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DRAFT
All comments welcome

Climate Insurance as part of a Post-Kyoto Adaptation Strategy

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Abstract

The 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. This paper examines the case for insurance mechanisms by addressing two fundamental questions: *whether* climate insurance programs should be part of an international adaptation strategy, and if so, *how*? Our discussion suggests that there is a promising and legitimate role for insurance mechanisms in an adaptation regime. We draw this conclusion in full recognition that insurance is not appropriate in all contexts, and that it must be viewed as only part of a comprehensive risk-management program. The challenge becomes how developed countries can provide support to promote sustainable, affordable and incentive-compatible insurance programs for vulnerable households, SMEs and governments without crowding out private sector involvement. In meeting this challenge, this paper concludes by presenting a proposal for a two-pillar (prevention and insurance) international risk-management strategy as part of an adaptation regime – a proposal that has recently been put forward by the Munich Climate Insurance Initiative.

1. Introduction

Insurance and other financial instruments that provide economic security against droughts, floods, tropical cyclones and other weather extremes have emerged as an opportunity for developing countries in their concurrent efforts to reduce their vulnerability to weather variability and adapt to climate change. This opportunity is due to a number of recent innovations: Technological advances make it possible to model and price risks with low-probability but high loss potentials; index-based insurance contracts provide a low-cost alternative to traditional loss-based insurance (Hess, et al., 2005); novel mechanisms for transferring catastrophe risks to the global financial markets are opening new windows for reinsurance arrangements; and donor-supported public-private partnerships are providing affordable insurance cover to low-income clients (Linnerooth-Bayer, et al., 2005). Emerging financial risk management opportunities for the developing world, although not a panacea for adapting to increasing climate risks, are demonstrating their potential for reducing the effects of weather extremes on national economies and providing security for investments as an important precondition to escape poverty. Many

donor governments, and including the European Commission,¹ are thus re-orienting from post-disaster assistance to supporting pre-disaster financial instruments.

Taking stock of this opportunity, and forging an appropriate role for risk-pooling and risk-transfer mechanisms within an adaptation strategy, is timely and urgent. The recent Bali Action Plan or roadmap 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). 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.

Risk sharing and transfer

Societies have many ways to *share or pool* risks. For example, an insurance company with many policies in a hurricane-prone area might form a risk sharing or pooling arrangement with an insurance company in a tornado-prone area. Should a severe hurricane season occur, the latter company will share some of the loss with the former, and vice versa. On a more informal level, a household in one village may form a risk-sharing arrangement with relatives in a far-away village that is not exposed to the same hazards. Or, a government may form a solidarity fund to provide assistance to low-income victims after a disaster occurs. There are no premiums paid, yet arrangements are put into place before the disaster. This contrasts with (usually ad hoc) post-disaster *loss-sharing* arrangements, usually in the form of humanitarian assistance.

Alternatively, risks can be *transferred* through market payments. An insurance company may transfer its hurricane risk to a reinsurer, or a farmer may transfer its risk by purchasing commercial insurance. Besides insurance, there are alternative risk transfer (ART) arrangements. One such arrangement is a *catastrophe bond*, which is an instrument whereby the investor receives an above-market return when a specific catastrophe does not occur (e.g. an earthquake of magnitude 7.0 or greater in a pre-defined area), but shares the insurer’s or government’s losses by sacrificing interest or principal following the event. Another instrument is *contingent credit*, which requires a pre-event fee to secure a pre-defined post-event annuity. Risk pooling and transfer can be combined. For example, the Caribbean states have recently formed a catastrophe pool covering their flood and hurricane risks, and transferred part of their collective risk by purchasing reinsurance and issuing a catastrophe bond.

Although *insurance* is defined as the transfer of the risk of a loss from one entity to another in exchange for a premium, it should be recognized that risk pooling and sharing commonly form the basis of insurance contracts (e.g., insurance pools).

¹The European Commission has recently allocated €25 million for a trust fund to support the Global Index Reinsurance Facility (GIRF), which is a new risk-taking entity that will (re)insure governments, banks and primary insurers in developing countries.

If risk-sharing and -transfer instruments are to be included in the post-2012 adaptation strategy, the role of insurance must be urgently established (see Harmeling and Bals, 2008). Although proposals for insurance instruments have been put forward, and even tabled in the negotiation process (e.g., the AOSIS proposal for an International Insurance Pool, A/AC.237/15), their precise role in an adaptation strategy is still largely undetermined. Many issues concerning their effectiveness for assisting adaptation remain unresolved. The purpose of this paper is to help define this role by addressing two fundamental questions: *whether* climate insurance programs should be part of an international adaptation strategy, and if so, *how*? To provide insights on these questions, it is necessary to further ask:

- How are developing countries affected by weather variability and extremes, and what is the attribution of climate change to these risks?
- Under what circumstances is it advisable for low-income households, SME's and governments to insure against climate-related risks?
- What is experience with insurance instruments and programs in developing countries?
- Can climate insurance be designed such that it contributes to adaptation instead of mal-adaptation?
- What principles should guide outside support for insurance programs?
- Can climate insurance play a constructive role in an adaptation regime, and, if so, what are options for more precisely defining that role?
- What are possible next steps forward on the part of governments pursuing the implementation of the Bali Action Plan?

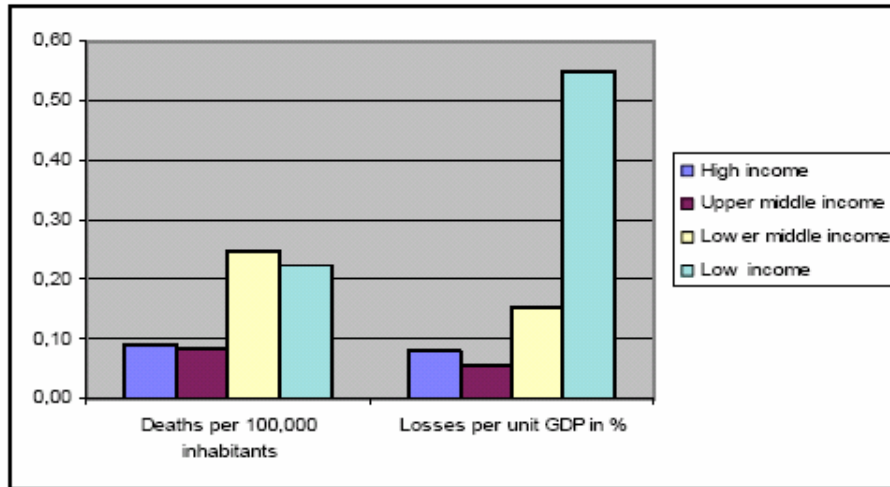
By addressing these questions in the sections to follow, we examine the case for insurance instruments as *one* strategy for adapting to climate change. We conclude that there is a promising and legitimate role for insurance instruments in an adaptation regime. This conclusion is based on full recognition that insurance is not appropriate in all contexts, and that it must be viewed as only a *part of a comprehensive risk-management program*. We also recognize that national and international support, especially premium subsidies, has a propensity to distort price signals, promote mal-adaptation and crowd out private insurance initiatives; yet, we argue that it may be essential in enabling insurance in developing countries, especially for the most vulnerable people. The challenge becomes how to provide international support that promotes sustainable and affordable insurance programs that set incentives for disaster prevention and encourage private sector involvement. In meeting this challenge, this paper concludes with a suggestion for a two-pillar international risk-management strategy for the most vulnerable countries as part of an adaptation regime – a suggestion that has recently been put forward by the Munich Climate Insurance Initiative (MCII, 2008).

2. How are developing countries affected by weather variability and extremes, and what is the attribution of climate change to these risks?

In the past quarter century over 95% of deaths from natural disasters occurred in developing countries, and direct economic losses (averaging US\$100 billion per annum in the last decade) in relation to national income were more than double in low-income

versus high-income countries (Munich Re, 2007). As pictured in Figure 1 a disproportionate share of economic and human burdens fall on low-income and lower middle-income countries.

Figure 1: Deaths and economic losses of weather disasters 1996-2005 according to country income groups



Germanwatch, Climate Risk Index, 2007
 (Sources: Munich Re NatCatSERVICE and World Bank).

Figure 1 pictures immediate direct losses, but does not show the long-term consequences of disasters on economic development, which can greatly amplify both the economic and human losses. Due to limited tax bases, high indebtedness and low uptake of insurance, many highly exposed developing countries cannot fully recover from slow- and sudden-onset disasters by simply relying on limited external donor aid (Mechler, 2004). In turn, external investors are wary of the risk of catastrophic infrastructure losses, and small firms and farmers cannot receive the credit necessary for investing in higher yield/higher risk activities. This leads to slowed economic recovery. For example, five years after the devastation of Hurricane Mitch in 1998, the GDP of Honduras was 6% below pre-disaster projections. Donor pledges of US\$ 2.7 billion were considered exceptionally high, but amounted to only about half of the estimated total reconstruction costs (Mechler, 2004).

More than three-quarters of recent economic losses can be attributed to windstorms, floods, droughts and other climate-related hazards (UNISDR, 2007). Experts generally agree that under all linear scenarios of future climate change, increasing losses in the coming decades will be dominated by changes in populations and wealth (Workshop on “Climate Change and Disaster Losses: Understanding and Attributing Trends and Projections”, 2006). In addition, the Intergovernmental Panel on Climate Change (IPCC) has predicted that climate change will magnify these losses because of increasing weather variability, and that overall extreme event impacts are ‘very likely’ to change (Solomon, Qin, et al., 2007). Although no one storm or flood can be attributed to climate change, it is expected that the odds of these events occurring will increase (see box below). There is even mounting evidence of a current “climate signal” with the IPCC reporting

observations of widespread changes in temperature, wind patterns and aspects of extreme weather, including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones (Carter, et al., 2007). This evidence is most strongly documented in the case of hurricanes, cyclones and heat waves (Barnett, et.al, 2005; Stott, et.al, 2004; Emanuel 2005).

Climate change: loading the odds

Scientists cannot attribute any particular storm or other event to a changing climate, but they can present evidence on the contribution of climate change to the risk of climate variability and extremes. By way of analogy, if we throw a loaded die and “six” appears, we cannot ascertain whether the “six” is due to loading, or not. We can only say that the probability of throwing a “six” is increased.

In sum, climate-related variability and extremes are imposing disproportionately large human and economic burdens on developing countries, and these losses are amplified by the inability of these countries to raise sufficient post-disaster capital for the recovery process. There is mounting evidence that climate change is adding to this burden, and the IPCC expects this attribution to increase over time.

3. Under what conditions is insurance advisable for helping low-income households, SME’s and governments adapt to climate-related risks?

While valuable in reducing the long-term effects of climate disasters on poverty and development, insurance instruments, particularly if left entirely to the market, cannot be a panacea for adapting to climate change. There are many reasons, including:

- Insurance is generally not appropriate for very slow-onset climate impacts, such as sea-level rise and desertification, which are considered uninsurable. Other instruments are needed in this case.
- Without government or donor support, private insurance is not easily affordable by governments, households and SMEs in highly exposed and vulnerable countries, where the opportunity costs of private risk-financing instruments can be prohibitively high in terms of meeting other human needs.
- Many developing countries lack an insurance tradition and market, which will take time to develop.
- Relying on market instruments (without donor support) will likely serve wealthier clients and not those most vulnerable to climate change.
- Perhaps most importantly, insurance must be considered within an overall risk-management and adaptation strategy in order to avoid counterproductive behaviour or “mal-adaptation” because of the security provided by an insurance contract (*moral hazard*). The two top priorities are avoiding dangerous climate change and preventing human and economic losses.

The benefits of insurance must be viewed together with the costs, keeping in mind the urgent need for other types of adaptation measures. By spreading losses temporally and

geographically, and assuring timely liquidity for the recovery and reconstruction process (which can, itself, save lives and livelihoods), insurance is beneficial to those in the risk pool. The costs include anticipated losses, and also the expense of doing business (transaction costs) and holding sufficient capital or reinsurance to cover losses (capital costs). Unlike other types of insurance (e.g., life or health), catastrophes affect whole regions or countries at the same time (co-variant risk). The insurer's cost of backup capital, diversification or re-insurance to cover co-variant claims can raise the premium far above the "actuarial fair price" or the client's expected losses. This means that over the long run insured clients can - on average - expect to pay more than their anticipated losses.

Insurance rationale

If insurance premiums cost clients more than their anticipated losses, and sometimes significantly so, what is the rationale for governments, household and farms to insure? The textbook rationale for insurance is based on the concept of "risk aversion" (see box below). Risk-averse persons prefer less consumption if it is steady to higher consumption if it is highly irregular or even subject to catastrophic shortfalls. Even risk-averse agents, however, should not purchase insurance if they have lower cost alternatives for providing post-disaster security. These may include accumulated assets/savings, post-disaster borrowing, kinship arrangements and government/donor support. These alternatives appear to work reasonably well for low-loss events, but are often unreliable and inadequate for catastrophic events (Cohen and Sebstad, 2003). Facing large losses, households may be forced to sell productive assets at very low prices; post-disaster inflation may greatly reduce the value of savings; money lenders may exploit their clients; entire families, even if geographically diverse, may be affected; and donor assistance rarely covers more than a small percentage of losses (Mechler, et al., 2006).

