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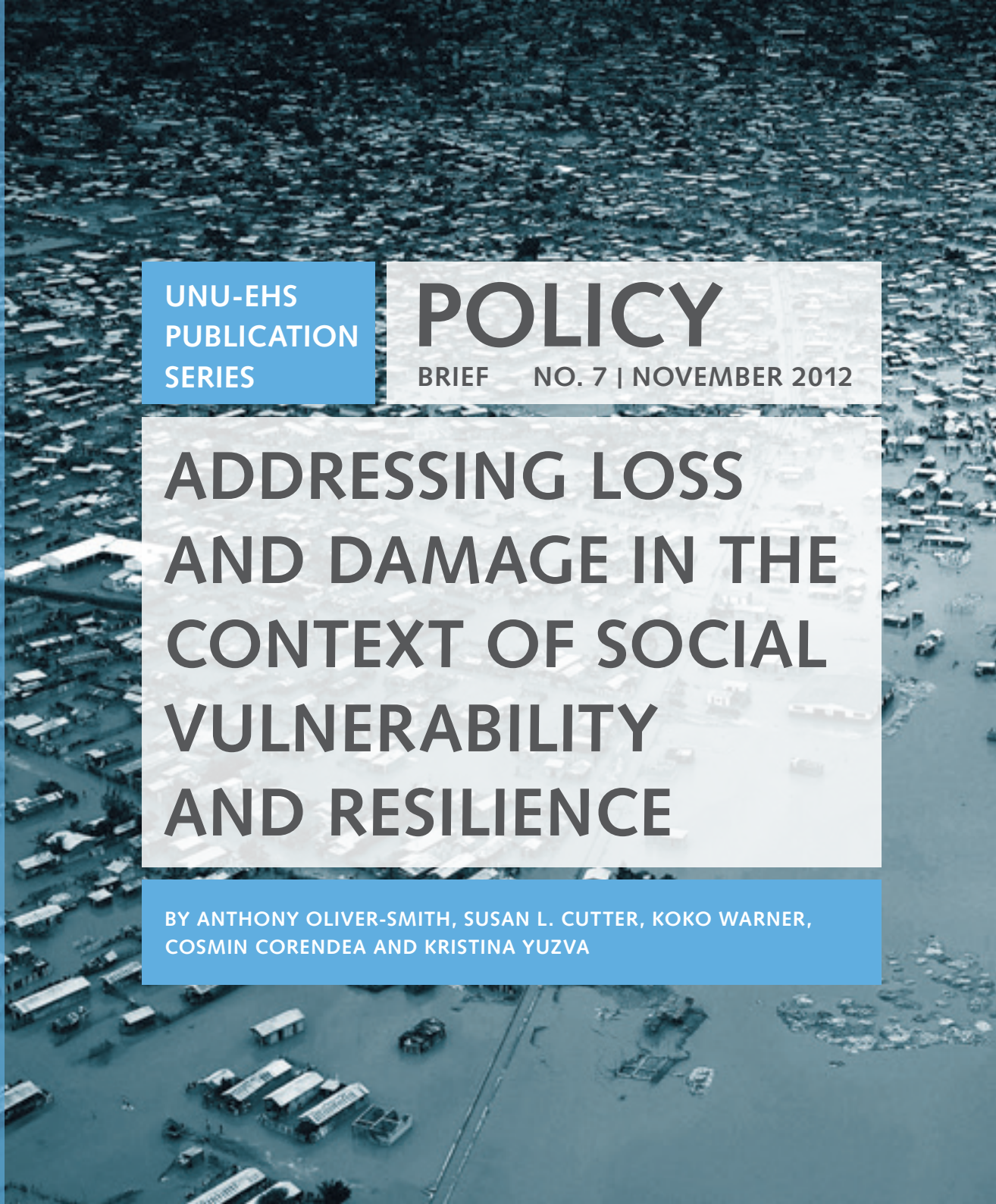

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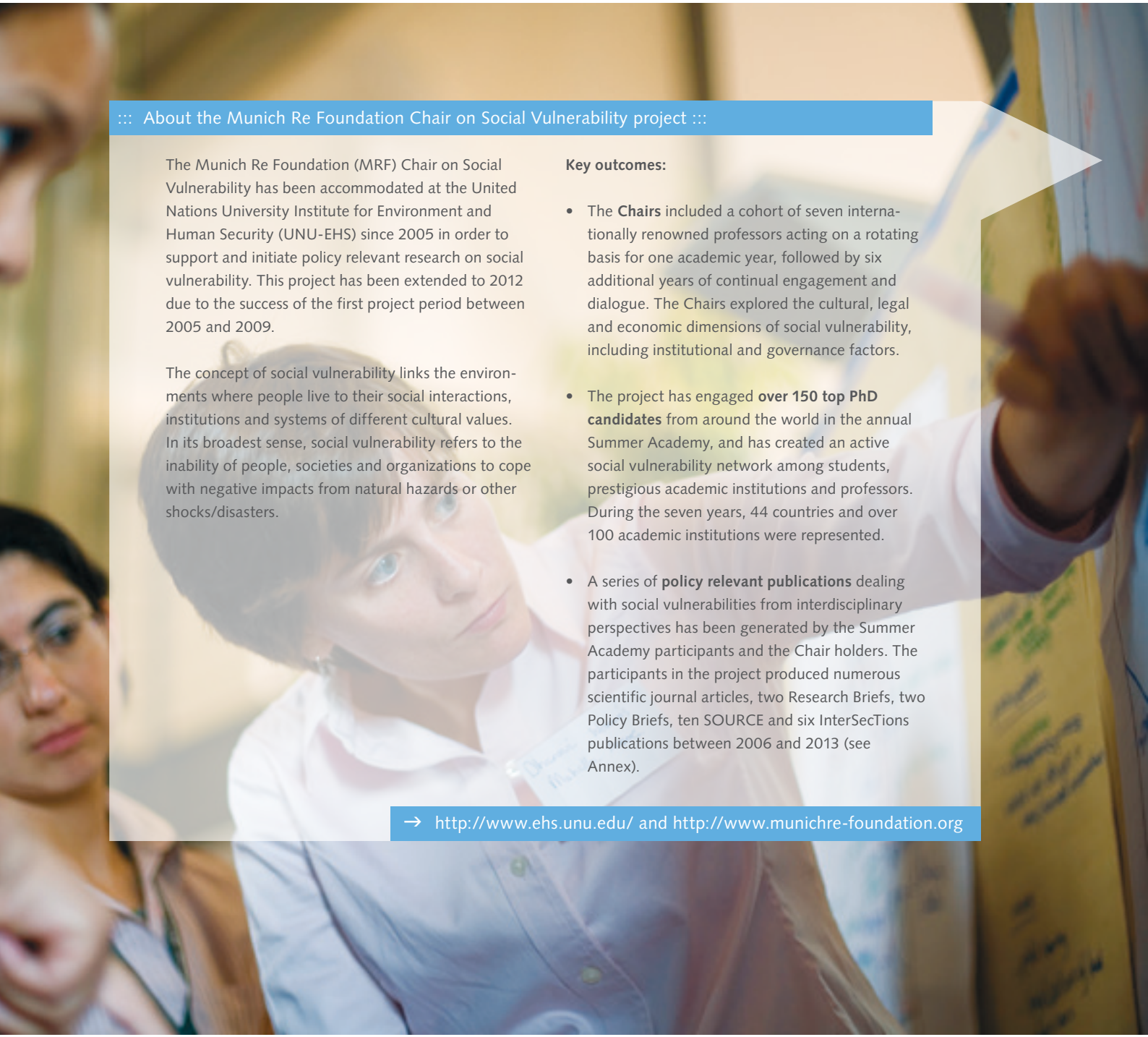
ADDRESSING LOSS AND DAMAGE IN THE CONTEXT OF SOCIAL VULNERABILITY AND RESILIENCE

BY ANTHONY OLIVER-SMITH, SUSAN L. CUTTER, KOKO WARNER, COSMIN CORENDEA AND KRISTINA YUZVA



::: About the Munich Re Foundation Chair on Social Vulnerability project :::

The Munich Re Foundation (MRF) Chair on Social Vulnerability has been accommodated at the United Nations University Institute for Environment and Human Security (UNU-EHS) since 2005 in order to support and initiate policy relevant research on social vulnerability. This project has been extended to 2012 due to the success of the first project period between 2005 and 2009.

The concept of social vulnerability links the environments where people live to their social interactions, institutions and systems of different cultural values. In its broadest sense, social vulnerability refers to the inability of people, societies and organizations to cope with negative impacts from natural hazards or other shocks/disasters.

Key outcomes:

- The **Chairs** included a cohort of seven internationally renowned professors acting on a rotating basis for one academic year, followed by six additional years of continual engagement and dialogue. The Chairs explored the cultural, legal and economic dimensions of social vulnerability, including institutional and governance factors.
- The project has engaged **over 150 top PhD candidates** from around the world in the annual Summer Academy, and has created an active social vulnerability network among students, prestigious academic institutions and professors. During the seven years, 44 countries and over 100 academic institutions were represented.
- A series of **policy relevant publications** dealing with social vulnerabilities from interdisciplinary perspectives has been generated by the Summer Academy participants and the Chair holders. The participants in the project produced numerous scientific journal articles, two Research Briefs, two Policy Briefs, ten SOURCE and six InterSecTions publications between 2006 and 2013 (see Annex).

→ http://www.ehs.unu.edu/ and http://www.munichre-foundation.org

Adressing Loss and Damage in the Context of Social Vulnerability and Resilience

by Anthony Oliver-Smith, Susan L. Cutter, Koko Warner, Cosmin Corendea and Kristina Yuzva

Forewords

In the context of climate change, the Intergovernmental Panel on Climate Change (IPCC, 2007) defined vulnerability as "the degree to which a system is susceptible to and unable to cope with, adverse effects of climate change". Resilience, by contrast, is usually portrayed in positive terms as the capacity of a system to maintain its basic functions and structures in a time of shocks and perturbations (Oliver-Smith, 2009). In all formulations, vulnerability research and resilience research have common elements of interest – the shocks and stresses experienced by the social- ecological system, the response of the system and the capacity for adaptive action.

Over the past seven years, the United Nations University Institute for Environment and Human Security (UNU-EHS), supported by the Munich Re Foundation (MRF), has assisted PhD students with policy relevant research on social vulnerability and resilience. The project engaged over 150 young scientists and professionals, along with seven MRF Chairs on Social Vulnerability, with internationally-recognized expertise in cultural, legal, economic and institutional dimensions of social vulnerability and resilience research.

Recognizing the global importance to understand and reduce loss and damage, particularly in view of its probable increase with climate change, the *Keystone Conference: From Social Vulnerability to Building Resilience in the Context of Climate Adaptation* invited former outstanding Summer Academy Alumni along with five Chairs and notable guests to discuss the thematic areas featured in the Subsidiary Body for Implementation (SBI) Work Programme on Loss and Damage. Through a series of interactive workshops, the participants identified elements, opportunities and gaps in addressing loss and damage in the context of social vulnerability and resilience.

This Policy Brief comprises recommendations coming out of the Keystone Conference to help frame the loss and damage decision which is mandated for the 18th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP 18, 2012) in Doha, Qatar. It should also support the interdisciplinary knowledge exchange in developing potential solutions to a growing global challenge.

Professor Dr. Jakob Rhyner

Director, UNU-EHS

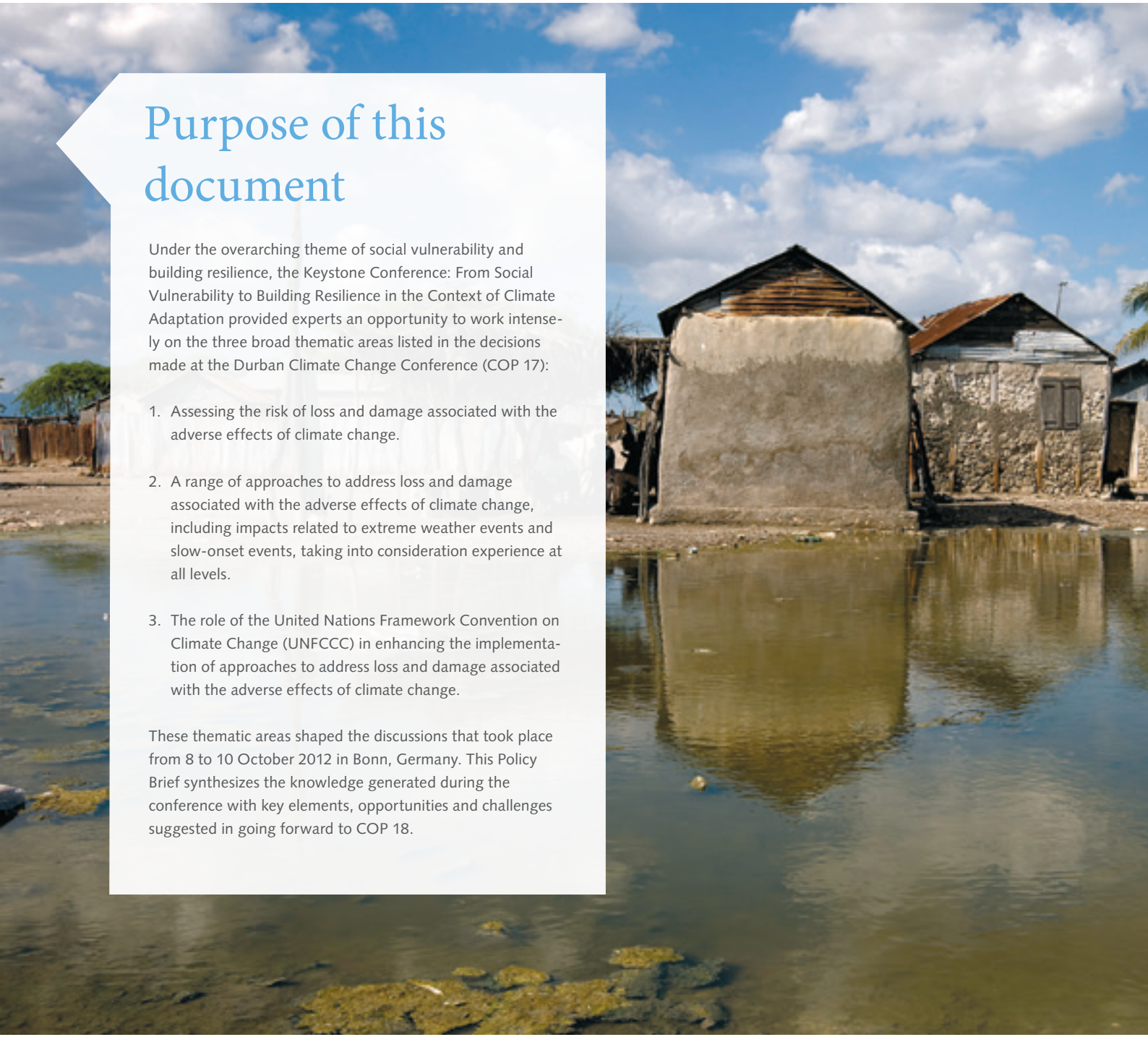
This Policy Brief is the result of a long academic process. Over a period of seven years, UNU-EHS and MRF organized an annual Summer Academy at Hohenkammer near Munich, at which more than 150 young professionals and scholars from diverse academic disciplines from different parts of the world were trained in addressing global challenges such as water hotspots, environmental change, migration and social vulnerability, climate change and disaster risk reduction. Seven leading professors with expertise in climate change and social vulnerability guided participants with their conceptual framings and research methods.

The Keystone Conference, held from 8 to 10 October 2012 in Bonn, Germany convened a cohort of scientists out of the Summer Academy alumni. The consensus that climate change is a top priority issue led the group to dedicate this meeting in support of discussions on loss and damage in the UNFCCC process. The goal of the meeting, entitled "From social vulnerability to building resilience in the context of climate adaptation", was to contribute to the SBI Work Programme on Loss and Damage, which will reach a decision at COP 18 taking place in November and December 2012. Under the working title "Loss and damage", the UNFCCC requested submissions to further understanding of the overall consequences of the effects of climate change: on society today and on generations to come.

The Keystone Conference featured rich discussions, new insights, new approaches and the combined strengths of interdisciplinary work. The knowledge derived from the seven Summer Academies is synthesized in this Policy Brief with the aim to highlight the relevance of research on vulnerability and resilience for the COP discussions. The findings will be delivered to Parties in the form of a UNU submission. There is a clear need to find solutions. We aim to play our part by bridging the gap between real risk, risk research and policy decisions.

Thomas Loster

Chairman of the Munich Re Foundation



Purpose of this document

Under the overarching theme of social vulnerability and building resilience, the Keystone Conference: From Social Vulnerability to Building Resilience in the Context of Climate Adaptation provided experts an opportunity to work intensely on the three broad thematic areas listed in the decisions made at the Durban Climate Change Conference (COP 17):

1. Assessing the risk of loss and damage associated with the adverse effects of climate change.

2. A range of approaches to address loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather events and slow-onset events, taking into consideration experience at all levels.

3. The role of the United Nations Framework Convention on Climate Change (UNFCCC) in enhancing the implementation of approaches to address loss and damage associated with the adverse effects of climate change.

These thematic areas shaped the discussions that took place from 8 to 10 October 2012 in Bonn, Germany. This Policy Brief synthesizes the knowledge generated during the conference with key elements, opportunities and challenges suggested in going forward to COP 18.

Summary of recommendations

1. *Consider loss and damage as part of an emerging dynamic system in which interactions of climate change with social processes shape and transform human societies*

2. *Mainstream the role of social vulnerability and social resilience in loss and damage policy discussions*

3. *Recognize that both causes and solutions for loss and damage are found in social-climate interactions*

4. *Evaluate loss and damage considering social processes across temporal and spatial scales*

5. *Assess social vulnerability and monitor progress in social resilience*

6. *Address potential loss and damage as part of risk reducing anticipatory, resilience building social processes*

7. *Focus on addressing system vulnerabilities and increasing social resilience and equity in the face of loss and damage decision-making and subsequent international and national policy discussions on loss and damage*

Abbreviations and acronyms

COP	*Conference of the Parties to the United Nations Framework Convention on Climate Change*
GHG	*Greenhouse Gas*
IPCC	*Intergovernmental Panel on Climate Change*
MRF	*Munich Re Foundation*
SBI	*Subsidiary Body for Implementation*
SREX	*Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*
UNFCCC	*United Nations Framework Convention on Climate Change*
UNU-EHS	*United Nations University Institute for Environment and Human Security*

Introduction

The topic of loss and damage associated with climate change is new for both science and policy. Science is exploring the consequences of climate change impacts driven by human action affecting the concentration of greenhouse gases (GHGs) in the atmosphere – which in turn affects atmospheric and ocean temperatures. The recent reports from the Intergovernmental Panel on Climate Change (IPCC, 2007a; 2007b) affirm that human-induced factors are responsible for generating significant increases in temperatures around the world, with serious impacts on specific socio-ecological systems. The energy basis for the development of industrialized societies is the driving force behind global climate change.

All of these changes are projected to affect natural systems globally, inducing alterations in hydrological, terrestrial, biological and aquatic subsystems. And all of these changes also have great potential for generating processes that affect large numbers of people, requiring a variety of adjustments to avoid serious losses and damage.

Climate science has already established the range of impacts that are expected to accompany increases in atmospheric GHG concentrations and associated temperature rises: increases in the rate of sea level rise, increases in glacial, permafrost, arctic and Antarctic ice melt, more rainfall in specific regions of the world and worldwide, more severe droughts in tropical and subtropical zones, increases in heat waves, changing ranges and incidences of diseases and more intense hurricane and cyclone activity.

The topic of climate change impacts also has major implications for policy discussions, particularly when impacts cause loss and damage to human society and the ecosystems upon which society depends. One of the emerging and pressing policy questions has to do with how climate impacts will affect human society, particularly when society faces economic, political, policy and social limitations in their abilities to adjust to the biophysical as well as social implications of climate impacts (at the community, national, regional and international levels).

There is a need to further shape science and policy thinking about the interaction between climate impacts and human society. This paper contributes to that effort by illustrating the relevance of the concepts of social vulnerability and social resilience to understanding how climate change impacts translate into loss and damage for human society.

Recommendation 1: Consider loss and damage as part of an emerging dynamic system in which interactions of climate change with social processes shape and transform human societies

"The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

United Nations Framework Convention on Climate Change, Article 2

Discussions of loss and damage in the UNFCCC climate negotiations

The UNFCCC was created to address the drivers of climate change, prevent dangerous anthropogenic interference with the Earth´s climate system, and address the adverse effects of climate impacts in a way that would allow ecosystems (and human systems dependent upon them) to adjust in non-disruptive ways.

The concept that climate change could be accompanied by loss and damage – the actual and/or potential manifestation of climate impacts that negatively affect human and natural systems – has emerged over three broad phases of policy discussions since the early 1990s, described briefly below.

Mitigation and avoiding dangerous climate change

Historically, the underlying UNFCCC discourse on loss and damage – and more broadly of climate change impacts on society – has evolved along two parallel lines. From the early 1990s to the mid-2000s, the dialogue has been characterized by an emphasis on mitigation: avoiding the causes of climate change first and cautioning polluters with the concept of polluter pays principle. The potential impacts of extreme weather events and longer-term impacts related to sea level rise, glacial melt, desertification, etc. were considered politically unacceptable and a strong case for ambitious mitigation. The early focus was on cautioning high emitting countries about the consequences of not curbing their emissions (e. g., polluter pays principle).

Adaptation and adjusting to climate change impacts

A second strand of discussion – focusing on adaptation – was also present at least from the time of the adoption of the Kyoto Protocol (KP) (a reason why the review process was built into the KP). The IPCC 2nd Assessment Report 1996 recommended stabilization of GHG emissions at the levels current at that time – and that an immediate reduction of 50–70 per cent was needed. However, by the mid-2000s and certainly with the publication of the IPCC 4th Assessment Report in 2007, the process reflected a realization among scientists and policymakers that emissions targets may be too low to prevent climate change and some of the negative impacts associated with it. Hence, it would also be necessary to discuss adaptation and issues around negative impacts of climatic change on human society. Scientists and policymakers concurred that some impacts of climate change may already be manifest and that adaptation was therefore a necessary complement to mitigation in order to cushion the blow to society from some of the expected impacts of climate change, including loss and damage.

Assessing and addressing loss and damage

At COP 16 (held in Cancun, Mexico, December 2010), the COP decided to establish the Work Program on Loss and Damage under the Subsidiary Body for Implementation (SBI). The Cancun Adaptation Framework recognized "the need to strengthen international cooperation and expertise to understand and reduce loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather events and slow onset events" (para 25). The Cancun Adaptation Framework asked the SBI to make recommendations on loss and damage to the COP for its consideration at COP 18 (para 29), as well as to strengthen international cooperation and expertise to understand and reduce loss and damage associated with the adverse effects of climate change. Decision 1/CP.16 also suggests that the SBI strengthen international cooperation and expertise to understand and reduce loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather events and slow onset events.

Recommendation 2: Mainstream the role of social vulnerability and social resilience in loss and damage policy discussions

There are three reasons to consider social vulnerability and social resilience in loss and damage policy: In the 1970s, these two concepts drove a paradigmatic change in research and management of natural disturbances and how they interact with human society (particularly in the disaster risk management community). Indeed, both concepts are foundational for important advances in our understanding of how human society interacts with climate change impacts. One of these concepts, vulnerability, emerged from disaster research. The other, resilience, saw its origins in the field of ecology, which in turn had drawn from engineering and physics. