

# **Addressing Human Vulnerability to Climate Change: Toward a ‘No Regrets’ Approach**

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## **Abstract**

This paper presents and applies a conceptual framework to address human vulnerability to climate change. Drawing upon social risk management and asset-based approaches, the conceptual framework provides a unifying lens to examine links between risks, adaptation, and vulnerability. The result is an integrated approach to *increase the capacity of society to manage climate risks with a view to reduce the vulnerability of households and maintain or increase the opportunities for sustainable development*. We identify ‘no-regrets’ adaptation interventions, meaning actions that generate net social benefits under all future scenarios of climate change and impacts. We also make the case for greater support for community-based adaptation and social protection and propose a research agenda.

Key words: Adaptation, climate change, social risk management, vulnerability, no-regrets.

## 1. Introduction

Societies have a long record of adapting to climate risks and climate changes. Household asset portfolios and livelihood choices are shaped by the need to manage climatic risks, especially in rural areas and for low-income households. Even so, climate events continue to bring devastation.

Recent evidence and predictions indicate that climate changes are accelerating and will lead to wide-ranging shifts in climate variables. There will be changes in the mean and variance of rainfall and temperature, extreme weather events, food and agriculture production and prices, water availability and access, nutrition and health status. The most adverse impacts are predicted in the developing world because of geographic exposure, reliance on climate sensitive sectors, low incomes, and weak adaptive capacity. Socio-economic impacts, though generally not well-understood, are likely to be profound and will impact humans through a variety of direct and indirect pathways (IPCC, 2007; Cline, 2007; Stern, 2007). The indirect risks are often hard to predict (they are the *consequences of consequences*) but could have the worst impacts.

Adaptation—adjusting to address ongoing and future climate changes<sup>1</sup>—is increasingly recognized as an urgent and necessary complement to greenhouse gas emissions reductions. But as we gear up adaptation efforts, we need better understanding of the risks facing poor communities and households; the potential impacts on household well-being and social outcomes; and how to effectively lower household vulnerability.

Instead of taking a doomsday approach, we argue that serious—even catastrophic and irreversible—damage to natural systems from climate change need not result in catastrophic and irreversible damage to humans. In contrast, catastrophic and irreversible damage to humans can result even from modest changes in natural systems. It all depends on the effectiveness of societies' adaptive capacity, which is shaped by policies and institutions. In fact, addressing human vulnerability to risks associated with climate change may offer opportunities for development and poverty alleviation through no-regrets pro-poor adaptation interventions.

This paper tries to address what we perceive as key gaps in current knowledge and practice of adaptation—gaps that arguably limit the ability to formulate effective anti-poverty and anti-vulnerability adaptation strategies. Some of the literature lacks attention to micro level impacts, and how risks associated with climate change affect household assets, livelihoods, and well-being. Thus, problem identification and interventions tend to focus on direct risks and direct impacts of climate change with insufficient attention to indirect risks and impacts on households. Further, many studies of disasters and adaptation are inconsistent in use of key terms such as risk, vulnerability, and adaptation and how these terms are interrelated.<sup>2</sup> For these and other reasons, there is limited understanding of how to leverage climate action and climate funding to also achieve other social goals such as poverty alleviation, gender balance, and empowerment.

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<sup>1</sup> A large number of recent publications address adaptation, including IPCC (2007); Stern (2006); UNDP (2007). Smit and Wandel survey the literature and the practice of adaptation. Among the forerunners to this literature was Ringius et al. (1996).

<sup>2</sup> See section 2 and O'Brien et al, 2007.

We are also motivated by social justice concerns. The impacts of climate changes fall disproportionately on people that have contributed the least to cause the problem and that have the least resources to cope with it (Stern, 2006; Mendelsohn, Dinar, and Williams, 2006). At stake are issues of fairness in the responses to a large global externality; the need to protect past and future gains from development; and potentially serious global repercussions of failing to address climate change effectively. We argue that the ‘social contract’ underpinning international responses to climate change should embody the principle of protecting the poor from extreme negative impacts.

We propose and apply a conceptual framework (social risk management<sup>3</sup>) with the explicit goal to *increase the capacity of society to manage climate risks with a view to reduce the vulnerability of households and maintain or increase the opportunities for sustainable development*. We apply the framework to identify no-regrets adaptation interventions to reduce vulnerability to climate risks.

The major contributions of the paper are that we (a) offer a unifying conceptual framework that links risks, adaptation, and vulnerability; (b) apply the framework to examine adaptation strategies at different levels and to identify no-regrets approaches; (c) offer a preliminary discussion of the role of community-led adaptation and social protection interventions; and (d) propose an agenda for further research.

This paper is organized as follows. The next section discusses poverty and vulnerability in relation to climatic shocks. Section 3 develops the conceptual framework and Section 4 applies it to the climate change challenges. Section 5 elaborates the rationale for social policy and social protection for adaptation and offers examples. In closing the paper, Section 6 proposes a research agenda and Section 7 concludes.

## **2. Poverty and Vulnerability to Risks Associated with Climate Change**

The experience with managing current climatic variability does not bode well for what may happen as climate changes increase climatic variability and climatic extremes. In many parts of Africa and elsewhere, variability in rainfall and temperatures already cause variability in agricultural production and food security (e.g., Molua, 2002). Studies of the costs to poor people of coping with the climate extremes of floods, droughts, and storms make clear the enormous costs and difficulty and the limited success (Kates, 2000). Natural disasters caused by climate extremes repeatedly wipe out the gains from development, destroying lives and livelihoods. Famines, as pointed out by Sen (1981), are man-made disasters that result from climatic risks and human failures to respond to the resulting declines in food production.

Climate events can result in irreversible losses of human and physical capital and may cause poverty traps. A longitudinal study in Zimbabwe followed children that were less than two years old (the age where children are most susceptible to malnutrition) when a severe drought hit in the early 1980s. Those that survived the famine were found to be stunted, translating into lower schooling achievements, inferior adult health, and an estimated 14 percent reduction in lifetime earnings (Alderman, Hoddinott, and Kinsey, 2006). Studies of Hurricane Mitch in

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<sup>3</sup> Holzmann and Jorgensen (2000).

Honduras showed that the hurricane exacerbated asset inequalities as the poor lost a greater share of assets in the disaster and recovered at a slower rate than the non-poor. And analysis of rural Ethiopian households hit by drought showed that while better-off households could sell livestock to finance consumption, the poorer often tried to hold on to their livestock at the expense of food consumption to preserve their options for rebuilding herds. Those poor households who exited the drought with few or no assets faced great difficulty rebuilding their herds (Carter et al, 2007). Dercon (2004a) also finds persistent effects on household consumption of rainfall shocks and famine in Ethiopia, implying that the long-term loss of well-being due to lack of risk management measures exceed the well-being loss from short-term consumption fluctuations.

Existing arrangements for managing climate and other risks offer some protection, at a cost, but are at best partially successful at shielding households from adverse impacts. The fluctuations in consumption and decumulation of human and physical assets that result from shocks have adverse consequences for household well-being and for economic growth that often persist after the original shock has subsided (Dercon, 2004a). Short run impacts on households include reductions in the quality and quantity of food, health, and nutrition; long-run impacts include destitution, landlessness, asset loss, irreversible malnutrition, child labor, and withdrawal from schooling. Recovery from shocks is often slow and incomplete, particular for the poor, who indicate in surveys taken after shocks that they have yet to repay debts and rebuild assets (Heltberg and Lund, forthcoming). Moreover, in anticipation of uninsured risk households often choose low-risk low-return activities and hold relatively liquid assets to the detriment of expected returns. A study in Southern India found that in the presence of high risk, poor farmers reaped lower returns to assets than did the better-off farmers, while the reverse was true in low-risk settings (Rosenzweig and Binswanger, 1993). The adverse impacts on asset growth of the ex-ante behavioral responses to risk may even outweigh the ex-post impacts (Elbers, Gunning, and Kinsey, 2007). This is why more effective risk management, including social protection measures, is needed (Dercon, 2004b).

The most vulnerable households are those with assets and livelihoods exposed and sensitive to climatic risks and who have weak risk management capacity. While all households are exposed to risks associated with climate change and could potentially be rendered vulnerable, the poorer households are the most at risk. This is because their assets and livelihoods tend to be highly exposed and sensitive to the direct and indirect risks associated with climate change, and because they lack access to formal and informal risk management arrangements. People that depend on agriculture (especially rainfed), livestock, and fisheries would be at risk. Within households, impacts will sometimes fall disproportionately on vulnerable individuals such as children, women, elderly, and disabled.

Improved management of climatic variability becomes all the more important as climate changes lower the returns to assets and livelihoods and increases volatility. There are both equity and efficiency arguments for such interventions (Dercon, 2004b). The remainder of this paper considers interventions to reduce vulnerability to climate change based in the social risk management framework.

### 3. Conceptual Framework

Social risk management (SRM) and asset-based approaches offer a framework for understanding the links between risks; human exposure and sensitivity; risk management (or adaptation); and household vulnerability outcomes.

#### 3.1 Asset-Based Approach

Building on Amartya Sen's entitlement approach (Sen, 1981) and other sources, asset-based and livelihoods approaches state that household well-being is multi-dimensional and directly linked to command over assets and livelihood strategies (Moser, 2006). Assets are understood broadly to include *productive assets* (human, natural, physical, and financial assets); *social and political assets*; and *location assets* (Figure 1).<sup>4</sup> Household decisions to accumulate and allocate assets—often called their livelihoods strategy—and returns to their *asset portfolio* (expected returns and variance of returns) are profoundly influenced by the external policy and institutional context, and by risks.

\*Figure 1\*

Household livelihoods, livelihood resilience, and well-being depend on the interface between risks; assets; and the policy, institutional, and structural context. Risk affects the expected returns and variance of returns on assets and livelihood strategies, and therefore household well-being and future asset accumulation. Households are poor because they have limited quantity and quality of assets; their assets have low expected returns and high variance of returns; and because they face an adverse structural context.

Adverse structural context—social differentiation, exclusion, discrimination—stemming from formal and informal policies and institutions contribute greatly to poverty and vulnerability. Access to markets and to community assets is often discriminatory, and asset-based approaches therefore explicitly consider social differentiation (Leach, Mearns, and Scoones, 1999). As forcefully argued by CPRC (2008), many of the very poor are discriminated against or otherwise socially marginalized, for example indigenous peoples, caste groups, people with disabilities, bonded laborers, refugees and internally displaced, and sometimes the young and the old. A number of structural traps reinforce poverty and marginalization: economic insecurity through exposure to shocks and absence of risk management; limited citizenship and absence of voice and rights; spatial disadvantages and remoteness; social discrimination through exploitation or

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<sup>4</sup> *Natural assets* also include the quantity and quality of land, water and forest resources, agro-ecological conditions (elevation, slope, climatic factors), and soil conservation investments. *Physical assets* include non-land physical assets such as livestock, machinery and equipment, the household's dwelling and other buildings, and community infrastructure. *Human assets* include size and composition of the household, education levels of its members, training and technical assistance received, and ethnicity. *Financial assets* include savings, credit, transfers (remittances and other cash transfers), and liquid stocks. *Social and political assets* include membership in various types of organizations, participation in collective action, social and political networks and social inclusion, voting rights, and participation in community, local and national elections. Finally, *location assets* are related to the geographical location of the household and include access to population centers, markets, roads and public services, and population density. See Siegel (2005).

exclusion; and limited job opportunities. All of these factors keep some individuals, groups, and nations poor and vulnerable.

Households also use their assets to cope with shocks but this interferes with their ability to maximize productivity. At times of need, households often have few coping options apart from drawing down their assets (although their ability to do depends on the structural context as mentioned above). In order to preserve the ability to use assets for short-term coping, households often prefer relatively secure and liquid asset portfolios to the detriment of expected returns and long-term adaptation. This can give rise to asset-based poverty traps (Carter and Zimmerman, 2000; Barrett and McPeak, 2004). Greater recognition of the role of such poverty traps and the trade-offs between short-term coping and long-term productivity and adaptation are important for adaptation and poverty alleviation, especially as the impacts of climate change accumulate over time (Davies, 1993; Yamin, Rahman, and Huq, 2005). These factors motivate our proposal for a greater role for social policy to promote resilience and to help break such poverty traps.

### 3.2 SRM Risk-Vulnerability Chain<sup>5</sup>

The risk-vulnerability chain conceptualizes the relationship between risks, risk management arrangements, and household vulnerability (Figure 2). The risks and the exposure and sensitivity to risk together determine expected losses from the risks. Households use risk management strategies that are either ex-ante (risk prevention, reduction, mitigation) or ex-post (coping) actions. Vulnerability—the probability of well-being below a benchmark such as the poverty line—depends on the risks, exposure and sensitivity, expected impacts and losses, and risk management.<sup>6</sup>

\*Figure 2\*

*Risk.* Risk is the chance of danger, damage, loss, injury, or any other undesirable consequences for a household (or an individual or a community). Risks interact. Many climatic risks and climate change variables are correlated and have inter-related impacts. Moreover, risks associated with climate change interact with other risks stemming from, for example, markets or policy failures.

*Exposure and Sensitivity.* Households' risk exposure and sensitivity depend on their asset portfolio, asset allocation, and livelihood strategies (e.g., crop and livestock mix and varieties, diversification of farm and off-farm or non-farm activities). The risk exposure and sensitivity of households is shaped by the policy, institutional, and structural context outside the control of households.

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<sup>5</sup> The World Bank's Social Protection Strategy (World Bank, 2001) drew on the SRM framework presented by Holzmann and Jorgensen (2000). Siegel and Alwang (1999) presented an integrated SRM and asset-based approach, while Alwang, Siegel, and Jorgensen (2001); Heitzmann, Canagarajah, and Siegel (2002); and Siegel, Alwang and Jorgensen (2003) developed the SRM risk-vulnerability chain.

<sup>6</sup> Other definitions of vulnerability are also in use, see below and Adger (2006).

*Expected Losses.* The expected losses from any risk depend on the probability of a risky event occurring and the exposure. Expected losses denote the severity of potential negative impacts from risks before any ex-ante or ex-post risk management.

*Risk Management Strategies.* Households and societies manage risks through multiple complementary strategies. These strategies all have real and opportunity costs and can be separated into *ex-ante* (before a shock occurs) and *ex-post* strategies (after a shock has occurred).<sup>7</sup> Risk management, if successful, results in *resilience*: ability to avoid the negative impacts of risky events and recover from them.<sup>8</sup>

*Ex-ante* risk management includes:

- Prevention or risk reduction—actions to reduce the probability of risky events (e.g., emissions reductions);
- Risk exposure and sensitivity reduction—actions to reduce household exposure to given risks (e.g., asset and livelihood diversification); and
- Risk compensation or risk mitigation—ex-ante actions to provide compensation in case of a risk-generated loss (e.g., formal insurance, holding of savings, social networks).<sup>9</sup>

*Ex-post* risk management includes:

- Risk coping—actions taken to make up for losses after realization of a risky event. This is often an ad-hoc risk management strategy with negligible upfront costs, but with potentially serious costs. Coping costs are rarely shared equally within households but borne according to age, gender, and status (for example, poor households forced to sell off women’s jewelry, withdraw boys or girls from school, or reduce food consumption of some members).

*Vulnerability.* Household vulnerability is the expectation of falling below benchmark levels of well-being should a risky event occur. Given measurement difficulties, well-being proxies such as poverty lines and health and nutritional status are often used. Thus, an individual or household is vulnerable to risks associated with climate change if these risks will result in a loss that pushes the household below the well-being benchmark (say, the poverty line). In our definition, vulnerability depends on the characteristics of the risks; exposure and sensitivity to the risks; expected impacts and losses; and risk management capacity.

Confusingly, other studies define vulnerability and other key terms very differently. What we call *risk* (meaning probability of an adverse event) is called *hazard* in the disaster risk

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<sup>7</sup> The costs of risk management are often overlooked. Yet both ex-ante and ex-post risk management have real and opportunity costs, even as the risky event may not occur or, if it occurs, ex-ante actions may not have success. It is also often overlooked that even the best of ex-ante strategies need to be complemented with ex-post coping (insurance, for example, rarely compensates the entire loss).

<sup>8</sup> We define *resilience* as the ability to resist the potential negative impacts of risky events and the extent to which households can recover from negative impacts of risky events.

<sup>9</sup> We use the term risk mitigation to imply mechanisms that compensate for loss whereas the climate change community refers to reduction in emissions of greenhouse gasses as mitigation.

reduction (DRR) community; what we call risk *exposure and sensitivity* (meaning the susceptibility of assets to risk) is called *vulnerability* in the DRR literature; and what we call *vulnerability* (meaning the probability of losses triggering well-being below a threshold such as the poverty line) is akin to the DRR concept of *risk*. Not surprisingly, there is a good deal of confusion as few studies are explicit and some are inconsistent in use of terms. Clearly, these two sets of definitions cannot be integrated into a single framework.<sup>10</sup> Nevertheless, we take the position that the differences are more semantic than real and that both traditions at heart aim to understand the causes of vulnerability and how to reduce it. We also agree with suggestions that there are complementarities and need for cross-fertilization between the communities working on disasters, climate change, social protection, and livelihoods promotion.<sup>11</sup>

\*Table 1 here\*

### 3.3 SRM Policy Matrix for Climate Change

Social risk management (SRM) is a framework for considering how society manages risk. Table 1 gives an overview of SRM instruments and strategies for addressing risks associated with climate change. The matrix conveys the message that adaptation can take place at different stages of the risk-vulnerability chain (ex-ante and ex-post), at different levels (from household to global), and at different levels of formality.

SRM comprises a range of interventions and strategies at the household, community, national, and international levels aiming to prevent risk, reduce exposure, mitigate the impact of adverse events, or cope ex-post (Holzmann and Jorgensen. 2000). There is a menu of formal or informal instruments, and no single instrument alone offers complete protection. As Table 1 demonstrates, efforts by households, communities, and nations need to be complemented by international responses. The policy menu should also balance between ex-ante risk prevention, exposure reduction, and risk compensation/mitigation with support for ex-post coping. The key is identifying instruments that are appropriate for given risks. Some have argued for rights-based approaches through social rights and guarantees or through universal coverage (such as universal old age pensions). As the SRM framework makes clear, rights-based approaches still need to consider which risks and which instruments to emphasize.

SRM seeks to reduce the vulnerability of households through a menu of instruments and focuses attention on replacing unproductive, asset-degrading coping strategies (e.g., withdrawing children from school, delaying health care, distress asset sales) with ex-ante mechanisms (e.g., insurance, weather forecasts) that help anticipate and address risks. SRM proposes a broad range of interventions (for example finance, insurance, ecosystem management, health, nutrition, education, safety nets). Although the SRM approach constitutes good development practice even in the absence of climate change, it is not ‘business as usual’; climate change adds impetus to scale up interventions that strengthen resilience (see section 7 for examples).

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<sup>10</sup> See O’Brien et al (2007) who go to the extent of presenting a diagnostic tool for distinguishing the two interpretations of vulnerability. See Adger (2006); Fussel and Klein (2006); Fussel (2007); Schipper and Pelling (2006).

<sup>11</sup> See Davies et al (2008) and Farrington, Slater, and Holmes (2004).

## 4. Applying the Framework

We now apply the SRM framework developed above to climate change. We start by exploring how climate change alters the existing risk profile and what that implies for policy. We then proceed to discuss the appropriate level for adaptation interventions.

### 4.1 Characterizing the Risks Associated With Climate Change

While climate has always been risky, ongoing climate changes are changing the risk profile and shifting it toward the poor in ways that adaptation responses need to take into account. We use the analytical framework developed above to systematically explore implications of the changing risk profile.

*Direct and indirect risks.* The direct impacts of changing climate bring about a range of indirect risks. For example, direct impacts on agricultural production will have indirect consequences for rural incomes, food prices, labor demand, health and nutrition, access to drinking water, deforestation and soil erosion, and settlement and migration. These indirect risks are hard to predict but could surpass the impacts of direct climate risks. Adaptation efforts will need to pay attention to both direct and indirect risks and to directly and indirectly exposed sectors, regions, and households through multisectoral adaptation strategies. To manage risk of malnutrition, for example, both agricultural, social protection, and international food trade interventions are needed.

*Higher frequency.* Climate change is expected to increase the frequency of climatic fluctuations, including extreme weather events and repeated droughts. More frequent, repetitive risky events could exhaust household, community, and national risk management options. Households will need to rebuild assets and livelihoods at shorter intervals, which may prove impossible for poor households and communities.

*Covariate risks.* Climate change will exacerbate covariate risks (those affecting entire communities), both direct (disaster; yield declines over large areas) and indirect (vector-borne epidemics; price and employment effects at regional, national, and international levels). Idiosyncratic risk (those affecting individual households such as illness) could also increase, but a particular aspect of risks associated with climate change is their geographic spread, resulting in more covariate risk. Consequently, localized risk management based on risk pooling or transfers may fall short. Instead, risk pooling or transfers over larger areas—nationally or internationally—using more formal public or market-based instruments will be required. Some responses are best provided as global public goods: climate early-warning systems, research in new technologies, well-functioning international markets for food, cross-border migration and remittances, disaster assistance, and international finance and insurance.

*Uncertainty.* There is a great deal of uncertainty about when, where, and how much predicted climate changes will manifest. Few problems confronted by social scientists and policy makers entail such complex long-term implications and this much uncertainty. Uncertainty complicates decision-making and cost-benefit analyses—should crop research, for example,

target widely consumed staples or instead shift toward drought-tolerant varieties whose importance may grow? Uncertainty extends into the policy arena: levels of funding, implementation arrangements, and effectiveness of proposed adaptation interventions are all uncertain and contested. Uncertainty, however, should not delay action. When confronted with other risks such as health, food security, or the threat of terrorism the response to uncertainty is not inaction as policy makers realize they need to minimize the risk of catastrophic losses. The same should be the approach to climate change.

*Irreversibility.* Absent successful adaptation, several risks associated with climate change could cause irreversible damages to life, assets, and social structures. Irreversible damages to human assets—malnutrition, lost schooling—are no less important than irreversible damages to natural and physical assets and need to be avoided. Improved disaster management and more risk-responsive safety nets can help prevent irreversible human damages and improve disaster recovery.

*Deviation from historical range.* Historical information on climate variables is critical for adaptation decisions across formal and informal risk management instruments. Climate changes will cause some climatic variables to deviate from their historical range. Time-series data will therefore provide inadequate guidance to forecasting climate variables and planning adaptation. The same may happen to traditional approaches to decision making in risky climates—“rules of thumb” based on communities’ historic experience could lose value. Availability of accurate and disaggregated climate predictions will form the basis for decision-making in an unprecedented manner. The ability of non-scientists—peasants, pastoralists, policymakers—to understand and act upon climate forecasts will increase in importance.<sup>12</sup> This poses a challenge for the science community to accurately communicate climate predictions and their degree of uncertainty (Moss, 2007). Furthermore, insurance will face limitations resulting in either higher risk premia on insurance policies (to compensate for uncertainty about risks and impacts), or outright refusal by insurance firms from underwriting certain risks.

*Slow onset.* The time lag until the full impacts of climate change unfold allows for sequencing responses but poses problems for motivating adaptation and assessing results. While some adaptation responses must begin now, others can wait, allowing some room for experimentation and learning. The downside is the difficulty of getting the attention of policymakers and even to know whether adaptation is on track. How do you motivate crop scientists, for example, to breed for future climates and how do you know whether they have succeeded? Focusing on closing the adaptation gap could be a helpful goal. Assisting households, communities, and countries better manage *current* climate volatility would be a first step in preparing for expected increases in *future* volatility. In addition, investments in infrastructure and physical structures with a long expected life should be climate proofed. In fact, any adaptation investments with long gestation periods before their benefits kick in are

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<sup>12</sup> Likewise, forecasts will also need to better respond to users’ needs (Ziervogel, 2004). Farmers and pastoralists, for example, have specific yet differentiated needs in terms of timing and geographic scale of forecasts. Research from Eastern Africa finds that forecasts fail to deliver the information most needed by pastoralists, namely the onset date and the total amount of rain at the location of the household. The information is presently provided at too aggregated a spatio-temporal scale for the use of pastoralists (Lybbert et al, 2007).

relatively more urgent. Developing heat and drought resistant crops, supporting an educated workforce, and establishing institutions to manage conflict will take far longer than, say, adjusting insurance regulations and are therefore more immediate priorities. Combined with uncertainty, delayed onset of risks adds a premium to no regrets interventions—investments and policies with high payoff under the current climate risks as well as in a future with riskier climate.

*Risk interactions.* Many of the direct and indirect risks associated with climate change are expected to interact in a manner that will potentially result in worsening of vulnerability over and above what would result from the individual risks. Risks therefore need to be considered in integrated fashion rather than individually or sector by sector. This is consistent with the multisectoral and multi-instrument approach of social risk management.

In summarizing the above, the characteristics of climate change risks imply a need for an integrated multisectoral approach to manage direct and indirect risks. No-regrets social policy interventions are called for.

## **4.2 Local Adaptation, Global Efforts**

An important question is at what level—households, communities, local governments, national governments, or internationally—to focus adaptation interventions. The answer has important implications for who implements, finances, and benefits from adaptation interventions. Applying the SRM lens to this question, we conclude that while most adaptation will necessarily take place at the local level, global efforts are required. What we mean is that most successful adaptation efforts are likely to be local as communities and other subnational actors respond to the localized manifestations of emerging climate risks. However, local actors will increasingly need external support because the risks—large, covariate, and possibly with irreversible damages—can overwhelm local adaptive capacity. A key issue facing the international community is therefore to identify the most effective means to support local adaptation.

Households and communities will do their best to adapt to perceived climate changes, even in the absence of facilitating government policy and sometimes despite of policy or regulatory constraints. Producers will seek out investment opportunities in assets, technologies, and livelihood strategies better suited for changing climates.<sup>13</sup> There are private incentives to adapt. Adger (2003), studying collective action for coastal risk management in Vietnam, noted how local networks substituted for the loss of state-led actions. When governments lacked the resources to provide coastal protection, indigenous management practices were mobilized instead.

Managing climate risks has traditionally been the responsibility of households, except for the largest extreme weather events and natural disasters where national governments and donors have stepped in (for example, with emergency food aid). In contrast, little support aims at managing more common climate risks. This may have to change as large covariate and repetitive climate events overwhelm many community institutions. Furthermore, household and community adaptation is not always equitable, sustainable, or desirable—left on their own, many

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<sup>13</sup> This has been termed *autonomous adaptation* in the climate change literature.

poor households and communities fall back on inequitable, unproductive, or asset-degrading coping strategies.

Unfortunately, some current approaches to donor funding for adaptation to climate change may bypass local institutions. The current push to formulate National Adaptation Plans of Action (NAPAs—essentially portfolios of adaptation projects prioritized by governments for donor funding) seems to have missed the opportunity to propose adaptation projects for community or local level public, private, or civic institutions. According to Agrawal (2008), only 20 percent of projects described in the NAPA documents incorporate local institutions as the focus of adaptation projects; even fewer identify local institutions as agents or partners in facilitating adaptation. The modest role envisaged for local institutions is surprising given that local institutions (and not just central ministries) would have to play a key role in many of the sectors targeted by NAPAs (agriculture, water, small-scale infrastructure, etc). For some reason, the supposedly widespread consultations that went into the production of the NAPAs did not result in a stronger role for local level adaptation and local institutions (Agrawal, 2008).

Global actors need to consider the global negative externalities associated with climate change risks and the global positive externalities from successful adaptation. At the regional level, some risks are potentially catastrophic: major declines of food production in entire regions of Africa, advanced desertification of large regions, or the drying up of rivers that supply regions and cities with water. Such regional disasters would overwhelm entire countries, and some of the most adversely affected countries stand at risk of dramatic upheavals without help. Equity and fairness perspectives therefore dictate international sharing of the adaptation burden. This burden sharing may well need to go beyond development assistance and include policies for freer labor and migration flows, water sharing, food trade, financial markets and insurance systems, and perhaps even peacekeeping in areas degraded by climate change impacts. Climate change, in other words, is a truly global social and environmental issue with vast international spillovers.

## **5. No-Regrets Social Policy and Social Protection for Adaptation**

The social sectors may offer valuable but not yet widely appreciated opportunities for no-regret interventions, which we define as strategies that yield benefits regardless of future trends in greenhouse gas emissions and climate scenarios. No-regrets interventions are useful for hedging climate exposure because of the uncertainty over climate scenarios (e.g., Barnett, 2001). They seek to build a general resilience that does not depend overly on detailed climate projections. However, ‘no-regrets’ does not mean cost-free: no-regrets options have real or opportunity costs or represent trade-offs (Wilby, 2008).

To date, many interventions for adaptation have addressed direct sectoral impacts of climate change, for example by focusing on climate proofing specific projects or pieces of infrastructure (e.g., roads, communication, water reservoirs, energy) or on irrigation and improved crops. Valuable as this is, there has sometimes been insufficient attention to indirect risks, to household vulnerability, to disaster risk management, and to inclusion of the poor and vulnerable in adaptation. A robust social policy response rooted in an understanding of the risks associated

with climate change and climate vulnerability facing the poor can help overcome this.<sup>14</sup> There is also a role for social policy to empower the poor and help them develop ‘voice’ and political assets to inform policy and make development accountable to their needs (Tschakert, 2007). Social protection could therefore become more of a priority sector for adaptation than it has been so far (Davies et al, 2008; Stern, 2008). With increases in concessional assistance for climate change and adaptation quite likely, this could mean a potential for increased external support for the social sectors.

Social policy can help negotiate the trade-offs between addressing climate change and addressing poverty. Interventions addressing climate change are sometimes at odds with poverty and other development objectives. For example, efforts to expand forest carbon finance have met with criticism from some indigenous communities for fear this could further undermine tenuous property rights to ancestral lands. Another example is the expansion of biofuel production causing food prices to spike with severe impacts on food insecure households in many countries. In contrast, social policy approaches to adaptation create synergies between climate action and poverty alleviation. The key is to understand the risks associated with climate change and climate vulnerability facing the poor and the vulnerable and to design instruments that help people manage these risks and support them as active agents in creating resilience (Eriksen et al., 2005).

Experience is building with social policy approaches that are responsive to climate risks. Despite the perennial problem of dealing with climatic shocks, coverage of programs and instruments helping the poor and vulnerable manage climate risks remains very low; pro-poor adaptation should aim to change this. As discussed in the following, different types of projects aiming to build resilience of the poor have been tried, even in low income countries, and give cause for some optimism: There is scope for creating and expanding programs covering both ex-post coping support for climatic shocks and ex-ante weather risk management. Programs to take forward include social fund and CDD support for community-based adaptation; safety nets for coping with climatic risks and natural disasters; livelihoods programs; microfinance; and index insurance (see for example IDS, 2007; Yamin, Rahman, and Huq, 2005; and the articles in Tanner and Mitchell, 2008). What these examples have in common is that they add a climate risk dimension to social protection programs that have traditionally focused more on the chronic poor.

There are both political and technical challenges to moving this agenda forward. Rainfall indices, combined with insurance instruments or budget flexibility, appear to offer an avenue to resolving some of the technical challenges involved in making targeting systems and funding mechanisms respond to climatic shocks. Even so, political challenges remain with questions on the effectiveness of social protection and on the merits of different targeting strategies. The political support for spending money on the poor, and in particular on recurrent (non-investment) items such as social protection, is sometimes weak. Better impact evaluation can be helpful to demonstrate the effectiveness of programs to policy makers.

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<sup>14</sup> Community-based risk assessment may be one tool to deploy to have interventions be guided by poor people’s often very localized risks and concerns; however, for both practical and theoretical reasons community-based risk assessment cannot stand alone and need to be complemented by macro and sectoral risk assessments (van Aalst, Cannon, and Burton, 2008).

## **5.1 Social Funds for Community-Based Adaptation**

Social funds are semi-autonomous institutions created to channel external support to communities. Social funds and community-driven development projects (CDDs) support small projects in sectors such as infrastructure, social services, microenterprise development, microfinance, forestry, and eco-system management which have been identified by communities and presented to the social fund for financing. Social funds and CDDs allow poor people and communities to become actively involved in their own development.

Social funds can support pro-poor adaptation by scaling up their work in sectors relevant for creating resilience such as eco-system management and restoration, water supply and sanitation, community forestry, coastal zone management, and disaster risk management (much of this is already happening but not at a wide scale). Through social funds, the international community could channel external finance to small-scale community-based adaptation projects in a large number of communities, even in countries with weak capacity. There might also be scope for community-based investments in avoided deforestation to attract new sources of carbon finance. However, external “experts” and project staff would need to accept that communities make investment decisions based on the risks and priorities perceived by the communities, which could well differ from formal climate predictions and expert judgment. This is the nature of community-led interventions and can be an advantage or a disadvantage depending on the perspective. There is also a need to watch out for elite capture and other governance issues in the way that communities manage projects.

## **5.2 Social Safety Nets for Coping with Natural Disasters and Climatic Shocks**

Most safety nets programs have traditionally targeted the chronic poor and safety nets for climatic shocks are relatively underdeveloped. But there is growing interest in using safety nets to help avoiding post-disaster famine and in assisting affected households and communities protect and rebuild their assets. Cash transfers, both conditional and unconditional, workfare programs, and in-kind transfers are some of the available instruments. Experience from South Asia and elsewhere suggests that large-scale cash support has been an important and well-performing part of the disaster response in several recent major disasters. It makes sense to prepare for better design and swifter and more equitable and consistent deployment after weather shocks. The key preparatory step is to build country capacity to deliver cash transfers or execute public works after natural disasters. The same capacity can be used to cope with manmade shocks such as food, fuel, and financial shocks. Countries and donors should work this into their disaster preparedness (Heltberg, 2007; Vakis, 2006).

It is useful but uncommon for existing safety net programs to have contingency arrangements in place for scaling up (Grosh et al, 2008). The key is to have programs in place before the onset of natural disasters, with flexible targeting, flexible financing, and flexible implementation arrangements (Alderman and Haque, 2006; de Janvry, et al, 2006). This would allow countries to provide relief and rehabilitation assistance, at short notice, to those affected by a variety of adverse events, whenever and wherever they may occur. Bangladesh, for example, has built capacity for rapid transfers in kind or cash to people affected by natural disasters. As part of an integrated approach to disaster risk management that also includes large-scale private

rice imports, these transfers have helped reduce the mortality from natural disasters and improve disaster recovery. In Honduras, an existing social fund was able to scale up labor intensive community projects after Hurricane Mitch. Within a few months, these projects created a large amount of temporary employment in communities where infrastructure had been disrupted by the hurricane. (Grosh et al, 2008).

There is an additional benefit if programs are able to offer a credible ex-ante guarantee to households that, under certain specified conditions, they will receive benefits. As a substitute for insurance, this would allow households to make livelihoods decisions with higher risks and higher expected returns. There are interesting innovations for weather risk management that combine insurance and safety net or social insurance approaches, with ongoing programs or pilots in Mexico, Ethiopia, Mongolia, Andhra Pradesh and elsewhere that include weather indices as triggers for payouts to farmers and to mobilize safety net transfers. Ethiopia's Productive Safety Nets Program is perhaps the best example of this approach. The program offers a combination of cash transfers and public workfare to around 6 million chronically food insecure people. The aims of the program are to reduce household vulnerability, improve household and community resilience to shocks, and break the country's dependence on food aid. The program has developed a mechanism based on rainfall indices for temporary expansion into drought affected areas threatened with food shortages.

### **5.3 Livelihoods Programs**

Access to assets and employment is vital for building resilience of the poor. As the productivity of many natural resource based livelihoods declines, peoples' transition into new livelihoods, often in new sectors and in urban areas, may need temporary support. Effective livelihood support requires a multi-sector approach and social protection can contribute through employment generation, asset transfers and asset building, livestock restocking, seed transfers, training and skills development, micro finance initiatives, and more orderly migration and access to safe and easy remittances. Employment generation programs such as Maharashtra's Employment Guarantee Scheme have shown that it is possible to transfer and stabilize incomes while building valuable community assets. Programs may also focus on building the assets of the poor and protecting the returns of these assets through access to markets and protection of rights (Davies et al, 2008). Countries such as Ethiopia and Nicaragua run projects that combine cash transfers with livelihoods support aimed at increasing the income generating capacity of rural households exposed to climate risks. Such efforts simultaneously reduce poverty and improve resilience

### **5.4 Microfinance**

Access to financial products and services is also of some importance to the poor for consumption smoothing and risk management but remains much below potential. A large proportion of low-income people are excluded from the banking system and forced to use cash, informal borrowing, and informal money transfers which are far less secure and flexible. Poor people face many barriers to financial access—distance from services, the inability to produce formal documents, and prohibitive costs. Across Sub-Saharan Africa, for example, only 20 percent of households have accounts with financial institutions (World Bank, 2007).

Microfinance can help bridge this gap and support adaptation through livelihood support and risk management instruments (Hammill, Matthew, and McCarter, 2008). Microfinance is the delivery of loans, savings, insurance, and other financial services to low-income groups so they can engage in productive activities, build assets, and protect themselves against risk. For these reasons, microfinance is recognized as one part of the toolkit to fight poverty, but far from the only one. Microfinance often does not cover the unbankable very poorest but serve a slightly more stable low income segment which has been ignored by traditional banks. In Bangladesh, however, the large NGO BRAC has pioneered approaches to sequencing safety net support, skills building, and microfinance in a program that aims to “graduate” the poorest into microfinance clients.

Microloans are the best type of microfinance and are most often given for productive purposes such as purchase of small assets or to finance working capital. This helps people start a small business and reduce their reliance on moneylenders. Microloans are not directly designed for risk coping, which would require lending to expand in times of shocks. Instead, microloans create resilience indirectly to the extent they are successful at helping people grow and diversify their incomes and assets. Microsavings complement this by giving low-income groups access to safe and cheap savings instruments. The ability to tap into savings in a crisis can literally mean life or death for the poor.

There is increasing interest in microinsurance as a direct risk management instrument. Formal insurance is often superior to informal measures such as low-risk low-return strategies and potentially unreliable social connections. Microinsurance aims to increase the outreach and coverage of formal insurance across lower income tiers not otherwise be covered by insurance. Microfinance tailors insurance products to the needs and purchasing power of low-income people. Common microinsurance products include health, life, and index-based (often linked to rainfall) insurance. While microinsurance can be offered by anyone, including NGOs and the private sector, microfinance institutions have shown the biggest interest, for example offering life insurance as a way to insure their outstanding loans (Alderman and Haque, 2007). Social funds have also shown interest in microfinance—although their lack of actuarial expertise can be problematic, the existing relationship between social funds and potential clients can help establish the trust that is critical to the uptake of any insurance product (Maleika and Kuriakose, 2008).

## **5.5 Weather-Based Index Insurance and other Conditional Financial Instruments**

Emerging lessons with index insurance at household, local, or national level show scope for insuring against low-frequency and high-cost weather events. Weather-based index insurance can sometimes substitute for traditional crop insurance which has failed because of the high administrative costs to verify claims. Weather-based index insurance uses objectively defined trigger events (e.g., rainfall, soil moisture) in an area to set contingent damage payments according to an index. Contracts and indemnity payments are the same for all buyers per unit of insurance with no use of field- or household-specific damage and loss data. In contrast to microinsurance, weather based insurance can be offered to countries or regions, as is the case for example with hurricane insurance. Index insurance discourages moral hazard and cheating, avoids adverse selection problems, and lowers transaction costs. It also makes the insurance

instrument accessible to the broader rural population (Skees, et al., 2002; Hess and Syroka, 2005). However, index insurance weakens the correlation between losses and payouts. This is known as ‘basis risk’—an insured party may suffer a loss yet not receive a payout. Index insurance still presents technical challenges (for example, data availability) and may not be easily affordable or in high demand in many countries.

Index insurance for farmers and for local and national governments is finding growing use in developing countries but is not a panacea (Alderman and Haque, 2007): it may not be appropriate for slow-onset climate impacts, preventing losses is sometimes more cost effective than loss-based insurance, and many low-income countries lack insurance markets and may not find insurance easily affordable. Some developing countries may choose not to take out insurance if indemnities crowd out concessional emergency funding. Therefore, weather-based insurance cannot stand alone. Many humanitarian crises are caused by factors other than climatic variability (conflict, poor governance, lack of infrastructure, political and macro-economic crises). Safety net and emergency response policies thus should not be tied exclusively to index instruments.

## **6. Toward a Research Agenda**

There is much uncertainty about the socio-economic implications of climate change and how best to design adaptation. Social scientists need to step up to this agenda. For a start, confusion over definition of key terms (risk, vulnerability, adaptation) should be avoided. As argued in this paper, the SRM and asset-based approaches provide a consistent conceptual framework to apply these definitions and can help make the causal relationships explicit and provide an integrated framework for considering interventions. We also recommend four different areas of social science adaptation studies: (1) monitoring change and responses; (2) predicting the consequences; (3) assessing policy alternatives; and (4) institutional arrangements and financing.

*Monitoring Household and Community Response to Climate Changes.* Meteorologists systematically monitor weather variables (defined and measured in a comparable manner) in specific locations over many years. Biologists monitor species and eco-systems. Social scientists have little or no comparable monitoring of the impact of that weather and how households, communities, and institutions respond to it over time. To build that body of information, we propose a long-term international monitoring program on climate and socio-economic impacts and responses.

This data collection would combine longitudinal information on weather; panel surveys of household production, consumption, migration, health, and well-being; and surveys of community responses in selected locations. It would result in the collection of spatially referenced climate, community, and household data (health, assets, livelihoods, and well-being). A mix of quantitative and qualitative information should be collected at regular intervals and over a long period. This kind of data would be an important global public good and could greatly facilitate real-time monitoring of impacts and responses to climate change.

*Understanding Poverty and Distributional Implications of Climate Change.* There is a need to better understand the socio-economic impacts of climate change at household and intra-

household levels. The longitudinal monitoring approach proposed above could help provide data, but modeling efforts will also be required and could complement monitoring. One approach to modeling could aim to better predict poverty and vulnerability effects by combining agronomic models, climate predictions, and distributive analysis at spatial, sectoral and household levels, and for different social groups. It might also be useful to offer model results that are more near-term (10-25 years forecasts) than the usual long-term.

*Assessing Alternative Adaptation Interventions.* Better estimates of the benefits and costs of adaptation interventions are needed to guide design and prioritization. Policy design, implementation, and governance issues should be studied for a broad range of adaptation options, seeking to assess the cost-effectiveness of alternative interventions and their distributional consequences. It will be interesting to learn from experience as policy implementation proceeds. This research should help policymakers prioritize, sequence, and finance adaptation interventions in a variety of sectors. Policy research should also consider issues of access and voice by the poor: do they gain from new technology? from policy interventions? do they influence policy? There is a long way to go but, eventually, research should be able to compare the effectiveness and the equity implications of different adaptation interventions.

*Institutional Arrangements and Financing of Adaptation.* There is a need to explore institutional arrangements for managing and financing adaptation, including NAPAs, Adaptation Funds, and Climate Investment Funds. Key questions are how well arrangements ensure coordination between different actors and utilize available knowledge (Vogel et al, 2007). There are also many issues related to fair, equitable, and effective ways to share the costs of adaptation. Concerns with ethics, social justice, and political economy are central—who pays and who benefits from adaptation.

## **7. Conclusions**

There is much uncertainty about the socioeconomic implications of climate change and how best to design adaptation. Risks associated with climate change could greatly increase vulnerability unless adaptation is stepped up. Developing countries and donor agencies should therefore do more to prepare for ongoing and future climate changes focusing on actions that are no regrets, multi-sectoral and multi-level, and that improve the management of current climate variability. In planning and financing, adaptation should be integrated with general development. Social scientists and development practitioners need to step up to this challenge with the aim to promote adaptation that is pro-poor and on a scale commensurate with the challenges.

This paper therefore developed and applied a social risk management and asset-based analytical framework to the challenges stemming from climate change. The proposed framework offers a unifying lens to examine the links between risks, adaptation, and vulnerability. We hope this framework can help guide efforts to reduce the vulnerability of households and safeguard the opportunities for development. The key is to understand the risks associated with climate change and climate volatility facing the poor and vulnerable and to deploy interventions for managing these risks.

There is a long way to go. Current climatic volatility is not well managed, particularly in low-income countries where climate events often result in irreversible losses and impede long-term development prospects. Social policy and social protection for reducing vulnerability and involving communities in development can assist the poor manage climate change and climate volatility and support them as active agents in creating resilience. Examples of interventions to take forward include social fund and CDD support for community-based adaptation; safety nets that better respond to climatic risks and natural disasters; livelihoods programs; microfinance; and index insurance. The new wave of financing for climate change adaptation represents a unique opportunity for deploying this kind of no-regrets and pro-poor interventions.

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**Figure 1: Schematic Presentations of Asset-Based Approach**

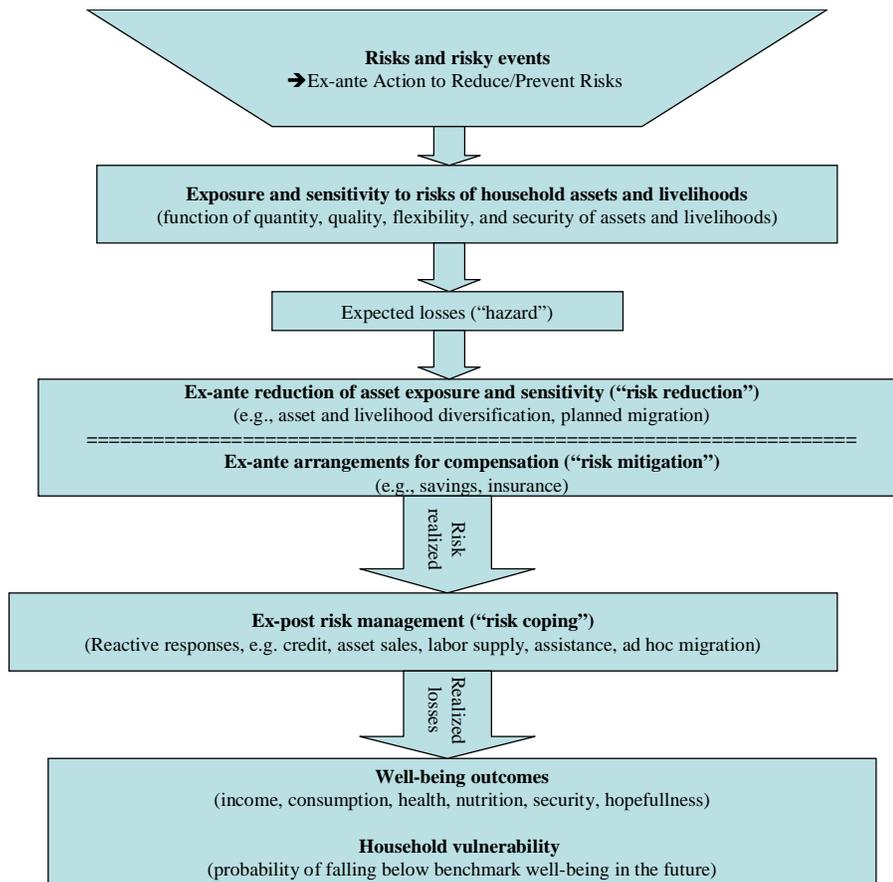
<b>Household Assets</b>			<b>Policy and Institutional Context</b>	
Productive	Social and Political	Locational	Community and Local	National and Global
Human Natural Physical Financial	Social and political networks	Agro-ecology Proximity to markets Access to infrastructure	Community and local institutions Norms and customs Services (e.g., education, health, water, sanitation) Exclusion Discrimination	Government, governance, Institutions Economic policies Regulatory and legal framework Property rights

<b>Household Livelihood Strategies (including risk management activities)</b>
On farm activities (including diversification strategies) Off-farm agricultural and non-agricultural activities Migration, remittances Activities to maintain and strengthen productive, social, political assets Social assistance

<b>Household Well-being Outcomes</b>
Income, consumption, savings Food security, health and nutritional status Empowerment and self-esteem Social connectedness and sense of family/community Environmental quality Perception of security Hopefulness toward the future

Source: Adapted from Siegel (2005).

**Figure 2: The Risk-Vulnerability Chain**



**Table 1: SRM Matrix of Interventions to Manage Risks Associated with Climate Change**

	<b>Individual and Household Level</b>	<b>Community and Local Level</b>	<b>National Level</b>	<b>International Level</b>
<i>Ex-ante</i>				
<b>Risk prevention</b>	Reduce emissions of greenhouse gasses			
<b>Reduction of exposure or sensitivity</b>	Investments to protect and enhance household assets; Adopt new technologies; Adjust assets and livelihoods; Permanent migration; Health and education.	Investments to protect and enhance community assets; Investments in physical and social infrastructure; Social capital; Rights and security; Water and sanitation.	Climate proof technologies and infrastructure; Climate predictions and forecasts; Public goods, physical and social infrastructure; Finance, technology, knowledge for producers; Human capital; Safety nets for assets / adaptation.	Research in climate proof technologies; Well-functioning international markets (e.g., in food); Options for permanent international migration; Climate predictions.
<b>Risk mitigation (or compensation)</b>	Insurance; Adjust asset portfolio and livelihood activities; Precautionary savings; Seasonal migration.	Mutual insurance Markets for households' assets; Physical and social infrastructure; Community savings and insurance.	Markets for household assets; Finance and insurance services development; Formal insurance; Migration.	International insurance; Predictable disaster assistance (with funds and rules for targeting & delivery); Options for temporary migration.
<i>Ex-post (after risky events)</i>				
<b>Ex-post coping</b>	Sell or draw down assets; Increase labor supply; Credit; Receive transfers.	Draw down community assets; Transfers from outside community.	Safety nets; Social funds/ community-driven development.	International disaster assistance (ex-post).

*Source: Adapted from Siegel and Alwang (1999) by the authors*