Weather risk destabilizes households and countries and creates water insecurity (Windfuhr and Bals, forthcoming). In the Southern African Development Community (SADC), as a case in point, floods, cyclones and droughts have been a major cause of hunger affecting more than 30 million persons since 2000. Governments and donors react to these shocks rather than pro-actively managing the risks. These emergency reactions have been criticized for being ad hoc, sometimes untimely and destabilizing local food markets (Hess and Syroka, 2005a).

Similarly, many highly exposed developing country governments do not have the means to finance the recovery costs of catastrophic disasters and could greatly benefit from transactions, like those in Ethiopia and Mexico. Least-developed countries can hardly afford the technical analyses and other start-up costs for insurance systems without support from outside. Scaling up will prove costly, especially since disaster risks, unlike health or accident, affect whole regions at the same time and thus require spatial diversification, reinsurance and/or large capital reserves.

Likewise, if governments do not have the necessary infusion of capital after a disaster to rebuild critical infrastructure and assist households and businesses with their recovery, the indirect costs can greatly exceed the direct losses from the disaster. Such delays can

lead to secondary economic and social effects, such as deterioration in trade, budget imbalances and increased incidence of poverty.

Risk aversion

Agents are risk averse if they are willing to pay more than their expected losses to avoid the risk of incurring very large losses at one time. This rationale is highly relevant for poor households and farms, where a large loss (e.g., the loss of crops from a drought) can threaten livelihoods and lives if victims cannot rely on informal risk-financing and self-insurance mechanisms. Meso-scale agents, such as microfinance institutions, marketing cooperatives and even donors, are risk averse if they cannot easily recover from large co-variant losses (e.g., if a drought leads to massive loan defaults). In contrast to individuals, developed countries' governments are often not, in theory, risk averse, and thus in most circumstances should not purchase insurance, but rather self-insure (in Sweden insurance for public assets is illegal). This is the result of a well-known theorem by Arrow and Lind (1970), who give two reasons for the risk neutrality of the public sector: If the government spreads its risk over its citizens (most usually by means of taxation), the expected and actual loss to each individual taxpayer is minimal due to the sheer size of the population. Moreover, a government's relative losses from disasters in comparison with its assets may be small if the government possesses a large and diversified portfolio of assets.

Neither of these reasons applies to highly exposed, small or low-income countries that have over-stretched tax bases and highly correlated infrastructure risks (Mechler, et al, 2006). Realizing the shortcomings of after-the-event approaches for coping with disaster losses, sovereign insurance may become an important cornerstone for tackling the substantial and increasing effects of natural disasters (Gurenko, 2004). This message became clear to the Mexican authorities after experiencing the 1985 earthquake in Mexico City. Colossal expenses on rehabilitation and reconstruction resulted in an increase in the fiscal deficit of \$1.9 billion over the next four years. As a result Mexico recently engaged in an international risk-transfer transaction to provide financial protection to its public sector (Cardenas, et al., 2007).

Beyond post-disaster benefits, insurance provides pre-disaster security necessary to take on productive but risky investments (Höppe and Gurenko, 2007). Due to high uninsured risk exposure, households, businesses and farmers may adopt low-risk, low-return strategies (e.g., placing relatives in low-paid but secure employment or planting low-yield drought-resistant seeds). This reduces their ability to accumulate the assets needed to escape poverty through savings and investment. In the words of agricultural insurance experts:

...those with few assets may accurately perceive that time is not an ally in their daily struggle to climb out of poverty... (those with assets may) suffer uninsured asset losses that suddenly cast them into poverty and possibly onto a downward spiral from which they have a difficult time re-emerging. These themes from the emerging literature on poverty traps underscore the relation between risk and

persistent poverty, as well as the opportunities afforded by innovations in risk management. (Barnett and Skees, forthcoming)

In sum, insurance is not appropriate in all contexts. Without outside support it will generally increase, not decrease, the expected (average) financial cost of disasters to those in the insurance pool. In cases where agents (households, farms and governments) have lower cost alternatives to providing post-disaster liquidity after disasters, insurance may not be advisable. In many contexts, however, these alternatives are ineffective (especially for large catastrophes), in which case agents should weigh the benefits of insurance with the costs. These benefits include, first and foremost, security against the wholesale loss of assets, livelihoods and even lives in the post-disaster period. Insurance not only provides the liquidity to smooth disaster shocks, but by enabling productive investments has the added benefit of helping high-risk agents escape disaster-induced poverty traps.

4. What is experience with insurance instruments and programs in developing countries?

Catastrophe insurance is playing an increasingly visible role in developing countries (Linnerooth-Bayer and Mechler, 2007 a,b,c). Novel and imaginative programs are demonstrating their potential to pool economic losses and smooth incomes of the poor facing weather variability and climate extremes, as well as transfer risks to the global capital markets. For the most part, these schemes are affordable due to outside support. They provide insurance to (1) farmers, property owners and small businesses (micro scale), (2) to donor agencies charged with providing disaster relief (mesa scale), as well as to (3) governments by transferring their risks to the global capital markets (macro scale). A few examples serve to illustrate:

At the micro-scale:

- In *Malawi*, smallholder farmers can purchase affordable index-based drought insurance, where, unlike traditional claims-based insurance, indemnity is based on an index of rainfall measured at a local weather station. By making farmers more creditworthy, this pilot loan/insurance scheme enables farmers to purchase hybrid seeds, and thus greatly increase their productivity. Moreover, insurance claims are paid when drought becomes imminent, but generally before hunger and other consequences take their toll. This timely liquidity can enable adaptive behaviour (for example, planting a second crop) (Suarez, et al., 2007; Hess and Syroka, 2005a);
- Similarly, herders in *Mongolia* can purchase an index-based insurance policy to protect them against livestock loss due to extreme winter weather or *dzuds*. A recent pilot program combines self-insurance, market-based insurance and social insurance. Herders retain small losses that do not affect the viability of their business (self-insurance), while larger losses are transferred to the private insurance industry (market-based insurance) and only the final layer of catastrophic losses is borne by the government with backing from the World Bank (social insurance) (Skees, et al., 2008; Skees and Enkh-Amgalan, 2002);
- The World Bank has also absorbed layers of *Turkey's* earthquake risk to enable an affordable nation-wide insurance program. This is the first time that the international

development community has provided pro-active risk-financing support to a developing country (Gurenko, et al., 2006).

Similarly, at the meso scale:

- The World Food Programme issued a novel parametric weather derivative or catastrophe bond to assure sufficient funds to the *Ethiopian government* to protect the livelihoods of Ethiopia's vulnerable drought-exposed populations (investors purchase a bond that pays an above-market interest rate if rainfall exceeds a specified level, but which pays part of the principal to the Ethiopian government if rainfall is below this level). This insurance instrument holds large promise for supporting institutions that have traditionally provided humanitarian assistance (Hess, 2006).

And at the macro scale:

- The *Mexican government* is the first to issue a catastrophe bond to partly insure its catastrophe fund and thus reduce its risk of large fiscal deficits following disasters. This bond transfers sovereign risk directly to the world's capital markets (Cardenas, et al. 2007);
- The *Caribbean island states* have recently formed the world's first multi-country catastrophe insurance pool to provide governments with immediate liquidity in the aftermath of hurricanes or earthquakes. There is a largely untapped potential for pooling uncorrelated risks of country governments ill prepared to respond to disasters with their own means (Ghesquiere, 2006).

At a recent expert workshop on *Insurance Instruments for Adaptation to Climate Risks*² in Laxenburg, Austria, these risk-pooling and risk-transfer programs were examined by those most familiar with them. The participants noted that experience is too short to judge if internationally backed public/private systems are viable in the long haul, but as pioneering "test balloons" (and some are beyond the testing phase) they may radically change the way development organizations provide disaster aid and support adaptation to climate change. For the most part, these programs directly or indirectly target the most vulnerable (see box below). Importantly, without exception they have received technical and/or financial support from international development and donor organizations.

The potential is large. Insurance still reaches only a small fraction of vulnerable communities and governments; for instance, over 40% of farmers in the developing world face weather-related threats to their livelihood (World Bank, 2005), and yet those benefiting directly from micro-insurance systems number in the thousands.

² An expert workshop, *Insurance Instruments for Adaptation to Climate Risks*, organized jointly by the International Institute for Applied Systems Analysis (IIASA), Munich Re, the German Agency for Technical Cooperation (GTZ) and the World Bank, and as part of the activities of the Munich Climate Insurance Initiative (MCII), took place at IIASA in Laxenburg, Austria, on Sept. 24-5, 2007.

Who are the most vulnerable?

In the UNFCCC context there is broad agreement that adaptation support should focus on the "most vulnerable countries", but to date there are no established criteria to identify these countries. It is remarkable, thus, that the final text of the Bali Action Plan specifies particularly vulnerable countries, namely the least developed countries (LDCs) and the small island developing States (SIDS), with separate mention of African countries "affected by drought, desertification and floods". However, the Bali Action Plan does not provide clear and agreed indicators on their particular vulnerabilities, as well as on how adaptation financing should be made available. Subsequently, Egypt has called for "the submission of a list of the most vulnerable countries affected by climate change", and on behalf of the LDCs, the Maldives have proposed the "development of vulnerability index criteria to assess the adaptation needs of LDCs, SIDS and African drought- and flood-prone countries for preferential treatment in accessing the funds in the future climate regime". (UNFCCC 2008: 33; see Harmeling and Bals, 2008)

For purposes of this discussion on *insurance instruments*, the most vulnerable households, farmers, business persons and governments might be considered those who are exposed to unavoidable risks for which they cannot afford to be in a formal or informal insurance pool. This might be subsistence farmers facing droughts, slum dwellers facing landslides, or governments of low-income developing countries facing multiple perils. In each case, vulnerability depends on the hazard, the extent of exposed persons, assets and livelihoods, as well as the ability of those exposed to engage in formal insurance arrangements. With these inputs IIASA has developed a model (CATSIM) that can inform users of the point (e.g., the 100 year flood) when governments or households face a liquidity gap, which might be a useful measure of financial vulnerability (Mechler, et al, 2006)

5. Can climate insurance be designed such that it contributes to adaptation instead of mal-adaptation?

In the context of weather variability and extremes, adaptation can be thought of as reducing risks to property, assets, livelihoods and lives. This can take many forms, including:

- physical interventions, e.g., flood defences or early warning systems;
- lifestyle changes, e.g., relocating or changing livelihoods; training for early warning systems;
- strategies for recovery, e.g., formal and informal insurance.

Insurance is generally not viewed as a measure to prevent loss of life and property, and for this reason it is commonly viewed as an alternative to adaptation, not an integral part as suggested here. This view overlooks the long-term preventive benefits of insurance. By enabling recovery, insurance can significantly reduce long-term indirect losses, even human losses, which do not show up in the disaster statistics.

This view also overlooks the propensity of well-designed insurance to provide strong incentives for physical interventions and lifestyle changes that reduce disaster risks. A few examples illustrate: Apartment owners in Istanbul, who choose to disaster-proof their

properties, pay less insurance premium making investments more attractive; Mongolian farmers, who insure their livestock, will face increasing premiums as climate change worsens weather conditions - giving them an added incentive to change livelihoods if animal husbandry becomes unproductive; in Thailand, designers of an index-based flood insurance system anticipate that middle-class property owners will relocate out of the high-risk areas; and Mexican government officials face higher interest on their catastrophe bonds if they do not take measures to reduce risks to public infrastructure. Well-designed insurance is thus not an alternative to adaptation measures, but it is an adaptation measure in the strictest sense.

Poorly designed insurance contracts, on the other hand, can discourage investments in loss prevention or even encourage negligent behaviour, commonly referred to as “moral hazard” or “mal-adaptation”. Insurers guard against moral hazard by requiring deductibles or co-insurance such that the insured incur part of their losses. Outside assistance, especially in the form of premium subsidies, can distort the price signal and in this way weaken incentives for taking preventive measures. If premiums do not fully reflect risks, they may perpetuate vulnerability by making it possible to remain in high-risk occupations or locations. Thus, bad design, ill-conceived external assistance and insurer behaviour have the potential to encourage mal-adaptation.

A major advantage of index-based insurance schemes is their avoidance of moral hazard. Mongolian farmers can only gain by taking measures to protect their herds against adverse winter weather since insurance claims are based on average livestock loss in designated regions. Finally, while index insurance discourages “bad risks”, it can paradoxically encourage “good risks”. In Malawi, for example, the insurance contract has enabled farmers to plant riskier but higher yield crop varieties. In this case, not only does insurance smooth the incomes of farmers facing weather variability, but it actually provides them the safety net necessary for riskier and more productive activities - ultimately reducing vulnerability to weather shocks and thus contributing to adaptation. This point cannot be overemphasized. In the words of an expert on the Malawi index insurance project:

We want farmers to adopt high return technologies that allow them finally to make the leap and accumulate earnings over time. Systemic risk is **the** factor impeding this and so far banks cannot handle the risk and the high transaction costs in rural areas. The Malawi transaction shows that there is a sustainable way to take the big rocks out of the way—drought risk—and clear the path to development. (Ulrich Hess, 2006)

This same “investment effect” operates at the national level. If governments can reassure outside investors that disasters will only temporarily disrupt critical infrastructure, this will create a more secure environment for attracting international capital.

