reduce the financial uncertainty and hence will encourage individuals to buy private insurance.

2.4 The role of governments in developing public-private partnerships in weather risk insurance

While provision of non-life catastrophe insurance has been by and large the domain of the private insurance market, in the case of catastrophe insurance governments of many disaster prone countries have been more than just simple by-standers. More often than not, governments intervened by creating specialized catastrophe insurance programmes under the pretext of correcting market failure. Most of the government sponsored catastrophe insurance programmes have been designed with at least some element of private participation varying from a simple product distribution function to risk sharing and operation of these programmes. The objective of this Section is to examine the role of government in the provision of catastrophe insurance and to determine whether the creation of government-sponsored disaster insurance programmes is consistent with the very role of government.

Most national catastrophe insurance programmes have emerged in the aftermath of major natural disasters. These disasters revealed, at least for a short period of time, the shortcomings of pure market solutions. Among the most common market failures have been frequent and well-documented insurance market break-downs in the aftermath of major catastrophic events. For instance, in the aftermath of the 2005 US "KRW hurricanes" (Katrina, Rita and Wilma) more than three million homeowners in the East coast of the US west of the Appalachian Trail have received cancellation letters from their insurance companies, which are determined to avoid another USD40 billion Katrina bill. In response to the dramatically reduced availability of catastrophe insurance coverage, state governments in the East coast of the US have resorted to the creation of state-owned catastrophe insurance pools which aim to provide catastrophe insurance coverage to businesses and homeowners who cannot obtain such coverage from the traditional insurance market. The main question is whether such government actions are consistent with the very role of government and the extent, to which such actions may adversely affect the development of the private insurance market. Below we attempt to provide some guidance on the role government can play in the provision of catastrophe insurance coverage.

Any government intervention in catastrophe insurance market must be based on clear evidence of market failure to provide the needed coverage for the population at risk for a long time. Typically, in the case of catastrophe insurance such a case can easily be made in most of emerging market economies where the level of private catastrophe insurance coverage remains well below 3-5 percent of total livable housing stock and is next to non-existent for the poorer segment of society. The low level of insurance penetration however should be considered in the

context of long-standing government policies on post-disaster aid, administratively imposed maximum limits on insurance premium rates, and existence of subsidized government disaster insurance. The very existence of these government policies may be the key obstacle to the development of the private market and their removal may be sufficient to see the resumption of rapid market growth.

A schematic summary of potential roles that can be assumed by government in provision of catastrophe insurance is provided in Table 2 below. As one can see, there are at least 20 different ways for government to intervene in the provision of catastrophe coverage, which may vary from highly interventionist implying direct government involvement in the provision of coverage and making insurance compulsory to relatively mild indirect involvement that rely on public awareness building and introducing economic incentives for buying insurance coverage.

Table 2. Government role in provision of catastrophe insurance

#	Level of intervention (High-Low)	Supply-side	Demand-side
1	H	Provision of re/insurance through government insurance entity	Provision of re/insurance premium subsidies
2	H	Provision of operator maintenance subsidies	Insurance claims subsidies
3	H	Regulatory requirement to provide catastrophe re/insurance at below market rates	Tax benefits
4	H	Capital subsidies (low cost debt or equity or government reinsurance)	Insurer's performance guarantee
5	H	Relaxed solvency requirements	Legal compulsion to buy coverage
6	L/H	Tax incentives (through equalization reserves, etc.)	Adding insurance requirements to mortgage lending, utility bills or taxation
7	L	Creation of public-private partnerships	Public education and insurance awareness building
8	L	Investment in public goods (risk maps, risk data, risk models, etc.)	Linking disaster aid to insurance
9	L		

Below we provide a brief summary of each of above mentioned government policies.

Supply-side policies:

1. Provision of reinsurance or insurance through specially created government owned insurance entities is one of the most common and the most interventionist ways of addressing market failures on the demand-side. On the reinsurance side, a typical example of such a policy would be the Florida Hurricane Catastrophe Fund (FHCF) and, on the insurance side, the above described Citizens Property Insurance Corporation. The major risk of such government interventions is in mispricing of risk and government

inability to control the burgeoning risk accumulations which eventually may result in the transfer of private insurance liabilities to taxpayers.

2. Provision of insurance operations subsidies is typically rationalized on the grounds of lowering the entry barriers to a given segment of insurance market with the view of encouraging competition and hence lowering prices as a result. Under the US Crop Insurance programme, the government subsidizes the crop insurance delivery and administrative costs of private insurance companies, as well as the companies' underwriting risk through the Standard Reinsurance Agreement. There is no evidence however that these policies resulted in a more cost efficient operation of agricultural insurers enrolled into the programme.
3. Often governments require private operators to provide certain types of catastrophe coverage at subsidized or technically inadequate rates. However, unless such a requirement is backed by the financial and technical capacity from the government (as is the case in France with the CCR), it is likely to be circumvented by the private sector. Such price restrictions are also likely to lead to the exodus of private re/insurers from the local market, thus leaving the government no choice but to provide alternative insurance and reinsurance arrangements. For instance, in the case of Florida, regulatory restrictions on the premium rates for hurricane coverage necessitated the creation of the Citizens Property Insurance Corporation as well as the Florida Hurricane Catastrophe Fund (FHCF), which also provides reinsurance to the local market at about 40 percent of the technical price of risk.
4. To make catastrophe insurance affordable, governments may provide capital subsidies to the private risk taking entities either in the form of attractively priced debt or equity capital or through subsidized reinsurance. The former solution is more common (see CCR and FHCF). The problem with subsidized reinsurance is that it tends to distort the market signals about the true cost of risk and, in the end, forces private reinsurers to withdraw from the subsidized segment of the market, thus leaving all the risk on the balance-sheet of government reinsurers.
5. From time to time, government may relax solvency margin requirements for catastrophe reinsurers to enable them recapitalize after a major natural disaster or after a major financial market crisis. The current weakening of capital requirements for foreign reinsurers accepting US based cat risk is the case in point.
6. Tax incentives are yet another form of less interventionist government policy aiming to increase the level of catastrophe coverage. Tax incentives typically are provided in the form of non-taxable equalization reserves (Switzerland), which enable reinsurers to reduce the cost of doing business.
7. Creation of public-private partnerships in catastrophe insurance is perhaps the most common and proven forms of government interventions. While the level of private participation may vary from dominant (CCRIF) to insignificant (FONDEN), typically private sector is at least involved in the distribution and claim settlement of insurance policies. The litmus test of the quality of such PPP programmes is the level of risk transfer to the private sector.
8. The least controversial and most successful government policy of all is investment in public goods such as development of risk maps, collection of quality data, and the creation of the market infrastructure that may include weather stations and satellite imagery for the purposes of product pricing as well as provision of funding for the development of complex risk models.

Demand-side policies:

1. Insurance premium subsidies is perhaps the most commonly used form of government intervention in the provision of weather related insurance coverage. Often, governments provide insurance coverage below its actuarial cost, which conceals the true cost of subsidies and ultimately results in large one-off financial shortfalls in the case of major natural disasters. For instance, the NFIP in the US has been providing flood coverage below actuarial costs for several decades only to find itself short of USD20 billion in claims payment capacity in 2005, in the aftermath of KWR hurricanes. All government owned national agricultural insurance programmes without exception provide considerable premium subsidies to insured farmers.
2. Insurance claims subsidies is yet another way to reduce the cost of insurance for consumers and hence stimulate demand for coverage. The US Crop Insurance Programme provides a good illustration of how claims subsidies can be used to reduce the cost of coverage. The main problem with this policy is that it conceals the true cost of coverage for the insured and hence distorts the true level of risk they have assumed. It also makes it difficult to budget and administer for the government as end-year underwriting results for weather related catastrophes may vary considerably from one year to another.
3. To entice consumers to buy insurance, often government may provide for advantageous tax treatment of insurance premium (e.g. making it tax deductible) and retained losses (e.g. losses retained under the deductible and in excess of the insured limit). As long as the preferential tax treatment applies to all insured policies for catastrophic weather perils in the market, this policy will cause very minimum distortions to the insurance market. Tax incentives are also likely to contribute to the uptick in demand for catastrophe insurance coverage as long as the premium rates paid by the insured (and the tax benefits received) are relatively high in relation to their incomes.
4. Re/insurer's performance guarantee typically comes in the form of formal government commitment to pay residual claims (e.g. claims in excess of re/insurer's own claims paying capacity) of a specific catastrophe re/insurer in case of a highly unlikely and severe natural catastrophe. This feature forms a corner-stone of most public-private partnerships in catastrophe insurance as it enables such programmes to realize considerable savings on the cost of additional layers of excess of loss reinsurance which they would have to procure otherwise. The major risk with such approach however is the increased moral hazard as the management of guaranteed entities is likely to feel more inclined to have the company assume more risk.
5. Introducing the legally binding requirement to buy catastrophe insurance coverage through the passage of special insurance legislation is perhaps the most effective form of government policy in terms of boosting the level of catastrophe insurance penetration and addressing the adverse selection problem. The policy however is hard to implement as it requires many years of national consensus building on the subject and a clear government commitment to see such legislation through.
6. Often to avoid political resistance to the introduction of mandatory catastrophe insurance coverage, governments opt for a more narrow solution by requiring that all new mortgage borrowers take out catastrophe insurance. For instance, in the case of the NFIP in the US, mortgage borrowers are required to buy flood insurance by law⁴³.

⁴³ The law is enforced by requiring mortgage lenders that make loans in flood prone areas to present the evidence of flood insurance on properties financed in these areas to Fannie Mae and Freddie Mac – the federally chartered buyers of the mortgages.

7. Although ranking as a soft policy measure, educating the public on their true risk exposures to natural perils and the benefits of insurance and personal risk management can be highly effective policies in increasing the level of insurance penetration for natural disasters.
8. To reduce consumers' reliance on post-disaster reconstruction subsidies and encourage the uptake of insurance, governments can limit such subsidies to a fraction of insured limit or even make such payments contingent upon the availability of catastrophe insurance. In Spain, for instance, post-disaster reconstruction subsidies for private citizens have been completely outlawed to encourage citizenry to buy insurance coverage from the Consorcio de Seguros - the government backed catastrophe pool. This policy has been very effective leading to an almost 100 percent rate of catastrophe insurance coverage.

The Section established that any government intervention in catastrophe insurance market must be based on clear evidence of market failure to provide the needed coverage for the population at risk for a long time. Typically, in the case of catastrophe insurance such a case can easily be made in most of emerging market economies where the level of private catastrophe insurance coverage remains well below 3-5 percent of total livable housing stock and is next to non-existent for the poorer segment of society. The Section also provides an overview of key government policies in disaster risk financing from the point of view of their effectiveness and long-term sustainability.

Text Box: Lessons Learned

Insurance solutions can be found for an increasing range of weather risk problems. There are numerous modes of government involvement in disaster insurance, which can be adapted for the requirements of a particular territory and peril.

Some of the following challenges must be addressed to increase the access of developing countries to insurance as a risk management/financing mechanism:

- data availability,
- insufficient capacity to assess risk, technical aspects of insurance
- lack of awareness and low demand for insurance,
- affordability and
- availability of locally tailored insurance and risk reduction solutions for the poor.

This applies to potential countries and sectors that could use insurance, as well as to the insurance industry itself, which has been hesitant to develop products and schemes that are applicable, attractive and affordable to developing countries and which effectively promote development.

3. Climate-related debt swaps: The potential for capitalizing insurance schemes

The concept of western governments using debt forgiveness as a vehicle for facilitating important climate risk reduction and adaptation measures in developing countries is politically and ecologically appealing. In drawing upon the responsibilities of those better able to afford to pay, it mirrors the underlying concept of Diaspora disaster insurance. In both cases, finance sourced from the more prosperous industrialized world is used to reduce future loss arising from climate change, which is ultimately a shared international burden. This conceptual synergy is helpful for a joined-up approach to risk sharing and insurance.

Of the numerous possible schemes for climate risk reduction and adaptation that might be funded by a debt swap, a strategy is required to identify those which would optimally reduce the risk of natural disasters in the developing world, and lower the residual disaster risk premiums. Alternative to forestry conservation projects, debt swaps might be targeted regionally at improving flood defenses and other critical infrastructure in developing countries.

In reviewing past debt swap schemes, risk management strategies will be developed for prioritizing mitigation schemes so as to minimize the adverse impact of future climate related disasters. An assessment will be made as to the benefit such mitigation schemes would have on facilitating insurance against future extreme windstorms, storm surges and floods.

This section of the report reviews debt write-offs and debt-swaps particularly for the highly indebted countries, and assesses the potential of debt swaps and other approaches including national financing and remittances to capitalize an insurance fund.

3.1 Debt swap introduction

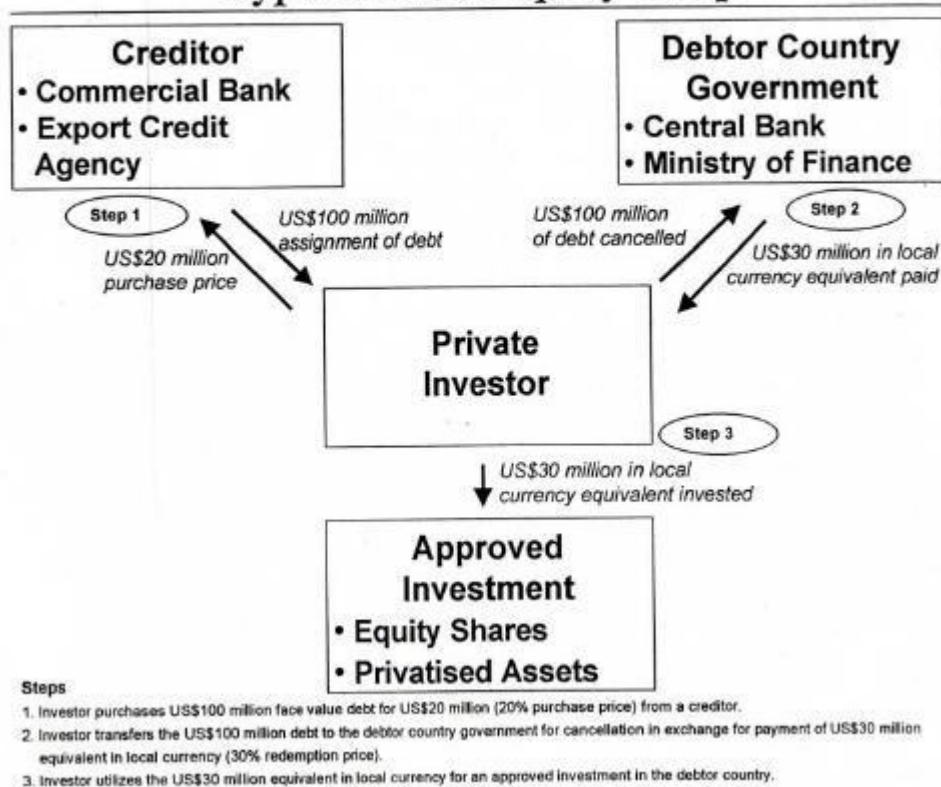
A debt⁴⁴ swap (or conversion) is defined as the cancellation of (part of the) external debt of a country in exchange for the debtor government's commitment to mobilise domestic resources (local currency or another asset, such as bonds, privatised public assets) for an agreed purpose on agreed terms⁴⁵. The cancellation of external debt usually comes at a discount from the face value. The terms 'debt swap', 'conversion', 'exchange', or 'leverage' are often used interchangeably. Figure XX illustrates how a basic debt-equity swap works.

Figure 8 (Source: DFI 2009)

⁴⁴ Throughout the paper, debt is taken to be "foreign debt"

⁴⁵ OECD 2007

Typical Debt-Equity Swap



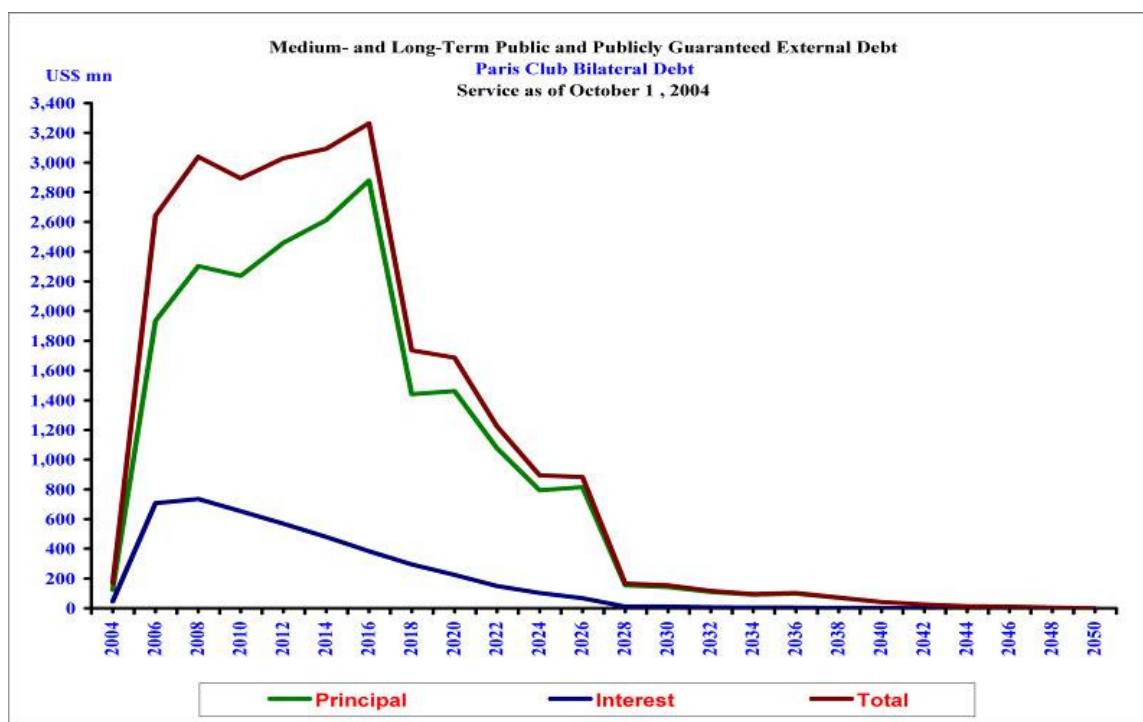
Source: DFI 2009

The major swap transactions involve debt-for-aid (development) swap – the cancellation of external debt in exchange for local currency paid for development projects (e.g. health, education) in the debtor country; debt-for-equity swap – the cancellation of external debt in exchange for local currency invested in equity (shares) in a domestic firm or a privatised public enterprise but also in natural resource stocks; debt-for-nature (environment) swap – the cancellation of external debt in exchange for local currency used to finance conservation. This latter category of swaps was originated by Thomas Lovejoy, a pioneer in conservation biology at the World Wildlife Fund. In arguing that financial crises in developing countries had decimated environmental budgets, he articulated for debt-for-nature swaps a rationale, which has since increased in urgency with the accumulating evidence for climate change. As a subsidiary benefit, expenditure on the environment should help to improve levels of economic activity depressed by the current global economic downturn.

Climate change requires the industrialized world to take not just political notice, but positive action over an alarming consequence of the rising debt burden of developing countries: the wanton damage of their regional ecosystems. In order to generate cash flow to service national debt, political sanction has been granted to the short-term plunder of natural resources through mining, logging, farming and cattle ranching, rather than to opportunities for long-term prudent resource management. Unless externally encouraged and assisted, the poorer countries of the world lack the practical political motivation and monetary funds to adopt durable conservation measures. Once these are in place, then effort can be focused on climate change adaptation measures and risk management. The structural uncertainty about climate change is intrinsically fat-tailed. The economic consequences of fat-tailed structural uncertainty about climate change require urgent

consideration of mitigation action⁴⁶. As the fragility of the global ecology of the Earth becomes ever more scientifically apparent, and the significant uncertainties in forecasting are better appreciated, debt-for-nature swaps should become increasingly viewed as a serious option.

Figure 9: Medium- and long-term Public and Publicly Guaranteed External Debt



Source: DFI (2009)

Bilateral Debt

Debt-for-equity swaps have been popular with creditor countries, but there have also been several billion dollars of debt-for-nature/development swaps, whereby debtor nations could have their debt discounted upon willingness to protect the environment. Swap transactions can create special incentives for NGO's, who can obtain more local currency for environmental projects by converting its foreign currency resources this way⁴⁷.

Rather than funds coming from existing stretched aid budgets, extra sources of development funding can become available for projects which might not be highly prioritized otherwise, because of the long-term, and less tangible, nature of the practical national benefits accrued. Among these projects are those having a focus on environmental protection or ecological preservation. Quite apart from these objectives, which enhance the international standing of a country on global environmental issues, a debt swap can also enhance, by lowering the debt burden of a country, the attractiveness of a country for foreign direct investors, and improve the value of debt titles in the secondary market.

Accepting that sovereignty is retained by the recipient government, criticism has been leveled at the shift of decision-making over the debtor country's internal resources. An extreme interpretation of a debt swap is that it imposes a degree of foreign domination over a country, albeit with the creation of net income which will serve the indebted government and population. To the extent that some external control is exerted to avoid misappropriation of funds or other

⁴⁶ Weitzman 2008

⁴⁷ Kaiser and Lambert 1996

misgovernance, this would seem a price worth paying to ensure the best outcome of a debt swap for the citizens of a deeply indebted country.

As with foreign aid, the range of decision-making covered by debt-for-development swaps is indeed creative and extensive: healthcare, sanitation, nutrition, education, street children, and children in armed conflict. The diversity in swap types and sizes mirrors the diversity amongst the intermediaries and creditors. For climate-related swaps to gain higher priority would require a degree of coordinated action on behalf of creditors, which would indeed be justified by the global concern over climate change. Even then, local priorities may direct environmental attention to urgent issues such as preventing land erosion.

General financial principles apply to all debt conversion operations, but there is a great diversity in their types. Thus, the search for innovation in debt swaps leads to the possibility of multilateralizing some swap operations. Where a developing country owes a huge amount to a developed country, such as Russia, with scant prospect of repayment anytime soon – if at all, it may make sense for western donors to pay the creditor the much discounted debt, and have the developing country set aside the money for some designated programme of environmental protection or social development. The plight of Nicaragua as a major debtor to Russia provides a striking illustration of the huge leverage that Western donors have in being able to secure debt cancellation at a small percentage of the debt.

A number of such swaps are transacted through an intermediary (usually an NGO), which is a third party that buys debts on the secondary market at a discount, and retires them, provided the debtor commits to financing agreed projects. The ecological NGOs, e.g. Conservation International, the Nature Conservancy, and the World Wildlife Fund, have been active in catalyzing such transactions, and have been influential in setting standards of good practice in project implementation.

Multilateral Debt

Bilateral debt accounts for about a fifth of developing country debt with a slightly lower proportion being multilateral debt, which is that portion of a country's external debt burden owed to international financial institutions (IFIs) such as the International Monetary Fund (IMF), the World Bank, the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank. These IFI's have preferred creditor status, meaning that payments to them must be given the highest priority, over commercial and bilateral debt. About half of the debt of the heavily indebted poor countries is multilateral, and about 10% is owed to international commercial banks.

The Multilateral Debt Relief Initiative (MDRI) provides for 100 % relief on eligible debt from three multilateral institutions to a group of low-income countries. The initiative is intended to help them advance toward the United Nations' Millennium Development Goals (MDGs), which are focused on halving poverty by 2015. The The Multilateral Debt Relief Initiative (MDRI) applies to countries that have reached, or will eventually reach, the completion point under the joint IMF-World Bank enhanced Initiative for Heavily Indebted Poor Countries (HIPC Initiative).

The HIPC Initiative entailed coordinated action by multilateral organizations and governments to reduce to sustainable levels the external debt burdens of the most heavily indebted poor countries. Currently, the HIPC initiative identifies 41 countries, most in Sub-Saharan Africa. Those outside this region are: Afghanistan, Bolivia, Comoros, Haiti, Honduras, Krgyz Republic, Madagascar, Nepal and Nicaragua. Multilateral debt relief for countries in Asia and Pacific is comparatively scarce, and the case can be made that most of the low-income Asian and Pacific countries receive too little debt relief⁴⁸.

⁴⁸ Cassimon et al 2007

Before considering any debt swap operations, debtor countries would clearly wish to establish the relief from multilateral debt, as afforded by MDRI and HIPC, and also what relief exists from bilateral debt. For example, within the framework of the HIPC Initiative, Germany makes a contribution to MDRI costs of around four billion euros. In addition, Germany agrees the full remission of bilateral debt for entitled countries. As illustrated by Zambia in 1994, it is possible for commercial debt of impoverished countries also to be swapped for development.

The table below lists the country coverage of the MDRI.

Table 3. Country coverage of the Multilateral Debt Relief Initiative

(Source: <http://www.imf.org/external/np/exr/facts/mdri.htm>)

Country Coverage of the MDRI		
	Eligible under the “MDRI-I Trust” (per-capita income at or below USUSD380)	Eligible under the “MDRI-II Trust” (per-capita income above USUSD380)
Countries that have benefited from MDRI as of end-November, 2008		
“Completion point” HIPCs: 23 countries that have reached the completion point under the Enhanced HIPC Initiative	Burkina Faso, Ethiopia, The Gambia, Ghana, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, São Tomé and Príncipe, Sierra Leone, Tanzania, Uganda	Benin, Bolivia, Cameroon, Guyana, Honduras, Mauritania, Nicaragua, Senegal, Zambia
Non-HIPC countries (2) with per capita income below USUSD380 and outstanding debt to the IMF	Cambodia, Tajikistan	
Countries that will be eligible once they reach the completion point under the Enhanced HIPC Initiative		
“Decision point” HIPCs: 11 countries that have reached the decision point under the Enhanced HIPC Initiative	Afghanistan, Burundi, Central African Republic, Chad, Democratic Republic of the Congo, Guinea-Bissau, Togo	Guinea, Haiti, Republic of Congo
	Liberia ¹	
7 additional countries may wish to be considered for HIPC debt relief. They met the income and indebtedness criteria based on end-2004 data.	Eritrea, Nepal	Comoros, Côte d’Ivoire, Kyrgyz Republic, Sudan
	Precise data on the per capita income of Somalia are not available at this juncture.	
¹ Liberia has no MDRI-eligible debt to the IMF but is expected to receive additional beyond-HIPC debt relief from the IMF to fully cover its remaining eligible debt outstanding at the completion point.		

Commercial Debt

Debt owed to commercial creditors such as private banks accounts for approximately two-thirds of developing countries’ overall debt burden. This is especially the case for middle-income countries. But an increasing number of low-income countries are also gaining improved access to international capital markets following recent bilateral and multilateral debt cancellation initiatives which have made them attractive borrowers once again.

Most major commercial banks in developed countries have held, or still hold, hard currency debts from developing countries, particularly in Latin America. Some banks have declared, as unrecoverable losses, a very large percentage of the outstanding commercial debt. Debt swaps provide a mechanism to help banks receive some return on their initial investment. If an NGO, or an international agency, can buy outstanding country-specific commercial debt at a deep discount (e.g.15%), this debt can then be repaid in local currency with an advantageous rate of conversion to provide funding for programme operations by an NGO or international agency in the disaster affected country.

These are sizeable outstanding debts owed by developing countries to international commercial banks, often as a result of syndication of large loans. As a number of countries, particularly in Latin America, have defaulted on such loans, multilateral financial institutions and governments of developed countries have been concerned that such defaults could jeopardise the stability of the global financial system. Accordingly, in the 1970's they created a forum, in the form of a cartel for the creditor banks. This forum became labelled as the London Club due to the fact that most of such loans agreements were reached in London. Whereas debts owed to the Paris Club are obligations to some foreign creditor nations, the London Club is an international group of private commercial banks whose credits are not covered by government guarantees or insurance. The group is designed to provide solutions to difficulties experienced by a number of countries, above all, developing countries, in repaying their foreign debt. The Club incorporates 600 commercial banks of industrialized countries.

In February 2000, the London Club agreed to forgive some of the Russian debt to commercial lenders. In this agreement, USD31.8 billion in claims held by commercial creditors were exchanged for USD21 billion in new Eurobonds. The London Club has a history of debt write-off. In July 2004, the London Club agreed to write off more than half the USD2.8bn of debt owed by Serbia and to reschedule payments on the remainder over the next 20 years. In times as recent as this, international commercial banks have been amongst the most successful and prosperous commercial organizations, and amongst the most generous donors to charitable causes, not least environmental protection. Accordingly, since Conservation International bought USD650,000 of Bolivian debt for USD100,000 on the secondary market in 1987, there has been a substantial volume of commercial debt-for-nature swaps. But times have changed. Over the past year, the international commercial banking system has had to receive an injection of government capital, and the overall system remains fragile. Nevertheless, some kind of swap-for-nature may be more appealing than a straight write-off.

In 2005, Argentina conducted the biggest sovereign debt restructuring process in history. Before its debt swap, Argentina owed about USD82 billion in principal and USD20 billion in past due interest. Bonds placed by the capital markets ended up in the hands of hundreds of thousands of retail investors. Many middle-income and lower middle-income countries devote significant amounts of their revenues on debt service payments to commercial banks and bondholders. When debtor countries have run into repayment difficulties, some private creditors have aggressively pursued their claims or sold their debt on the secondary market at a discount to other creditors, which have in turn aggressively tried to recoup payment of the full face value of the debt.

3.2 Discussion of debt swap merits

Well-intentioned pledges made by wealthy western nations to increase aid substantially are subject to revision according to altered politico-economic priorities. Similarly, a commitment to writing off debt to heavily indebted poor countries may fall short of full implementation of the designated amount. When there is economic hardship back home, as at present, elected politicians are sensitive to the finite public appetite for increasing aid to developing countries. However, there may be greater public appeal in a bilateral arrangement where financial assistance comes attached with some strings, which ultimately can be seen to convey some

reciprocal benefit to the donor countries. Thus, from a creditor's perspective, the concept of a debt swap can be a useful auxiliary supplement to the foreign aid agenda.

Tackling a corner of the overall international debt problem, important as this may be, is secondary to the primary aim of influencing development policies in poor highly indebted countries. Criticism of debt swaps for implicitly acknowledging the legitimacy of the debt titles purchased has been muted by the widespread acceptance of their positive role in nature conservation and poverty alleviation. Even in the industrialized world, green policies are politically tortuous to implement, especially at times of economic austerity and high unemployment, although they may be adopted within a package of government measures to boost a weakening economy and create employment.

Good intentions on environmental protection often fall short of good practice. The track record of ring-fenced or conditional development funding unfortunately does little to allay skepticism that a swap may not work because of misadministration or the fungibility of funds, or the lack of real sustained commitment to the environment.

Debtor and Creditor Perspectives

The question as to what makes a debt swap really work for debtor and creditor countries is important for establishing further progress with this kind of financial transaction, and optimizing its practical benefits. In formulating lessons learnt from experience with debt-for-environment swaps in economies in transition, the OECD has identified some generic risks of debt-for-environment swaps (DFES)⁴⁹:

- Downgrade of the country's credit rating which may lead to the increase of the cost of future borrowing. As an example, Argentina has faced this kind of debt swap predicament.
- Distorting negotiations on more efficient debt treatment operations (restructuring and relief).
- Macro-economic and political instability which can lead to the lack of confidence by creditors. Costa Rica suspended debt swaps at the end of 1989 because of concern over potential macro-economic impacts, and when operations were resumed, they were more limited.
- Inflation caused by the injection of excessive amounts of local currency into the national economy. However, the case study of Costa Rica shows that this may not be significant.
- Fiscal difficulties that can lead to the lack of resources to service the swap at a national level.
- Using DFES as an argument to reduce regular government environmental expenditure.
- Inefficient public management of debt swap funds and round-tripping caused by the lack of adequate monitoring of expenditure. (Round Tripping refers to the situation where capital belonging to a country leaves the country and is then reinvested into the country in the form of Foreign Direct Investment.)

OECD has identified the following advantages for the debtor country:

- It provides new and additional local currency expenditure that does not replace other public spending.

⁴⁹ OECD 2007

- It can leverage additional local expenditure on environmental public goods that are highly important as the foundations of the country's sustainable development, but are typically not urgent because of the immediate pressures to provide food and security to poor people, even if this undermines the long-term, sustainable basis for local food supply.
- It offers opportunities to integrate environmental quality improvements with poverty reduction, social well-being and economic recovery through protecting public health, creating new jobs and harvesting local resources and skills to generate sustainable revenues to local communities.
- It provides a unique opportunity to move towards the fulfilment of international environmental agreements (such as the Climate Change Convention, the Convention on Biological Diversity).
- It can contribute to the alleviation of regional and cross-border conflicts related to the management of trans-boundary natural resources (e.g., surface waters, forests).
- It is a practical and effective instrument to mainstream the environment in the social and economic growth agenda of the debtor government.

OECD has identified the following advantages for creditor countries:

- For creditors concerned with global environmental problems (climate change, biodiversity), a DFES offers an opportunity to purchase global environmental benefits more cheaply than at home. This benefit is proportional to the scale of potential global benefits that can be produced in the debtor country (e.g., the potential reduction of emissions of greenhouse gases, the size of potential carbon sinks, and the size and diversity of endemic natural ecosystems).
- For creditors concerned with international security, a debt-for-environment swap offers an opportunity to foster cross-border co-operation and confidence building between (potentially) antagonistic countries. Such measures may include protecting common natural biological resources, (e.g., nature reserves, endangered species, rivers or lakes). A debt-for environment swap can also help uproot sources of international/regional conflicts, (e.g., by improving the management of water resources in trans-national rivers or by reducing pollution loads that affect the quality of life in neighbouring countries).
- For creditors concerned with poverty reduction, a debt-for-environment swap offers various win-win opportunities to eradicate poverty while enhancing environmental sustainability. In low-income countries, such as the Kyrgyz Republic, a large share of the population depends heavily on natural ecosystems for daily subsistence. Sustainable management of natural resources, such as water, soil, forests, is a solid source of food, energy and income to many local communities.
- A debt-for-environment swap may also have a positive effect on a creditor country's environmental and political image in light of the increasing political promotion of debt forgiveness to the poorest countries and global co-operation for environmental protection.

Understanding What Works and What Doesn't

According to OECD, some of the main lessons learnt from the experience with preparing DFES in the context of overall debt restructuring and long-term and comprehensive treatment of debt are⁵⁰:

⁵⁰ OECD 2007

- Credible commitment to economic and fiscal reforms is an important and necessary condition to convince creditors to give a debtor country a preferential debt treatment. The need to maintain a sound macroeconomic position to ensure future growth and investment to pursue sustainable borrowing is key.
- The DFES should not be proposed if the overall macroeconomic situation in the country is improving and the external debt level is not unsustainable (by IMF criteria) as it affects the credit rating position of the country and will increase the cost of future borrowings. DFES should be designed as part of the country's overall debt management strategy integrated into strategic negotiations on long-term approaches to debt treatment.
- A debtor country should utilise the momentum of existing international processes that call for debt cancellation/reduction and should seek to link the DFES to such processes (e.g. the CIS-7 initiative for EECCA countries).
- Best results are achieved when DFES are realised within the framework of negotiations with Paris Club creditor governments. It is particularly important that the agreement between the debtor country and the Paris Club contains an explicit clause which allows creditors to undertake, on a voluntary and bilateral basis, individual debt swaps with the debtor country, including DFES. Such a clause significantly facilitates the process and creates a window of opportunity for the debtor country to approach creditors with requests for them to consider DFES.
- DFES should not limit the opportunities for unconditional debt relief or restructuring in the future, as unconditional relief is always better for a debtor country than conditional swaps. However, DFES should be proposed immediately after unconditional relief has been exhausted (an additional "sweetener") and should be prepared early in the process.

Noting that debt swaps are regaining popularity, not least because of the climate change agenda, Hurley has contributed to the literature by summarizing a number of basic concerns raised relating to debt swaps⁵¹. These concerns are noteworthy in that they apply generally to debt swaps for risk reduction.

Sustainability

There is the usual Dutch Disease concern that a country could become unduly dependent on the funds freed-up via such arrangements for investments in a particular sector. This is undesirable because debt conversions are short-term injections of extra funds. If a debt swap provides for a single injection of financial investment, there should be a programme of reforms, with a plan for sustained long-term maintenance supported by an adequate level of local funding and political interest. As with the principle of co-insurance, it is important that the recipient country share the financial and reputational risk of project failure by allocating some of its own budgetary and contract management resources. Clearly, it helps greatly if swap projects are chosen judiciously, so that practical implementation is achievable. Most crucial for success is the ability and political will to carry through the necessary policies to meet the swap obligations. A trilateral partnership of public, private and multilateral agencies would help establish the basis for success to develop.

Coherence

Debt swaps must be entirely consistent with national development plans. The representative of El Salvador spoke highly of their swap operation with Spain stressing that the deal was entirely consistent with the country's 2021 education plan. He suggested that a debtor country must have a long-term sectoral strategy in place as a necessary precondition if these kinds of conversions are to be effective.

⁵¹ Hurley 2006

A direct measure of success of a debt swap is the degree to which the financial transfer has been effective in addressing the issues specifically targeted, e.g. environmental, ecological etc.. In this regard, it is vital that the priorities of the recipient country are properly aligned with those of the donor nations. There must also be genuine commitment of political leaders of the recipient country to the ideals of environmental protection and ecological conservation. Needless to say, if gratuitous political lip-service is paid to these ideals, then expenditure to further these causes is liable to be wasted, and the debt swap may be little more than a veneer to cover a plain debt write-off. However, if, as for example with Costa Rica, a swap provides a valuable means for extending pre-existing government policy on environmental protection, then expenditure can make a tangible and welcome difference.

Transparency

Under standard debt swap arrangements, funds are transferred into a special account. Transparency and accountability are important in the management of the counterpart fund. There should be clear channels for civil society participation to ensure funds are well used. One route is the establishment of tripartite committees with representatives of debtor and creditor government and local civil society groups.

Administrative burden and donor coordination

Debt swaps represent a heavy administrative burden on often already overstretched debtor country government. Political negotiations and agreements must first be reached at high level before the technical and operational level details can be worked out at lower levels.

Additionality

If debt conversions substituted for increased donor overseas development assistance, then other poor countries would effectively be paying for them. At the same time, debtor governments could use the funds freed-up via these arrangements to substitute for investments they would have otherwise had to make with their own funds. It would therefore not translate into *additional* investment.

Conditionality

In the past, debt conversions have been used to impose policy covenants and conditions on beneficiary countries such as privatisation of key sectors or industries, or have been tied to the purchase of goods and services in the creditor nation. These links are objectionable. Spain has recently shifted its policy, and no longer ties swaps and binds debtor nations to the purchase of goods from Spanish companies. The UK government has traditionally not engaged in any debt-for-development or debt-for-nature swaps, taking the view that if a debt burden should be written off, the UK government would prefer to cancel it outright and leave the country to decide how the released funds should be used.

Illegitimacy

Loans may be deemed to be illegitimate in origin. Donors may portray swaps as an act of good will when in some cases loans had been extended to undemocratic governments for political purposes and had served no useful developmental purpose. These debts clearly need to be cancelled but creditors must explicitly recognise shared responsibility.

Selectivity

The eligibility of countries for debt swaps raises issues of selectivity. Consider the case of the Philippines. Japan holds 70% of the country's Overseas Development Assistance portfolio, but has traditionally preferred to provide fresh finance rather than engage in lengthy and technical debt swap arrangements.

3.3 Debt swaps and disaster risk reduction

Some DFES swaps may also double as debt-for-disaster-reduction swaps. Analogous to, and in conjunction with, the short-term plunder of natural resources through mining, logging, farming and cattle ranching, is the short-term despoliation of the environment, and destruction of natural barriers which mitigate the risks of landslides, floods, and storm surges. Excessive logging on steep terrain can precipitate landslides, debris avalanches and mudslides in heavy rain. Clearance of land for farming can increase run-off to rivers and exacerbate flood risk. Removal of coastal mangrove swamps can eliminate a natural barrier to the inland progress of a storm surge or tsunami.

The foresight of early action to mitigate risk often may be rewarded with a high future benefit leverage over initial cost: a judicious modest investment can save a much larger financial and human loss when a natural disaster strikes. Examples are numerous: timely repair to sea or river defences can avert major flood disasters; attention to the water level in glacial lakes in mountain regions can avert lake outburst floods; thoughtful land-use planning can restrict inundation loss in flood-plains.

Recognizing the political reality of global interdependence, the cost burden of natural disasters in the developing world is inextricably shared with the more prosperous industrialized nations through ex-post appeals for assistance and relief. It therefore makes economic sense for these wealthier nations to encourage risk reduction in poorer countries through whatever ex-ante means are available. But compared with the pressing everyday basic needs of food, health, sanitation and shelter, risk reduction has fewer benefits within the short planning time horizon of everyday life in the developing world. Consequently, another way has to be found of facilitating expenditure on risk reduction.

One such solution is via a debt swap. Indebtedness to a developed nation, (or any other nation, e.g. Brazil or China, with resources which are interested to participate), may be reduced on condition that the amount of the debt relief is spent on disaster risk reduction projects approved by the nation participating in the debt swap. Already, governments of developed nations have been providing practical aid to hazard-prone developing countries through hazard assessment; hazard technology transfer; provision of monitoring equipment and expertise etc..

Hazard surveys of infrastructure may identify weaknesses in critical installations and structures which are in desperate and urgent need of repair, and threaten severe economic loss. Engineering sources of concern are dams, levees, embankments, reservoirs, bridges and tunnels, as well as buildings. Compared with debt-for-nature swaps, debt-for-risk reduction swaps have the potential for achieving a much smaller cost-benefit ratio: a modest amount of debt forgiveness can allow risk reduction works to be undertaken which could save a vast amount of future economic loss – which western governments would ultimately have to share. A disaster with a vast loss potential is a glacial lake outburst flood (GLOF), which could cause catastrophic flooding downstream. Water associated with glacial retreat, thawing of permafrost, late freezing or early ice break-up may be retained by the glacier's terminal moraine, which, if breached, would lead to the sudden discharge of large volumes of water and debris. Apart from their destructive power, GLOF's accelerate land degradation and are a threat to biodiversity.

There are some serious risk consequences of climate change which are hard to mitigate, other than through reducing global warming, or keeping people out of harm's way. In the last few decades, the Peruvian Andes have experienced a temperature increase of up to 0.3°C/decade. Projections of future climate change predict a warming of several °C for the 21st century. With most climate models predicting precipitation to rise during the wet season and to fall during the dry season, the impact on the water cycle is worsened in terms of the magnitude and frequency of extreme weather. A debt swap might in principle be tied to systematic land use planning, and reducing the size of the population most at risk from floods and landslides, but the catalyst of population growth renders this rather unrealistic a target.

The future prospect of more severe Atlantic hurricane seasons is another impact of climate change that merits debt swap consideration. Ravaged by three hurricanes in 2008, a country in

urgent need of financial assistance in disaster risk reduction is Haiti, which owes a total of USD 1.6 billion to external creditors. A sizeable amount—USD 1 billion—of this is owed to multilateral lenders such as the World Bank and Inter-American Development Bank, with sizeable bilateral debts owed to European countries, such as France, Italy and Spain.

Text Box: Debt Swaps for Post-Disaster Response

The December 24th, 2004, Indian Ocean tsunami disaster was unusual among tragedies striking the developing world. Almost as if the disaster had occurred within Europe itself, the outpouring of European aid was overwhelming. The Paris Club rescheduled all debt service payments due in 2005 for Sri Lanka and Indonesia. Additionally, as part of the post-disaster response, Italy converted USD32 million of Indonesian debt into a swap to further the reconstruction of Aceh province and North Sumatra. During the 2006-2008 period, Italy eliminated USD5 million and €10.74 million of Indonesian debt by financing ten projects. Seven more projects, including the construction of a fishing port, three irrigation schemes and two roads are planned.

As another example of a debt swap for earthquake reconstruction, Norway waived USD20 million of Pakistan debt in November 2005, a month after the devastating Kashmir earthquake of October 8th, 2005. In the aftermath of any natural disaster afflicting a heavily indebted country, a contribution to the aid effort might be made with debt swapped for reconstruction. This might be as a substitute for direct aid, or a supplement to it. In the absence of such swaps, the ravages of a natural disaster would serve to deepen further the indebtedness of a poor hazard-prone country. In a vicious circle, a disaster disrupts production and the flow of goods and services, undermines economic development, so increasing poverty, which erodes further the economic resilience needed for a country to cope with a natural disaster.

3.4 Debt swaps and climate risk insurance

After disaster strikes in developing countries, ex-post financing of much of the loss is typically generated by global charitable appeals. Western governments contribute sizeable sums for disaster response, and similar or even larger sums are raised through the humanitarian benevolence of their citizens. It is in the interests of donors to encourage risk reduction measures which contribute to risk reduction, and to seek ways to make disaster insurance more viable and affordable.

Commercial Insurance Practice for the Developing World

The enthusiasm of commercial insurers to underwrite risk in the developing world does vary quite widely from the willing to the very reluctant. Out of a sense of corporate social responsibility, there are some insurers (e.g. Interpolis Re) prepared to consider subsidizing their premiums. But in actuarial practice, the extra uncertainty over claims management demands higher premium loading, which would tend to price out developing world business.

Some private sector insurers have developed innovative financial risk transfer products to mitigate the impact of disaster events. These provide means for the public sector in developing countries to leverage their funds through capital market instruments, so allowing governments to smooth their budgets over time, and ensure funds for relief activities. Recognizing that new forms of private-public partnership can increase resilience against the financial impact of large catastrophes, Swiss Re launched in January 2008 a securitisation product called GlobeCat. Through a GlobeCat transaction, contingent finance might also be arranged in advance: for example, USD1 million of forgiven government debt could be used to secure contingent disaster relief funds of USD45 million. If a triggering event were to strike, the funds would be quickly available for relief efforts rather than having to be raised slowly ex-post. Rapid access to funds

after a disaster can save lives and speed economic recovery, but contingent finance could deepen further the debt burden.

NGO's such as the Rockefeller Foundation are exploring the possibilities of climate risk insurance. With substantial uncertainty loadings, these commercial premiums might be expected to be quite high. As a GlobeCat earthquake illustration, USD20 million of cover for Guatemala and El Salvador earthquake were obtained at a rate above LIBOR of 6%. As an additional contribution to facilitating climate risk insurance, debt swaps could have a role in subsidizing commercial insurance premiums payable by developing countries.

If post-event contingent finance and charitable donations are to be minimized, then a catastrophe insurance fund needs to be established before a disaster strikes. As with catastrophe insurance pools in the developed world, some form of public-private partnership is required. For developing countries, reliance on external assistance necessitates broadening the base of the public-private partnership to include multilateral institutions, foreign governments, multinational corporations with commercial ties, as well as Diaspora communities settled in the developed world. A sizeable proportion of adaptation levies could be allocated to bolster catastrophe insurance funds.

Financing of climate change adaptation in the developing world

For the developing world to begin to prepare for climate change, national governments will need substantial external assistance in securing funding for climate adaptation projects, and helping to establish viable insurance schemes. In this endeavor, public-private partnerships will need to involve the principal multilateral institutions as well as foreign governments and major international corporations.

The United Nations Framework Convention on Climate Change (UNFCCC) secretariat has estimated that, by 2030, developing countries will require between USUSD28 billion and USUSD67 billion to enable adaptation to climate change, and that globally tens of billions will be needed annually for adaptation purposes⁵². These sums may not seem large compared with the cost of bailing out the international banking system, but they are massive when compared with the sums allocated to assist the developing world.

As of 2009, only a small fraction of the required funds are available for adaptation, and procedures for accessing them are protracted. The Kyoto Protocol's Adaptation Fund, for example, was established to finance concrete adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol. The Adaptation Fund is to be financed with a 2% levy on certified emission reductions (CERs) that are issued for CDM project activities. According to a recent study, the revenue that would be generated from the sale of the 2% CER share until 2012 is projected to be between USD160m to USD950m. However, by September 2008, the Adaptation Fund was not yet operating, and had the modest amount of approximately USUSD111 million. The Adaptation Fund is notable among climate change funds with respect to the magnitude of revenues it is hoped to generate for adaptation. The funding presently given to, or pledged by, donor countries to climate change funds operated by the Global Environment Facility is a few hundred million dollars. Given the deficit in funding available for adaptation, there is an urgent need for new voluntary and compulsory financing mechanisms.

The recently proposed International Air Travel Adaptation Levy (IATAL) is optimistically projected to generate annually the sizeable sum of USD4 to 10 billion (Muller et al, 2006). The resistance of western governments to impose carbon tax burdens on the aviation industry, and the problems of implementing a global policy, make it doubtful that a substantial mandatory levy would be politically acceptable. But air-ticket levies have been introduced to support the international drug purchase facility, UNITAID, which has a 2011 ambition to raise annually USD1 billion, including a sizeable voluntary solidarity contribution. However, a reality check on this ambition is the

⁵² Rinne 2008

willingness of air travellers to make charitable contributions under the UNICEF Change-For-Good programme. Since this commenced in 1994, BA has collected about £25 million, which averages out at less than one-tenth of the €1 UNITAID levy on French economy flights.

Although it is politically unlikely that bilateral government donations could ever generate a large proportion of the money needed to cover the cost of adaptation in developing countries, debt swaps may be able to make a valuable contribution. As a contribution to focusing the search for such assistance, this document offers a landscape review of climate-related debt swaps, which provide another potential avenue of assistance funding for adaptation or climate risk insurance. The underlying proposition which is being explored is that climate-related debt swaps might become viable supplementary financial instruments for helping make climate adaptation/insurance a reality. The viability will vary from one developing country to another according to its indebtedness and susceptibility to climate change, but other factors are relevant for success, and these are discussed in this review.

Debt swaps and adaptation

The current global economic crisis is a shock to the 21st century world order, but it also provides a global opportunity for supporting climate change adaptation in developing countries. As Sachs has pointed out, a financial package from the G20 could potentially be a triple win, leading to stimulus for richer countries, development for poorer countries, and environmental sustainability for all⁵³. Part of this package could include climate-related debt swaps. These could fund selected adaptation projects, which would mitigate adverse effects of climate-related disasters, as well as facilitate climate risk insurance.

Strategies for climate change adaptation involve a wide range of measures. Apart from livelihood diversification and population migration, there are agriculture changes using alternative crops and varieties, as well as physical infrastructure improvements to canals, irrigation, drainage, water storage etc. to maintain food and water security. In some sectors, adaptation actions can lead to high benefit-cost ratios and/or be implemented at low cost – e.g. implementing water use efficiency⁵⁴. Failure of indebted countries to adapt adequately could have calamitous consequences, not just for these countries, but for the prosperous donor countries as well. It is not just that debt payments will default as adverse consequences mount, but socio-economic instability may lead to political violence on an international scale, and/or mass migration. Accordingly, although the risk time horizon may be farther, the concept of debt-for-adaptation merits consideration as with swaps for nature and the environment.

Through a series of future swaps, the involvement of developed and other nations in these initiatives can expedite the process of implementation and facilitate research and development in these important areas. There are numerous possible climate adaptation projects which might merit funding. In order to prioritize climate adaptation projects systematically in developing countries, detailed risk assessments are required to identify and evaluate the physical and economic impacts of climate change⁵⁵. Some major international studies with this scope are in progress, but already it is clear from work completed for the Philippines⁵⁶, that attractive worthwhile opportunities exist for adaptation funding to mitigate climate change risk.

The practical effectiveness of the adaptation strategies will depend on the conscientious commitment of risk reduction resources, both public and private. The daunting scale of the climate change threat is ill-matched against the available resources of government and corporate sector alone. An instructive practical paradigm of a public-private partnership in mitigating climate change risk in a developed country is flooding along the East coast of England. Commercial insurance against coastal flood risk exists, but is essentially reliant on UK government

⁵³ Sachs 2009

⁵⁴ OECD 2008

⁵⁵ Warner and Spiegel 2009

⁵⁶ RMSI 2008

maintenance of the sea barriers to a level sufficient to resist all but the most severe storm surges in areas of high population density. Without adequate public expenditure on coastal defenses, storm surge risk would not be widely insurable at an affordable price. The financial value of such public expenditure can be quantified: the benefit-cost ratio of investment in flood defenses has been estimated by the Association of British Insurers to be as high as 7 to 1⁵⁷.

Will the global financial crisis dampen willingness to swap debt for adaptation?

The capability of developing countries to meet their international debt obligations is inevitably eroded by global financial crisis, such as has enveloped the world over the past year. In the short-term, the global financial crisis will impact negatively on developing countries in many ways⁵⁸. Aid budgets, foreign direct investment, equity investment, and remittance flows are likely to be reduced. Commercial lending will be tightened. Export revenues will fall and employment will be lost. Ministers of low-income countries have pledged steps to improve their economies on their own, but they need donors to fulfill their pledges of development financing and provide more concessional loans. If a developing country's ability to service debt is impaired, then some debt re-scheduling or swapping may be inevitable. Indeed, repayment of excessive amounts of foreign debt could stunt economic growth. But just as the US is intending to boost its depressed economy through expenditure on new climate change technology, so developing countries may also gain some valuable economic relief through climate change adaptation projects.

It was in the aftermath of the second oil price shock of 1979 that developing countries faced worsening external payments conditions, leading to aggravated debt burdens. Repayment of debt through increasing resource-intensive exports caused serious environmental degradation, notably deforestation and loss of biodiversity. It became clear that the value of forests and biodiversity was not adequately valued, and hence these economic assets were over-exploited. There is concern that developing countries may be forced along this harmful path after the current financial crisis. Although the current debt burdens of Western donor governments are rising to bail out failing banks and other corporations, debt swaps for the environment may nevertheless remain attractive, especially recognizing the priority assigned to climate change mitigation under the Obama administration. Climate change is a long-term challenge over-riding short-term economic cycles, and the concepts and ideas discussed here will be relevant to tackling this challenge in the future.

Thus, despite the economic downturn, on June 11, 2008, the largest debt-for-nature swap agreement in Madagascar's history was signed between the government of Madagascar and the government of France, allocating roughly USD20 million to preserve Madagascar's rich biodiversity. Furthermore, the US has given its continuing commitment for a debt swap to finance tropical forest conservation programmes in Indonesia, which are worth USD19.6 million, and a debt-for-nature scheme worth €20 million has been under negotiation between Indonesia and Germany.

It is noteworthy that the significantly larger sum of €75 million has been promised by Australia for a debt-for-health swap with Indonesia, while a debt-for-health swap scheme worth €143.6 million has been established between Indonesia and German covering HIV/AIDS, malaria, and tuberculosis. The relative sizes of the sums earmarked for health and the environment reflect the obvious priority to try to save lives in the short-term.

3.5 Prospects for climate-related debt swaps

As with debt-for-nature swaps, a debt-for-risk-reduction swap could be effective if the priorities of the recipient country are aligned with those of the donor nations⁵⁹. Respect for recipient sovereignty is indispensable for a debt swap; authority for risk reduction work must remain with the recipient government. Accordingly, a measure of viability of a debt-for-risk-mitigation swap is

⁵⁷ ABI 2006

⁵⁸ Te Velde 2008

⁵⁹ DFI (2009)

the political will of a recipient government to address risk reduction issues. Furthermore, there must also be effective governance to implement and enforce public policies. Without the necessary administrative institutional infrastructure to support government policy, then debt relief for risk reduction may be rather ineffective.

For countries where the political will can be channeled towards environmental protection, a debt swap can provide a valuable means for advancing government policy on risk reduction, and thus contribute meaningfully to reducing risk from natural disasters. Given the specific conditions which are particularly conducive to debt swap funding for climate risk insurance, an exercise to prioritize countries according to viability would be instructive. Heavily indebted poor countries (HIPC) are unlikely to come into the reckoning for debt swaps because of the general availability of 100% multilateral debt relief, and because of concerns over the adequacy of administrative infrastructure.

However, a number of middle-ranking developing countries might be good candidates. Take Indonesia for example, which has debt in excess of USD100 billion, of which more than USD1 billion is owed to Germany. The legitimacy of some of this debt has been questioned, because it includes the cost of 39 warships bought from the former GDR. To its credit, Germany is the leading country seeking to alleviate poverty by reducing the debt burden of the Indonesian government by way of debt swaps. Yet, if a German debt-for-environment swap is to make a meaningful contribution to Indonesian climate change adaptation, and at the same time reduce Indonesia's debt burden significantly, then the size of the swap would have to be much more than just a few % of German-Indonesian bilateral debt. However, a constraint on the volume of German debt swaps is that only restructured debt is eligible⁶⁰. Hypothetically, the swap would have to be of a size similar to the €143.6 million debt-for-health swap, rather than the €20 million allocated.

Debt swaps could potentially make an important contribution to adaptation, provided that extra priority is assigned by donors to the challenge of climate change, so that it ranks alongside health as an especially worthy cause for a debt swap. The 2006 report by the Association of British Insurers on UK coastal flood risk was subtitled: *thinking for tomorrow, acting today*. Climate change needs to be perceived as a risk requiring concerted action now, just as health does.

At a time of global economic crisis, how can industrialised countries be persuaded to reduce the indebtedness of developing countries, to further climate change adaptation there in a significant way? Lessons can be learned from past experience in risk reduction. In the context of natural disasters, there have been bilateral agreements between developed and developing countries to transfer hazard monitoring technology, so as to improve warning systems. One example involved a transfer of German scientific and technical expertise in volcano monitoring to Indonesia, which has a very high density of dangerous volcanoes. This was a win-win situation: German science received extra financial support from the German government, and Indonesia received much needed technical assistance in volcanology.

The conventional terms of a debt swap might be extended to cover the transfer of green technology (e.g. solar power), to a developing country, thus increasing development there, while stimulating the economy in the developed country. To supplement the volume of climate-related debt swaps, an environmental NGO might buy debt at a heavy discount, and the proceeds used partially by the creditor government to support its own environmental technology or construction industries. Through such initiatives aimed at gaining some reciprocal economic benefit in creditor countries, climate-related debt swaps could be boosted in volume well beyond the comparatively modest amounts set aside for ecological protection in developing countries.

⁶⁰ Berensmann 2007

3.6 Additional sources and the financing challenge for insurance-related schemes

National financing

Unveiling at the end of June 2009 Britain's manifesto for Copenhagen, the UK Prime Minister said advanced countries must provide assistance to developing nations to enable their economies to grow while adapting to the changing global climate. Gordon Brown has proposed a working figure of USD100 billion dollars (£61.9 billion) a year by 2020 to be financed through a combination of the carbon market, new and additional sources of predictable finance, and a limited amount of development aid. He stressed that although the figure is envisaged for 2020, some funds would have to be made available from 2013 onwards.

The UK supports a Norwegian proposal to the ongoing climate negotiations whereby countries would set aside some of their emissions permits to be auctioned at international level to generate climate funding. Aviation and maritime emissions should also be tapped into as a funding source, although the actual willingness of airline passengers to pay a carbon levy remains to be tested. A potentially more controversial proposal is to use Official Development Aid (ODA) to tackle climate change. The UK nevertheless advocates limiting the use of development aid for this purpose to 10%, acknowledging that this should not jeopardize the achievement of the Millennium Development Goals. In 2008, UK ODA was 0.43% of gross national income (GNI). By 2010, excluding debt relief, the UK will have spent cumulatively an additional £12.5 billion of new ODA.

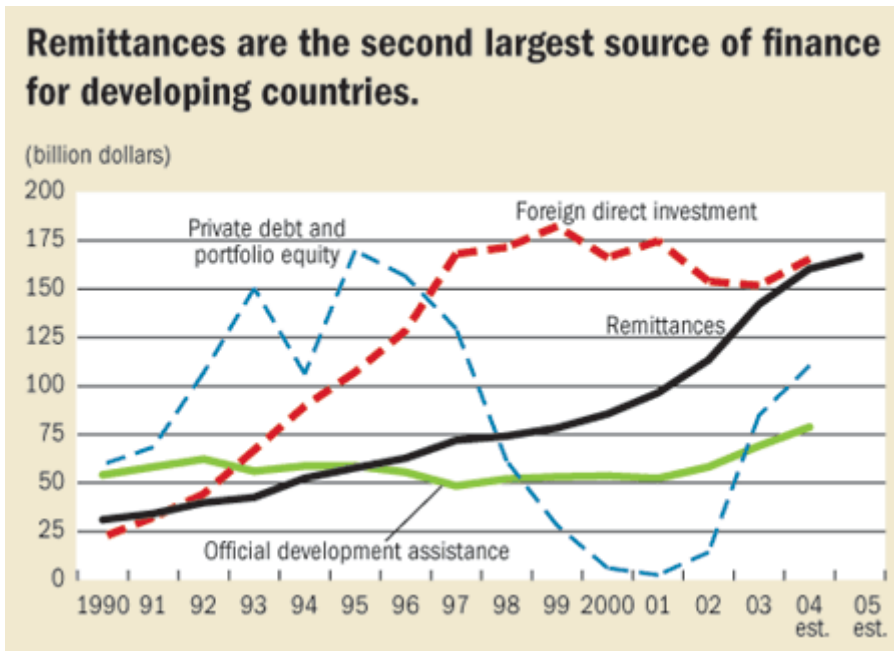
The allocation of some development aid for climate change adaptation is contentious among charities and aid agencies, but is a fair reflection of the difficult but unavoidable prioritization decisions which advanced countries must now make, especially during times of economic stringency. Climate change adaptation is no longer relegated as a second-rank side issue, for which funding is subsidiary and optional, but is a primary long-term welfare issue, alongside healthcare, sanitation and education. From a national government perspective, debt relief and development aid for climate change adaptation have to be raised much closer to the base level set for saving people from preventable diseases and lifting people out of poverty. In particular, the volume of debt swaps for the environment needs to be raised nearer the volume of debt swaps for healthcare improvements.

As an example, consider German-Indonesian bilateral debt. In 2008, Germany cancelled € 50 million of Indonesia debt, in exchange for the funding of Indonesian public health programmes. By contrast, in the previous year, Germany cancelled a quarter of this debt amount (€ 12.5 million) to protect national parks in Indonesia, acknowledging that forest protection is closely related to climate change.

Remittances as a source of financing

Immigrant communities living in affluent countries are well known for generosity to their poorer compatriots back home in developing countries. Indeed, this is a prime motivation for immigration. Remittances are among the most important sources of finance for many developing countries, illustrated by the figure below.

Figure 10



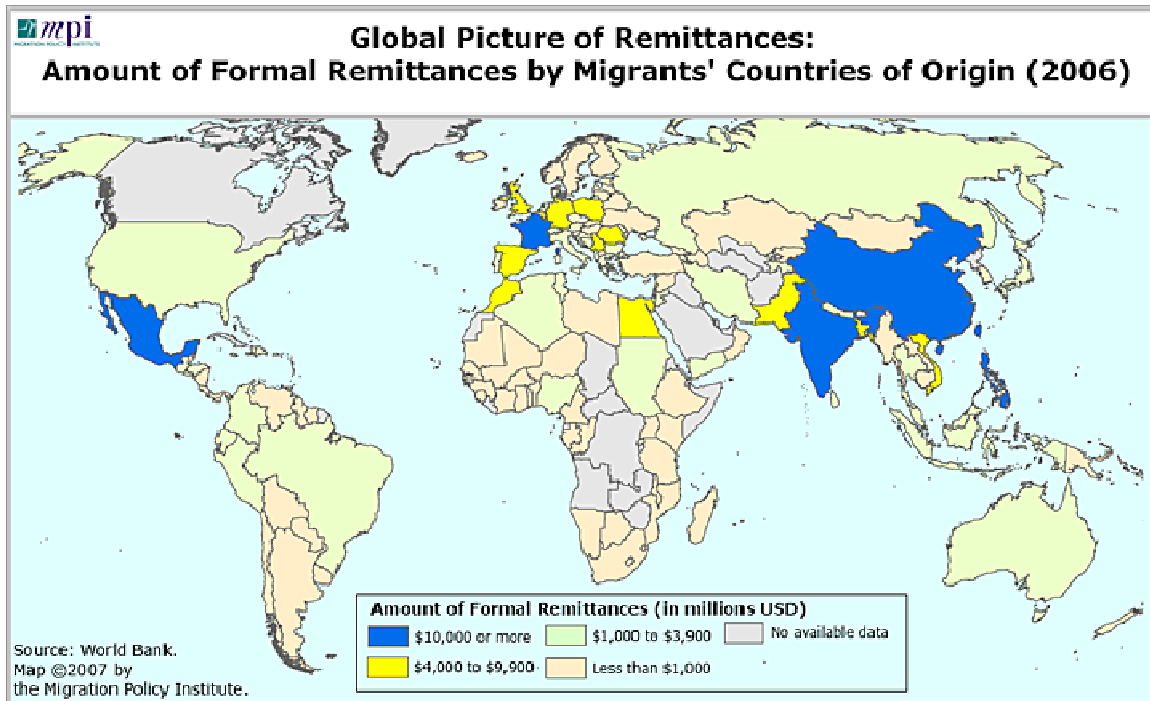
(Source: Microfinance Institute 2004)

As estimated by the Inter-American Bank, remittances may form a substantial part of national GDP – almost a quarter in the case of Haiti. Furthermore, prior to the current global economic downturn, remittances have been increasing on both an absolute and per migrant basis. The importance of remittances in post-disaster relief is already recognized by the US government. Migrants from devastated countries may be permitted to work longer in the US, so as to earn aid money to send home.

The importance of remittances in post-disaster relief is well recognized: remittances typically leap upwards after disasters. Remittances are a form of ex-post insurance for less developed countries: Diaspora communities help to diversify sources of external finance for meeting disaster repair costs. Rather than face the prospect of increasing remittances over a prolonged period of time to cover catastrophic loss, remitters would benefit from risk pooling schemes, such as provided by natural hazards insurance. The key factor in tapping remittances for helping to provide a source of finance for insurance and risk reduction activities is the degree of geographical specificity which can be achieved—Diaspora members are unlikely willing to contribute remittances to any scheme which does not directly benefit their own extended family in a precise location in a developing country. The map below shows the amount of formal remittances by migrants to their countries of origin. Locations within these countries could prove fruitful ground for linking Diaspora remittances to insurance and risk reduction programs—if the Diaspora and receiving communities can effectively be engaged in the design and implementation of specific programs for development, risk reduction, and insurance⁶¹.

Figure 11

⁶¹ Warner, Gurenko and Woo 2008.



(Source: Migration Policy Institute and World Bank 2007)

Recognizing the global inter-connectedness of the international financial community, the practical possibility exists for the world-wide Diaspora of a developing country to be actively involved in supporting the development of local insurance. A pilot study conducted by Risk Management Solutions (RMS) in 2008 among the Indian Diaspora in England has encouraged further development of this concept.

In developing countries, home insurance against natural perils is beyond the economic means of most inhabitants. However, those with relatives abroad may seek help from them. In principle, some part of the remittances received might already be allocated for disaster insurance. But this forward planning is generally a low priority for remittance expenditure, given the many urgent everyday needs. In any case, home-owners may reason that, in the event of a disaster, the risk burden ultimately would fall on governments and charitable organizations to provide funds for reconstruction.

Since ex-post government participation is customary, if not obligatory, some government participation may be invoked ex-ante to make natural peril insurance more affordable in developing countries. Structures for incorporating such participation still need to be explored. An interesting illustrative micro-insurance scheme requiring government participation to cover extreme losses has been devised by RMS for China to help cover earthquake-related risks. While micro-insurance systems exist for life insurance, significant business and implementation challenges have prevented similar systems from being developed for catastrophic risk cover.

The RMS pilot project shows that modest **affordable** premiums of less than 10 Chinese Renminbi (approximately USD1.50) could be charged for the approximately 55 million low-income households in rural China. This would generate total premium income of around 550 million RMB (USD80 million), which exceeds the total estimated risk and operational costs of around 400 million RMB (USD60m). The primary insurance layer would cover losses of up to 2 billion RMB (USD300m), the next reinsurance would cover up to 4 billion RMB (USD600m) losses, while the top layer of 12 billion RMB (USD1.8bn) for the most extreme events would involve government participation.

In this basic scheme, there was no Diaspora contribution, but part of the earthquake insurance burden in earthquake-prone regions of China could be shouldered by more affluent Chinese Diaspora communities dispersed throughout the industrialized world, where insurance is a familiar standard commodity. Diaspora disaster insurance would provide coverage against a remitter's obligation to increase remittances to pay for catastrophic loss from a natural disaster. For the financial challenge of climate risk insurance, an insurance fund might be established with initial contributions drawn from a wide range of public and private sources with a political or commercial regional interest. Apart from government organizations, contributions might be solicited from major multi-national corporations with substantial regional business interests, as well as a social responsibility agenda. An inclusive approach to finding sources for building sizeable climate insurance funds would seem to be both financially necessary, as well as socially desirable.

Text Box: Potential for debt relief to combat climate change

Debt swaps for the environment have made a modest but valuable supplementary contribution to protecting global biodiversity. Successful transactions depend on both parties having an enduring commitment to environmental protection. Options for debt relief to combat climate change could include some of the following, as recently report by the Joint Ministerial Forum on Debt Sustainability (see DFI 2009):

- **Commercial debt** might be purchased at a discount in the secondary market, or donated, and cancelled or converted into local currency to combat climate change. UNDP would need to explore whether this option would also allow conversion into foreign currencies for the capitalization of an insurance fund. Otherwise, such converted funds could be used to implement risk reduction in coordination with an insurance approach. Commercial debt relief would be largely confined to LMICs and LICs, unless climate change conversion options were included in IDA reduction measures, and could yield **USD 14 billion**.
- **Bilateral debt** might also represent an opportunity to use mechanisms such as cancellation or conversion, for ODA and non-ODA, Paris and non-Paris club debt. Paris Club bilateral debt relief would apply largely to non-HIPC low income countries (**USD 40 billion**, of which USD 30 billion might be convertible).
- **Multilateral debt** might be cancelled (like HIPC or MDRI) and funded by grants, with the liberated funds invested to combat climate change. A question arises whether grants could simply be secured for capitalizing and insurance fund, but in such a case such grants may be at odds with debt relief. Multilateral relief could apply to HIPCs, LICs, and LMICs, and could reach **USD 90 billion** of Multilateral Debt Relief Initiative (MDRI) if cutoff dates were moved, more institutions participated, and multilateral relief were widened to other low income countries.

(Source: DFI 2009)

4. Considerations for operationalising a UNDP insurance facility

The previous chapter outlined a basic model or institutional set-up that could be considered for insurance, including variations and alternatives for this basic model. This short chapter now examines questions that the UNDP may address to further refine its planning to increase the ease of access to insurance by developing countries, for the purpose of better managing natural hazard risk and sustainable development.

Regarding the realization of an insurance facility, the previous chapter outlined a basic model or institutional set-up that could be considered for insurance, including variations and alternatives for this basic model. The sections below outline issues that the UNDP may address to further refine its planning to increase the ease of access to insurance by developing countries, for the purpose of better managing natural hazard risk and sustainable development.

4.1 Strategic questions about facilitating and implementing insurance coverage

The design of insurance coverage for weather-related extreme events in developing countries depends on the answers to several strategic questions. This section explores some of the basic questions including what ends insurance should serve and capitalization requirements. Additionally, insurance design depends on whether it would be intended to provide cover for specific programs, or projects within countries or regions, or whether entire jurisdictions such as municipalities, provinces, countries, or regions would be covered. Additional questions relate to whether donor involvement would be bounded in time, and whether the insurance program would seek independence at some future point in time (i.e. be independent in generating its own capital, premiums, and fees or associated costs of operation).

Objectives for climate risk finance, transfer, compensation and insurance

The UNDP's exploration of Climate Risk Financing, Transfer, Compensation and Insurance responds to the "demand from UNDP program countries to test, pilot and expand financial instruments and mechanisms that can support social safety nets and other climate risk management approaches"⁶². From the same document, it can be read that the development of a suite of financial mechanisms including climate risk financing instruments are in harmony with the United Nations Development Program's (UNDP) climate change strategy. The UNDP concept note states that it (the UNDP) will explore the feasibility of establishing a Climate Risk Finance Facility for Development. It is helpful to explore the named objectives of the proposed facility and analyse some of the elements that would be useful to support these goals (see text box, quoting directly from the June 2009 Concept Note).

⁶² As stated in a June 7 Towards a Climate Risk Finance Facility for Development, UNDP Concept note.

Text Box: Objectives of a UNDP Climate Risk Finance Facility for Development

A June 2009 Concept Note stated that the goal of this facility would be to “assist public authorities in implementing development and risk-reduction oriented Climate Risk Financing Mechanisms at the local and regional levels”. The immediate objectives of the facility are to:

- (i) provide technical assistance to design and implement required policy and institutional infrastructure to develop risk financing instruments;
- (ii) link national and regional actors with national and international insurers/reinsurers;
- (iii) facilitate financial flows towards risk products through innovative financing schemes;
- (iv) promote risk sharing tools that guide and catalyze investments in risk reduction and development.

The facility is intended to build upon UNDP strengths (including extensive presence in developing countries, experience in climate change, and expertise in fiduciary, regulatory and institutional capacity building), supporting existing programs and projects (in particular those that are sensitive to climate risk).

(Source: UNDP 2009)

Broadly, many of the above named objectives of a facility could fit well with UNDP’s significant institutional capabilities. Objectives (i) and (iii) provide an interesting challenge of providing technical assistance while also channeling funding sources towards insurance systems. It is not clear in this goal whether the role of UNDP would be to broker deals between potential donor nations and potential recipients, to serve as a financial channel for the said flows, or help design innovative financing schemes. Collaboration with major international financial institutions and in particular the GFDDR at the World Bank make sense to achieve sound technical assistance and practical implementation of the principles of the Hyogo Framework of Action. Each of these and perhaps other options could prove fruitful and further refinement of this objective will help determine next steps for UNDP in moving towards its objectives. Returning to the list above, objective (i) is one of the goals which may require a special effort to fulfill: it would require an expert personnel with practical, theoretical, and policy experience in specific developing country regions on issues of insurance design and implementation. It is possible that the kinds of insurance approaches needed in developing countries do not (yet) exist, or are only now in the process of development. Thus, as the roadmap in chapter 6 will explore, ways will need to be identified to ensure careful selection of experts that will provide technical assistance so that advice is tailored to the needs of national and subnational levels in specific developing countries.

With a worldwide network of field offices and experience, the UNDP appears well-positioned to fulfill objective (ii) above in linking national and regional actors in policy dialogue processes and partners in the international and national insurance and reinsurance sector as well as policy advocates and experts. The UNDP appears well placed to facilitate dialogue with international and national stakeholders involved in risk management and risk reduction, including humanitarians, other UN organizations and particularly the UNSIDR system, development agencies and donors. Activities could be undertaken along the lines of the successful dialogue that resulted in the *Index Insurance and Climate Risk: Prospects for Development and Disaster Management* (Hellmuth et al. 2009) publication, which documents current experience, questions that remain to be answered, and lessons learned. This process will over time help build frameworks and understanding of how to link disaster risk reduction, insurance, and adaptation approaches in developing countries.

To fulfill objective (iii), it may be necessary to partner with organizations such as major international development banks and other international financial institutions to take advantage of existing expertise in managing large scale financial flows, particularly if debt swaps and related approaches are engaged.

Finally, objective (iv) could build on the findings from the multi-level dialogues (objective (ii)) as well as engage in or observe projects that actively incorporate risk sharing tools in risk reduction and development. One challenge will be to demonstrate bankable value-added in reducing risk in order to attract investment. Risk sharing approaches may be able to help facilitate more active investment in an array of beneficial activities, from investment in clean development projects or public infrastructure to a range of public investments. What is critical is that investors have confidence in the backing of an insurance mechanism to reduce the risk of investment (MIGA plays this role in the World Bank group, for example). However, unlike MIGA and other such approaches, the goals of the UNDP facility seem to point more towards benefits for the poor themselves, rather than benefits for particular companies or sectors. Thus to achieve objective (iv) pathways would require exploring that can demonstrate the business case for investments which are in harmony with comprehensive risk reduction to natural hazards, and which promote sustainable human development. To generate any significant amounts of investment, ways must be found to show the direct value-added of risk reduction and development for the poor (not “just” for particular sectors) This will become particularly important in the context of climate change, as sector-specific foci may be too short-sighted to effectively reduce risk and enhance adaptive capacity and development.

4.2 Scope of activities and type of operational entity

Just as questions related to capitalization affect the potential design of an insurance system, it is also necessary to define whether the insurance program should support projects, provide technical assistance for risk management and risk assessment or related activities, etc. Many alternatives exist for an operating entity, depending on the desired scope of activities.

Alternatives for operationalization depends on scope of activities

Depending on the scope of activities which the Donors and Trust establish for the operating entity, its form could vary across several different alternatives:

- **Direct provision of insurance** (systemic approach, CCRIF, TCIP, FONDEN, and other such initiatives often geared towards developing country governments). Such an approach may represent one of the most promising models for developing country access to insurance and is therefore presented in greater depth in chapter 5 below.
- **Grant facility:** Insurance scheme financial support to promote the growth of specific insurance related activities (ILO Microinsurance Innovation Facility, several such facilities at the World Bank that channel donor support or manage funds)
- **Technical assistance facility:** Bottom-up focus on fostering tailored insurance approaches, such as several established at the World Bank. For example, the International Fund for Agricultural Development (IFAD) and the World Food Programme (WFP) are developing technical collaboration through the Weather Risk Management Facility. That facility facilitates access to weather index-based risk management approaches and develop models that could be scaled up⁶³. The technical assistance can also have a sub-category which some private companies are already addressing including brokerage and back office support, risk aggregator, services for scaling up (Microinsurance), providing a knowledge platform (Munich Re Foundation, CGAP and others for microinsurance)
- **Awareness and education** (CGAP, Insurance Associations, UNISDR system, ProVention, etc.). The World Bank has established the Global Index Insurance Facility to

⁶³ Hellmuth et al (2009), p. 103.

underwrite index insurance in developing countries. The World Bank's Global Facility for Disaster Reduction and Recovery spans the four activities mentioned here, providing support for knowledge management and policy development for disaster risk management, projects and programs within countries, and recovery financing for low-income countries affected by natural hazards (through IDA).

Within these strategic goals, a particular opportunity and challenge will be to define appropriate roles in serving as (as the concept note points out) a developer of capacity, a "neutral broker," and contributing to an enabling environment including sound governance, use-able data, trust, etc. UNDP's design of a Facility will depend on the answers to these strategic questions. After this key step, additional considerations such as capitalization can be addressed.

Alternatives for operationalization depends on magnitude of mobilized capital

The magnitude of financial resources available to capitalize the fund will help determine the nature and scope of activities undertaken by the insurance facility. The pool necessary to backstop insurance activities has a high liquidity demand, one of the reasons why this kind of fund can be expensive. Capitalization requirements for the provision of insurance services to back public sector activities, much like the CCRIF in the Caribbean, would demand a larger magnitude pool. One proposal by the Munich Climate Insurance Initiative estimates that for a global Climate Insurance Pool the annual premium payment would range between 3.5 and 5.1 billion USD⁶⁴. A smaller magnitude of resources for the fund would allow coverage for projects, microinsurance schemes and locally-tailored risk transfer and risk sharing approaches. The facility could operate as a type of reinsurance facility for these community-focused insurance schemes if it were possible to effectively and efficiently aggregate risks.

Coverage provided under a "large" mechanism could be based on parametric index-based triggers. Insurance contracts issued by the facility could pay claims by countries based on the measurement of the intensity of a pre-defined natural event in a pre-defined area over a pre-defined period, up to a certain predetermined limit per year. This type of insurance mechanism provides for a much greater speed of disbursement and will be less costly to administer than traditional insurance since it does not require the insurer to evaluate losses on an indemnity basis. The determination of intensity of the predefined event will be made by an independent meteorological agency.

Coverage under a "smaller" fund foresees that each risk in participating countries requires a tailored strategy for both risk reduction and risk transfer. A suite of instruments and national approaches for these risks are needed. The focus then could be on low and medium-level risks and could help ensure that affected participating countries or projects have the support they need to manage middle-layer risks in ways that do not violate insurance principles or prevent the proper functioning of market solutions. Coverage under this kind of fund could provide support to enable micro- and national insurance systems in developing countries by providing technical assistance, capacity building and possibly absorbing a portion of the insurance costs. Examples include support for index-based insurance to protect farmers (e.g., the recent systems in Malawi, India and elsewhere), to protect government infrastructure (e.g., the recent catastrophe bond in Mexico), or to help create regional systems.

The prospects for a larger magnitude pool are significantly enhanced if, as noted recently⁶⁵ by Development Finance International, a much more substantial amount of debt than has been swapped is considered *potentially* eligible to be relieved to combat climate change. All Paris Club and many non-Paris Club governments and many commercial creditors have demonstrated generous willingness to fund relief on their own debts for many countries, and on those of multilateral institutions for Highly Indebted Poor Countries (HIPCs). The scale of relief in recent

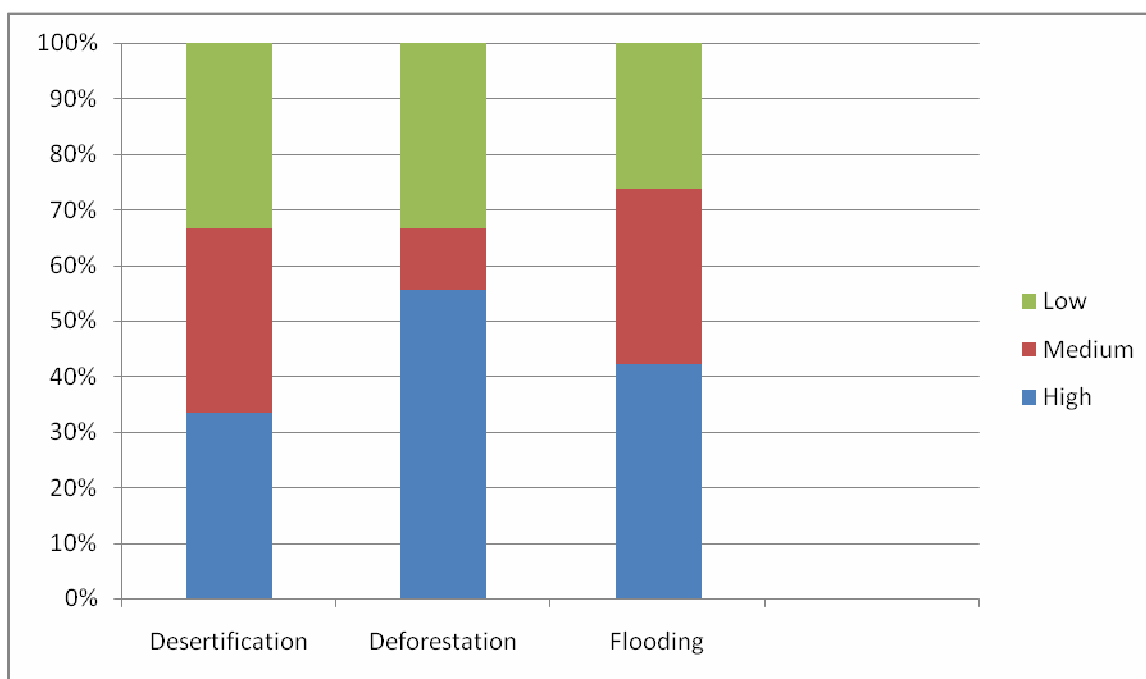
⁶⁴ MCII 2008

⁶⁵ DFI, 2009

years for HIPC's exceeds USD100 billion. Except to those creditors fatigued by debt relief, a compelling case could be made for debt relief on the scale of USD billions for climate change adaptation.

This chart below illustrates part of this case. Figure 12 shows the relative debt distress risk of a group of 58 HIPC and other IDA countries threatened by desertification, deforestation or flooding (DFI, 2009). Action to relieve debt distress is especially urgent to combat deforestation induced by climate change. Haiti is a prime example of a country with a high debt distress risk, which is already in a precarious state of deforestation. There is an ongoing debate about the potential of debt relief to offer a dual benefit of combating climate change and other environmental degradation. At least one review the performance of the Debt for Nature Swap (DNS) Programs in light of their dual objectives of lowering deforestation rates as well as the cost of debt servicing finds this approach to have only limited success⁶⁶. These authors suggested that private and public debt-for-nature swaps have not significantly reduced debt burdens or deforestation in developing countries. As Figure 12 below indicates, there is clearly a need for debt relief in countries most vulnerable to climate change. But it is not clear whether debt relief will generate capital needed to put into risk sharing activities such as those discussed here, or whether debt relief can help facilitate other activities such as investments in risk reduction.

Figure 12: Debt distress risk of countries threatened by desertification, deforestation, or flooding



(Source: DFI 2009)

A more recent major study released by the Joint Ministerial forum on Debt Sustainability takes a more positive view of the potential of debt relief to combat climate change⁶⁷. This report recognizes debt relief as a mechanism for delivering rapid and predictable development financing, and for spending ODA to support the development priorities of debtor countries. This view casts debt relief as a tool in freeing capacity to support national strategies for addressing the negative impacts of climate change. The question that must be answered is whether these resources would come in the form of liquid funds that developing countries would agree to capitalize an

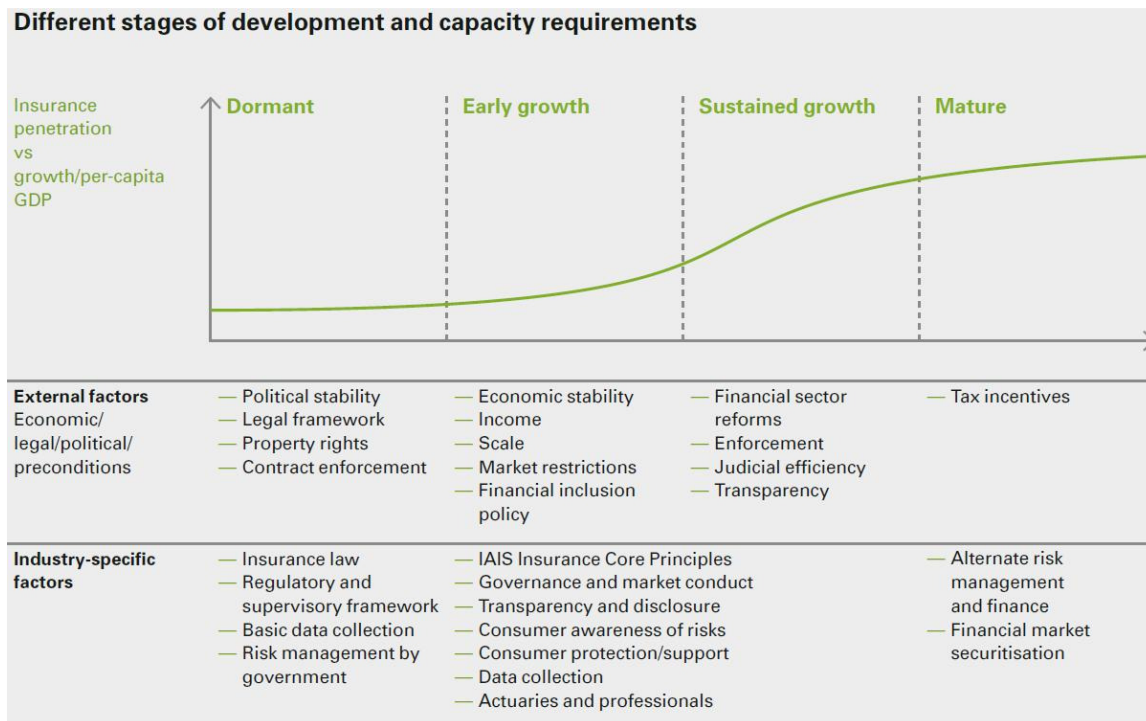
⁶⁶ Jha, R. and Schatan, C. (2001)

⁶⁷ DFI (2009)

insurance fund. Thus, significant political will would need to be in place to channel such resources into a risk reduction and insurance approach. Clearly the need is there. The debate remains whether the past willingness of creditor governments to swap debt for nature conservation will also be in place to address the negative impacts of climate change in developing countries. Further, it remains to be seen whether donor and debtor nations will see a strong enough case for risk reduction and insurance to invest any resources freed by debt relief to capitalize such a risk sharing and risk reduction approach.

Experience from practitioners engaged in implementing insurance solutions in developing countries suggests there are different capacity requirements depending on the stage of insurance program development. Another consideration revolves around the timing of design and implementation: As insurance penetration grows in developing countries, different factors will play a particularly important role in the success of the program and the contribution of insurance to overall sustainable development and growth. Figure 13 illustrates some of the important factors that may be considered as UNDP explores its role in promoting access to insurance for managing climate related risks in developing countries (courtesy of Munich Re Foundation).

Figure 13



(Source: MRF 2008)

In the early stages external factors such as underlying governance frameworks are particularly important. A facility could focus on facilitating the healthy growth of financial markets, data collection, and supporting risk management approaches that are coherent and which promote resilience to climate change. In the early growth stage of insurance programs in a given region or country, the facility could coordinate with other institutions concerned with economic growth and financial inclusion (particularly for poverty reduction), as well as specific issues related to the growth of consumer markets for insurance and fostering a corps of actuarial professionals and consumer protection experts. These first two phases could be particularly important as many of the barriers for establishing risk reduction and insurance schemes exist here. A contribution by UNDP and other organizations to capacitating these early phases of insurance market growth in developing countries could contribute substantially to access in these countries.

Text Box: Lessons Learned about making insurance work in developing countries

Recently a few major milestones have been passed in the documentation of good practice and lessons learned about building insurance institutions to serve the poor in developing countries. Mentioned throughout this publication, the 2009 publication of *Index Insurance and Climate Risk: Prospects for Development and Disaster Management* (Hellmuth et al.) carefully documents existing cases of institutions that have been built to serve the poor, using indexed approaches. Some of the lessons noted in this publication are useful to UNDP's considerations for moving forward to promote the triple and hopefully complementary goals of sustainable development, disaster risk reduction, and adaptation to climate change.

The design of an insurance facility may benefit from considering whether the insurance provided is intended to be scaled up in developing countries. Many successful pilots are documented in the literature, but few survive to become mature, long-term business models. Some of the frequently-mentioned challenges in practice and in literature (particularly related to index-based approaches) include:

- **Reducing transaction costs.** Hellmuth et al (2009) note that reducing transaction costs associated with insurance in developing countries is a key factor. Index-based approaches are beginning to be used more frequently because of their ability to lower transaction costs related to designing and managing contracts and payouts. This in turn makes it possible to offer coverage at a lower premium which becomes more affordable for poor clients. Hellmuth et al note, "To be successful, the transaction costs will have to be kept low without diminishing the quality of the insurance coverage as it is scaled up" (p. 95). Moving forward, UNDP could contribute to these efforts, possibly utilizing its worldwide network and familiarity with local development conditions to help aggregate risk, reduce uncertainty through combinations of appropriate data combined with development-related activities that reduce risk, etc. UNDP may seek enhanced partnerships with organizations that can help provide more and more accurate data for the purposes of risk reduction and insurance activities, which could also reduce uncertainty and lower transaction costs.
- **Risk awareness and education.** Practitioners and scholars regularly stress the key role of insurance literacy in scaling up risk sharing approaches in developing countries (see Churchill 2007, and Hellmuth et al. 2009). For insurance approaches designed to facilitate risk reduction and adaptation, this element is even more crucial for potential clients to understand the links between risk reduction activities and lowered exposures. The clients may be farmers who trade their labor on risk reduction activities for premium support (as emerging evidence in Ethiopia suggests), or they may be national ministries of finance and offices of risk reduction which must coordinate and plan national risk reduction activities in a coherent fashion. Hellmuth et al. note that capacity building is needed at the local level in designing contracts and products that respond to local needs. Awareness raising reaches across the spectrum of potential stakeholders, from community groups to national institutions. Building client knowledge and trust is central to robust, sustainable risk sharing programs.
- **Accountability.** Ongoing commitment to and demonstration of risk reduction is one way to show accountability to the sources which help capitalize risk reduction and insurance activities. A lack of accountability leads to donor reluctance. It will be important in the future to improve evaluation and monitoring of the costs and benefits of risk reduction and risk transfer, and report these in a transparent way to donors. Hellmuth et al. recommend building evaluation and impact studies into project design and implementation (p. 98). Providing evidence of risk reduction and the tangible benefits to development count help bolster donor willingness to engage.

5. Options for access to insurance against natural disasters by developing countries

Developing countries with very low catastrophe insurance penetration represent a challenging and underserved market for the private insurance sector. This chapter provides a basic model for access to insurance against natural disasters by developing countries. The chapter outlines a framework for a viable demand based business model, which has been tested in reality by insurance schemes such as the Caribbean Catastrophe Reinsurance Facility, (CCRIF), by various insurance approaches in the private sector, by national programs such as FONDEN, and by international financial institutions such as the World Bank and regional development banks.

This chapter briefly explores options for access to insurance against natural disasters by developing countries. Chapter four includes framework for a viable demand based business model that has been tested in reality in regions like the Caribbean and with the insurance/reinsurance companies, and related risk layering schemes in countries like Turkey and Mexico.

Insurance mechanisms with a special focus on helping participating countries reduce catastrophe-related risks are described here. These are a necessary and complementary part of programmes that work to support sustainable development, poverty reduction, and adaptation to climate change. Entrepreneurs are beginning to find ways to provide insurance for the lower end of the market, particularly through microinsurance products that are made accessible by support from civil society and the public sector. This market is only feasible if premiums are affordable to the poor, which opens an opportunity for negotiators seeking opportunities for helping the most vulnerable adapt to climate change. The case for including insurance and other risk-transfer instruments in a climate adaptation strategy builds on a growing recognition that the developed world, because of its emissions of greenhouse gases, is contributing to weather-related losses in the developing world.

5.1 Business Case for a UNDP Insurance Facility

Insurance is an essential component of a financially secure and stable strategy for coping with the vagaries of natural disasters. Yet, while disaster insurance is widely available in the developed world, it remains still a rarity in developing countries. With the prospect of climate change exacerbating already severe meteorological and hydrological hazards, it is clear that development in countries lacking an adequate catastrophe insurance infrastructure will be strongly set back or even reversed. Indeed, perpetual under-development may be the fate of many hazard-prone countries exposed to a harsher climate.

A prudent development programme planned for a world of deteriorating climate should thus include consideration of an insurance facility. A prerequisite for the affordability of climate disaster insurance is the mitigation of excessive climate risk through practical and effective adaptation measures. Funding for climate adaptation can be contributed from a diverse range of sources, including debt swaps for climate, as well as carbon trading levies, emissions taxes etc. Risk assessments would need to be undertaken to prioritize the adaptation measures.

Where climate disaster risk falls, or is brought down, within the actuarial bounds of insurability, a UNDP insurance facility would be of enormous value in expediting the practical implementation of disaster insurance schemes in developing countries. In particular, an important function of a

UNDP insurance facility would be to assist in the complex and challenging task of aggregating sufficient insurance funds. Supplementary to insurance premiums, climate disaster insurance funds would need bolstering through external contributions from engaged parties in both the public and private sector, prepared to shoulder some of the climate risk. At inter-government level, fund donations might be offered, or, less directly, debt swaps might be arranged. At corporate level, companies with major commercial ties with specific developing countries would have a self-interest in helping build up insurance funds. At an individual level, fund contributions may be elicited from the wealthy with close links with a particular developing country, as well as from the general Diaspora spread around the globe.

Advocates of a UNDP insurance facility recognize the necessity and growing urgency of establishing an actuarially sound framework for providing an insurance umbrella for the developing world against the future perils arising from climate change. Those countries which are not adequately covered by disaster insurance are liable to have their economic development stunted in the decades ahead, even more than in past decades of a more benign climate. This stark reality facing the developing world underlies the business case for an insurance facility established under the auspices of UNDP.

5.2 Guiding Principles for Insurance Designed to Address Climate Risks and Development

The four guiding principles below are relevant for insurance designed to address the climate-related risks of countries vulnerable to climate change. These were agreed by Parties to the UNFCCC in the Bali Action Plan.

Address risk management needs of all countries but especially the most vulnerable

Support for risk-management instruments should target the specific needs and special circumstances of those developing countries which "are particularly vulnerable to the adverse effects of climate change" (UNFCCC, Article 3.2. and Article 4.4); For insurance approaches, this indicates that ways need to be found to include high-risk, highly vulnerable countries in risk sharing and transfer approaches in ways that are effective and efficient. The design of insurance-related approaches must ensure the technical feasibility of the participation of particularly vulnerable countries. This principle is discussed in greater depth in section 5.2 below.

Differentiated responsibilities and respective capabilities

All countries should be involved, and actively doing what they can to engage in disaster risk reduction and benefit from insurance-related approaches. Insurance instruments must be closely linked with a climate risk management strategy that places priority on preventing human and economic losses. This means that disaster risk reduction and insurance approaches need to be closely linked. A major focus on risk reduction and adaptation, with insurance a means to these ends rather than "only" and end in itself. The principle of "common but differentiated roles and responsibilities and respective capabilities" assigns all countries a role in fighting climate change and adapting to it. Even low income developing countries must do their part in defining their preferred adaptation pathways, and should receive support from the international community to realize these plans. Industrialized countries that have historically contributed to the greenhouse gas emissions that drive anthropogenic climate change may contribute resources and other forms of support to help vulnerable countries. All countries have the responsibility to address risk management and adaptation in their planning processes. Continuing progress on risk reduction could be a requirement for receiving premium subsidies (to account for added catastrophe risk due to climate change) in pooled risk sharing systems (technical assistance available for planning and implementing country-driven risk reduction plans).

Polluter pays principle

Funding for adaptation related activities (in this case risk reduction and insurance) will come from those countries that have contributed most to the increase in greenhouse gas emissions which is driving climate change. Funds for adaptation activities need to be allocated on a strategic basis and not involve international micro-management at the project level. The possibility of a third

party paying the premium on behalf of participating developing countries or projects for sustainable development. The two principles of “polluter pays” and “common but differentiated roles and responsibilities and respective capabilities” now raise the real possibility that the international community may realign its priorities and find ways to help pay for a range of adaptation activities for developing countries, including risk sharing and risk transfer approaches like insurance. This is a distinct departure from traditional insurance concepts and poses several design issues related to moral hazard. Third parties may indeed pay the premium for developing countries or for particular projects, as in the case of projects such as the World Food Programme in Ethiopia, but these will need to be strongly linked in the future to risk reduction efforts.

Additionally, three principles can usefully guide the institutional design of insurance related approaches⁶⁸:

- **“Institutional lightness”**: Strategic allocation should use **existing international bodies and initiatives** to allocate funding streams, and not try to duplicate them under a “climate change banner”. At the same time, the institutional model must ensure accountability to the Conference of the Parties (which may authorize the funding to make the pool function). The model should have a clear governance structure separating political interests from operating directives. The model must be sustainable from an operational perspective, ‘easily governed’, and enhance the stability of participating countries (deliver pre-agreed upon results or levels of protection).
- **Developing country ownership and public transparency** of decision making is a prerequisite for success. The model will have greater chances for success if it is regionally-driven and owned, including a mix of partners ranging from regional stakeholders, global private sector reinsurance partners, and a global fund of last resort to ensure long-term sustainability of each pool.
- **Avoid market distortions and involve private market as appropriate**. In providing support for insurance, care should be taken not to significantly distort insurance prices or market competition. This means that attention should be given to issues of affordability and market failure. Provision of insurance coverage to communities and groups of people is an increasingly common feature for providing insurance coverage to the poor. Microinsurance in particular faces the necessity of lowering transaction costs for low-income households. Research and practical experience indicates that aggregating risk through pooled solutions in groups of people lowers the cost of providing insurance, fights moral hazard and adverse selection, and can raise awareness about risk management. Not-for-profit insurance-related mechanisms are particularly welcomed⁶⁹.

5.3 Risk reduction and insurance as part of climate adaptation

This section explores the links between disaster risk reduction and insurance in a climate change context, taking lessons from past experiences and exploring the enabling conditions and prerequisites that need to be in place. It cannot be overemphasized that insurance must be viewed in the wider perspective of managing the spectrum of risks. Several examples in this section provide illustrations (see text boxes).

The central role of risk reduction in insurance scheme design

Disaster risk can be reduced through systematic efforts to analyse and manage the causal factors of disasters, reducing exposure to hazards, lessening vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events. Disaster risk reduction measures are, therefore, thoroughly appropriate to help counteract the added risk arising from climate change.

⁶⁸ MCII 2009

⁶⁹ Goes, A. and J.Skees (2003)

A comprehensive approach to reduce disaster risks is set out in the United Nations-endorsed *Hyogo Framework for Action 2005-2010: Building the Resilience of Nations and Communities to Disasters*, whose expected outcome is “the substantial reduction of disaster losses, in lives and the social, economic and environmental assets of communities and countries.” A great variety of policies and measures are useful to reducing disaster risk and promoting adaptation to climate change. These include:

Strong institutional basis for implementation: requires fostering political commitment and community participation to reduce disaster risk, and developing or strengthening the institutional, legislative and operational mechanisms for disaster reduction. It involves integrating disaster risk reduction into development planning and decentralizing responsibilities where necessary. It also calls for assessing human and financial needs, and allocating the necessary resources.

Risk knowledge and early warning: requires the collection and use of data on disaster risks, and hence the development and maintenance of capacities and infrastructure to observe, analyse and forecast hazards, vulnerabilities and disaster impacts. It requires developing early warning systems that are people-centred, well integrated into decision-making processes and effectively disseminated.

Awareness raising and education: requires information-sharing systems and services, promoting dialogue and cooperation among scientific communities and practitioners, including disaster risk reduction in school curricula, and developing training and learning programmes on disaster risk reduction at a community level, for local authorities and targeted sectors. Finally, it requires strengthening research capacity and engaging the media to raise awareness.

Addressing underlying risk factors: requires the sustainable use and management of ecosystems, land use and natural resources, and integrating disaster risk reduction strategies and climate change. It calls for promoting food security for resilience, integrating disaster risk reduction planning into the health sector and promoting safe hospitals. Protecting critical public facilities and implementing recovery schemes and social safety nets is also necessary. It also involves promoting income diversification options, promoting financial risk sharing mechanisms and establishing public-private partnerships. Finally, it requires integrating disaster risk considerations in land-use planning and building codes, and incorporating disaster risk assessment in rural development plans.

Disaster preparedness for effective response: requires a plan and programme to assess and strengthen existing policy, technical and institutional capacities including those for management and coordination; mechanisms for the coordination and exchange of information and early warnings; contingency planning and response readiness, such as evacuation and standby arrangements for the provision of essential services and supplies; and the periodic review, rehearsal and modification of the plan. Finally, it requires the allocation of necessary financial resources including an emergency fund.

Financial risk sharing mechanisms and insurance

Among the many measures presented above, the Hyogo Framework calls for financial risk sharing mechanisms⁷⁰, which include a variety of instruments such as catastrophe bonds, weather or index-based derivatives, micro-insurance and traditional disaster insurance. Risk transfer tools including insurance do not reduce risk as such, they smooth consumption and lessen the financial and economic impacts caused by hazard events. Risk transfer tools including insurance may or may not reduce risk; they are not the right tools to address every risk for every population. Insurance may fail for a variety of reasons: as a result of an ineffective legal system to enforce insurance contracts, strong exposure by a population to risk, incomplete risk information

⁷⁰ Hyogo Framework Article 4 (ii) (k): “Promote the development of financial risk-sharing mechanisms, particularly insurance and reinsurance against disasters.”

and high transaction costs⁷¹. In part as a result of such failures, there is controversy regarding the use of insurance as a risk reduction tool. Moreover, there is insufficient experience demonstrating that traditional insurance can assist the poor to escape poverty. While some schemes have tried to embed insurance within a disaster risk reduction framework, current micro-insurance programmes lack direct links and incentives to reduce direct losses from disasters.

Given that national resources are limited, investing in a risk transfer instrument necessarily involves the opportunity cost of investing in other measures. For this reason it is important that decisions regarding any risk transfer tool are based on clear understanding of its benefits and limitations. A primary misunderstanding is that insurance is a “silver bullet” for risk management and adaptation. In fact, insurance will fail to reduce risk and to advance adaptation unless it is implemented along with disaster risk reduction measures.

Investing in disaster risk reduction measures, such as raising community risk awareness to reduce vulnerability and enforcing building codes, is a first step toward adaptation. This paper provides an initial analysis of the potential for insurance to enable adaptation if implemented among a wide array of risk reduction measures. Information in the annexes of this paper explore some cases that have explicitly linked disaster risk reduction and insurance although much more is still to be learned through experience, consultation and discussion.

Text Box: Risk reduction and flooding insurance the UK

To understand what works, consider a successful practical example of a public-private partnership in the climate risk domain: the provision of commercial flood insurance in UK. Property insurance policies in the UK cover a wide range of perils, including windstorm and flood. Unlike windstorm hazard, flood hazard is subject to a significant degree of active control by the UK government, which is responsible for maintaining flood defences and directing floodplain usage policy, both of which mitigate flood insurance risk. The Thames Barrier, which is raised from time to time to protect London against storm surge flooding, is the most notable of numerous high-priority publicly-funded flood projects. The mitigating impact of flood defences is taken into account in catastrophe flood insurance risk models.

The continued commitment of the UK government to public expenditure on flood control is essential for the viability of a commercial flood insurance market. Where there are repeated flood losses in specific river basins, such as happened in England over the past few years, the Association of British Insurers (ABI) puts pressure on the UK government to improve flood protection, otherwise there is a potential threat of the withdrawal of flood coverage for properties within particular flood-prone postcodes. Already, online insurers, whose business model involves fine segmentation of risk, effectively red-line some high-risk districts, whilst offering competitively cheap rates to low-risk districts. UK governments are wise to pay heed to the ABI, for a key aspect of the UK public-private partnership on flood risk is the major benefit to the government in having a sizeable component of flood losses met by insurance. The imagery of every flood disaster includes pictures of the Prime Minister visiting the worst hit areas, promising ex-post government help to those who are under-insured for property or contents loss.

With the prospect of increasing flood risk associated with climate change, the Association of British Insurers has been alert to the need for the UK government to act decisively to mitigate the flood hazard, not least by taking action on carbon emissions. It is of mutual interest to the public and private sectors that UK flood insurance remains commercially available.

(Source: Warner et al. 2009b)

⁷¹ Barnett, Barrett and Skees, 2007.

Insurance mechanisms can play a role in realizing the overarching aim to reduce risk. Taken alone, however, insurance cannot achieve this goal. First and foremost, the focus in designing tools to adapt to and manage climate-related risks must be on reducing the risk. Adaptation to climate change is not a generic process, and the modes and effectiveness of risk reduction and risk transfer will be distinct in different cases. The current challenge is to identify the potential role of insurance for reducing risks to adapt to climate change, particularly in a developing country context where traditional insurance penetration has always been low. By design, insurance can play a role in addressing some of the risks associated with climate change, particularly for climate-related extreme events. However, insurance should not be treated as a sustainable or cost-effective solution for managing all the risks in all contexts associated with climate change. Rather, insurance can be one important part of a comprehensive disaster risk reduction strategy. In such a strategy, there are certain prerequisites that need to be in place to allow insurance to play a complementary role in managing residual climate risks.

Text Box: Example of a public-private partnership: US terrorism risk

It is relevant to consider terrorism risk here, because, like flood risk, this is a hazard that can be mitigated substantially through government action. Insurers are all too aware that terrorism risk depends crucially on government effort in controlling terrorist threats through the diligence of law enforcement, security and intelligence services. In UK, France, Spain, Netherlands and Germany, terrorism risk insurance pools are operated by the states themselves. In USA, very large differences in the exposure of different insurers encouraged the search for a more equitable option than risk pooling, which would have disadvantaged the largest companies. Support from the state, acting as a reinsurer of last resort, was the ultimate answer.

Terrorism risk in the US homeland provides an important example of a public-private partnership facilitating a commercial insurance market, which otherwise would have been very small, and inadequate to meet the needs of the US economy. In the aftermath of 9/11, insurers were very reluctant to provide terrorism coverage in the USA, especially in major cities, such as New York, where they had a substantial aggregation of risk. However, after extensive insurance industry discussion and lobbying, the Terrorism Risk Insurance Act (TRIA) was passed in 2003, was renewed for two years in 2005, and further renewed for seven years in 2007. With the provision of a US government backstop to US terrorism insurance losses, insurers were able to manage terrorism risk. Without government involvement insurers may have chosen not to provide any cover for terrorism risk.

The price of US terrorism insurance has fallen since 9/11, and the take-up of terrorism insurance has increased in the urban areas considered most vulnerable to terrorist attack. The decrease in premium and increase in uptake is linked to government risk reduction efforts in strengthening border security, and increasing the operational force of the FBI and intelligence services. Furthermore, as security weakness is key to target attractiveness, terrorist insurance coverage terms and premiums are sensitive to local improvements in property security.

Limitations of insurance in a climate change context

Beyond those technical barriers noted in chapter 2, additional limitations of insurance in the context of climate change include (1) it does not prevent or reduce the likelihood of direct damage and fatalities from extreme weather events; and (2) it is not always the most appropriate option to manage risks (for example, in terms of cost-effectiveness or affordability). These same limitations are potentially aggravated in a climate change context (i.e. more frequent and intense extreme events). Climate change also poses additional challenges for insurance, a point that further underscores the vital importance of disaster risk reduction. Two of these issues include:

- **Potential un-insurability associated with increasing frequency and magnitude of extreme weather events.** The United Nations Environment Programme's Finance Initiative (UNEPFI) reports that by 2025, insurers may withdraw from some markets as the risks become too high for the pool of premium available. This has happened periodically in the United States. CERES, a United States-based NGO, has identified a growing move by insurers to reduce coverage in coastal areas. In this context, it would be beneficial to further explore the use of alternative risk transfer products such as catastrophe bonds (catastrophe bonds), which pass the risk on to investors in the capital markets rather than to reinsurers. At the very least, maintaining affordability will be challenging as climate risk impacts increase in frequency and magnitude, becoming less insurable. Given increased levels of uncertainty coming with climate change, higher risks to insurers ultimately mean higher premiums for clients unless significant risk reduction measures are in place.
- **Unsuitability of traditional insurance for longer-term foreseeable hazards like sea-level rise and desertification.** Two preconditions for insurability of disasters are the unpredictability of a specific event, which means that losses occur suddenly and cannot be foreseen; and the ability to spread the risk over time, regions and between individuals/entities. For two of the already ongoing changes caused by global warming, that is, sea-level rise and desertification, the insurability criteria cannot be fulfilled. Both processes are slow and continuous changes that potentially affect the population of one or more countries. They can lead to a deterioration of living conditions in developing or poor countries and, in the long term, could threaten the survival of human populations in affected regions. Further, only rapid and significant reduction of greenhouse gas emissions that lead to global warming could effectively prevent these risks in the long run. For this reason, insurance alone is hard-pressed to address some of the dire effects of climate change.

These additional issues, as well as the general limitations today explored in this paper, can be addressed through implementing well designed initiatives that maximize the incentives for disaster risk reduction. For the effective application of insurance programmes, it is critical that public interventions ensure long-term risk reduction for the entire spectrum of climate risks—not only those that can be addressed by insurance. The public sector must play an active role to integrate risk reduction into all development efforts (for example, by not allowing some activities that could lead to mal-adaptation in the future, such as building sea walls that will need to be replaced in the future due to sea level rise).

Text Box: Creative insurance solutions for climate adaptation

The Malawi micro-insurance pilot project described at some length in the literatures illustrates the benefits of an index-based insurance and seed distribution package for farmers. The effectiveness of this package could be made more powerful if premiums were tailored to reflect not the average historical risk but the risks facing the next season. Seasonal forecasts differ from the historical average in Malawi mainly because of the El Niño Southern Oscillation (ENSO) phenomenon, which is the major single source of climate variability on seasonal-to-inter-annual scales. Droughts are strongly related to ENSO in many areas within Southern Africa, including Malawi, and are expected to become more frequent and intense under a changing climate.

(Source: Patt et al. 2008, referred to in Warner et al. 2009b)

5.4 Model for an insurance mechanism to address climate related risks and sustainable development

Recently models such as the Caribbean Catastrophe Risk Insurance Facility (CCRIF) have shown the feasibility of multi-country risk transfer and risk sharing. In the context of climate

change, such models are useful for thinking about how organizations like the UNDP might approach the institutional arrangements for establishing an insurance mechanism.

An institutional model for an insurance pool for developing countries could include a few basic elements, and then be elaborated upon to create different options and alternatives. These elements address the financing and operation of the insurance pool. Additional important principles can be built into the governance and incentive structure, such as active engagement in risk reduction and ensuring that insurance coverage enhances sustainable development. These elements are listed below and discussed in greater depth in the following sections⁷². They include:

1. **Source(s) of capital for the trust**
2. **A trust fund**
3. **A Charity (or Trust)**
4. **An Operating Entity**

Capitalizing an insurance fund for developing countries: Donors and debt swaps

Donors. A pool of resources is needed to capitalize an insurance mechanism, and this would likely be provided through a variety of tools including donor support, debt swaps, etc. These interests would help define the purpose and use of the mechanism, its governing principles and bodies, and would play an ongoing role in ensuring proper capitalization of the insurance mechanism. However, the governance structure of the overall mechanism would be designed in a way to ensure a kind of “firewall” between political interests of various organizations and countries, and the technically sound operation of the insurance mechanism. Over time if desired, the insurance mechanism could conceivably become independent of donor support, such as in the CCRIF model where member countries pay a membership fee and annual premiums which are used to capitalize the fund in the longer term⁷³.

Debt swaps. Debt swaps represent a potential complementary source of funding for extreme weather events in developing countries. Debt swaps do not appear to have the potential to provide a large volume of funding to capitalize insurance activities, but could provide in-country or in-kind resources for a range of risk management and risk reduction activities which could complement insurance approaches.

The utility of a debt swap in facilitating climate insurance depends on the indebtedness of a developing country, and the willingness of bilateral debt partners to swap a substantial volume of debt for climate adaptation initiatives rather than for other worthy socio-economic purposes. As its part of a debt swap, the developing country is obligated to spend money on some significant development which would not have been funded otherwise. For a debt swap for climate adaptation, money would be spent on mitigating the impact of climate change, which would make insurance more affordable, and hence more viable. Climate vulnerability studies can identify the most suitable mitigation projects, e.g. re-forestation, which leverage a significant loss reduction benefit for a moderate cost outlay. Risk analyses can then be undertaken to calculate the future economic benefit in loss reduction, which would provide a quantitative measure of accomplishment. Apart from risk mitigation, debt swaps might contribute in part to building up climate disaster insurance funds. This option might be especially attractive in areas where practical adaptation measures are not patently very cost effective. The balance between

⁷² These ideas were developed in communication with Simon Young of CaribRM and CCRIF. See Young, S., Warner, K., Iyehen, E. (2009) Institutional Options for Climate Risk Insurance. Draft Discussion Document for AOSIS Grenada Meeting. 25 July 2009. CaribRM and MCII.

⁷³ Ghesquire 2008

financing risk mitigation and consolidating insurance funds is a judgement which is best informed by an overall risk assessment.

A key element of a debt swap is the exchange of foreign currency expenditure to repay debt for local currency expenditure to benefit the local economy. The payment of insurance premiums in foreign currency is thus not a suitable usage of debt swap proceeds, although payment in local currency should be permissible.

A few specific questions arise about how debt swaps could be used to capitalize a fund:

- Debt swaps do not produce cash directly, but cash would be needed to capitalize the fund and to pay for insurance premiums? Are debt swaps a feasible way to help finance a climate insurance pool or fund/capitalize an insurance fund?

A debt swap for climate adaptation could be used to persuade countries who owe money to put things in place that will enable insurance (like regulatory frameworks, risk reduction). As its part of a debt swap, the developing country is obligated to spend money on some significant development which would not have been funded otherwise. For a debt swap for ecology, money is spent on rainforest preservation. For a debt swap for climate adaptation, money would be spent on risk reduction against the impacts of climate change - including, potentially, the funding of a climate insurance pool.

- Are there ways to define those things that are equivalent to the debt forgiven and how can indicators of accomplishment be established?

Where a debt swap funds climate adaptation, a risk analysis would be required to calculate the future economic benefit in loss reduction, which would be a measure of accomplishment.

Elements of an insurance facility for developing countries

(Trust) Fund

A trust fund would provide capital for operations, technical assistance, premium support, and back-up funding serving a reinsurance purpose for developing countries participating in the insurance scheme. The trust fund is answerable to the owners of the resources used to capitalize the fund. Those donors or institutions would ensure a flow of funding to capitalise the fund, based on a set of defined accountability standards. The trust fund could be deposited at an appropriate financial institution specializing in holding financial assets. A grant agreement could be established between the trust fund and the Charity.

Assuming a given amount of funding would be available to start and maintain a trust fund, the trust fund could have four parts:

- **Premium support fund** – the topic of subsidies can provide ample room for debate. Yet it may make sense to provide support directly to countries to cover the risk premium of transferring that risk which can be attributed to climate change (due to rising sea level, greater rainfall variability, increased storm frequency/intensity etc.). Alternatively, technically sound approaches could be identified to provide sufficient risk signaling through the accurate pricing of risk and premiums, while ensuring that premiums become or remain affordable for the poor. Because attribution science may not yet provide the definitive answers, an alternative approach would be to work out the formula for donor contribution to premiums: it may make sense to start on the basis of an agreement and then later move towards attribution-based calculations. Preliminary cost-benefit analysis suggests that risk transfer will be the most efficient way (financially) to deal with 'residual' climate change risk (that risk which cannot be adapted to in a cost-efficient way). Significant areas of the proposed technical assistance programme (grants) would link to

design and implementation of adaptation (e.g. modelling, support of Country Risk Officers etc.), and the availability of premium subsidy could be made dependent on reaching or showing sustained progress towards established benchmarks in adaptation and risk reduction. Eligibility for participating in the insurance pool could be defined based on progress in prevention and risk reduction activities, and on the projected adverse impact of weather related disasters on households, SMEs and national economies. While the exact eligibility criteria subject to negotiations, as a starting point we would like to propose the eligibility criteria that provide a blend of risk reduction efforts undertaken by countries seeking cover (with support from the in the form of grants for risk reduction), and objective risk-related criteria and economic coping capacity. In this respect, the most vulnerable countries should receive additional subsidies for premium, such as from more general adaptation funding that may become available through the climate negotiations, or through various donor and developing country assistance programmes.

- **Technical assistance fund** - provide best practice for operations and governance, modelling support, evaluation of risk management programmes, support for Country Risk Officers etc. Would require a Task Force and some sort of secretariat, and would support development and operation of pools globally. This could interact with other institutions such as the World Bank's Global Facility for Disaster Risk Reduction (GFDRR) and be guided by the principles of the Hyogo Framework. The technical assistance fund could also assist with developing needed data for risk assessment and management, and provide an evaluation or monitoring process that can assist countries in assessing what constitutes country-appropriate risk reduction plans and results. The technical assistance could also assist in institutional development.
- **Capitalisation fund** - would provide capital to each pool so that each could retain some risk while building its own capital.
- **Fund of last resort** - a 'top-layer' catastrophe coverage for all pools so that they could avoid reinsuring the lowest frequency events (which are relatively expensive to reinsure due to the cost of capital.) Global diversification of this fund would maximise its financial efficiency and ensure the stability of the (regional) catastrophe risk pools.

Charity (or Trust)

A charity could provide the legal instrument that defines the beneficiaries and what the trust money can be spent for. The charity administers financial assets on the behalf of the pool members. The assets are typically held in the form of a trust, a legal instrument that spells out the beneficiaries and what the resources can be spent on. The charity would act as the conduit of funds from the trust fund, and own the operating entity which executes the day-to-day business. The charity would be governed by an executive board with representation of entities participating in the insurance pool. The charity could be governed by an executive board with appropriate regional representation but also with the necessary independence to ensure sound technical operation of the fund. The charity would benefit the participants and would be limited to a pre-defined range of activities such as providing insurance solutions and risk management support.

A (not-for-profit) Operating Entity

An operating entity could be established in the public or private sector or in some combination, organized to perform the fiduciary function of the trust fund and to execute the day-to-day business of the risk transfer programme. The operating entity could function independently based on best technical standards. The operating entity can be owned by an independent partnership, a bank or law firm, a charity, or other institution with capacity to serve as a trustee and managing an estate. This entity could be a special purpose entity (SPE, see below) in the private sector (such as a not-for-profit company), or a public sector entity. The entity manages investments, keep records, manages assets and prepares audits and other necessary documents, pays insurance claims and other items related to day-to-day business of the entity.

A **special purpose entity (SPE)**, sometimes also referred to as a "**special purpose vehicle**" is a legal entity created to fulfil narrowly defined, specific objectives defined by the Charity in careful discussion with the donors which capitalize the fund in the initial phases of planning. This form of operating entity allows a trust an operational arm without requiring a large institutional apparatus to operate that entity and can isolate the trust from financial risk. The operating entity can be a limited company of some kind or a limited partnership.

A special purpose entity may be owned by one or more other entities. Depending on the jurisdiction, ownership by certain parties may be required in specific percentages of total ownership. A "firewall" between political and technical considerations must be established in the governance structure of the entity. The operating entity must be governed in a way that guarantees that it function in technically sound ways. The structure of the Charity executive board can play a decisive role in ensuring independence of the operating entity within its given operational mandate. The executive board would need regional representation from non-political (i.e. non-elected) organizations for "ownership", and also have a technical "external" representation. The chairperson of the board could be elected by the regional representation and the technical representation, and would ideally also bring in an "external" perspective and expertise.

5.5 A note about insurance pools

Pool approaches provide a stable and practical way to provide insurance coverage. Pools serve several purposes: They collect premium for coverage provided and can also provide premium subsidy to cover climate-change related additional risk (for example, against a pre-industrialisation benchmark). Pools can also include policies for non hydro-meteorological risks (e.g. earthquake) as this leads to diversification of peak risk and improves efficiency in operations (issue of risk correlation). Pools would also act as underwriters for country-specific index insurance programmes aimed at particularly vulnerable sectors of society (e.g. farmers, micro-finance recipients etc.) and for other local or regional parametric programmes supporting key industries. The UNDP would need to work out whether all developing countries, or only highly vulnerable countries (or particular subsets of regional groups) would have access to the premium subsidy.

What are the benefits of a pooled insurance solution?

Pooling solutions have many advantages and are viewed by the insurance industry today as a good risk management solution. The main advantage of a pooled solution is that participants ensure the availability of financial resources in advance and under agreed-upon terms. For a pool to function, all partners must come to agreement, making the pool solution a stable and durable financial solution once consensus has been reached.

Pools can promote risk reduction. Eligibility criteria for participation in the pool can be progressive and linked to prevention and risk reduction. Greater risk reduction efforts can earn higher levels of coverage. Noted above, the peer element in pools can be powerful in promoting good risk reduction practice, such as enforcing sound building standards. Because pools encourage all participants to lower their risks, they can promote better risk management for an array of risks, not only climate risks. Pools also diversify risk & reduce adverse selection if linked to a wider issue. The wider the participation in the pool, the greater is the ability of the pool to diversify risk and reduce adverse selection. A pooled insurance solution for climate risk can lower the average premium because fixed costs are spread over many pool members. Pools can reduce adverse selection if membership is linked to a larger purpose (for example, participation in a wider adaptation framework) and even low-risk countries join the pool.

Pool solutions build consensus and align the interests of participants. Consensus helps create a strong basis of understanding because every element must be articulated: eligibility criteria,

rules of procedure and rules governing how insurance payouts are handled. Every participant commits to the terms which are negotiated, peer reviewed, and agreed on by all participants.

Pools can reduce political risks. Because the pool is steered by a board representing all participants, the payouts do not favour any one member and are distributed fairly. Getting to an agreement on a pool requires deliberation among participating countries. Manipulation by narrow political interests is difficult with the governance structure of an international insurance pool because the managing board can authorize payouts within the parameters that all parties agree upon. The payouts are regulated, the downside is that if the overall losses exceed capacity of the pool not all damages are reimbursed. But this means the pool cannot go bankrupt. The pool has a clear payout structure and the downside is that if the losses exceed this not all losses.

Pools cover the risks considered most urgent. Pooled solutions find terms adequate to cope with the effects of global warming (minimal solutions). The most urgent risks are covered, even though the pool may be a compromise situation for individual participants. A challenge is that in the process of finding agreeable terms, the pool always has to be a compromise of all partners. One risk of a pool solution is that the pool does not have enough money to pay out all the damages, leading to only partial coverage. Yet additional insurance solutions, such as reinsurance, can be organized to address the risk of a pool being overwhelmed. Nevertheless, the stable pool structure keeps the pool functioning and each participant gains more than it stands to lose by sharing risks.

Experience with pools. Experience with pooled solutions such as the Turkish Catastrophe Insurance Programme (TCIP, installed in 2002) and the Caribbean Catastrophe Reinsurance Facility (CCRIF, installed in 2007) have shown that a pool can be a tool accepted by governments and the financial services sector, particularly insurance. The CCRIF⁷⁴, formed in early 2007 has made payouts for two consecutive hurricane seasons in the region, remained solvent, and was recognized by the commercial insurance sector as an innovative tool. The pool is gaining a reputation as a valuable and innovative form of catastrophe cover on the global stage. Other earlier pool models, particularly national pools, have met with mixed results largely because of the ability of different political groups to influence spending for particular interests. Political independence, clear governance structures, and agreements in advance of a contract reduce the need for political agreement during crisis situations and allows better advance planning for risk management and for budgets.

⁷⁴ The CCRIF recently won the Re/Insurance Initiative of the Year award. The CCRIF is the first multi-country risk pool in the world, and is also the first insurance instrument to successfully develop a parametric policy backed by both traditional and capital markets. It is a regional insurance fund for Caribbean governments designed to limit the financial impact of catastrophic hurricanes and earthquakes to Caribbean governments by quickly providing financial liquidity when a policy is triggered. Last year, the CCRIF paid out approximately USD 1 million to Dominica and St. Lucia in the aftermath of the November 2007 earthquake that shook the Eastern Caribbean.

6. A Road Map and concluding remarks

Climate changes are expected to raise not only average temperatures but also weather variability and the frequency of extreme weather events. The economic and social effects of these changes are already particularly pronounced in developing countries and expected to become more severe in the future. How will poor and vulnerable people manage these risks, particularly when they may have little or no financial resources to cope with the crises? A growing body of evidence, some of which was presented in this report, suggests that insurance and other weather risk hedging instruments can play a positive role in helping vulnerable countries to adapt to climate change.

While the Bali Action Plan calls upon policymakers to consider insurance as part of an adaptation strategy, it offers little detail on how this goal can be achieved. Yet, weather risk insurance markets still remain rather nascent, particularly in the developing countries, due to the lack of reliable data, low incomes and often misguided government policy on post-disaster compensation. Despite major advancements in weather risk modeling technology and development of innovative weather risk transfer instruments, these by and large remain inaccessible to enterprises and households in developing countries.

To make weather risk insurance a main stream post-2012 adaptation strategy in developing countries, a strong commitment is needed on the part of international development organizations, donor governments and the governments of developing countries to the development of national, regional and global weather risk markets as well as alternative risk transfer mechanisms in the countries where the markets are still nascent.

The donor community and governments should be mindful of potential risks arising out of misguided interventions in the functioning of nascent risk markets. Excessive post-disaster and premium subsidies are fraught with potential market disintermediation, which will only exacerbate the growing exposures of governments, businesses and households in developing countries to climate related natural disasters. In shaping future insurance market interventions policy-makers should consider scoring these proposals against the long-term sustainability criteria developed in this paper. These include insurability, customization (vs. replicability), affordability, sustainability, and market complementarity.

Road Map and Next Steps

Practical progress in broadening access to climate-related disaster insurance will be a challenge to develop and sustain. However, as with many complex and seemingly intractable politico-economic problems, the task becomes more manageable if there is a road map available to help guide the way ahead and provide a basic sense of direction and momentum. Detailed specific decisions about choice of implementation plans, which can obstruct progress, can be deferred to future technical discussions.

Without being exhaustive, findings from this report indicate that the following steps could help move the dialogue forward about increasing access of developing countries to insurance against climate related disasters.

1. First, several **unanswered questions** require focused examination:

It would therefore be useful to circulate this report and associated document to relevant internal experts. Upon revision of the document, it may be useful to use it as a background document for dialogue among agencies and governments that could be

involved in further design and implementation of novel insurance solutions in developing countries

It could be useful to capitalize on the critical mass of experts at a large international meeting such as the Copenhagen Climate Change Summit, i.e. organizing a focused meeting at the fringes of the conference and invite experts with different perspectives to weigh in on the key questions above.

2. Second, a **series of workshops** could promote donor support, explore modalities and create momentum. The process which led to the book *Index insurance and climate risk*—a series of dialogue workshops and associated coordination—provide a useful model for documenting experience, sharing lessons learned, and pushing knowledge frontiers forward. A series of workshop meetings with agencies and governments on the key themes of this and other reports could in this way help charter new territory while also familiarizing potential donors with the need for risk reduction and risk sharing relative to other pressing development priorities. These dialogues may provide the basis for subtle shifts in priorities that may be needed in the future if mechanisms such as debt swaps are to be used to capitalize an insurance fund.
3. Third, in the medium term an **insurance conference on climate-related disasters** in the developing world could be organized and hosted either by the UNDP or an appropriate partner organization with insurance knowledge. One could organize the conference to bring together key implementers and design experts and focus on knowledge creation and sharing, and again pushing forward understanding.
4. Fourth, UNDP might consider a **consistent monitoring and evaluation** approach for its ongoing programs to evaluate how risk reduction and insurance affect sustainable development. Such monitoring could yield valuable information for the design of a facility, and feed important lessons and information into the wider community. UNDP might consider designing and implementing a **pilot project** for a specific territory in the developing world threatened by climate change. Such a pilot could explore the feasibility of linking risk reduction and insurance approaches and would ideally run for a period of three to five years to allow sufficient learning time and evaluation. The results of the pilot could be reviewed at a workshop or conference with donors.
5. Fifth, UNDP might consider organizing a **donor conference for governments** to discuss debt swaps and other modes of debt relief, importantly, such a conference could have a particular focus on using these modes of debt relief to capitalize risk reduction and insurance approaches. Along similar lines, the UNDP might organize a **donor conference for multi-national corporations** to discuss fund capitalization in countries where they have strong commercial interests. If the UNDP facility took a particular interest in specific areas, a similar approach could be used to explore the potential of linking microinsurance and remittances.

This road map shares some important common ground with other current international initiatives seeking to enlist the force of debt relief to combat climate change (DFI, 2009). A notable addition is the insurance pathway to risk mitigation and risk transfer. Coordination with supportive organizations, e.g. DfID, the Commonwealth Secretariat etc., to promote a global insurance perspective should facilitate collective progress towards achieving these milestones.

Closing remarks

As the frequency and intensity of extreme weather events mount, the urgency of building on successful risk reduction initiative is increasing as well. The previous sections indicate that insurance can be a useful component of a comprehensive risk reduction strategy. Insurance solutions can only support effective adaptation where they are implemented among measures to reduce disaster risk and increase societal resilience. If not embedded in a comprehensive risk

reduction strategy, insurance may actually encourage risk taking behaviour, potentially leading to greater fatalities and damage.

Today the need is greater than ever to reduce and transfer risk in ways conducive to climate change adaptation and sustainable development. Insurance, if properly designed, can be a valuable risk management tool to support both sustainable development and adaptation in developing countries. To harmonize climate risk insurance with adaptation, it is essential to align incentives with disaster risk reduction. The need for funding for a wide array of climate change-related activities presents both a challenge for establishing a facility for risk reduction and insurance at an organization like the UNDP. However, it also represents a unique situation where donors may massively realign their funding priorities towards combating climate change in developing countries. Additionally, the drive towards a new climate change agreement in Copenhagen in December 2009 represents a historical chance to establish a comprehensive risk management framework that prioritizes disaster risk reduction and uses insurance solutions as one tool to help achieve adaptation.

UNDP has a special role to play. It is an organization with a worldwide outreach and the trust of many developing countries. If the UNDP can find ways to help developing countries adapt to and manage the climate risks they face using risk reduction and risk transfer tools, developing countries may experience a positive cycle of growth. Major barriers must be addressed, among them political will for funding, technical aspects and governance aspects, and the articulation of a demand for risk reduction and insurance in developing countries. By exploring some of the key questions about the risks associated with climate change, the UNDP may contribute to finding and implementing approaches that help help motivate and shape resilience and adaptation to climate change.

Annex 1: Review of market weather risk insurance & hedging instruments

Weather risk hedging instruments for developed markets

In the recent years, in response to the growing manifestations of climate change many companies have been trying to make their operations more weather proof. However, often due to the nature of the business this strategy may not be practical or cost-effective. As a result, to deal with their risk exposures companies often turn to weather risk hedging which offers numerous benefits. For instance, by hedging their risk exposure to unfavorable from the business point of view weather companies can reduce the volatility of their earnings, improve market valuation and the terms of borrowing.

What is weather risk hedging? Weather risk hedges are financial instruments that allow financially offset or considerably reduce the weather risk exposure faced by the buyer of such a contract in day-to-day business operations. By making an investment in such a hedging instrument, the buyer of the contract expects to generate income in the amount closely approximating that lost due to a bad weather.

As more and more companies turn to weather risk hedging to protect their earnings and market valuations against the vagaries of weather, demand for weather risk hedging instruments will expand beyond energy utilities and market speculators – the traditional buyers of weather risk protection. Such market development will in turn bring down the transaction costs and improve the liquidity of weather risk hedging instruments.

However, today the weather risk markets still face numerous challenges. From the buyer's perspective, one of the main limitations of weather derivatives is a potential mismatch between payoffs and actual financial losses due to adverse weather conditions, the problem known as the basis risk. The presence of considerable basis risk is also what differentiates weather derivatives from traditional insurance contracts, which typically indemnify the buyers for the exact amount lost due to an insured risk subject to an insurance deductible. For readers more familiar with insurance, weather derivatives can also be described as insurance contracts with rather high deductibles and where claim settlement is done on the agreed amount (rather than the real loss) basis. In most cases the problem of the basis risk can be addressed to the satisfaction of the buyer through a more comprehensive understanding of correlations between the chosen weather index and the company's financial performance. In addition, businesses that are particularly concerned with the basis risk can always buy weather derivative contracts that attach at the lower and exhaust at the higher values of the weather index.

From the outset weather derivatives should be clearly distinguished from traditional insurance products which tend to deal with less frequent and more catastrophic events and which typically contain very little basis risk as they tend to indemnify or restore insured to the financial position they were before the occurrence of an adverse catastrophic event. Broadly speaking, weather derivatives can be mainly characterized as financial hedges against events which are not too far from the mean. Events covered by weather derivatives occur with a medium to high probability and cause material damages to the insured entity of a kind that are significant, but not detrimental to its very existence, but, at the same time, cannot be fully absorbed by it without major adverse financial consequences.

The most common derivatives are call and put options. The buyer of the option pays to enter into a contract that may require the seller of the option to pay at the end of the option period an amount calculated from a specified weather index. Payment is made to a buyer of a call option only if the weather index exceeds a specified level (the strike value) at the end of a contract

period. Payment is made to the buyer of a put option only if the weather index is lower than the strike value at the end of the contract period. Payments are linked to the difference between the value of the strike and the value of the weather index.

In the market parlor, weather risk hedging contracts are also often referred to as weather derivatives or weather indexed insurance. From its inception, following the growing demand from energy-providers for temperature based hedges, the market concentrated on such temperature measures as the accumulation of degree-days in multi-month seasons, average, as well as maximum or minimum temperatures. These temperature measures are then used by market participants, e.g. the buyers and sellers of weather hedging contracts, to develop risk hedging solutions that fit best their risk management needs. The most common temperature risk hedging contracts are degree days and average temperature contracts. The US trades almost exclusively in degree-day contracts while the global market trades in both degree-days and average temperature contracts. A brief description of these common weather derivative contracts available in the US and Western Europe follows.

Degree-days contracts. These contracts come in two types – Heating Degree Days (HDD) and Cooling Degree Days (CDD) contracts. In the US, the temperatures are measured in degree Fahrenheit and the temperature threshold is set at 65 degrees. Below this temperature people generally turn on their heating and above this temperature they turn their air-conditioning on. For a CDD, how much the average daily temperature exceeded the threshold is recorded. If the average temperature on a day does not exceed the threshold, a zero is recorded. For a HDD, how much the average daily temperature falls short of the threshold which requires heating is recorded. If the average temperature on a day does not fall below the threshold, a zero is recorded. So mathematically, one can define the value of CDD and the HDD index contracts as follows:

$CDD = \sum \max (T1 - 65, 0)$ for the number of days in the selected contract period

$HDD = \sum \max (65 - T1, 0)$ for the number of days in the selected contract period

The CDD or HDD value is then multiplied by the minimum tick fluctuation value per degree to arrive at the total payout of the contract, which is frequently subject to a cap. In addition to going either long or short on the heating degree days index, it is also customary to write call or puts on the HDD or CDD indices. In the latter case, payments under HDD or CDD contracts become contingent upon the cumulative value of the index exceeding a specified amount (the strike value). See Box I below.

Text Box: Calculating the value of the HDD Monthly Weather Futures Contract in New York

A monthly HDD value is simply the sum of each daily HDD value recorded during a given month or season. For example, if there were 10 HDD daily values recorded in November 2007 in New York, the November 2007 HDD index would be the sum of the 10 values. Thus, if the HDD values were 25, 15, 20, 25, 18, 22, 20, 19, 21 and 23, the monthly HDD index value would be 208. The value of a CME Weather futures contract is determined by multiplying the monthly HDD value by USD20, which is the value of the tick per degree. Using the example above, the CME November Weather contract would settle at USD4160 (USD20x208=USD4160). However, if in the above example the contract was written as a call on the HDD index with the strike value of the contract set at 100, then the contract would be worth only (208-100) xUSD20=USD2016.

Degree-day contracts continue to be the most prevalent in the market as they fit quite well the risk hedging needs of energy suppliers and are rather liquid which makes them readily accepted by the market players. They are however are not particularly useful for other segments of economy exposed to weather risk, which are more interested in the average temperature indices.

Average temperature contracts. The transition to weather hedging contracts linked to average temperatures began in December 2001 when the London International Financial Futures Exchange (LIFFE) commenced offering weather futures indexed to temperature in Berlin, London and Paris. Since then the coverage of the contract has been expanded to several other European and US cities. The main attraction of average temperature contracts is a continuous spectrum of temperature with no cut-off that divides the spectrum into positive values and zero, like it is the case with degree-day contracts. In addition, the concept of average temperature is easy to explain and understand which simplifies the acceptance of these contracts by the new users of the weather derivatives markets.

Other perils derivative contracts. Weather derivatives linked to variables other than temperature have been developing as well. Wind-speed, precipitation, snowfall, flood and stream-flow contracts have been originated on numerous occasions as well. Yet, the volume of trading in these contracts remains rather low. In addition, market is yet to learn how to structure and price contracts dealing with two or more weather variables, like, for instance, temperature and precipitation, and do it in an economically efficient manner.

Various forms of derivative contracts

The principal contract in weather trading by dealers is the swap. A swap contract can be described as a specific case of a collar trade where the upper and lower strike levels are the same. In a swap, the transacting parties agree to tick rates and caps that are symmetric about the mid point distribution of the selected weather index. For instance, if the distribution of average temperatures of the past summers can be approximated well by a Gaussian distribution and the swap level is the mean of the distribution, the probability of each party paying would be 50 percent.

In its recent attempts to expand its customer base beyond energy suppliers, the CME Group has developed three types of contracts for hurricane futures and options in six U.S. defined areas – the Gulf Coast, Florida, the Southern Atlantic Coast, the Northern Atlantic Coast, the Eastern U.S., and CHI-Cat-In-A-Box – Galveston-Mobile. These contracts are: (i) Hurricane Event futures and options; (ii) Hurricane Seasonal futures and options; (iii) Hurricane Seasonal Maximum futures and options. The underlying indexes for Hurricane futures and options on futures are calculated by Carvill, a leading independent reinsurance intermediary in specialty reinsurance that tracks and calculates hurricane activity.

These new hurricane risk transfer contracts help insurers offering hurricane insurance coverage to increase insurance capacity in the coastal areas of the US. In addition, businesses and local governments with large and widely spread risk exposures can mitigate them by buying the protection directly from the capital markets.

Another important and growing source of risk transfer capacity for weather related risks can be found in the global catastrophe bond market (also known as the market for “insurance-risk linked securities”). The overall issuance of ILS securities in 2007, for instance, was close to USD7.5 billion (e.g. bond principal at risk or “insured limit”) out of which, the coverage for the US hurricanes accounted for 34%, for the European wind storm for 16% and the Japanese typhoon – 8%, respectively⁷⁵. The most common form of risk transfer in the ILS market has been to transfer the risk of the issuer to investors by selling them catastrophe bonds, which would pay a risk premium and the LIBOR rate in return for investors’ agreement to forego a percentage of principal in case of occurrence of a catastrophic event covered under the risk transfer contract. However, since the collapse of Lehman Brothers, the issuance of new ILS has been halted due to

⁷⁵ The 2008 Review of ILS Transactions What Price ILS? – A Work in Progress. By: Morton N. Lane, President; Roger G. Beckwith

considerable problems with addressing the counterparty risk and ensuring the proper maintenance of the collateral.

Table 4 presents a brief analytical summary of the above described weather risk hedging products which we prepared in accordance with five earlier developed criteria insurance product assessment criteria.

Table 4. Assessment of market weather risk hedging products

Hedging product	Assessment criteria				
	Insurability	Affordability	Customization	Financial sustainability	Market impact
Degree-days contracts	Temperature	Market price	Standardized contracts	Sustainable	Positive
Average temperature contracts	Temperature	Market price	Standardized contracts	Sustainable	Positive
Multi-variable contracts	Precipitation, temperature, speed of water flow, wind speed	Market price	Customized contracts	Sustainable	Positive
Hurricane futures and options	Wind	Market price	Standardized contracts	Sustainable	Positive
Catastrophe bonds	Wind, flood	Market price	Highly customized	TBD	Positive

Insurability. As can be seen from the table, so far the key perils addressed by the commercial weather hedging market included temperature, precipitation, and wind, although in some instances flood was addressed as well.

Customization. Despite the growing volumes of standardized weather risk hedging contracts over the last few years, by and large weather risk hedging and insurance market still relies on highly customized solutions. This high level of customization in many respects impairs the further growth of the market as in the absence of large transaction volumes individual transaction costs remain rather high.

Sustainability. As weather related risk (e.g. increased volatility of weather patterns) become more and more pronounced for millions of businesses world-wide, demand for weather risk hedging instruments will be only growing over time. This in turn will drive the further growth of different weather risk hedging markets and risk transfer instruments that can help business to manage their growing risk exposure to the risk of weather.

Affordability. The growth of the markets is currently impaired by considerable transaction costs due to the still rather low volumes of trading and often rather high price-to-risk multiples. Overtime however we expect the risk spread-to-expected loss risk multiples, which currently hover between 2 and 4 depending upon the time of the year and type of peril, to considerably come down due to

the growth of issuance and major improvements in the quality of the underlying risk models and risk data, which are used to price these transactions.

Market complementarity. All of the above described market instruments are innovative in nature and provide a very important contribution to the development of weather risk hedging tools in the real sector.

Weather risk hedging in emerging markets

Recently, with the help international development organizations, weather risk transfer products have started making the inroads to the developing countries as well. The three most widely known examples of the weather risk market innovations in developing countries include:

1. The weather insurance offered by Swiss Re in the Millennium Village Project.
2. The Ethiopian drought insurance index provided by Paris Re.
3. Index-based parametric insurance for agricultural producers.

Using our 5 product assessment criteria for insurance products below we provide a brief summary of these three transactions.

The Millennium Village Project

To address the risk of draught in Sauri, Kenya, Swiss Re, at the request of the Millennium Promise Alliance (a New York registered NGO), developed a customized weather index, the Climate Impact Index (CII), which is composed of both a Normalized Difference Vegetation Index (NDVI) and Water Requirement Satisfaction Index (WRSI), chosen to optimally correlate with district-level maize production. The NDVI is a simple numerical indicator that assesses whether the area being observed contains live green vegetation or not – the information obtainable from satellite imagery. In this case the decadal NDVI data was received from NASA, spatially averaged. The WRSI provides an indication of a specific crop's potential performance based upon the availability of water during its growing season (vs. water demand experienced by a crop).

The risk transfer product has been designed in the form of a put on the CII and was intended to provide protection for the local maize farmers against adverse growing conditions. To the extent local precipitation data are not available, a pure NDVI product could be utilized. Live green plants appear relatively dark in the red spectrum and relatively bright in the near-infrared since chlorophyll, the most abundant plant pigment, is most efficient in capturing red and blue light.

The product provides ex ante relief as it pays out very quickly after the growing season so relief can be provided while there is a need and before liquidation of scarce local assets.

Insurability. Drought is the main risk addressed by the above mentioned products. While not being fully insurable in its least severe and more frequent and systemic manifestations, the risk could be well addressed in its more extreme manifestations by innovative index-based insurance products similar to the NDVI index.

Customization. The project scores very well in terms of finding the right balance between the needed level of product customization and its potential for replication in other parts of the world. Since the ability of the CII to approximate the local drought conditions was not predicated on the availability of the local reliable weather data (and hence expensive weather risk data generating

infrastructure) or crop yield data, the product offered a unique and highly innovative risk management solution that benefited 50,000 thousand maize farmers. The product however can be replicated on a large scale or be extended to other groups of customers including governments, aid agencies, large agricultural producers, agribusinesses such as grain elevators, coops and ethanol plants, seed companies and the like.

Affordability. Since the premium was fully paid by the Millennium, the local farmers received a 100% subsidized insurance coverage.

Sustainability. Although in this case Swiss Re charged an actuarially sound premium for the insurance coverage, it was paid not by the farmers but by the NGO on their behalf. This creates a financial sustainability problem as the ultimate users of the products are unable to renew coverage in the absence of significant subsidies from government or donors. To illustrate, the pioneering Ethiopian transaction described next has not been renewed and there are all indications that upon expiration at the end of 2008, the insurance coverage provided under the Millennium insurance project will lapse as well.

Market complementarity. Despite considerable subsidies in support of the described insurance product, there were hardly any adverse impacts on the development of weather risk or insurance market. This could be explained mainly by the fact that the product offered was highly unique and hence did not have to compete with any similar insurance products in the marketplace. However, this situation is bound to change in the future as more and more market players enter the new product niche with their own similar type products.

Ethiopia drought index

The Ethiopia Drought Insurance Pilot Project of the UN World Food Programme attempted to utilize market mechanisms to finance the risk of drought in Ethiopia. Under the project, AXA RE provided WFP with the world's first insurance contract for humanitarian emergencies. The contract provided US USD7 million in contingency funding in a pilot scheme to provide relief subsidies to 17 million people in the case of an extreme drought during Ethiopia's 2006 agricultural season. The insurance contract, a derivative based upon a calibrated index of rainfall data gathered from 26 weather stations across Ethiopia, took advantage of financial and technical innovations in the weather risk market. Payments are triggered when the value of the index indicates that rainfall is significantly below historic averages, pointing to the likelihood of widespread crop failure. The policy also complemented the recent UN moves towards greater effectiveness through the creation of an emergency fund which provides fast injections of cash to aid operations in the first few days following a disaster.

Insurability. Similar to the Millennium project, the Ethiopia transaction offered coverage for drought, or to be exact, more severe forms of drought, which is insurable.

Customization. The cover developed was fully customized to meet the needs of the WFP in case of a sudden and severe drought in Ethiopia. However, the extraordinary extent of the project customization was also the main drawback of the project, as the sophisticated insurance index could be no longer used once the WFM decided not to renew the original insurance contract.

Affordability. Although the coverage was relatively expensive for the UN WFP (about USD1 million of premium per USD7 million insured limit), it adequately reflected the odds of a severe drought event that could have triggered the payment. Had the coverage been triggered, the

payments under the coverage would have been converted into the immediate humanitarian aid (the coverage was never triggered while it was on the risk).

Sustainability. Transferring weather risks from poor countries like Ethiopia to the international risk market on a larger scale allows insurers to diversify their portfolios. This diversification helps to stem the rising cost of weather-related insurance in developed countries while providing more effective financial protection to developing countries. While the risk covered by AXA Re under the contract was actuarially priced, it was paid not by the ultimate beneficiaries but by the UN WFP, which from the very beginning posed a long-term sustainability problem. Despite winning the praise from the market and the development community for the innovation, all original concerns about the sustainability of this transaction materialized when the coverage was not renewed by the WFP upon the expiration of the policy.

Market complementarity. Although the transaction was fully funded by the UN donor agency, it did not produce negative externalities for the market as the insurance product was truly unique. The transaction however demonstrated the technical feasibility of insuring drought in developing countries and paved the way for similar deals in the future.

Index-Based Parametric Crop Insurance Products

Due to the growing adverse impacts of weather on agricultural production in developing countries and the financial sustainability problems invariably faced by government-owned agricultural insurance programmes world-wide, the interest in using index-based risk transfer instruments in lieu of traditional agricultural insurance has grown considerably over the last 10 years.

Internationally index-based weather risk insurance contracts have emerged as an alternative to traditional crop insurance. Most of the agricultural risk transfer projects attempt to address losses in crop yields at the time of a widespread drought. Index-based parametric insurance (or risk transfer products) have important advantages over traditional indemnity type insurance (such as reduced costs of policing moral hazard and a faster payout). The payouts under these contracts are linked to the underlying weather risk defined as an index based on historical data (e.g. for rainfall, temperature, snow, etc) rather than the extent of loss (e.g. crop yield loss). As the index is objectively recorded at the same time for all farmers, the problem of moral hazard is minimized as there is no longer a need to monitor individual contracts, which significantly brings down the administrative costs. Weather-indexed insurance can help farmers avoid major downfalls in their overall income due to adverse weather related events. This improves their risk profile and enhances access to bank credit, hence reducing their overall vulnerability to climate variability. Unlike traditional crop insurance where claim settlement may take up to a year, quick payouts under private weather insurance contracts can improve recovery times and thus enhance farmers' coping capacity. However, one of the inherent disadvantages of weather derivatives is that because of the way the index is defined there may be a mismatch between payoffs and actual farmer losses, the problem known as a basis risk.

Various agricultural weather derivative pilot schemes are currently on the way in emerging markets. As of the end of 2008, there were 16 agricultural risk financing pilots supported by the World Bank alone. About 20 index-based insurance programmes have been implemented in low- and middle-income countries. So far, however, India proved to be the only well-tested and proven success story of all.

The ICICI Lombard General Insurance Company, with support from the World Bank and International Finance Corporation, conceptualised and launched a pilot rainfall insurance scheme in Mahabubnagar, Andhra Pradesh in July 2003. The district had previously experienced three consecutive droughts. The scheme was implemented through the KBS (Krishi Bima Samruddhi) local area bank of Basix, one of India's largest microfinance institutions. KBS Bank bought a bulk of insurance policies from ICICI Lombard and sold around 250 individual policies to groundnut

and castor farmers. The index capped rainfall level per sub-period at 200 mm, and weighted critical periods for plants growth more heavily than others. KSB decided that only borrowing farmers can buy weather insurance policies. Eventually KSB planned to lower the interest rate on its loans to the insured farmers due to the reduced default risk. Since then, the programme grew exponentially. In 2007, over 600,000 farmers purchased index-based parametric crop insurance in India.

Recently, the concept of index-based parametric weather risk hedging has been applied to develop a macro-hedging solution for countries which are particularly exposed to weather risk. Malawi has been the first country to benefit from the index-based parametric weather risk hedging⁷⁶. In 2008, the World Bank issued its first weather risk management contract to help Malawi financially protect itself against the risk of a severe drought. The UK Department of International Development (DfID) provided financial support to cover the premium payment for the contract. Malawi suffers from chronic drought that cuts agricultural yields and depresses farmer incomes, negatively affecting the government budget. When drought strikes, it increases the price of maize, the main source of food for a large part of the population. Working with Malawi, the World Bank structured the contract as an option on a rainfall index. The index links rainfall and maize production so that if precipitation falls below a certain level, the index will reflect the value of the projected loss in maize production. Under the contract, if the maize production in the country, as estimated by the rainfall index, falls 10% below the historical average, Malawi will receive a payout of up to a maximum of USUSD5 million.

Insurability. Most of agricultural index-based risk transfer projects address the risk of drought, e.g. insufficient precipitation at the critical periods of plants' growth. Once the data on precipitation patterns have been obtained, insurance becomes a viable option as international reinsurers can properly price and underwrite the risk without being exposed to the risk of moral hazard.

Sustainability. The index-based parametric crop insurance products can be financially sustainable, as has been proven in India, where poor farmers were willing to pay up to 5-7% of the insured crop value in insurance premiums. Such high premiums could be justified only if the insurance payout comes very quickly, as is the case in India, and there is a strong correlation between the size of the farmer's loss and the overall insurance payment. These problems however are not easy to overcome as they require considerable investments in weather stations and a well developed payments infrastructure. Also, given the small size of individual contracts and extensive outlays on the prerequisite development of underlying risk models, data mining, product distribution and farmers education, it is essential that these products cater to the needs of a broad customer base. Covering small groups of farmers with these products is simply not viable due to the very high transaction costs involved in producing the custom-tailored products that cannot be easily replicated for other crops or locations.

Affordability. Due to considerable costs involved in developing the index-based products and the small targeted customer base and the relatively low incomes of the rural population, in the absence of subsidies these products typically pose a major affordability challenge. Nevertheless, as has been shown by the India market experience with weather derivatives, if properly designed to address the buyers' specific risk management needs, weather derivatives can be attractive even to the poorest of farmers.

⁷⁶ Osgood et al. (2008)

Market complementarity. The index-based parametric crop insurance can be seen as a major market innovation and a major step forward in addressing the risk management needs of rural communities and even countries. While most, if not all, of the weather derivative pilots in developing countries were subsidized by the development community, given the innovative nature of these products they did not displace any other insurance products from the market. Weather risk management technology can be now applied to address numerous risk management objectives of different customer segments. The potential application of this product spans diverse sectors of economy ranging from agriculture and energy production to tourism.

Summary

The Section provided a broad overview of the existing weather risk hedging and insurance instruments in both the mature and emerging markets. Due to the complexity of weather risk, the availability of weather risk hedging products is still rather limited by the availability of data, considerable transaction costs involved in developing these products as well as the relatively low demand for such products by consumers. Nevertheless, while in developed countries the growth of the weather risk hedging business is driven by the market innovation, in the emerging markets will have to rely on the weather risk pilot projects supported by the donors and the World Bank. Although in some cases the donor supported projects have paved the way for the consequent market takeoff (as has been the case in India), more often than not the pilots supported by the donors could not be mainstreamed or replicated.

Annex 2: Examining promising climate change insurance initiatives

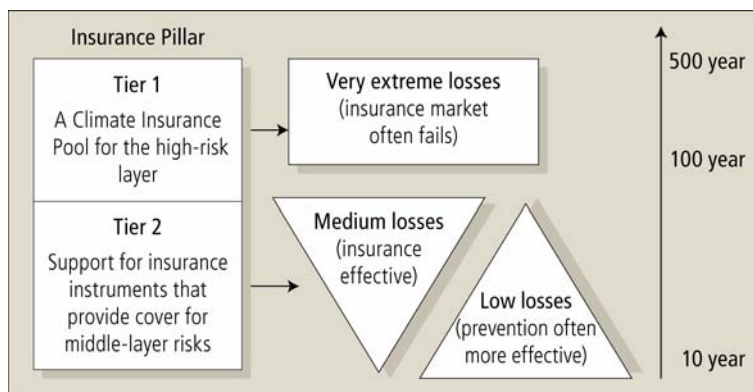
One of the latest most promising initiatives in weather risk insurance has been the one recently recently proposed by the Munich Climate Insurance Initiative (MCII) – a global NGO comprising representatives of the UN, the World Bank, reinsurance and insurance industry, research and academic community⁷⁷.

The proposed insurance programme has two different windows, reflecting the different levels of risk that need to be addressed by an effective climate adaptation programme for developing countries - the “high level” risk which would exceed the ability of any given country to pay in the case of an extreme event, and the “middle level” risk which can be addressed by an affected country if the proper facilitating framework were in place.

As pictured in Figure II, the “high level” tier of risk would be addressed by insurance cover provided through the Climate Insurance Pool (CIP) to developing countries falling victim to infrequent and severe climate-change-related events.

The second “middle level” risk tier, to be retained by countries, would be dealt with through a Climate Insurance Assistance Facility (CIAF) that provides assistance for setting up national and possibly regional risk-pooling and -transfer mechanisms that cover medium-loss events.

Figure 14: A two-tiered insurance programme as part of a risk-management module



(Source: MCII 2008, referenced in Bayer et al. 2009)

Tier 1: A Climate Insurance Pool for extreme weather events

The first tier of the Insurance Programme would provide premium-free insurance cover in developing countries for losses caused by extreme weather events with a (negotiated) predetermined severity and return period. The latter would be based on historical data from a baseline period to avoid a reduction in support as climate increases the frequency of severe events. This insurance entity, further referred to as the Climate Insurance Pool (CIP), will be financed by annual contributions from the (proposed) multi-lateral adaptation fund, which itself

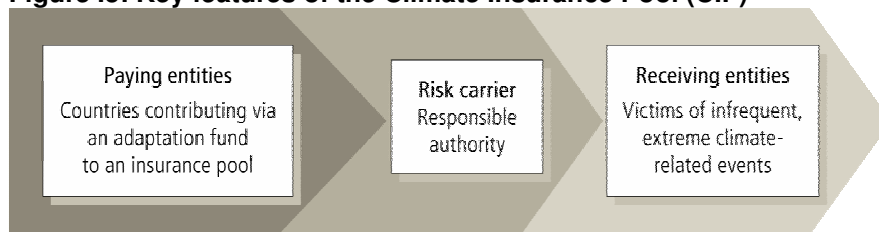
⁷⁷ Insurance Instruments for Adapting to Climate Risks, A proposal for the Bali Action Plan⁷⁷, Version 2.0, MCII.

may be financed by the developing countries. The main rationale behind the CIP is to supplement other climate adaptation funding with insurance indemnity payments via an insurance scheme that can best address the increasingly frequent considerable government budgetary outlays on recovery and reconstruction work in the aftermath of weather related natural disasters. Below we summarize the key features of the CIP.

The key features of the proposed Climate Insurance Pool:

- **CIP Premium Paying Entities:** Countries contributing to a multi-lateral adaptation mechanism would agree to a premium payment formula (many possibilities, such as based on “ability to pay,” “polluter pays,” or other concepts).⁷⁸ The CIP would receive a fixed annual allocation from a multi-lateral adaptation fund equaling the expected average annual costs of the insurance scheme.
- **Beneficiaries of CIP Coverage:** Countries that agree to participate in the scheme will benefit from CIP coverage in the event they fall victim to rare but extreme climate-related disasters that go beyond their capacity to respond and recover within a reasonable time. To become eligible for CIP indemnification payments, governments will have to fulfill basic standards of fiscal and budgetary transparency and commit themselves to certain risk reduction measures. Thus, it is envisaged that beneficiary countries will make NO premium payments, but may be subject to meeting certain standards of risk management.
- **Risk Carrier:** The CIP operations could be managed by a dedicated professional insurance team responsible for risk pricing, loss evaluation and indemnity payments, as well as placing reinsurance.

Figure I5: Key features of the Climate Insurance Pool (CIP)



(Source: MCII 2008)

To rate the proposed MCII Insurance Programme we apply our earlier developed framework for scoring large catastrophe insurance programmes, which includes such criteria as: (i) insurability, (ii) customization, (iii) affordability, (iv) sustainability, and (v) market complementarity.

Insurability. To qualify for coverage, any weather related event triggering payment from the CIP must be extraordinary in the statistical sense (e.g. lie in the extreme percentile of the historic distribution) and occur within the geographically predefined zones that meet the economic vulnerability criteria. Generally, the CIP coverage is likely to be extended to cover very high loss events occurring at low frequencies, often in the frequency range of every 100 to 500 years, in pre-defined areas of developing countries that are vulnerable to weather related catastrophic perils. A list of eligible for coverage catastrophic scenarios (e.g. frequency and severity of events and areas where they are likely to occur) will be established by an independent modeling firm and then negotiated with the countries. Further verification of events eligibility will also be

⁷⁸ In principle such contributions could be proportional to the current or accumulated CO₂-emissions, while a threshold for paying entities of CO₂/capita emissions could be fixed, with countries below this threshold being fully exempted from the payments. One component could also be GDP based.

administered by an independent modeler. To reduce the uncertainty involved in covering highly unpredictable catastrophe event, the CIP coverage will be provided on a parametric basis. In addition, every loss scenario qualifying for the CIP coverage will be capped at the maximum insured limit.

Hence, we can conclude that by restricting the coverage to only highly catastrophic weather events on a parametric basis and by capping the payout to the overall insured limit, the CIP will be effectively in the position to insure weather related risks to economic development – the perils which otherwise do not lend themselves easily to insurability.

Customization. The coverage provided by the CIP will be highly customized to the needs of individual country members. This will be accomplished by identifying the most catastrophic loss scenarios from weather related events in each participating country, which will require country specific risk assessments. This level of customization however will not be an obstacle to the further mainstreaming of the programme, as the commercial risk models developed for the participating countries can be then reused and updated to revise, if necessary, the existing coverage parameters (e.g. coverage attachment point, price, etc.).

Affordability. The coverage will be highly affordable to participating countries which will make NO premium payments, but may be subject to meeting certain standards of risk management. The CIP premiums will be financed by annual contributions from the (proposed) multi-lateral adaptation fund, which itself may be financed by developed countries. While the exact formula of contributions and disbursements of an enhanced adaptation fund is yet to be determined, there is a growing consensus based on principles of the UN Framework Convention on Climate Change that adaptation funds will be (1) raised according to common but differentiated responsibilities and respective capabilities of countries (UNFCCC, Art. 3), which can be translated into criteria such as “ability to pay” and “polluter pays”; and (2) disbursed to those who suffer most from climate change. The CIP conforms to these principles.

Sustainability. Our sustainability rating comprises two important criteria – financial sustainability and incentives for proactive risk management.

The long-term financial sustainability of the CIP appears to be the weakest link of the proposal as the scheme is entirely dependent on the politically negotiated and agreed contributions of developed countries to the multi-lateral adaptation fund. However, it appears that there is a growing international support for such a global climate adaptation insurance fund. Without being comprehensive, the recent proposals include: levies on the auctioning of emission rights (e.g., the US International Climate Change Adaptation and National Security Fund); the European Union’s ETS Auction Adaptation Levies; withholding and auctioning a portion of assigned amount units as recently proposed by the Norway; a levy on carbon emissions as recently put forth by the Swiss; extending the levy on revenues from the Clean Development Mechanism to other international Kyoto mechanisms; and levies on international aviation and maritime transport (the Tuvalu Adaptation Blueprint). With at least of one of these proposals taking strong hold, the sustainability prospects for the CIP will be greatly enhanced.

Another important element of sustainability rating relates to how well the proposed insurance scheme incorporates incentives (e.g., deductibles) and/or conditions (e.g. eligibility criteria) for proactive risk preventive measures. The CIP includes country criteria to foster prevention and risk reduction. Countries that wish to participate in the programme will be required to commit to long-term national disaster risk management and overtime will have to show good progress on fulfilling these plans.

Market complementarity. To avoid distorting the private catastrophe risk reinsurance and capital markets, the CIP will utilize market based pricing of its covers and will rely heavily on risk transfer to private risk carriers. The CIP would retain no more that approximately 25% of the risk. Market based pricing will be ensured by having the CIP reinsure its risk retention (across its whole risk

programme) on a quota share basis⁷⁹ to the reinsurance or capital markets at a market price, which will then be applied to price the CIP's own insurance contracts with country beneficiaries. This approach will establish the true cost of retained risk every year, stimulate further development of the sovereign risk transfer market globally, and will add some additional claims payment capacity to the CIP over time. To avoid insolvency in the case of very high losses, for instance, from multiple events, the facility should also reinsure on an excess loss (XL) basis (insuring losses above a certain limit). The capital surplus that the CIP will build over time will be retained in the fund and used for absorbing more risk (e.g. higher risk retention) during years of high reinsurance prices (hard reinsurance market). Therefore the proposal scores high on the market complementarity count.

The Section reviews one of the most promising recent global initiatives in weather risk insurance – a two-tiered insurance programme proposed by the MCII. The proposed insurance programme has two different windows, reflecting the different levels of risk that need to be addressed by an effective climate adaptation programme - the “high level” risk which would exceed the ability of any given country to pay in the case of an extreme event, and the “middle level” risk which can be addressed by an affected country if the proper facilitating framework were in place. The proposed design of the facility is then analyzed using all five criteria of long term sustainability.

⁷⁹ A quota share reinsurance treaty is a reinsurance contract that provides protection on a proportional basis. For example, the CIP may wish to reinsure the first USD100,000 of loss by allowing reinsurers to share in 80 percent of the risk on a quota share basis. If a USD100,000 loss is paid, the CIP retains 20 percent and reinsurers pay 80 percent.

Annex 3: Examples of debt-for-environment swaps

It is ironic that, in October 2004, at a time when the US Environment Protection Agency was loathe to recognize the urgent need for US action on climate change, the US committed USD6.5 million to preserve tropical rain forests in Jamaica, and protect them from mining, population expansion, agriculture development and deforestation⁸⁰. In this debt-for-nature swap, the Jamaican government is scheduled to invest USD16 million over 17 years to manage the forests and the national parks. According to Terry Williams of the Nature Conservancy, *Jamaica had already been committed to saving the environment. This debt swap enables the Jamaican government, local conservation groups, and local communities, to realise this ambitious goal.* This case study highlights the value of debt swaps in facilitating green policies in the developing world, which could not possibly otherwise afford to take serious and concerted action, sustained over many electoral cycles.

In another gesture of environmental goodwill, the US forgave USD10 million of debt owed by Panama, which could then allocate this sum to enact a 14 year plan from 2003 to protect the Chagres National Park from industrial development, agricultural growth and urban expansion. Apart from its ecological importance, the special economic significance of the Chagres Basin lies in its water which supplies the Panama Canal. With revenue received from the Panama Canal, resources generated by the swap allow a permanent endowment to fund the area after the 14 year period expires. The dual alignment of ecological and economic interests makes this debt swap an attractive paradigm for a sustainable future: ecological good sense can also make economic good sense. More than two hundred of the thousand plant species in the Chagres National Park are rare, and a valuable reservoir of possible new drug compounds. Recognizing that a quarter of all pharmaceuticals can be traced to the rain forest should heighten awareness of the full potential economic value of nature conservation.

With 80% of its rare plants only found there, biodiversity is a natural characteristic of Madagascar, which has both economic as well as ecological value. Such a rich botanical resource warrants the government of Madagascar's commitment to environmental preservation, and provides a generous ecological return on a series of debt swaps and other debt relief transactions. Apart from the usual NGO's, these debt swaps also involved participation of the Missouri Botanical Garden. Biodiversity is also one of Costa Rica's most valuable assets. In addition to over ten thousand plant varieties, there are several hundred mammals and nearly a thousand species of birds. Starting in 1987, Costa Rica has been one of the pioneers of debt swaps, and a number of debt swaps have been successfully completed to protect 25% of the land to maintain this biodiversity. Conservation in one Central American state is devalued by ecological neglect in another, so it is welcome that, in 2006, a USD24 million debt owed by Guatemala was forgiven by the US in order to fund forest conservation over fifteen years.

Peru also has a highly ecologically diverse rainforest, having more than 20,000 plant species and 1800 animal species. In a debt swap, Peru committed USD10.6 million over a twelve year period to preserve 17.5 million acres of rain forest. Natural resources of the rain forest are a valuable contribution to the Peruvian economy. But the timber, minerals, mining and logging will be managed ecologically, and not over-exploited to the detriment of the environment.

⁸⁰ Kokenes 2008

In 2004, the US Treasury, in conjunction with Conservation International, the Nature Conservancy, and the World Wildlife Fund completed a debt swap enabling Colombia to invest USD10 million over ten years. Half is allocated for local environmental projects in selected areas; the other half is allocated to Fondo Patrimonio to procure a further USD40 million loan to sustain protected regions in the Andes, Llanos and Caribbean corridor. The ability to leverage far more extensive ecological projects than would otherwise be possible is a noteworthy concept that might be more widely replicated.

Environmental protection is a worldwide concern, and the debt swap concept is similarly global in relevance. The first Asian debt-for-nature swap was between the Philippines, Haribon Foundation, and the World Wildlife Fund. Initiated in 1988, this USD2 million swap progressed the development of the mountain forests and marine ecosystems of the St. Paul National Park on Palawan, and the El Nido National Marine Park, where coral reefs and endangered sea turtles needed protection. In 2002, the US Treasury structured a debt swap between the World Wildlife Fund, the Philippines, and local Philippine conservation agencies. The USD8.2 million raised was used to sustain and restore tropical rain forests in the Philippines. The circumstances under which this debt swap materialized are noteworthy for its political pragmatism. The Philippine government under President Gloria Arroyo had been cooperative with Washington in the war on terror, a policy that Philippine Finance Secretary Jose Isidro Camacho hinted the United States might reward by helping reschedule the country's more than 50 billion dollars in debt. A small part of that reward was placement on a list of countries that could avail themselves of a debt-for-nature swap under the U.S. Tropical Forest Conservation Act.

It is a basic tenet of bilateral debt swaps that the sovereignty of the recipient nation should be retained, and that the dignity and independence of the recipient government be respected by NGO's. In July 1987, a debt-for-nature swap in Bolivia was misrepresented by the local newspapers. It was incorrectly alleged that the region preserved would be under the control of the conservation organization. In fact, there was no infringement of national sovereignty. As it turned out, there was an unfortunate difference over interpretation of the term '*sustainable development*' between the Bolivian government and the NGO, Conservation International. This underlines a basic political issue over the practical value of debt swaps in achieving the intended goals. Ultimately, the sovereign government carries the responsibility for implementing the development plan, whether it be for environmental protection or provision of goods for the underprivileged. Exercise of this state prerogative can result in varying degrees of success outcomes.

Compared with Latin America, the transition economies of Central and Eastern Europe, Caucasus and Central Asia pose different opportunities and challenges. Poland in particular has been a success story. Over the years, the Polish DFES scheme has generated an unprecedented amount of over half a billion dollars. Due to its outstanding performance and very solid expenditure programmes, the Polish EcoFund has also attracted additional multimillion donor grants for environmental purposes. A key role has been played by the Polish Ministry of the Environment in gaining the interest and trust of creditors. As Polish experience has shown, swap negotiations enhance the status of environmental departments, and make them partners with financial and industrial agencies.

The focus so far has been on debt forgiveness by western nations. It would be remiss not to comment on the billions of dollars of debt written off by China to more than forty countries. Since the turn of the century, more than USD10 billion in debt has been cancelled for 31 countries in Africa. However, the underlying motivation seems to be debt for improving political, public and trade relations rather than debt-for-environment. Indeed, in Indonesia, the expansion of the

country's electrical grid has come at the expense of the environment – the coal-based Chinese technology is highly polluting. Emerging donors, such as China, may ask fewer environmental questions than western or multilateral donors, but the overall impact on environmental standards should not be exaggerated, since the raising of environmental standards is a long-term process.

The Chinese approach to bilateral debt is somewhat self-serving, although effective at delivering good publicity to the donor country, both when debt is given and forgiven. China's commitment to a hands-off approach is in stark contrast to the West, and some experts say the lengths to which China goes to be seen as a benevolent partner with Africa is unprecedented. Having suffered colonialism, China is keen to be seen as a benign force, and still thinks of itself, in many ways, as a part of the developing world.

References

- ABI [Association of British Insurers] (2006) Coastal flood risk. Summary Report.
- Atkinson A.B. (Ed.) (2005) *New sources of development finance*. Oxford University Press.
- Barnett, B.J., Barrett, C.B., Skees, J.R. (2008) Poverty Traps and Index-based Risk Transfer Products. *World Development* 36:1766-1785.
- Barrett, C.B., Barnett, B.J., Carter, M.R., Chantarat, S., Hansen, J.W., Mude, A.G., Osgood, D., Skees, J.R., Turvey, C.G. and M.N. Ward (2007) *Poverty Traps and Climate Risk: Limitations and Opportunities of index-Based Risk Financing*. IRI Technical Report No. 07-202. IRI, Columbia University, New York.
- Bayer, J. and R. Mechler (2007) *Insurance against Losses from Natural Disasters in Developing Countries*. Background paper to World Economic and Social Survey 2008: Overcoming Economic Insecurity.
- Linnerooth-Bayer, J., Warner, K., Bals, C., Hoeppe, P., Burton, I., Loster, T., Haas, A. 2009. *Insurance, Developing Countries, and Climate Change*. Special issue on Climate Change and its Economic Impact on Insurance. The Geneva Papers on Risk and Insurance – Issues and Practice. (published July 2009)
- Berensmann K. (2007) Debt swaps: an appropriate instrument for development policy? *Deutsches Institut für Entwicklungs politik*.
- Bray, J. (2003) Attracting reputable companies to risky environments: Petroleum and mining companies. In Bannon, I. and Collier, P. (Eds) (2003). *Natural Resources and Violent Conflict: Options and Actions*. World Bank. Washington, D.C.
- Callaghy T.M. (2004) *Innovation in the Sovereign Debt Regime: From the Paris Club to enhanced HIPC and beyond*. World Bank, Washington DC.
- Caribbean Catastrophe Risk Insurance Facility (2008) Annual report 2007-2008. Available at: http://wwwccrif.org/main.php?main=27&media_type=Photos&year=2008 Accessed: 28. August 2009
- Cassimon D., Vaesson J. (2007) Theory, practice and potential of debt for development swaps in the Asian and Pacific region. *Economic Systems*, Vol.31.
- Charpentier, A. (2008). Insurability of climate risks. *The Geneva Papers*. Vol. 33 (91-109).
- Churchill, C. (Ed.) (2007). *Protecting the poor: A microinsurance compendium*. Co-published by the Munich Re Foundation and the International Labour Organization (ILO), Geneva, Switzerland.
- DFI (2009). *Debt Relief to combat climate change*. Joint Ministerial Forum on Debt Sustainability. Commonwealth Secretariat and Organisation Internationale de la Francophonie. World Bank, Washington, DC. 23 April 2009. Paper prepared for the Government of Guyana, funded by DfID.
- Dlugolecki A 2007 *The Cost of Extreme Events in 2030: A Report for United Nations Framework Convention on Climate Change*. Available on UNFCCC website.
- Dlugolecki et al. (2009) *Coping with climate change: Risks and opportunities for insurers*. Chartered Insurance Institute, London.

Ghesquiere, F., Mahul, O., Forni, M., Gartley, R. (2006). Caribbean Catastrophe Risk Insurance Facility: A solution to the short-term liquidity needs of small island states in the aftermath of natural disasters, www.aidandtrade.org, IAT03-13/3

Gurenko, E. (2004) Catastrophe Risk and Reinsurance: A Country Risk Management Perspective, London: Risk Books.

Hellmuth, M.E., Osgood, D.E., Hess, U., Moorhead, A., and Bhojwani, H. (eds). 2009. Index insurance and climate risk: Prospects for development and disaster management. Climate and Society No. 2. International Research Institute for Climate and Society (IRI), Columbia University, New York, USA.

Hess, U. and Syroka, J. (2005) Weather-based insurance in Southern Africa: The case of Malawi, Agriculture and Rural Development Discussion paper 13, The World Bank, Washington DC.

Hoeppe, P. and Gurenko, E. (2006) 'Scientific and economic rationales for innovative climate insurance solutions', in E. Gurenko (ed) Climate Policy, Special Issue on Insurance and Climate Change 6(6): 600–606.

Hurley G. (2006) Renewed enthusiasm for debt swaps. European Network on Debt and Development.

Intergovernmental Panel on Climate Change (IPCC) (2007) Working Group II Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability Summary for Policymakers. Cambridge University Press, Cambridge.

Jha, Raghendra and Schatan, Claudia (2001). Debt for Nature: A Swap Whose Time Has Gone?. Available at SSRN: <http://ssrn.com/abstract=243755> or DOI: 10.2139/ssrn.243755

Kaiser J., Lambert A. (1996) Debt swaps for sustainable development, EURODAD, France.

Kokenes S. (2008) Debt-for-Nature swaps – conservation or cemetery? VDM Verlag, Saarbrücken, Germany.

Lane, M.N., Beckwith, R.G. (2008) The 2008 Review of ILS Transactions What Price ILS? – A Work in Progress.

Linnerooth-Bayer, J., Mechler, R. (2007) Insurance for Assisting Adaptation to Climate Change in Developing Countries: A Proposed Strategy, in Climate Policy, E. Gurenko (Ed.) Special Issue on Insurance and Climate Change.

Madeiros C., Polan M., Ramlogan P. (2007) A primer on sovereign debt buybacks and swaps. IMF Working Paper.

Maynard, T. (2008): Climate Change: Impacts on Insurers and How They Can Help With Adaptation and Mitigation. In: The Geneva Papers. Vol. 33 (2008). Pp. 140-146.

MIGA News 26 November 2002. <http://www.miga.org>

Mileti, D. S. (Ed.) (1999) Disasters by Design: A Reassessment of Natural Hazards in the United States. Joseph Henry Press, Washington DC.

Mills, E. (2007). From risk to opportunity: 2007. Insurer responses to climate change. CERES report, October 2007. <http://insurance.lbl.gov/opportunities>.

Muller B., Hepburn C. (2006) IATAL – an outline proposal for an international Air Travel Adaptation Levy. Oxford Institute for Energy Studies.

Munich Climate Insurance Initiative (MCII) (2009) Ideas for Institutional Set-Up of Risk Reduction and Insurance. Discussion paper for the Bonn III Climate Negotiations. Bonn.

Munich Climate Insurance Initiative (MCII) (2008) Proposal to the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA). International Insurance Mechanism: A proposal for the Copenhagen Agreed Outcome. Submission to the UNFCCC on 6 December 2008. 4th session of the AWG-LCA. Poznan 1-13 December, 2008.

<http://unfccc.int/resource/docs/2008/smsn/ngo/033.pdf>

Accessed: 28 August 2009

Munich Re Foundation (2008) Microinsurance Conference 2008: Making insurance work for the poor. 5 – 7 November 2009. Cartagena, Columbia. Edited by Zahid Qureshi and Dirk Reinhard. Munich.

Munich Reinsurance Company (2007) Topics: Natural Disasters. Annual Review of Natural Disasters 2006. Munich, Munich Reinsurance Group.

Morduch, J. (2005) Consumption smoothing across space: Testing theories of risk sharing in the ICRISAT study region of South India. In Dercon, S. (Ed.) 2005. Insurance Against Poverty. A study prepared by the World Institute for Development Economics Research of the United Nations University (UNU-WIDER). Oxford: Oxford University Press.

Müller, B. (2008) International Adaptation Finance: The Need for an Innovative and Strategic Approach. Oxford Institute for Energy Studies, EV 42, June.

OECD (2007) Lessons learnt from experience with Debt-for-Environment Swaps in economies in transition, Paris.

OECD (2008) Economic aspects of adaptation to climate change, Paris.

Osgood, D.E, Suarez, P., Hansen, J., Carriquiry, M. and Mishra, A. (2008) Integrating Seasonal Forecasts and Insurance for Adaptation among Subsistence Farmers: The Case of Malawi. Policy Research Working Paper No. 4651. World Bank, Washington, DC.

Oxfam America, Private Sector Team (2009) Drought Micro-insurance in Ethiopia: An Innovative Model to Increase the Resilience of the Poorest Households. Prepared for the UNFCCC Technical Workshop held 27-28 April in Cairo, Egypt.

Patt, A. Peterson, N, Carter, M., Velez, M, Hess, U., Pfaff, A. and Suarez, P. (2008) Making Index Insurance Attractive to Farmers. Paper presented at a workshop on “Technical Issues in Index Insurance“, held 7-8 October 2008 at IRI, Columbia University, New York.

Available at: <http://iri.columbia.edu/csp/issue2/workshop>

Rinne P. (2008) Climate Change Adaptation www.climateactionprogrammeme.org

RMSI (2008) Mainstreaming climate risk management for agriculture sector in the Philippines, Report for the World Bank.

Sachs J. (2009) Boost the developing world. Nature, Vol.457, February.

Schnarwiler R. (2008) Disaster Risk Financing: Reducing the Burden on Public Budgets. Proc. IDRC , Davos.

Shah H., Wagh S., Woo G. (2009) Perspective of Indian Diaspora towards catastrophe micro-insurance.

Skees, J.R., Barnett, B.J and Murphy, A.G. (2008) Creating insurance markets for natural disaster risk in lower income countries: The potential role of securitization. *Agricultural Finance Review* 68: 151-167.

Skees, J., Varangis, P., Larson, D.F., Siegel, P. (2005) Can financial markets be tapped to help poor people cope with weather risks? In Dercon, S. (Ed.) 2005. *Insurance Against Poverty. A study prepared by the World Institute for Development Economics Research of the United Nations University (UNU-WIDER)*. Oxford: Oxford University Press.

Smith, J. (2007) Preliminary estimates of additional investment and financial flows needed for adaptation in 2030. Presentation 28 August 2007 in Vienna to the Dialogue on Long-Term Cooperative Action, Vienna. Stratus Consulting, Inc.

Solomon, S., Qin, D., Manning, M., Alley, R.B., Berntsen, T., Bindoff, N.L., Chen, Z., Chidthaisong, A., Gregory, J.M., Hegerl, G.C., Heimann, M., Hewitson, B., Hoskins, B.J., Joos, F., Jouzel, J., Kattsov, V., Lohmann, U., Matsuno, T., Molina, M., Nicholls, N., Overpeck, J., Raga, G., Ramaswamy, V., Ren, J., Rusticucci, M., Somerville, R., Stocker, T.F., Whetton, P., Wood, R.A. and D. Wratt (2007): Technical Summary. In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M. Averyt, K.B., Tignor, M. and Miller, H.L. (eds.) *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.

Suarez, P., Linnerooth-Bayer, J. and Mechler, R. (2007) *The Feasibility of Risk Financing Schemes for Climate Adaptation: The case of Malawi*, DEC-Research Group, Infrastructure and Environment Unit, Washington DC: The World Bank.

Swiss Re (2007) *Sigma*.

Tammelin, B., The World Bank, UNISDR (2006) *Strengthening the NMHS in Southeast Europe: Meteorological and Hydrological Information Sharing – Status Needs, Capacity Building*.

Te Velde, D.W. (2008) *The global financial crisis and developing countries*. ODI Report, London.

UNECLAC (2001) *Debt for Nature: a swap whose time has gone?*

UNDESA (2007) *Developing Index-Based Insurance for Agriculture in Developing Countries*. Innovation Briefs No. 2. United Nations – Department of Economics and Social Affairs, New York, NY. Available at: <http://www.un.org/esa/sustdev/publicationsinnovationbriefs/no.2.pdf>

UNIDO (2003) *Debt swaps*. Working paper No.1., Vienna, Austria.

UNISDR (2009) *Global Assessment Report*. Geneva

United Nations International Strategy for Disaster Reduction (UNISDR) (2007) from <http://www.unisdr.org/disaster-statistics/impact-economic.htm>
Accessed: 28 August 2009.

UNISDR 2005. *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. Final Report of the World Conference on Disaster Risk Reduction A/CONF.206/6. 18-22 January 2005, Kobe Japan.

UNFCCC (2007) *Bali Action Plan* from http://unfccc.int/meetings/cop_13/items/4049.php

UNFCCC (2009) Fulfilment of the Bali Action Plan and components of the agreed outcome. Available at: <http://unfccc.int/resource/docs/2009/awqlca5/eng/04p02.pdf>

Ward, R. E.T., C. Herweijer, N. Patmore, R. Muir-Wood (2008): The Role of Insurers in Promoting Adaptation to the Impacts of Climate Change. In: The Geneva Papers. Vol. 33 (2008). Pp. 133-139.

Warner, K., Spiegel, A. 2009a. Climate change and emerging markets: The role of the insurance industry in climate risk management. In: The Geneva Reports Risk and Insurance Research. www.genevaassociation.org. No. 2. The Insurance Industry and Climate Change—Contribution to the Global Debate. July 2009.

Warner, K., Ranger, N., Surminksi, S., Arnold, M., Linnerooth-Bayer, J., Michel-Kerjan, E., Kovacs, P., Herweijer, C. 2009b. Adaptation to climate change: Linking disaster risk reduction and insurance. A policy paper prepared for the 2009 Climate Negotiations. Bonn, Germany. Produced in close collaboration with the UN International Strategy for Disaster Reduction (UN ISDR) and the United Nations University.

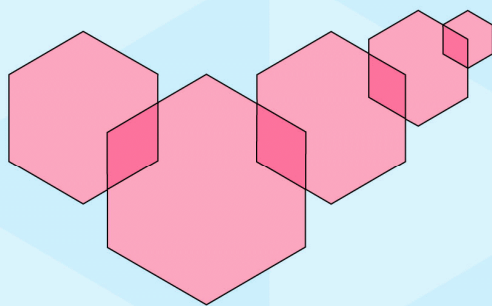
Warner, K., Bouwer, L.M., Ammann, W. 2007. Financial services and disaster risk finance: Examples from the community level. Environmental Hazards. 12pp. 10.1016/j.envhaz.2007.04.006

Weitzmann M. (2008) On modeling and interpreting the economics of catastrophic climate change. From www.economics.harvard.edu/faculty/weitzman/files/REStatFinal.pdf

Woods N. (2008) The silent revolution in development assistance. International Affairs, Vol.84, No.6.

World Bank (2007) World Development Report 2008: Agriculture for Development. World Bank. Washington, DC.

Young, S., Warner, K., Iyehen, E. (2009) Institutional Options for Climate Risk Insurance. Draft Discussion Document for AOSIS Grenada Meeting. 25 July 2009. CaribRM and MCII.



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