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WEAVING THE NET: CLIMATE CHANGE, COMPLEX CRISES AND HOUSEHOLD RESILIENCE

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EXECUTIVE SUMMARY

The unexpected rise in food prices in 2008 had a complex causality, with climate variability acting as an important trigger. This was followed by the financial meltdown in 2009 and high food prices again in 2011-12. These complex crises, with impacts that cascade across space and time in unpredictable ways, produce severe hardship among vulnerable groups in developing countries. Household impacts tend to manifest themselves in similar ways regardless of the crisis origin, thus offering the possibility of a robust policy response for a broad range of crises. Based on an analysis of the food crisis, a review of coping strategies used by vulnerable groups, and their subsequent efforts to build adaptive capacity, this paper presents a set of four policy conclusions.

INTRODUCTION

Heat stroke, saltwater intrusion, and harvest failure—these are discrete phenomena that can be directly related to a warming and more variable climate. But climate change impacts also occur as complex system changes, where the climate signal interacts with other factors in unpredictable ways.

In 2008, weather, ecology, and food and energy markets combined to produce a sudden and unexpected spike in food prices that triggered a global crisis. Followed by a financial meltdown in 2009 and new food price spikes in 2011 and 2012, these global events profoundly affected the livelihood of millions of people in developing countries. As an expression of their complexity, it is only now, long after the fact, that we are gaining a fuller understanding of the causes and effects of the food, energy, and finance crises. Among poor and vulnerable households across the globe, however, the unexpected events produced an all too familiar outcome: loss of household assets and income, higher malnutrition rates, a heavy burden on women, and extreme psychological stress and strain among poor families (Heltberg et al. 2012), outcomes that are similar to the impacts of natural disasters and other shocks and stresses (for an extensive review of the impacts of natural disasters on households, see UNISDR 2009).

Vulnerable urban and rural communities are systems within systems, open to an interconnected and interdependent world where global changes in the supply and demand of services and commodities are transmitted to the local context. To understand the climate vulnerability of these communities, we must see how systems at different levels interact and how global events are expressed as local realities. Indications are that climate change will lead to more disturbances in global food systems, where supplying nations are few and harvest failure will have high impact, leading to global price spikes and volatility (von Braun and Tadesse 2012) and thus reducing not only food availability, but also access to food for those that already spend a high proportion of household budgets on food (Hossain et al. 2013). The High Level Panel of Experts on Food Security and Nutrition (HLPE), established by the World Committee on Food Security (CFS) as part of global institutional reform in the wake of the food crisis, finds that climate change will make it even harder to overcome the already huge challenges to global food security, as it reduces the productivity of the majority of existing food systems and harms the livelihoods of those already vulnerable to food insecurity (CFS 2012a).

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Climate change impacts have a global dimension, but their manifestations are local and contextual, affecting men, women, and children who lack the resilience to maintain access to food of sufficient quantity and quality. Families enter or move out of poverty depending on a set of factors over which they have limited control, and where illness often erodes household income and leads to indebtedness and destitution (Krishna 2010). Continuous and unrelenting strain will ultimately take them across thresholds beyond which the effects of malnutrition, lost opportunities, and productive assets will become irreversible. They will enter a new state of deprivation, where recovery will become difficult or impossible. It is in this dynamic downward movement that direct or systemic effects of climate change can become determinants of dwindling resilience, as they increase the risk of ill health and eroding household assets.

Research on the effects of the food crisis has given us a new understanding of how households manage crises, what coping mechanisms and adaptive strategies are at their disposal, and which policies enhance their resilience. Although climate-induced crises are difficult to pre-

dict, understanding how household adaptive capacity is constructed is the basis for adequate support. Since different kinds of shocks and stresses—such as extreme weather events, price hikes, or disease—tend to produce similar outcomes at the household level in terms of asset loss, malnutrition, and lost opportunities, it follows that similar supportive policies could protect against a wide range of threats, not only those triggered by a changing climate.

This paper takes the social and human dimensions of climate change impacts as its point of departure. It argues that despite the complex nature of systemic climate change effects, characterized by uncertainty and nonlinearity, policy responses are available that offer potentially robust protection against climate change impacts, while also addressing a broader set of shocks and stresses.

To demonstrate the linkages between complex global change and local impacts, section two presents the evolution and timeline of the recent food crisis and how global food prices were transmitted to households. Although the emphasis here is on impacts on global food systems and on the interaction between food and energy markets, we also present other examples of complex crises with local impacts where climate change plays a role. Sections three and four describe how households were affected by the food crisis and the adaptation strategies they generally use, with an emphasis on diversification, mobility, and institutions. To enhance households' adaptive capacity and protect them against a range of crises, the final section offers a set of policy conclusions combining a global approach with local and contextual measures: the establishment of vulnerability observation systems, strengthening of safety nets, support to adaptive capacity, and promotion of risk governance.

THE FOOD CRISIS AND BEYOND

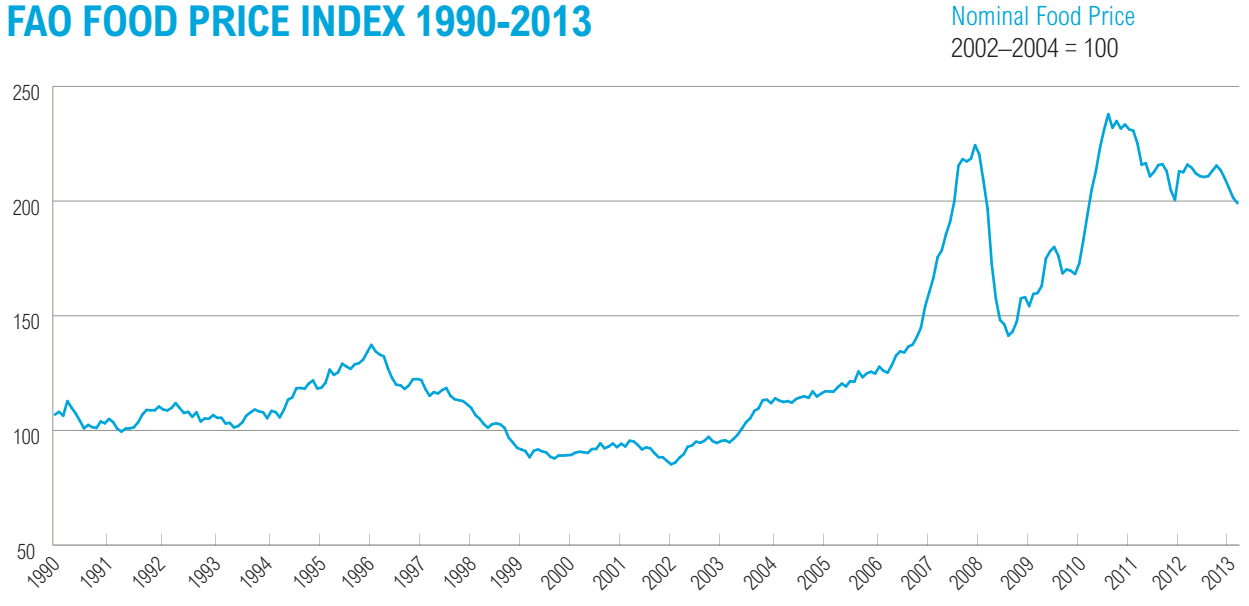
Chain of events

A "triple crisis" was the term frequently used to describe the global food, finance, and energy crises, which began in late 2007. Such overlapping crises have occurred before—most recently in the mid-1970s,[1] although there is limited evidence of local-level impacts in developing countries from that period. We now seem to have entered a new era of food price volatility (von Braun and Tadesse 2012), and prices have remained at a high level since the onset of the food crisis.

Almost stable for 20 years, the FAO food price index more than doubled

FIGURE 1

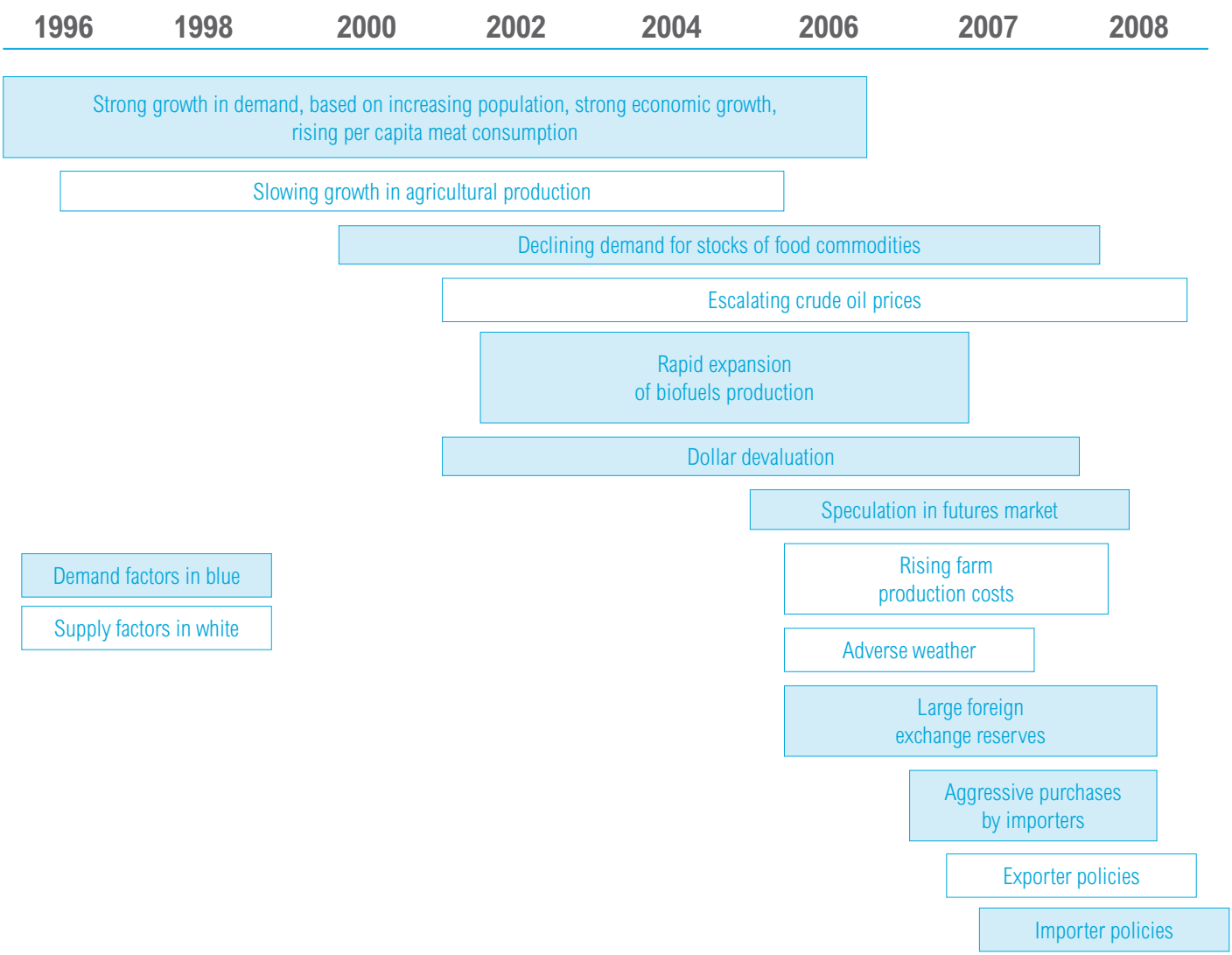
FAO FOOD PRICE INDEX 1990-2013



Source: http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/ (last accessed 27 October 2013).

FIGURE 2

TIMELINE OF EVENTS THAT CONTRIBUTED TO THE 2008 FOOD CRISIS



Source: Adapted from Trostle (2008) and Headey and Fan (2010).
Note: The accumulation of causal factors resulted in a critical mass-like situation, with adverse weather immediately preceding the spike in food prices. Blue boxes signify factors that contributed to a change in demand, white boxes to factors that influenced grain output and supply.

between 2007 and 2008 (Figure 1), a dramatic change not predicted by any of the food early warning systems in place after the crisis in the mid-70s (Headey and Fan 2010).

The sudden shift erupted due to the confluence of several factors (Headey and Fan 2010; CFS 2011), where each one on its own would hardly have had such dramatic effects.

High oil prices, resulting from the inability of the oil industry to increase production at a time of high demand (Hamilton 2009) led to increased costs of fertilizer and fuel for farm operations and agricultural transports, a cost increase that was directly transmitted to food prices.

In turn, increasing oil prices led to a high demand for biofuel ethanol to substitute for oil, which in the U.S. triggered a diversion in maize production from the food to the fuel market, reducing the availability of food globally. As prices rose, extreme climate events—in the form of drought and floods in the major producing countries of Australia, Ukraine, Russia, and the U.S.—reduced grain output further.

A well-functioning international food market would have been able to mobilize stocks and grain reserves to meet demand. But stocks were low, and several large producing countries responded with export bans to ensure the supply of food to domestic markets, further reducing available food and further driving up prices (Martin and Anderson 2010; Headey 2011).

Whether the increase in speculative grain trading helped cause the price increase—or rather was a reaction to a commodity scarcity and thus a symptom—is still debated (CFS 2011a; Headey and Fan 2010). There is no question that trading did increase, however, possibly contributing to spiraling prices.

Adverse weather was one among a complex set of factors that contributed to the crisis. Figure 2 shows the timeline of events. The crisis was preceded by a gradually increasing long-term global demand for food, in parallel with a growing population. Supply had kept pace with demand for many years mainly through an expansion of land, which kept food prices at bay, while the increase in agricultural productivity beginning during the green revolution had started to decline. Adding one causal factor to the other created a critical mass effect, where the weather-related reduction in grain output from the few major producers had a triggering role.

Local effects

The crisis was felt globally but had particularly dramatic effects in those developing countries, which are net importers of food and also have a high oil import bill. Most countries in this category are found in Sub-Saharan Africa, particularly in West Africa (World Bank 2011). Emergency food aid managed by the World Food Programme (WFP) could no longer be financed in early 2008 as the price of staples soared, forcing WFP to plan for the unprecedented phasing out of relief and school feeding programs, until it was bailed out by a donation from the Saudi government (Global Humanitarian Assistance 2011). Poor households—for which food already represented a high proportion of their budgets—could no longer meet their basic needs unless they had access to substitute foodstuffs from domestic markets. FAO reported dramatically increased malnutrition levels, although the methodology and reliability of these estimates is disputed (Masset 2011).

Apart from the well-understood impact of high food prices on urban populations, the crisis also undermined the notion that smallholder farmers are normally self-sufficient in terms of food. Reports from several countries showed that many farmers regularly failed to meet their needs from their own food production, being net consumers rather than producers of food (Ivanic and Martin 2008). And the potential of increased farm income from the higher market prices was offset by the increase in the cost of fuel and fertilizer.

For farmers, the volatility of food prices is as much a concern as their level. Expectations of a stable and high price allow farmers and the agricultural industry to invest to meet increasing demand. If food prices cannot be predicted, farmers and investors will not make forward-looking and risk-taking decisions (World Bank 2011). Due to the seasonality of cropping cycles, farmers are unable to respond to sudden increases in food prices until the next season, when a collective response that increases output will most likely again reduce prices.

A boost of grain production did take place in 2009, replenishing global stocks and reducing prices. This trend was reinforced by falling food and energy demand as the U.S. housing market collapsed in late 2008, triggering a global finance crisis.

Climate variability again played a role in August 2010, when the price

Biofuels remain contentious. As countries try to reduce their dependence on oil, the market for biofuels becomes more profitable than that for food.

of wheat started to rise (Figure 1), partly due to crop failure in Russia as a result of a severe heat wave and floods in Australia. At the same time, unprecedented drought in China's main wheat-growing region, a country that has been largely self-sufficient in wheat, triggered large-scale imports. After the first quarter of 2011, prices were at an all-time high and 13 percent higher than 2008 crisis levels (Figure 1). This time, droughts and floods seemed to be a more prominent factor than in 2008, although oil price increases again contributed to the price hike. High but less volatile food prices continued in 2012 when the severe heat wave and drought in the U.S. and in much of Europe and Central Asia again reduced maize and wheat harvests.

Biofuels and land deals

In an August 2012 piece in the Financial Times, FAO's Director General Jose Graziano Da Silva stated that competition for a U.S. corn crop that had been ravaged by the worst drought in 56 years was only going to intensify. He urged the U.S. Government to reduce its biofuel quota and enable higher volumes of crops destined as food to reach the international market.

"Much of the reduced crop will be claimed by biofuel production in line with U.S. federal mandates, leaving even less for food and feed markets. An immediate, temporary suspension of that mandate would give some respite to the market and allow more of the crop to be channeled towards food and feed uses."

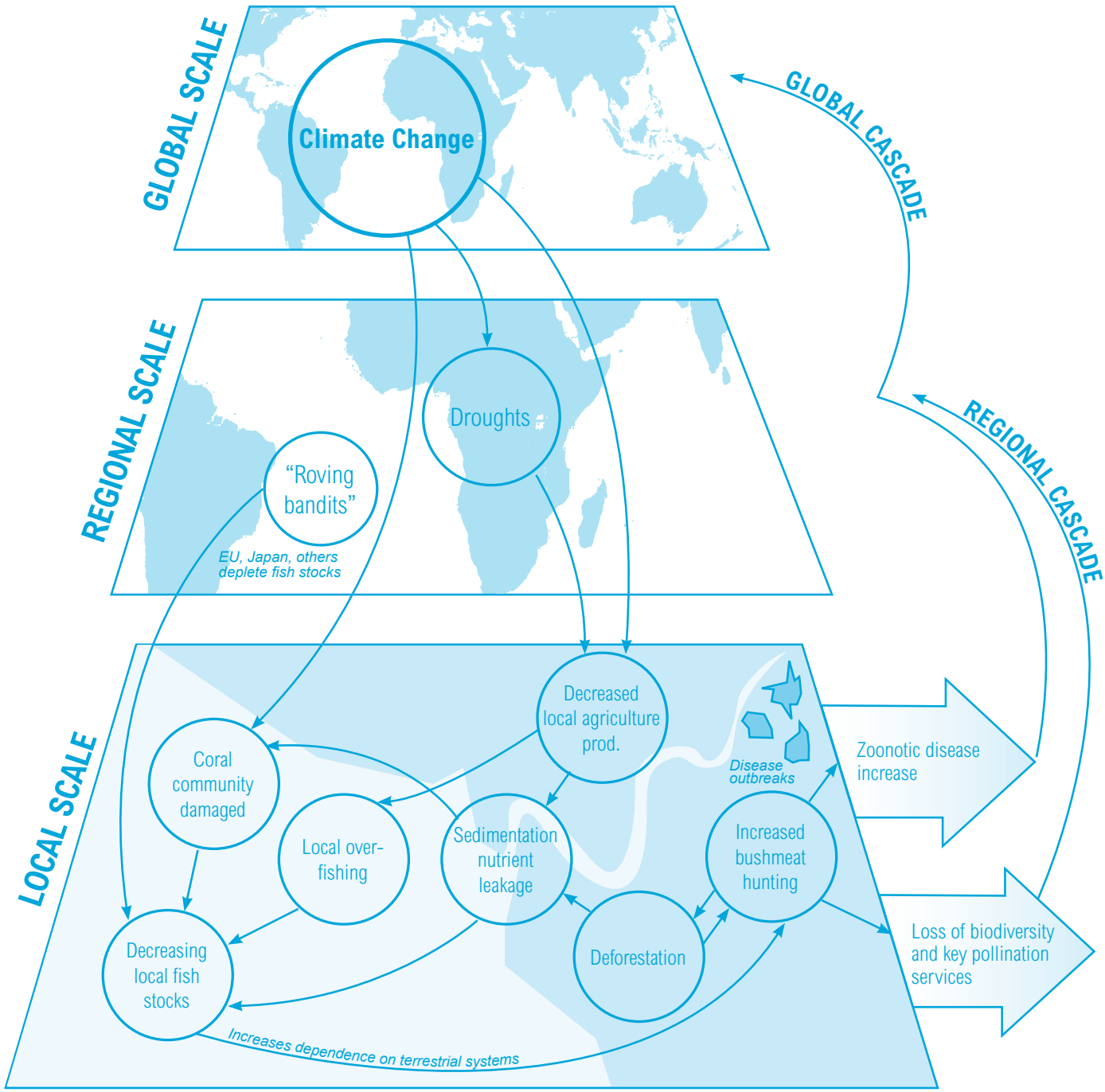
Biofuels remain contentious. As countries try to reduce their dependence on oil, the market for biofuels becomes more profitable than that for food. The U.S. is the world's major maize exporter. Between 2007 and 2011, the share of the U.S. maize crop used for ethanol production increased from 31 to 40 percent. If biofuel production quotas were maintained at this level, it would not only further stimulate domestic biofuel production in the U.S., but also trigger land-use change for biofuel production in other countries. This is already happening. In Guatemala landowners are reportedly displacing tenants in favor of leases for large-scale ethanol production from sugar cane (Rosenthal 2013; CFS 2013). This series of events illustrates how anticipation of food and energy insecurity can lead to large-scale land deals where industrialized and middle-income countries and businesses seek to benefit from a new market and also insulate themselves from coming crises by securing their own supply (Cotula et al. 2009). Land deals in the form of purchases and leases have increased dramatically, particularly in Sub-Saharan Africa. In 2011, it was reported that 50–80 million ha were under negotiation (CFS 2011b) for biofuel or food production or to hedge against anticipated future food price increases, in which case the land would be idle. While there may be benefits for governments and the rural population—if deals are fair and transparent, bring new technology and employment opportunities, and respect local land rights—the risks are very high when these conditions are not at hand. Examples where such ideal conditions exist are few and far between. The risk is rather that elites use the global demand for land to further undermine customary land rights (Cotula et al. 2009; CFS 2011b).

The food crisis and the "Arab Spring"

The food crisis had dramatic political fallout in several countries. An IMF study showed that the quality of governance matters in managing food price increases and their impacts (Arezki and Bruckner 2011). Many low-income countries experienced a significant deterioration of democratic institutions as a result of the food crisis, directly related to an increase in civil unrest. Increased food prices led to reduced consump-

FIGURE 3

MULTIPLE CASCADING ECOLOGICAL CRISIS: FISH AND ZOONOTIC DISEASE



Source: Galaz et al. 2010a

tion and increases in the gap between the rich and the poor (CFS 2011a).

Tracing the systemic impact of the climate change signal, new analyses (Werrell and Femia 2013a) also suggest that the food crisis contributed to the coming of the "Arab Spring." Countries like Tunisia, Egypt, and Libya are highly dependent on food imports. With food representing 35–45 percent of per capita income, in comparison to less than 10 percent in most industrialized countries, skyrocketing bread prices added to the frustrations of the young population and became an added aggravating factor along with other economic, social, and political drivers (Sternberg 2013). "Climate change may not have caused the Arab Spring, but it may have made it come earlier" (Johnstone and Mazo 2013). In Syria, extreme drought over several years left 1 million people food-insecure (Erian et al. 2010) and preceded increasing public protests against the regime and the outbreak of violence (Werrel and Femia 2013b).

Cascading crises

The period of global crisis starting in 2008 may be the harbinger of a "new" normal state of affairs, where food insecurity reigns and the most vulnerable are at great risk. It has been identified as an example of crises that have a local origin with elements of deep ecosystem change and that cascade in space and time as they cross geographic boundaries and trigger a chain of events that may not be immediately apparent or understood (Duit and Galaz 2008; Galaz et al. 2010a). Other examples studied by Galaz et al. (2010a) include the avian H5N1 influenza outbreak, black stem rust on wheat, declines in coral reef ecosystem services, and methane emissions from thawing permafrost.

Another example with a climate change dimension concerns the effects of overfishing by high-capacity vessels along the West African coast. The losses of fish catch combined with droughts in the region have deprived poor coastal communities of livelihood opportunities (Figure 3). Instead, they have increasingly turned to the use of wild "bushmeat," which is believed to have facilitated transmission of Ebola and other viruses to humans, creating a highly complex cross-scale and cross-sector crisis.

Addressing cascading crises presents extraordinary challenges for decision making in governance systems used to operating within more limited scales, sectors, and administrative boundaries. Climate change is a global contributor to this likely new normal, which along with other context-specific social, economic, and ecological causal factors will produce very specific and highly problematic local outcomes. There will certainly be vulnerable communities at the receiving end, which requires both a global public policy response and local actions tailored to help those affected. Understanding the anatomy and evolution of the food crisis may help us in the design of appropriate preparedness and response actions for such complex future events. The following section describes in further detail how communities were affected by the recent global crises.

In summary, a complex interaction of global and local changes in climate, ecology, and markets precipitated the unexpected food crisis in 2008. It was followed by further events, all transmitted into local realities with specific political, economic, and social determinants. These crises could be the harbingers of a new normal where events cascade in space and time, calling for policy responses with sufficient robustness to deal with the impacts of the unpredictable. Such responses must include means of observing indications of fundamental change that depend on the interaction of diverse phenomena across sectors, disciplines, and geographical boundaries. The design of such observation systems will be discussed in the final section.

HOUSEHOLD IMPACTS

As the availability and access to food in developing countries declined in 2008—both because of reduced imports and higher food prices—there were many reports of riots and unrest in major cities. Initially, anecdotal evidence and modeled data based on simulations indicated that the crisis had taken a severe toll on vulnerable populations (Ivanic et al. 2011; Narayan and Sanchez-Paramo 2012). But evidence was lacking to determine who was most seriously affected, how severe impacts were, what coping strategies were used, how gender and age influenced impacts, where support came from, and what role governments played to help.

Living with crisis

In 2012, a comprehensive study by the Institute for Development Studies and the World Bank (Heltberg et al. 2012) helped answer many of these questions. Looking at the 2008–11 crisis period in 17 countries, it presents findings about coping in a globalized world, where

education is increasingly valued as an asset and migration and remittances are parts of household safety nets. Using qualitative methods, the study included an analysis of the role of the informal sector and drew attention to groups that are often excluded from traditional household surveys, such as beggars and unregistered migrants.

The study found that impacts of higher global food prices and declining growth are transmitted to households and communities through three main channels: formal and informal labor markets; price shocks affecting food, fuel, and other commodities; and through reduced opportunities for migration.

In all countries studied, an early reaction to high food prices was a reduction in the number of meals and the quality of food eaten. Women often took on the role of "shock absorbers" in order to provide more for children and other family members. In a study on the impact of the food crisis on women in developing countries, Floro et al. (2010) pointed out that coping mechanisms are not gender neutral.

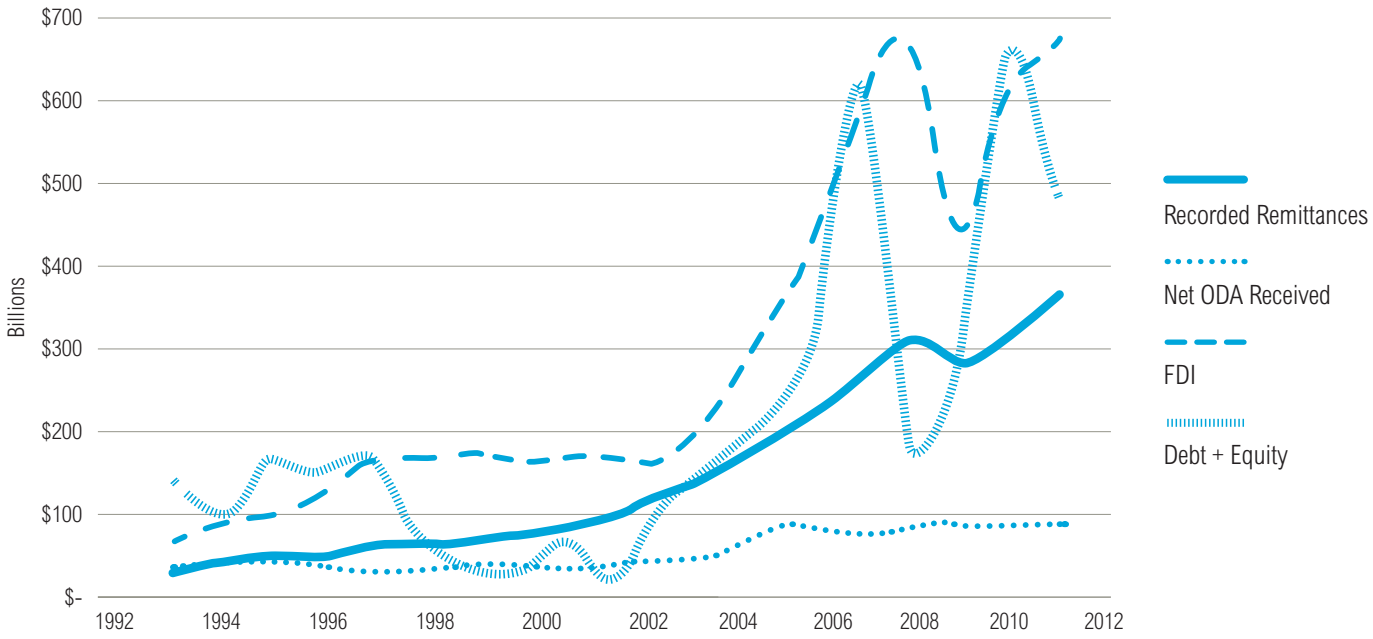
Richer consumers are less sensitive to increasing food prices than the poor, who often have to pay more for smaller daily quantities as they lack the financial resources to buy in bulk and live away from low-cost supermarkets (Tacoli et al. 2013).

Since food costs represent a smaller portion of rich consumers' expenditures, they can maintain the same level and quality of consumption even when prices increase, keeping them at a high level and contributing to inequity in the distribution of food (CFS 2011a).

Although there were many cases where children were taken out of school or their attendance became erratic, this was less common than expected from earlier crisis events (Heltberg et al. 2012). Parents often made great sacrifices to keep their children in school, something attributed to the success of investments in universal education over the past decades and a normative change in

FIGURE 4

RESILIENCE OF REMITTANCES COMPARED TO OTHER FINANCIAL FLOWS TO DEVELOPING COUNTRIES



Source: Adapted from Sirkeci et al. (2012).

the perceived value of education. Still, youth were found to be the most vulnerable; they were unable to find jobs or pay for higher education, and often resorted to drug use, crime, and sex work. A higher incidence of STDs and HIV/AIDS in Kenya and Zambia was directly related to these destructive crisis-triggered coping efforts (Lubaale and Hossein 2012).

The sale of assets and indebtedness became increasingly common the longer the crises lasted, thus eroding households' resilience in the face of new shocks. Informal safety nets, including remittances from migrant family members and income gained from informal sector enterprises, were clearly the most important sources of support in all countries studied. Safety nets weakened over time as more and more people depleted their assets, however, contributing to the gradual erosion of social norms and community cohesion and ultimately to the weakening of their resilience.

Migration

Early reports and anecdotal evidence indicated that labor migration from developing to industrialized countries came to a halt and even reversed during the food and finance crises. As food prices in urban areas rose, there were also reports of a reversal of rural-to-urban migration within developing countries. Recent comprehensive and systematic studies give a more nuanced picture, however. On the basis of a number of case studies, Sirkeci et al. (2012) found a 40–60 percent decline in new migration, confirming the findings by Heltberg et al. (2012), but no global net return of migrants, although that may have been the case for some countries (Sirkeci et al. 2012). There was also a dip in international remittances during the 2008 food crisis, but much less than for foreign direct investments (Figure 4), and very little change during the subsequent 2010 financial crisis. The authors conclude that remittances constitute one of the least volatile and most resilient financial flows to developing countries. Migrants managed to find jobs in sectors less influenced by the crisis, putting such a premium on their immigrant status that they absorbed income reductions rather than returning home. Other studies also show how migrants increase their remittances in direct response to natural disasters in their home countries (Mohapatra et al. 2012), making households that receive remittances better able to manage disaster impacts.

Volatility impacts

While the 2008 and 2010 food crises receded in the short term as high prices again triggered a boost in production, food prices have remained at much higher levels than before 2007 (Figure 1). Reviewing recent research, von Braun and Tadesse (2012) found that a rising medium-term price trend has triggered extreme short-term price spikes and increased volatility. We seem to have entered a period of increasing global food insecurity. Crises are likely to be a normal feature for developing countries, with multiple origins and complex causality (Kanbur 2010). For households that were spending 50 percent or more of their budgets on food before the crises, and where the much higher price level at global markets has been transmitted to domestic markets, there may have been fundamental shifts in their patterns of expenditure and in the nutritional content of the food they consume. About this little is known. Early results from a research project initiated by IDS and Oxfam indicate that the recent crises are leading to profound changes in people's well-being and development (Hossain et al. 2013).

In summary, evidence of impacts of the recent crises indicate a gradual erosion of household assets, human capital, and coping mechanisms over time, with notable attempts to protect investments in children's education. International migration showed remarkable resilience, demonstrating the value that households attach to mobility as a means of livelihood diversification. A policy response needs to protect households against the erosion of assets and enhance their functioning adaptive actions, as further discussed in the concluding section.

HOUSEHOLDS DEALING WITH RISK

Poverty dynamics and the adaptation discourse

To be poor is to constantly manage a range of risks but with insufficient resources to do so effectively—from those only affecting individual households to those that impact communities, regions, and nations. The crisis narrative now emerging shows us a dynamic dimension of poverty that is hidden beneath long-term trends and aggregated data. In a particular society, there may be as many households that rise out of poverty as are pulled down into destitution, as demonstrated in a major study of poverty dynamics in countries in Africa, Asia, Latin America, and the U.S.

(Krishna 2010). A limited net increase or decrease in poverty rates will not reveal the dramatic shifts upwards and downwards that are hidden beneath income averages in a society undergoing deep change. If we are entering a new era of instability, volatility, and crisis, where climate change is a direct or indirect aggravating factor, it is critically important that strategies for poverty alleviation with an adaptation profile incorporate an understanding of this dynamic change.

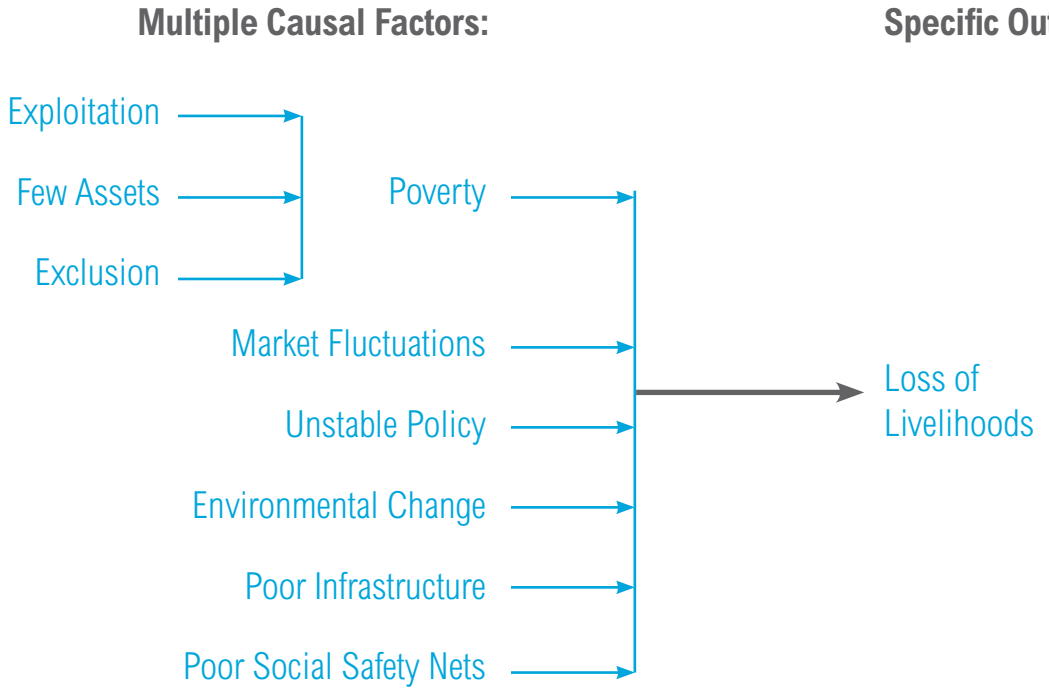
Studies on climate change adaptation have led to a new interest in factors that determine societies' ability to cope with shocks and risks, partly drawing on a discourse originating in the analyses of the great famines in India in the 1940s and in Africa in the 1970s and 80s (Sen 1983), but adding new elements. The new discourse has two strands. One is about measures to climate-proof investments in sectors such as infrastructure, agriculture, and water management, and to protect communities from the direct impacts of weather-related natural disasters. The other is about the strategies of communities and households to strengthen their adaptive capacity, and the enabling institutional, governance and political environment that will support such efforts.

Many causes—similar outcomes

The political fallout of recent crises makes it necessary to position an analysis of impacts on households in a broader framework, including political, social, economic, and environmental determinants of vulnerability. Food insecurity is about much more than poor harvests. As Kanbur (2010) shows, different causes of crises and shocks—price hikes, natural disasters, or disease—lead to similar outcomes in terms of livelihood insecurity (Kanbur 2010). A simple model adapted from Ribot (2010) demonstrates how multiple causes deliver similar outcomes:

FIGURE 5

COMBINATIONS OF STRUCTURAL CAUSES OF POVERTY AND CHANGES IN THE ENVIRONMENT OF THE POOR THAT ALL RESULT IN THE LOSS OF LIVELIHOODS



Source: Adapted from Ribot (2010).

It thus becomes nonsensical to design specific responses for specific threats for specific threats. This has been a tendency in the climate change debate, where efforts are made to single out climate change triggered weather-related events from those that have other causes. Rather, it makes sense to search for the kinds of robust responses that strengthen resilience and adaptability to a range of potential events, starting with present vulnerability (Wilbanks and Kates 2010). Such interventions are typically multisector and multilevel, are placed in the broader context of development rather than being stand-alone actions, and deliver value regardless of whether communities are affected by climate change or other threats (Heltberg et al. 2010).

This is not to say that different crisis events do not have different characteristics. The sudden and traumatic loss of life, physical injuries, and destruction of homes following an earthquake is obviously different from the drought-triggered gradual undermining of food security resulting from failed harvests, dying livestock, and reduced income from assets sold simultaneously by many households, a process that may take years to unfold as negative impacts accumulate. And this in turn is obviously different from a household crisis triggered by a spike in food prices, leading to deterioration in the quality and quantity of nutritious foods consumed and in the terms of trade of household products and services. Preparedness and response must be tailored to each one of them. The point is that they share some fundamental elements. Ultimately these crisis events all lead to a loss of livelihoods, which is likely to have the most destructive and long-lasting effects on the poorest households.

Against a foundation of structural poverty determinants, changes in government policies, market fluctuations, disaster events, erosion of safety nets, or ill-health can lead to the loss of livelihoods. The most damaging and long-term impacts of shocks on households are when they result in the sale and loss of assets such as land and other items necessary for production and reproduction, and when children are taken out of school to contribute to household income. These impacts may be very difficult to reverse and can become irreversible. An illustrative example is presented by Hermida (2011), who studied the long-term impacts of the 1976 earthquake in Guatemala on health and education among poor families. The earthquake caused extensive destruction of public and private assets and made many families homeless. They adapted through the sale of assets, taking children out of school to work, and reducing food consumption and migration; that is, similar coping strategies as those reported by Heltberg et al. (2012) from the recent food crisis. In 2000, twenty-four years after the earthquake, those who were children in 1976 were found to have enjoyed significantly fewer years of schooling and had shorter average height than those who had not been affected. These negative impacts were more pronounced for women than for men. Studies from other natural disaster events document similar effects. Negative impacts on child schooling were reported after crop loss in Tanzania (Beegle et al. 2003) and after Hurricane Mitch in Nicaragua (Vakis et al. 2006). The latter also led to increased malnutrition among infants (Baez and Santos 2007), while the nutritional status of women was found to deteriorate more than among men during crises in Ethiopia (Dercon and Krishnan 2000). In Zimbabwe, it was found that children suffering malnutrition due to drought had lower earnings as adults (Alderman et al. 2006). An extensive review of short- and long-term impacts of natural disasters—including floods, storms, droughts,

It makes sense to search for the kinds of robust responses that strengthen resilience and adaptability to a range of potential events, starting with present vulnerability.

Formal and informal institutions play an important role in mediating crisis impacts and the implementation of adaptation strategies.

and earthquakes—on poverty and human capital can be found in the *2009 UNISDR Global Assessment Report on Disaster Risk Reduction* (UNISDR 2009).

A shock may impact an entire community. This happened during the recent crises and is usually the case when a medium- or large-scale natural disaster happens. During a protracted event, impacts take their toll first on those with the least capacity for coping, and then increasingly on those better resourced who have benefited from the strength of informal safety nets, gradually weakening them until the most vulnerable begin falling through into destitution.

Individual and collective outcomes

Under normal circumstances, and contrary to popular perception, risks that affect only one or a few households have a more profound impact on individual livelihoods than covariate risk, which impacts a whole community. Many studies have shown that the most serious risk facing households is ill health. Disease or accidents that affect family members' ability to work and drain their resources to pay for drugs and medical treatment tend to have a much more serious and long-lasting impact than other shocks and risks (Heltberg and Lund 2009; Collins et al. 2009). Poverty is then just "one illness away" (Krishna 2010).

The normal and seasonal fluctuations in food prices can usually be managed through available household coping mechanisms. Recent dramatic price spikes, however, have broad impact, easily exhausting traditional community safety nets and coping strategies, requiring outside intervention to protect the vulnerable if such support is available (Heltberg et al., 2012). In this respect, they resemble large-scale natural disasters, where entire communities are affected in a similar manner.

Adaptation strategies

To understand how households manage risk, it is useful to analyze climate variability adaptation strategies that have obvious applicability for other crises, accepting that multiple causal factors produce similar household outcomes. The following five categories have been used to characterize adaptation strategies in a rural setting (Agarwal 2010):[2]

1. mobility—the distribution of risk across space, e.g. through migration
2. storage—distribution of risk across time
3. diversification—distribution of risk across asset classes and resources
4. communal pooling—distribution of risk across households
5. market exchange—which may substitute for the other categories if households have market access.

Formal and informal institutions play an important role in mediating crisis impacts and the implementation of adaptation strategies (Agarwal 2010; Crane 2013). Hence, a rural household has good adaptive capacity when (a) it is able to participate in rural as well as urban economies; (b) it can participate across regions; (c) it can participate between countries through market access and migration; (d) it enjoys opportunities to diversify its income through a range of crops and livestock; (e) it is adapted to several environments with varying sensitivity to climate variability and representing wide agro-biodiversity; or (f) when it can rely on a safety net

of pooled community resources. All these categories help a household manage risk and build its resilience.

It is easy to identify a number of conditions that underpin these strategies. Access to information, freedom of movement and assembly, secure tenure, regulatory frameworks that give predictability to markets, general respect for people's rights, and legitimate and accountable institutions are part of an environment that enables households and communities to adapt to change and manage risk.

The role of safety nets

Informal safety nets play a key supporting role in managing crises impacts, whereas government social protection played a significant role only in those countries studied where such systems remained from the era of Soviet domination (Heltberg et al. 2012). In the search for policy to support household adaptive strategies, there is a growing interest in safety nets that provide protection from a wide range of risks (European Report on Development 2010; DFID 2011; CFS 2012b). Brazil and Mexico have developed social protection programs during recent years that seem to lift large groups of poor families out of poverty, using conditional cash transfers where families are obliged to send children to school, and making use of health services in order for them to remain in the program.

In Ethiopia, the Productive Safety Net Program has seemingly been able to replace the large relief programs of the last decades, improving food security and building household and community assets among millions of vulnerable families through a combination of public works and cash transfers (Berhane et al. 2011). The program includes predictions of the risk of crop failure, so that a crisis can be met at an early stage. A new initiative, the Africa Risk Capacity regional program, also aims to provide early cash support to communities facing drought (Clarke and Vargas Hill 2013).

In India, the Mahatma Gandhi Rural Employment Guarantee Program (NREGA) has had a measurable impact on food security for millions of people, while also providing environmental benefits. Food security is increasingly perceived as a question of human rights (CFS 2012b). This underpins a new generation of social protection programs that show their potential in an era of recurrent crises and the looming threat of climate change. A social protection approach provides the infrastructure to identify and target vulnerable individuals and households, while instruments used in disaster risk reduction and climate change adaptation can contribute to a more dynamic understanding of vulnerability, where the identification, assessment, and mitigation of risk are fundamental. To reduce vulnerability, there is a need for predictable scaling up of targeted support in times of crisis, using contingency funding and already established social protection systems as pipelines that deliver support to vulnerable individuals and households (CFS 2012b).

Risk governance

Global crises with heavy local impacts require a new approach for development actors. Poverty and vulnerability are dynamic conditions, where people enter and leave. To protect households and communities from becoming more vulnerable and to maintain the objective of helping them move out of poverty, a set of specific measures under the "risk governance" heading are needed (UNISDR 2011), meaning the set of policies and instruments that a government employs to protect people and natural and physical infrastructure. They include the continuous inventory and assessment of risk, observation systems that give real-time information about socioeconomic change, including monitoring of food and fuel prices, combined with dynamic social protection. We also need to follow changes in support systems based on natural resources that people depend on in specific localities. Equally important are changes in the public space where people enjoy secure rights and the opportunity to seek information and form associations for joint action, and where mediating institutions have legitimacy and accountability.

Fragile states

Some of the countries and communities that are most exposed to risks and crises are least equipped to support people's adaptation strategies or protect them through risk governance. This is not only about states in conflict or post-conflict—such as Afghanistan, Zimbabwe, and Burma, which are highly vulnerable to climate risk (Maplecroft 2010) and where some 1.5 billion people live (OECD 2012)—but also those with limited government capacity and outreach, such as in Eastern Europe and Central Asia. In these countries, a different and potentially very challenging approach is required where international and multilateral organizations will have to play an active role and where resilience and conflict resolution efforts need to become interlinked (Harris et al.

2013). So far, the conflict management and peace-building discourse is largely divorced from the discourse on climate change and the complex global crises discussed here.

In summary, a range of very different crisis events, stresses, and shocks ultimately lead to a loss of livelihoods among poor households. Some effects may be long-lasting and ultimately become irreversible. At the individual level, ill-health seems to be a particularly dangerous risk. Insights into adaptation strategies that diversify households' assets and resources and defend against livelihood erosion lead to policy options. Advances in the design of safety nets and social protection, as well as progress in the design of governance measures to deal with risks, offer new approaches to deal with risk and ultimately enhance households' adaptive capacity. Given the special importance of health and migration for household resilience, these are given particular attention in the discussion of adaptive capacity in the concluding section.

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CONCLUSIONS

A new perspective on development investments is needed as the climate signal is getting stronger. Development is not linear; poor households struggle to manage risks and shocks with varying success. Recent crises have demonstrated that in a world of increasing uncertainty and volatility, where complex crises may unexpectedly cascade in space and time, a development path must build on an understanding of how those that are poor and vulnerable manage risk and change. Little will be gained by designing new or scaling up existing international emergency instruments, which tend to intervene when vulnerable groups have already lost productive assets. It is rather about adopting a risk management perspective among all development actors. In view of the dramatic impacts of crises on vulnerable people, the most urgent challenge is to develop a policy response that addresses their needs and creates the space where their adaptation actions become effective.

The current crises have generated a wealth of analyses and policy conclusions among multilateral, regional, and international bodies with different perspectives. In 2008, the UN Secretary-General launched a unique inter-agency initiative—the High-Level Task Force on the Global Food Security Crisis. This body gathered a broad group of multilateral organizations with mandates ranging from emergency relief to trade and peacekeeping. In 2009, the UN Committee on Food Security (CFS), initiated as a result of the food crisis in the mid-70s, was reformed and re-launched. It created a High-Level Panel of Experts on Food Security and Nutrition, which has issued analytical reports with policy recommendations on food security and price volatility (CFS 2011a), land tenure (CFS 2011b), climate change (CFS 2012a), social protection (CFS 2012b) and biofuels (CFS 2013). Food security has also become an item high on the agendas of the EU and G20. As a direct result of the food crisis, new financial facilities have been created in the EU and World Bank to help provide nutritional support to vulnerable groups, meet additional expenses of food imports, and promote agricultural development.

In their strategic and policy recommendations, these newly created bodies usually distinguish between immediate and longer-term measures and between addressing systemic causes and protecting the most vulnerable groups and populations. A longer term and systemic approach typically includes investments in the agricultural sector, particularly in research, improving trading regimes, ecosystem management, rural market and infrastructure development, revising biofuel standards, and addressing macroeconomic aspects and finance sector problems.

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Most of them agree on the urgent need to more systematically stabilize the livelihoods of poor households while allowing them to build assets, even when times are difficult. The question is: Have they defined the problem too narrowly by making it a food security issue only? As the analysis of the food crisis shows, a broad systems approach is needed to capture the range of complex causes. Climate change will have both immediate and direct impacts and be one causal factor behind complex systemic change. With long-term household livelihood security as our objective, a set of policy conclusions can be drawn based on the crisis analysis presented here. They fall into four categories: (1) establishing vulnerability observation systems, (2) strengthening safety nets, (3) supporting a robust adaptive capacity approach, and (4) promoting risk governance.

1. Vulnerability observation systems

The 2008 food crisis came as a surprise. It was not predicted by any of the market and food production monitoring instruments in place (Headey and Fan 2010). After 2008, monitoring has improved but food prices have stayed at a very high level. Global and regional food security and biofuel policies have been revisited and revised. Still, the question remains how policies can be developed to better capture the dramatic impacts that global crises with climate triggers have on vulnerable households. It is a paradox that in an era when events can be followed in real time across the globe, we have little knowledge about changes in hardship for those struggling to stay above the poverty line. It was only long after the fact that we learned about the experiences of those living through the series of crises (Heltberg et al. 2012). The new IDS/Oxfam project analyzing development impacts from the crises will provide new and urgently needed information (Hossain et al. 2013).

To observe deep trends as they unfold, we need longitudinal data that register change in the determinants of household security and resilience over time. These are less likely to be found within most time-limited project frameworks. But certain longitudinal research projects—such as the stages of progress data sets used by Krishna (2010), or programs that have been active for several years and provide data about household consumption—are steps in the right direction. Regularly updated maps showing water risk in watersheds with a high number of rural and urban poor will have an important role to play (Reig et al. 2013). Observation systems also need to use data regularly collected by governments, such as health and population statistics or censuses. Registering change in adaptive capacity could be done by modifying some of the indicators that are collected routinely, such as by organizing demographic and social data according to watersheds rather than administrative boundaries (Balk et al. 2013). Headey and Ecker (2013) have proposed that a sensitive composite indicator of food security could be dietary diversity, which has a strong connection to economic status and malnutrition, is sensitive to shocks, and can be collected relatively cheaply.

New opportunities also come from the quick spread of IT across the developing world. In countries where financial transactions take place using mobile phones, changes in people's mobility and transfer of money could be tracked and used along with crowd

sourcing on specific issues to provide information on behavioral change.

There is also a need to monitor changes in ecosystems that undermine the livelihoods of those that depend directly on them. A new initiative by IUCN—the Red List of Ecosystems (IUCN 2012)—is intended to monitor change in ecosystem biodiversity and productivity, offering the opportunity to detect early indicators of threats to human well-being if combined with social data on immediately dependent populations. The new intergovernmental panel on biodiversity and ecosystem services (IPBES), modeled on the IPCC, may also offer such data to be collected, monitored, and analyzed over time. "Mining" the internet for early signs of abrupt ecosystem change could form part of such monitoring (Galaz et al. 2010b). Ecosystem observation systems should include attention to local innovations in ecosystem management, such as the development and spread of "re-greening" through agroforestry in the Sahel region in Africa (Garrity et al. 2010).

If governments and international organizations are to improve their ability to anticipate crises, the critical factor is to capture trends in the mid- and long term, based on the combination of a variety of social, economic, epidemiological, ecological, and sector data, and to use them for early signals of deep change in societies' adaptive capacity. In order to make the international agenda capture the dimension of crisis and change, vulnerability observation systems should logically find their place among the post-2015 sustainable development goals. They will be Earth data, but about a populated Earth.

An even greater challenge than collecting and compiling diverse data lies in making sense of its meaning and taking appropriate action. Policy makers and those tasked to implement policy within and outside government are traditionally organized according to sectors, disciplines and institutional or regional boundaries, where action is taken in accordance with their meaning in predetermined mandates, beliefs, and mental models. There will be occasions when unpredicted events and processes generate information that is difficult to interpret because there is no precedent and where a relevant response will not be obvious. Analyses and learning from the management of non-routine crisis events through networks of very different institutions is becoming increasingly important in order to identify determinants for effective action, even if the chance of a complex event repeating itself is slim and applying learning literally from one event to the other may therefore be risky and provide faulty guidance (Moynihan 2008).

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2. Safety nets

Governments must design safety nets with a broad scope and robustness (CFS 2012b). These could build on experiences from the new generation of social protection programs developed in middle-income countries such as Mexico and Brazil, and increasingly emulated in and adapted to low-income countries, such as the Productive Safety Net Program (PSNP) in Ethiopia, but also on an analysis of the impact that social protection systems had in former Soviet republics during the food crisis (Heltberg et al. 2012). They must be effective in urban and rural areas regardless of shocks, whether natural disasters, climate variability, food price volatility, recession, disease outbreaks, or any other crisis that will be difficult to predict (Kanbur 2010; Lin and Martin 2010) but where a dynamic response is needed. These "adaptive social protection" programs (Bene 2012) must disaggregate according to gender and age vulnerability and shock impacts. They must be nationally owned, and ultimately nationally financed, but may need financial and technical support in their early stages. Proposals exist for how donor support could be designed (Holmqvist 2010). There is much scope for promoting South-South exchange and sharing of experiences, not least

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as regards scaling up the delivery of environmental benefits that can be created through public works programs. Such approaches, exemplified by PSNP in Ethiopia, NREGA in India, and Bolsa Verde in Brazil, tend to give more priority to generating income and smoothing consumption at the time of crisis than to develop more comprehensive improvements in ecosystem management. Secure access to natural resources—along with equitable and effective governance systems—are of fundamental importance to the adaptive capacity of the rural poor. Policies that succeed in combining asset-building of vulnerable households with effective stewardship of natural resources will help enhance their adaptive capacity.

3. Supporting adaptive capacity—a robust and no-regrets approach

Studies on how households adapt to climate variability—and other changes—reveal the importance of strategies such as mobility, diversification, and market exchange. All require functioning institutions and all can be supported through enabling policies, whether by facilitating mobility and remittances, exchange between rural and urban economies, or promoting market infrastructure. But they are strategies that can only be employed to their full potential if people have access to education, information, and freedom of assembly, enjoy good health, and have secured rights. They contribute to the resilience that will be valuable whether crises occur or not; they are "no-regrets" and robust interventions[3] and should be at the foundation of risk management strategies. This is an approach that has much in common with the local adaptive capacity framework developed by the Africa Climate Change Resilience Alliance (Jones et al. 2010). Two aspects of adaptive capacity are worth mentioning here.

First, a changing climate has health impacts, partly by influencing the ecology of pathogens and vectors, thus changing epidemiology and disease patterns, both at individual and covariate levels (IPCC 2007). If destitution is only "one illness away," as argued by Krishna (2010), it will therefore be important to give particular attention to gaps in the access to affordable preventive and curative health services and to health insurance as part of the adaptive social protection package.

Second, mobility, migration, and remittances are fundamental household adaptation strategies that have shown remarkable resilience during the recent crises. Still, accommodating mobility is rarely included in adaptation policy. The "climate refugee" discourse, with its perception of passive victims, has not helped in recognizing its strategic role for households. Although there are undoubtedly many examples of distress migration in situations of hardship, evidence-based national adaptation policy should incorporate mobility as one of its elements, taking account of the utility and benefits of migration.

States often create obstacles to internal migration where migrants' rights are not respected. Being unregistered in their temporary location, migrants are barred from access to basic services. Facilitating financial remittances and ensuring the rights of migrants will serve the dual goals of promoting development through employment and asset generation, while protecting households from the risks of a narrow resource base.

4. Risk governance

Risk governance[4] represents the set of policies and instruments that a government employs to protect people and natural and physical

infrastructure. It includes policy measures such as inventories of risk, procedures to assess and mitigate risk in planning and public investment, risk transfer through insurance and other means, decentralization of responsibility and resources to empower local government to deal with risk, and fostering partnerships with the private sector and civil society in managing risk. Although social protection has been presented here as a policy conclusion in its own right, it is also part of a risk governance approach. Risk governance needs to be promoted through normative approaches, in dialogue between partner countries, and by being central to aid policies. A special case needs to be made for those countries that are high risk, but with limited institutional or governance capacity to protect their populations. Here, a special role must be assumed by international and multinational organizations that sometimes have to replace government institutions in fragile states. They often have good response capacity but not always the mandates or resources allowing them to act with a broader risk reduction perspective, as outlined above.

Much attention has been given to insurance as an innovative way to protect and enhance the productivity of rural households in the face of increasing climate variability and change. For example, insurance was an important theme in the Loss and Damage Work Program launched under the UNFCCC at COP16 in Cancun 2010. Index-based insurance is of particular interest, where payouts are triggered by objective meteorological measurements rather than assessment of damage on crops or livestock. A recent major review of existing evidence by the World Bank (de la Fuente et al. 2013; Arnold et al. 2013), however, finds very limited evidence that insurance will have the desired effect on poor and vulnerable rural households. There are many small pilot projects, but very few have been scaled up. Most include substantial premium subsidies, without which insurance products have been unaffordable to poor farmers and there has been very limited demand.

A tentative conclusion is that index-based insurance as an adaptation instrument has proven its value for well-established farmers in an institutional environment that provides easy access to credit and a range of inputs, and at the macroeconomic level, where governments can share risk in regional arrangements and provide support for affected populations, but not—at least not yet—as a viable tool for the most vulnerable households.

It is appropriate to briefly mention development actors as parts of the risk governance system, even if structures, policies, and actions leave much to be desired in that respect. The siloed organization of donor agencies, international organizations, and funding streams still tends to prevent the integration of natural disaster risk reduction into conflict management or climate change adaptation into peace-building operations. Many countries in conflict or post-conflict are among the most vulnerable to climate change impacts (Maplecroft 2010) and to the effects of volatile prices of food, fuel, and other commodities, as demonstrated by the analysis of the lead-up to the "Arab Spring." Steps to bridge these critical gaps through shared conceptual frameworks and new institutional arrangements are being proposed (Harris et al. 2013). New attempts—in the form of the New Deal compact to enhance human security in fragile states— promise to go beyond the realm of conflict management (OECD 2012) and could include broader measures for the protection of livelihoods threatened by local effects of global crises. As mentioned above, there is an urgent need to bring these issues onto the post-MDG agenda in order to develop appropriate policy and action.

Finally, the prospect of an increasing frequency of difficult-to-predict and complex crises requires governance arrangements that can deal with situations for which there is limited experience or preparedness. At the same time, impacts on vulnerable households will most likely play out a familiar and painful scenario where remedial action is now increasingly well-understood. To protect those most at risk requires immediate action at both levels.

REFERENCES

Adger, N., I. Lorenzoni, and K. O'Brien. 2009. *Adapting to Climate Change: Thresholds, Values, Governance*. city: Cambridge, UK: Cambridge University Press

Agarwal, A. 2010."The Role of Local Institutions in Adaptation to Climate Change." In R. Mearns and A. Norton, eds. *Social Dimensions of Climate Change. Equity and Vulnerability in a Warming World*. Washington, DC: The World Bank.

Alderman, H., J. Hoddinott, and B. Kinsey. 2006. "Long Term Consequences of Early Childhood Malnutrition." *Oxford Economic Papers* 58 (3): 450–474.

Arezki, R., and M. Bruckner. 2011. "Food prices and political instability." IMF Working Paper WP/11/62. Washington, DC: IMF.

Arnold, M., A. de la Fuente, C. Benson, D. Clarke, X. Gine, and R. Vargas Hill. 2013. "Financial innovations for social and climate resilience: Establishing an evidence base." Synthesis report. Washington, DC: The World Bank.

Baez, J., and I. Santos. 2007. "Children's Vulnerability to Weather Shocks: A Natural Disaster as a Natural Experiment." Doctoral Dissertation. Syracuse, NY, and Cambridge, MA: Maxwell School of Public Affairs (Syracuse University) and Kennedy School of Government (Harvard University).

Balk, D., J.M. Guzman, and D. Schensul. 2013. "Harnessing Census Data for Environment and Climate Change Analysis." In G. Martine and D. Schensul, eds. 2013. *The Demography of Adaptation to Climate Change*. New York, London, and Mexico City: UNFPA, IIED, and El Colegio de Mexico.

Beegle, K., R. Dehejia, and R. Gatti. 2003. "Child Labor, Crops Shocks and Credits Constraints." NBER (National Bureau of Economic Research) Working Paper 10088. Cambridge, MA: NBER.

Bene, C. 2012. "Social Protection and Resilience to Climate and Disaster." IDS (Institute of Development Studies) Programme Briefing. Brighton: IDS.

Berhane, G., J. Hoddinott, N. Kumar, and A.S. Taffesse. 2011.*The Impact of Ethiopia's Productive Safety Nets and Household Asset Building Programme: 2006–2010*. Washington, DC: International Food Policy Research Institute.

CFS (Committee on Food Security). 2011a. "Price volatility and food security." A report by the High Level Panel of Experts on Food Security and Nutrition. *HLPE Report 1*. Rome: CSF.

CFS (Committee on Food Security). 2011b." Land tenure and international investments in agriculture." A report by the High Level Panel of Experts on Food Security and Nutrition. *HLPE Report 2*. Rome: CSF.

CFS (Committee on Food Security). 2012a. "Food security and climate change." A report by the High Level Panel of Experts on Food Security and Nutrition. *HLPE Report 3*. Rome: CSF.

CFS (Committee on Food Security).2012b. "Social protection for food security." A report by the High Level Panel of Experts on Food Security and Nutrition. *HLPE Report 4*. Rome: CSF.

CFS (Committee on Food Security). 2013. "Biofuels and Food Security." A report by the High Level Panel of Experts on Food Security and Nutrition. Rome: CSF.

Clarke, D.J.. and R. Vargas Hill. 2013. "Insuring Countries Against Natural Disasters: Pool Rules." IFPRI Policy Brief 22. Washington, DC: International Food Policy Research Institute.

Collins, D., J. Morduch, S. Rutherford, and O. Ruthven. 2009. *Portfolios of the Poor. How the World's Poor Live on $2 a Day*. Princeton, NJ: Princeton University Press.

Cotula, L., S. Vermeulen, R. Leonard, and J. Keeley. 2009. *Land grab or development opportunity? Agricultural investment and international land deals in Africa*. London: International Institute for Environment and Development.

Crane, T.A. 2013."The Role of Local Institutions in Adaptive Processes to Climate Variability. The cases of southern Ethiopia and southern Mali." Oxfam Research Report. Boston: Oxfam America.

de la Fuente, A., X. Gine, and R. Vargas Hill. 2013. "Index insurance for social and climate resilience: Establishing an evidence base." Desk review. Washington, DC: The World Bank.

Dercon, S., and P. Krishnan. 2000. "In Sickness and in Health: Risk-Sharing Within Households in Rural Ethiopia." *Journal of Political Economy* 108 (4): 688–727.

DFID (UK Department for International Development). 2011. "Cash Transfers." Evidence Paper, Policy Division. London: DFID.

Duit, A., and V. Galaz. 2008."Governance and Complexity—Emerging Issues for Governance Theory." *Governance: An International Journal of Policy, Administration, and Institutions* 21 (3): 311–335.

Erian, W., B. Katlan, and O. Babah. 2010. "Drought vulnerability in the Arab region. Special Case Study: Syria." Geneva: UNISDR.

European Report on Development. 2010. Social Protection for Inclusive Development. *A New Perspective in EU Cooperation with Africa*. Florence: European University Institute.

Fan, S., T. Torero, and D. Headey. 2011. "Urgent Actions Needed to Prevent Recurring Food Crises." IFPRI Policy Brief 16, March, 2011. Washington, DC: International Food Policy Research Institute.

Floro, M.S., E.O. Tas, and A. Törnqvist. 2010. *The Impact of the Global Economic Crisis on Women's Wellbeing and Empowerment*. Stockholm: Swedish International Development Cooperation Agency.

Galaz, V., F. Moberg, E-K. Olsson, E Paglia, and C. Parker. 2010a. "Institutional and Political Leadership Dimensions of Cascading Ecological Crises." *Public Administration. Accessible at: <doi10.1111/j.1467-9299.2010.01883.x>*.

Galaz, V., B. Crona, T. Daw, Ö. Bodin, M. Nyström, and P. Olsson. 2010b. "Can Web Crawlers Revolutionize Ecological Monitoring?" Frontiers in Ecology and Environment 8 (2): 99–104.

Garrity, P. G., F.K. Akinnifesi, O.C. Ajayi, S.G. Weldesemayat, J.G. Mowo, A. Kalinganire, M. Larwanou, and J. Bayala. 2010. "Evergreen Agriculture: a robust approach to sustainable food security in Africa." *Food Security* 2: 197–214.

Global Humanitarian Assistance. 2011. "Saudi Arabia." Accessible at: http://www.globalhumanitarianassistance.org/countryprofile/saudi-arabia

Hamilton, J. 2009. "Causes and Consequences of the Oil Shock 2007-08." Brookings Papers on Economic Activity. Washington, DC: Brookings Institute. Accessible at: http://www. brookings.edu/-/media/Files/Programs/ES/BPEA/2009_spring_bpea_papers/2009_spring_bp ea_hamilton.pdf

Harris, K., D. Keen, and T. Mitchell. 2013. *Improving links between disaster resilience and conflict prevention*. London: Overseas Development Institute.

Headey, D., and S. Fan. 2010."Reflections on the Global Food Crisis. How Did It Happen? How Has It Hurt? And How Can We Prevent the Next One?" *IFPRI Research Monograph 165*. Washington, DC: International Food Policy Research Institute.

Headey, D. 2011. "Rethinking the global food crisis: The role of trade shocks." *Food Policy* 36 (2): 136–146.

Headey, D., and O. Ecker. 2013."Rethinking the measurement of food security: from first principles to best practice." *Food Security* 5 (3): 327–343.

Heltberg, R., and N. Lund. 2009. "Shocks, Coping, and Outcomes for Pakistan's Poor: Health Risks Predominate." *Journal of Development Studies* 45 (6): 889–910.

Heltberg, R., P.B. Siegel, and S. Jorgensen. 2010. "Social Policies for Adaptation to Climate Change." In R. Mearns and A. Norton. *Social Dimensions of Climate Change*. Washington, DC: World Bank.

Heltberg, R., N. Hossain, and A. Reva, eds. 2012. *Living Through Crises. How the Food, Fuel and Financial Shocks Affect the Poor*. Washington, DC: World Bank.

Hermida, P. 2011. "The Long-Term Effect of Natural Disasters: Health and Education in Guatemala After the 1976 Earthquake." Paper presented at the Fifth Annual PopPov Conference on Population, Reproductive Health, and Economic Development, January 19, 2011, Marseille. Accessible at: SSRN: http://ssrn.com/abstract=1845910

Holmqvist, G. 2010. "External Financing of Social Protection—Opportunities and Risks." Background paper for the European Report on Development.

Hossain, N., R. King, and A. Kelbert. 2013. "Squeezed. Life in a Time of Food Price Volatility, Year 1 Results." Joint Agency Research Report by IDS, Oxfam. Oxford: Oxfam GB.

IPCC (Intergovernmental Panel on Climate Change). 2007. Confalonieri, U., B. Menne, R. Akhtar, K.L. Ebi, M. Hauengue, R.S. Kovats, B. Revich and A. Woodward. 2007. "Human health." In M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, eds. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

IUCN (International Union for Conservation of Nature). 2012. *The IUCN Programme* 2013–2016. Gland, Switzerland: IUCN.

Ivanic, M., and W. Martin. 2008. "Implications of higher global food prices for poverty in low-income countries." *Agricultural Economics* 39:405–16.

Ivanic, M., W. Martin, and H. Zaman. 2011. "Estimating the Short-Run Poverty Impacts of the 2010–11 Surge in Food Prices." *Policy Research Working Paper 5633*. Washington, DC: World Bank.

Johnstone, S., and J. Mazo. 2013. "Global Warming and the Arab Spring." In C.E. Werrell and F. Femia, eds. *The Arab Spring and Climate Change. A Climate Security Correlations Series*. Washington, DC: Center for American Progress.

Jones, L., E. Ludi, and S. Levine. 2010. "Towards a characterization of adaptive capacity: a framework for analyzing adaptive capacity at the local level." ODI Background Note, December 2010. London: Overseas Development Institute.

Kanbur, R. 2010 . "Protecting the Poor Against the Next Crisis." Presentation in the Distinguished Lectures Series of the Egyptian Centre for Economic Studies, Cairo, March 23, 2010. Accessible at: http://kanbur.dyson.cornell.edu/papers/Protecting%20the/ 20Poor • 20Against' 20the%20Next/20Crisis.pdf

Krishna, A. 2010. *One Illness Away*. Why People Become Poor and How They Escape Poverty. Oxford, UK: Oxford University Press.

Lin, J.Y., and W. Martin. 2010."The Financial Crisis and Its Impacts on Global Agriculture." Policy Research Working Paper 5431. Washington, DC: World Bank.

Lubaale, G., and N. Hossain. 2012. "Crisis in Kenya. Living with Hunger in an Era of Economic and Political Shocks." In R. Heltberg, N. Hossain, and A. Reva, eds. 2012. *Living Through Crises. How the Food, Fuel and Financial Shocks Affect the Poor*. Washington, DC: World Bank.

Maplecroft. 2010. "Maplecroft: South Asia most at risk from climate change, Scandinavia safest." Accessible at: http://preventionweb.net/go/16004

Martin, W., and K. Anderson. 2010. "Export Restrictions and Price Insulation During Commodity Price Booms." *World Bank Policy Research Working Paper 5645*.Washington, DC: World Bank.

Masset, E. 2011. "A review of hunger indices and methods to monitor country commitment to fighting hunger." *Food Policy* 36: 102–108.

Mearns, R., and A. Norton, eds. 2010. *Social Dimensions of Climate Change. Equity and Vulnerability in a Warming World*. Washington, DC: World Bank.

Mohapatra, S., G. Joseph, and D. Ratha. 2012. "Remittances and Natural Disasters: ex-post response and contribution to ex-ante preparedness." Environment, Development and Sustainability. *Springer*, vol. 14(3): 365-387.

Moynihan, D. P. 2008. "Learning Under Uncertainty: Networks in Crisis Management." *Public Administration Review* 68 (2): 350–361.

Narayan, A., and C. Sanchez-Paramo, eds. 2012. Knowing When You Do Not Know. *Simulating the Poverty and Economic Impacts of an Economic Crisis*. Washington, DC: World Bank.

OECD (Organisation for Economic Co-operation and Development). 2012. *Think global, act local: Confronting global factors that influence conflict and fragility*. Paris: OECD.

Reig, P., T. Shiao, and F. Gassert. 2013. "Aqueduct Water Risk Framework." Working Paper. Washington, DC: World Resources Institute. Accessible at: http://www.wri.org/publication/aqueduct-waterrisk-framework

Ribot, J. 2010. "Vulnerability Does Not Fall From the Sky. Towards Multi-Scale, Pro-Poor Climate Policy." In R. Mearns and A. Norton, eds. *Social Dimensions of Climate Change. Equity and Vulnerability in a Warming World*. Washington, DC: World Bank.

Rosenthal, E. 2013. "As Biofuel Demand Grows, So Do Guatemala's Hunger Pangs." New York Times, January 6, 2013.

Sen, A. 1983. *Poverty and Famines. An Essay on Entitlements and Deprivation*. Oxford, UK: Oxford University Press.

Sirkeci, I., J.H. Cohen, and D. Ratha, eds. 2012. *Migration and Remittances during the Global Financial Crisis and Beyond*. Washington, DC: World Bank.

Sternberg, T. 2013. "Chinese Drought, Wheat, and the Egyptian Uprising: How a Localized Hazard Became Globalized." In C.E. Werrell and F. Femia, eds. *The Arab Spring and Climate Change. A Climate Security Correlations Series*. Washington, DC: Center for American Progress.

Tacoli, C., B. Bukhari, and S. Fisher. 2013. "Urban poverty, food security and climate change." Human Settlements Working Paper no 37. London: International Institute for Environment and Development.

Thornton, T.F., and N. Manasfi. 2010. "Adaptation—Genuine and Spurious. Demystifying Adaptation Processes in Relation to Climate Change." *Environment and Society: Advances in Research* 1: 132–155.

Trostle, R. 2008. *Global agricultural supply and demand: Factors contributing to the recent increase in food commodity prices*. Washington, D.C.: United States Department of Agriculture.

UNISDR (United Nations International Strategy for Disaster Reduction). 2009. "Deconstructing disaster: risk patterns and poverty trends at the local level." In *2009 Global Assessment Report on Disaster Risk Reduction: Risk and Poverty in a Changing Climate*. Geneva, United Nations.

UNISDR. 2011. *Revealing Risk, Redefining Development. Global Assessment Report on Disaster Risk Reduction*. Geneva: United Nations.

Vakis, R. 2006. "Complementing natural disasters management: The role of social protection." *Social Protection Discussion Paper* 0543. Washington DC: The World Bank

von Braun, J., and G. Tadesse. 2012. "Global Food Price Volatility and Spikes: An Overview of Costs, Causes and Solutions." ZEF Discussion Papers on Development Policy No. 161. Bonn, University of Bonn.

Werrell, C. E., and F. Femia, eds. 2013a. *The Arab Spring and Climate Change. A Climate Security Correlations Series*. Washington, DC: Center for American Progress.

Werrell, C.E., and F. Femia. 2013b. "Climate Change Before and After the Arab Awakening: The Cases of Syria and Libya." In C.E. Werrell and F Femia, eds. *The Arab Spring and Climate Change. A Climate Security Correlations Series*. Washington, DC: Center for American Progress.

Wilbanks, T.J., and R.W. Kates. 2010. "Beyond Adapting to Climate Change: Embedding Adaptation in Responses to Multiple Threats and Stresses." *Annals of the Association of American Geographers* 100 (4): 719–728.

World Bank. 2009. *Adapting to Climate Change in Europe and Central Asia*. Washington, DC: World Bank. Accessible at: http://issuu.com/world.bank.publications/docs/9780821381311/1?zoomed=&zoomPercent=&zoomX=&zoomY=&noteText=&noteX=&noteY=&viewMode=magazine

World Bank. 2011. "Responding to Global Food Price Volatility and Its Impact on Food Security." Development Committee Meeting, April 16, 2011. Washington, DC: World Bank. Accessible at: http://siteresources.worldbank.org/DEVCOMMINT/Documentation/22887406/DC2011-0002(E)FoodSecurity.pdf

ENDNOTES

1 In the early 1970s the U.S. cut grain production to reduce its surplus, while demand from the USSR and China increased dramatically, forcing high price increases. When the Yom Kippur war erupted in 1974 and triggered an oil crisis with rationing in many countries, prices increased to even higher levels. The crisis led to a number of new instruments to cope with food emergencies and to the establishment of the Committee on Food Security.

2 Expanding on these categories in an analysis of adaptation strategies among northern indigenous people, Thornton and Manasfi (2010) add three categories: intensification, innovation, and revitalization.

3 The 2009 UN Social Protection Floor Initiative arrives at similar interventions in the form of access to essential services and social transfers, originating from a rights perspective. Accessible at: http://www.socialseurityextension.org/gimi/gess/ShowTheme.do?tid=1321

4 The concept originates in the disaster risk reduction discourse (see UNISDR 2011) but is used here in a broader sense, including all potential shocks and risks.

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We thank the following reviewers who contributed to the development of this issue brief:

Dalal Al-Abdulrazzak, UNDP

Jennifer Baumwoll, UNDP

Tessa Bertrand, World Resources Institute

Wendi Bevins, World Resources Institute

Mogens Laumand Christensen, World Resources Institute

Alex Doukas, World Resources Institute

Victor Galaz , Stockholm Resilience Centre

Derek Headey, International Food Policy Research Institute

Rasmus Heltberg, The World Bank

Vijay Jagannathan, World Resources Institute

Robert Winterbottom, World Resources Institute

ACKNOWLEDGMENTS

The author wishes to express his sincere thanks for critical reviews and guidance to all the reviewers mentioned above.

Deep appreciation for support, encouragement and invaluable assistance in turning the draft into a publishable paper when the author was already at a distant location go to the former close colleagues in the Vulnerability and Adaptation Team at WRI: Heather McGray, Ayesha Dinshaw, Sara-Katherine Coxon and Pieter Terpstra. Special thanks also to Janet Ranganathan for encouraging the author to develop a nascent idea into an issue brief.

The paper was much improved through editorial guidance from Ashleigh Rich and Daryl Ditz. This paper was developed in part through work funded by USAID under the ALARCC project.

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978-1-56973-816-0