In sum, well designed insurance reduces disaster losses in two ways: By providing early liquidity, long-term loss of livelihood and lives is prevented; by pricing risk, strong incentives are set for pre-disaster preventive behaviour. However, ill-conceived external

assistance for risk premium and inflexible insurer behaviour can result in an incentive for mal-adaptation. Because of the absence of moral hazard, index-based systems are particularly promising as instruments for adaptation.

6. What principles should guide outside support for insurance programs?

While the benefits of catastrophe safety nets are uncontested, the role of outside assistance for insurance instruments is controversial. Opponents rightly argue that support in the form of subsidies can distort the price signal and encourage mal-adaptation; support in the form of reinsurance can crowd out the role of the private market. Proponents argue that the market often fails to provide “correct” price signals, and that enabling insurance for the poor can create a role for the private sector by encouraging public-private partnerships. We proceed by examining the current role of the private sector, the advantages and disadvantages of public-private partnerships, and conclude with principles for guiding outside assistance.

- *Private market provision of insurance*

Is outside support always necessary to insure the poor, or will insurance emerge autonomously from market forces? There are scattered examples of micro-insurance schemes that offer catastrophe cover without outside support. These schemes are viable due mainly to very low cover. For example, Proshika, a large MFI in Bangladesh, offers compulsory group-based disaster insurance to its clients. Under this program 2% of the savings balance is annually transferred to a fund that will pay twice the amount of the savings deposit in the case of property damage due to disasters, while savings stay intact. The scheme operates without reinsurance or donor support. With more than two million clients in 20,000 villages and 2,000 slums, this insurance fund has wide geographic diversification. But the indemnity payments are only twice the amount in the savings account, which will likely be only a small percentage of disaster damage.

Observers point to Malawi as a micro-insurance system that operates with only minimal start-up assistance from the international community. Insurance in the Malawi pilot project protects the farmer and bank against a loan default, and the premium can easily be paid by the five-fold foreseen productivity increase of the hybrid seeds made possible by the loan. However, extending cover to provide security against drought-induced food scarcity (livelihood insurance) would be largely unaffordable by Malawi’s smallholder farmers. This risk cannot be covered by the private market acting alone, and is currently absorbed by post-disaster emergency food programs on the part of the World Food Programme, FAO and other donors. Emergency food assistance, while currently indispensable for humanitarian reasons, not only disrupts local food markets, but gives farmers little incentive to their diversify crops or livelihoods, activities that render them less vulnerable to droughts.

- *Outside support through internationally backed public-private partnerships*

The inability of the poor to afford sufficient insurance cover and the reluctance of the private market to commit capital and expertise to the low-income market can be overcome by forming partnerships with insurers, governments and NGOs, with support

from bi-lateral and multi-lateral development/donor organizations. Recent experience illustrates diverse roles that these partners can play.

In Mongolia, a syndicate pooling arrangement protects the under-developed insurance industry against extreme losses and insolvency. The government supports this syndicate by absorbing the losses from very infrequent extreme events (over 30% animal mortality), and it can call upon a World Bank contingent debt arrangement to back this commitment (Skees, et. al., 2008). The designers of this program argue that subsidizing the “upper layer” is less price distorting than subsidizing lower layers of risk because the market may fail to provide insurance for this layer. On the demand side, most people, including Mongolian farmers, tend to underestimate very low probability events; on the supply side, insurers tend to charge premiums above the market price because of the large ambiguities in the risk estimates.

Commercial reinsurers have to date been reluctant to commit significant capital and underwriting expertise to develop micro-insurance programs, although they are absorbing the low-probability/high-consequence layers of many recent public/private programs (for example, in Turkey, Ethiopia and Mexico). Exceptionally, Swiss Re in partnership with an NGO and academic research institute has insured about 150,000 smallholder farmers in Kenya, Mali and Ethiopia against drought through an index-based product. The insurance is purchased by the NGO with international backing, and other partners are being solicited to provide further financial support.

The reinsurance and catastrophe bonds that transfer risks from Mexico and Ethiopia to the international capital markets were made possible by outside technical support from IFIs and other types of start-up assistance. The same is true for the largely self-financing Caribbean Catastrophe Risk Insurance Facility (CCRIF), although, here too, donors have pledged significant capital to the reserve fund.

- *Advantages of international support for disaster insurance systems*

For governments and donor organizations, there are advantages to reorienting from providing post-disaster humanitarian aid to enabling public/private insurance systems. By sharing responsibility with individuals and the state, donors leverage their limited budgets and substitute a calculable annual commitment for the unpredictable granting of post-disaster aid. With donor-supported risk-transfer programs, developing country governments will rely less on debt financing and international donations, and assurances of the timely repair of critical infrastructure will attract foreign investment.

Moreover, for many in the developing world an insurance contract is preferred to humanitarian assistance. According to a developing country participant at the Laxenburg meeting:

Communities value disaster insurance not because it rewards them or makes them richer after a disaster. They value insurance because they see it as instrument of dignity. Financial support to recover from a disaster becomes their right without

sacrificing their self respect. It is far more dignified to claim your right for recovery than to find yourself dependent on the ad hoc generosity of donors. (Hari Krishna, 2007)

Most importantly, by making outside assistance or premium reductions contingent on requirements for prevention as part of a comprehensive risk management program, pre-disaster assistance can ultimately reduce the human and economic toll disasters take on the poor. This means that switching to pre-disaster donor aid, even at extra cost, can be an efficient long-term strategy because of its potential ultimately to reduce the need for humanitarian assistance.

- *Challenges of international support for disaster insurance systems*

Despite compelling arguments for internationally supported public/private partnerships, there are concerns that excessive public and international assistance will distort market prices and greatly jeopardize the incentive effects of insurance, crowd out private initiatives, and create unstable systems due to the inability of donor institutions to make long-term commitments.

Critics rightly point out that subsidized premiums in the US farm insurance program have weakened incentives to plant more robust crop varieties, or to move away from farming in high drought or flood risk areas (Skees, 2001). In the words of a US insurance expert participating at the Laxenburg meeting:

If the intent is to improve the wellbeing of farmers, it may be preferable to give them direct monetary transfers than to subsidize insurance premiums. A particularly “bad” subsidy is one that is proportional to the premium since the disincentive to change crop practices becomes greater as the risk (and premium) increases. Furthermore, given the political economy of subsidies, it is likely that any subsidy will benefit the larger farmers more than the smaller farmers. (Jerry Skees, 2007)

Tempering this argument is the fact that even donor-supported insurance has a greater incentive effect than the current practice of free post-disaster aid to disaster victims. Moreover, existing risk markets do not always reflect the “real” market price and thus give “optimal” price signals because of risk misperceptions and ambiguity in the estimates leading to distortions in demand and supply. Finally, the disincentives created by reduced-premium insurance might be compensated by linking support with vulnerability reducing measures and subsidizing only the “frictional” costs of insurance (see box below).

A related concern is that public or international involvement in the provision of insurance, even with “smart” subsidies, will impede the development of the private insurance market. Although private insurers and re-insurers are constrained in their ability to offer world-wide catastrophe risk coverage, there is still concern that public assistance will crowd out private operations.

Incentive compatible "smart" subsidies

Subsidies can take many forms, including assistance for marketing insurance products, absorbing layers of risk and directly paying or reducing premiums. One idea is to provide support for public/private systems only to the point that premiums do not fall below the “real risk” price, or expected loss. Insurance premiums are often significantly higher than expected loss for many reasons, including high administrative and capital costs incurred by insurers and their need of an extra premium to cover ambiguous risks (those that are difficult to quantify). These “frictional costs” can be several multiples of the actuarially fair value or real risk price. Donors could subsidize premiums and provide other means of support to eliminate the frictional costs but maintain the real risk price, which arguably is the proper signal for the insured to reduce their vulnerability, or adapt. For those unable to pay even the actuarially fair risk premium, their contribution might be in terms of actively contributing to risk reducing strategies, like constructing safety hills or installing rain-collection devices.

Commenting on the prospects of climate-related aid, a private-sector participant at the Laxenburg meeting said:

The weather index industry is tiny, and climate-related aid could be significant. Pouring large amounts of “smart” aid in at the top will put too much pressure on the system - like a “sausage machine”. It will be impossible to handle all the cash, and eventually the pressure to spend would render the subsidies as not smart at all. Even though my business potentially stands to gain from a significant influx of climate-related aid, the prospect terrifies me due to the potential for it to destroy or distort the commercial market. (Richard Leftley, 2007)

Private-sector actors also worry about outside support unfairly advantaging some private companies over others, or crowding out competing private companies altogether. While partnerships like the TCIP actually create an opportunity for the private market to carry out business, deep premium subsidies or ill-conceived public-private partnerships can prevent private companies from entering the market. This issue underlines the importance of the following proposed principles to guide the formation of public/private partnerships:

- For those who can afford the price of insurance, internationally supported partnerships should be limited to ensuring conditions for private insurance provision through competitive markets;
- For those who cannot afford sufficient insurance cover, internationally supported partnerships can legitimately intervene, but care should be taken not to significantly distort prices or competition. This can be achieved by designing highly socially targeted insurance products that serve only the designated segment of the population;
- For those who cannot afford any insurance cover, intervention may cover 100% of the premium value with the possibility of requiring in-kind payments through risk-reduction activities.

Insuring those who can and cannot afford full cover

The Malawi loan/insurance package, the Turkish Catastrophe Insurance Pool and the Caribbean Catastrophe Risk Insurance Facility are examples of insurance systems that target those who can afford the risk-based premium. In all cases, the product is kept affordable partly by limiting cover: in Malawi, the insurer will reimburse only the cost of the seeds; in Turkey, the TCIP will cover up to \$60,000 of damage that accrues to mainly middle-income property owners; and expected cover in the Caribbean is sufficient to address the liquidity needs of the government in the first few months following a natural catastrophe. International organizations have a role to play in this market, but many argue that this role should be limited to providing access and ensuring competition, for example, by providing assistance for establishing the product (the most difficult aspect of setting up the CCRIF was negotiating an agreement among governments), enabling access and setting up regulatory structures. In other words, internationally backed public/private partnerships should take utmost care to ensure unimpeded competitive market conditions.

Examples of insuring those who can afford a small premium but not the full risk-based market price include the Mongolian Index-Based Livestock Insurance Program and the Indian weather risk derivatives crop insurance program. Herders in Mongolia pay only a limited premium payment, insufficient to attract private insurance capital. Only outside support (donors or others “buying” part of the product) can create an attractive market for private insurers in the first several years of the program.

The extreme poor, who cannot afford even a small payment to an insurance system, are reliant on post-disaster humanitarian assistance from their governments or outside donors. One suggestion is that these persons be brought into an insurance system by allowing them to undertake risk-reducing activities as a substitute for a premium payment (see discussion in Bals, et al., 2007).

7. What role might insurance instruments play in a climate-adaptation regime?

The case for intervention is greatly strengthened by recent evidence that GHG emissions are contributing to increased weather variability and risks of extreme events, and disproportionately burdening vulnerable countries in the developing world. According to the climate convention’s principle of *common but differentiated responsibilities and respective capabilities* industrialized countries are obligated to absorb a portion of this burden. The question is how best to take on this responsibility.

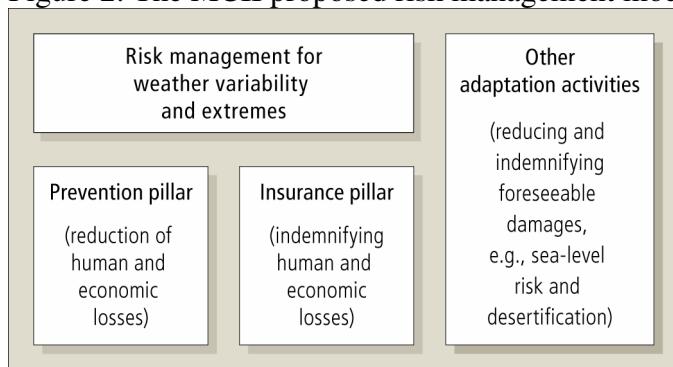
The recent Bali Action Plan or roadmap specifically calls for risk management and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance, as a means to address loss and damage in developing countries particularly vulnerable to climate change (Decision -/CP.13, Bali Action Plan). 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.

Although numerous proposals for insurance instruments have been put forward, and even tabled in the negotiation process (for example, AOSIS has called for an International Insurance Mechanism that would be an internationally-sourced pool of funds to help small island States manage financial risk arising from increasingly frequent and severe extreme weather events), their precise role in an adaptation regime is still largely undetermined. To help define this role, the Munich Climate Insurance Initiative (MCII) has put forth a proposal for an adaptation scheme to address weather variability and extreme events facing developing countries.

7.1 The MCII proposal

The MCII insurance proposal suggests a risk management module as part of an international adaptation strategy. As shown in Figure 2, this module includes two pillars, *prevention and insurance*, which would act together to reduce the human and economic burdens on developing countries. The pillars would be fully financed by a post-Copenhagen adaptation fund. The MCII endorses the growing consensus that this fund be financed in accordance with the Convention’s principles of common but differentiated responsibilities and respective capabilities of countries (UNFCCC, Art. 3), and that it be disbursed to those who suffer most from climate change.

Figure 2: The MCII proposed risk management module



7.1.1 The prevention pillar

Insurance activities must be viewed as part of a risk management strategy that includes, first and foremost, activities that prevent human and economic losses from climate variability and extremes. The first pillar of the MCII proposal thus calls for comprehensive risk management across vulnerable countries building on detailed risk assessments. Risk assessments can uncover otherwise unforeseen possibilities for risk reduction, and help lay the groundwork for risk transfer systems. The Prevention Pillar would not require developing countries to fully internalize the price of increased climate-related risk; however, qualification for participation in the Insurance Pillar might include progress on a credible risk management strategy with a specific focus on most vulnerable communities and sectors.

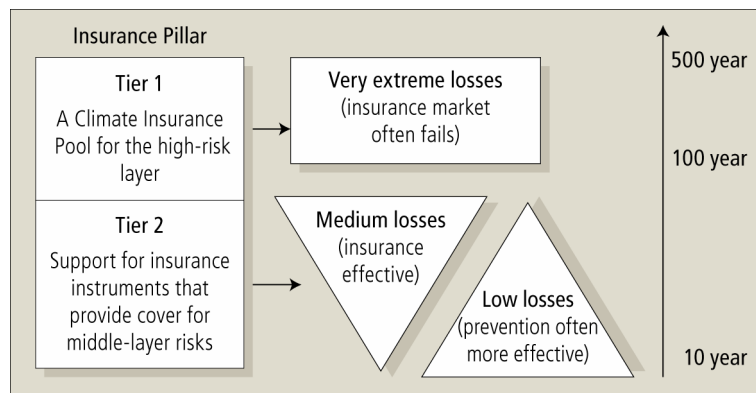
7.1.2 The insurance pillar

MCII’s proposed insurance pillar has two tiers that reflect the different layers of risk that need to be addressed for effective climate adaptation: (1) “high level” risk that exceeds the ability of any given country to pay in the case of an extreme event, and (2) “middle

level” risk that is within the ability of any given country to cope if the proper facilitating framework were in place. “Low level” risks can often be more cost effectively addressed with prevention measures, and this risk layer is therefore not addressed in the MCII proposal.

As pictured below, the first tier would provide insurance cover to vulnerable countries for a pre-defined high layer of risk (e.g., this might be defined for events that are expected to occur only every 100 or 500 years), and the premiums would be fully paid from an adaptation fund. The second tier would enable risk-pooling and -transfer mechanisms that provide cover for medium-loss events (e.g., this might be defined as events expected to occur less frequently than every 10 years but more frequently than every 100 years). Both tiers would be fully financed by a post-Copenhagen adaptation fund (and thus presumably by Annex 1 countries).

Figure 3: A two-tiered insurance pillar as part of an adaptation fund



Insurance Pillar Tier 1

Tier 1 of the Insurance Pillar builds on earlier proposals by Bals, Butzengeiger and Warner (2007) and Höpfe (2008). It takes the form of a Climate Insurance Pool (CIP) to indemnify developing country property and infrastructure (and potentially lives and livelihoods) against low-frequency, high-consequence events. This tier is financed by annual contributions from a post-Copenhagen multi-lateral adaptation fund, which itself will likely be financed by Annex 1 countries. The CIP would receive a fixed annual allocation from this multi-lateral adaptation fund equaling the expected average annual costs of the insurance scheme. Countries that qualify (and agree) to participate in the scheme will benefit 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, it is recommended that (1) vulnerability assessments are carried out based on the government’s risk, exposure and ability to cope (see box “*Who are the most vulnerable?*”, p. 10), and (2) governments fulfill basic standards of fiscal and budgetary transparency and commit themselves to risk-reduction measures. The CIP operations would be managed by a dedicated professional insurance team responsible for risk pricing, loss evaluation and indemnity payments, as well as placing reinsurance. There are many options on the scope of the CIP

operations, including how to define an extreme event, what losses to indemnify and how much, and how to link with prevention (see box below).

The question naturally arises why this type of support should be offered at the international level rather than transferring funds so it can be offered at the national level? A compelling argument for disbursing a portion of climate adaptation funding to an international solidarity entity rather than to national climate change funds is that by pooling the risks of extraordinary losses, far less reserve capital is needed than if each country creates its own catastrophe fund for this same purpose.

Options for CIP operations

What counts as an extraordinary climate-related event?

Any measure triggering payment from the CIP must be based on negotiated criteria of “vulnerability” as well as an independent and objective assessment to ascertain that the event, in fact, is extraordinary in the statistical sense that it lies in the extreme percentile of the historic distribution. This threshold will be adjusted over time to avoid the problem that climate change renders “extraordinary events” as “ordinary”, and thus reduces indemnity. The specific country risk will be established by independent modeling firms. Parameters for measuring the losses or economic seriousness of an event can be either loss-based or parametric (index-based). Since post-disaster payments can lead to moral hazard and mal-adaptation, parametric systems offer a mechanism to help reduce moral hazard significantly

What is the scope of the insurance entity?

While in most cases national or regional governments are likely to be the main recipients of CIP indemnity payments, it is also possible to allocate at least a part of such payments to households and SMEs affected by disasters through local NGOs and financial services organizations (such as local banks and insurance companies).

What portion of the country losses will be absorbed?

Negotiations on this issue could consider estimates of potential future losses from major catastrophe scenarios in country beneficiaries.

How can the CIP be linked with prevention?

Countries that wish to participate in the CIP might be required to establish vulnerability assessments and risk-management plans, as well as show progress on fulfilling these plans and exhibit good governance.

Although post-disaster assistance, especially if the affected people or countries do not contribute to the pool, can be criticized for distorting market risk prices and crowding out commercial insurance, it should be noted that the market often fails in providing cover for very low-probability, high-consequence risks, especially in poorer countries. The reasons for market failure are twofold: (1) individuals are generally myopic and misperceive the seriousness of low-probability risks, and (2) because these risks are

difficult to estimate and ambiguous, insurers have to “load” the risk premium, on account of the higher risk capital they need to cover such risks.

Insurance Pillar Tier 2

A second tier of the MCII proposal would take the form of a Climate Insurance Assistance Facility (CIAF) that would provide support for the middle layer of risk not compensated by the CIP described above. This tier is based on a proposal by Linnerooth-Bayer and Mechler (2007), and is similar to a recent proposal set out by the International Fund for Agricultural Development (IFAD) and the World Food Programme (WFP) for a IFAD-WFP Weather Risk Management Facility funded by the Bill and Melinda Gates Foundation (IFAD-WFP, 2008). It would *not* directly provide insurance to households, farmers or governments, but would offer support to nascent micro- meso- and macro-scale disaster insurance systems like those now operating (or formerly operating) in Mongolia, Ethiopia and the Caribbean, respectively. The core of this second tier is the provision of capacity building and technical support, which might include such activities as collecting and disseminating weather data, financing risk assessments or weather stations, or supporting delivery systems, all of which render these systems more accessible and affordable to poor communities. In addition, this tier can provide more direct support by offering or brokering pooling and reinsurance arrangements, or even, if appropriate, subsidizing premiums. In supporting these systems, a guiding principle is to aim at premiums that reflect the real risk price, which would allow flexibility in subsidizing that part of premiums above the real risk price, or frictional costs (see box page 15).

Again the question arises why this type of support should be offered at the international level rather than transferring funds to national governments for this purpose. Like the CIP, there are opportunities for pooling micro-insurance and national insurance schemes that offer support for the middle layer of risk. Moreover, there are economies of scale in developing an expert core to support countries in their efforts to build insurance systems. This does not mean that this tier cannot operate at smaller scales, for example, by means of regional facilities. In fact, an African Insurance and Adaptation Facility has been proposed for this purpose (Linnerooth-Bayer and Bals, 2007). In such cases the UNFCCC might identify criteria to guide bilateral or multilateral support for regional facilities (to assure they promote bona fide adaptation).

The MCII two-pillar proposal meets the challenge of providing support to promote sustainable, affordable and incentive-compatible insurance programs with minimal crowding out of private sector involvement. While the first tier arguably distorts prices by offering premium-free insurance for an upper layer of risk, it can be justified by market failure for this risk layer due to misperceptions on the part of potential clients and risk aversion (and premium loading) on the part of insurers. By enabling insurance for the poor, this tier opens opportunities for capitalization through risk transfer programs involving the private market. Indeed, since the market currently fails for this risk layer, this proposal actually creates a new market for the private sector in reinsuring the CIP. The second tier imposes affordable prices on heretofore un-priced risks, thus substituting

for the negative incentives and moral hazard created by post-disaster aid, and creates ample opportunities for the private sector in insuring and reinsuring these programs.

8. Synthesis and policy messages

The messages to the climate adaptation policy community and Party negotiators are twofold: (1) Insurance mechanisms have a promising and legitimate role in an adaptation regime, and (2) practical options exist for including insurance mechanisms in the post-Kyoto adaptation strategy.

- *Insurance mechanisms have a promising and legitimate role in an adaptation regime*

There is now broad scientific consensus that climate change is contributing to worsening climate variability and extremes, which are imposing disproportionately large human and economic burdens on developing countries. These losses can be amplified by the inability of households, SMEs and governments to raise sufficient post-disaster capital for the recovery process. Recognizing that insurance to meet this liquidity gap will not be appropriate in all contexts, and especially if reliable informal arrangements are in place, agents should weigh the benefits and costs of insurance strategies.

There are large potential benefits for insurance in the developing world: providing security against the wholesale loss of assets, livelihoods and even lives in the post-disaster period, changing the way development organizations provide disaster assistance and, at the same time, engaging the private sector in vast markets, ensuring reliable and dignified post-disaster relief, setting powerful incentives for prevention, and not least, spurring economic development. There are also many challenges: assuring sustainability and affordability in light of co-variate risks; defining an appropriate role of donors in light of the inefficiencies of subsidies; and assuring that systems avoid moral hazard and contribute to “good” investments.

While the benefits and challenges of catastrophe safety nets are uncontested, the role of outside assistance for insurance instruments is highly controversial. Opponents rightly argue that support in the form of subsidies can distort the price signal and encourage maladaptation; support in the form of reinsurance can crowd out the role of the private market. Yet, most experts agree that even subsidized insurance systems are in this regard preferred to post-disaster aid, and the reinsurance market is not yet prepared to commit sufficient and affordable capital to markets serving the poor. Experts also agree that outside support should be closely coupled with a risk management program including a vulnerability assessment. Pilot programs are offering a testing ground for the efficacy of international assistance, and these programs should be carefully monitored and built upon by governments, international development organizations, NGOs, private insurers, and the climate-adaptation community.

The case for intervention as part of an adaptation regime is legitimized by the failure of the market, and greatly strengthened by recent evidence that GHG emissions are contributing to increased weather variability and risks of extreme events. According to the climate convention’s principle of *common but differentiated responsibilities and*

respective capabilities, industrialized countries are obligated to absorb a portion of this burden.

- *Practical options exist for including insurance mechanisms in the post-Kyoto adaptation strategy*

As a practical way forward, this discussion has laid out a two-pillar international risk-management program as part of an adaptation regime - financed fully by Annex 1 countries – a proposal that has recently been put forward by the Munich Climate Insurance Initiative. A *risk prevention* pillar would directly support risk-reduction measures. A two-tiered *insurance* pillar would address high- and medium-layers of risk. The first tier takes the form of a Climate Insurance Pool that indemnifies victims of extreme catastrophes in non-Annex 1 countries by a percentage of their losses. A second tier provides support to enable micro- and national insurance systems in vulnerable developing countries by providing technical assistance, capacity building and possibly absorbing a portion of the insurance costs. Low-level risks would continue to be absorbed fully by the respective governments and private sectors.

The MCII two-pillar proposal meets the challenge of providing support to promote sustainable, affordable and incentive-compatible insurance programs for vulnerable households, SMEs and governments in the developing world, and at the same time enabling private sector involvement. Because of the substantial economies of pooling public- and private-sector risks, there are strong arguments for creating facilities, like the CIP, at the global or regional scales.

By clarifying the opportunities and challenges of insurance as an instrument for adaptation, and outlining a practical way forward, it is hoped that this discussion contributes to the opportunities facing negotiators at COP 15 in Copenhagen in adopting a comprehensive adaptation strategy that enables risk management and insurance through the funding of a global adaptation strategy.

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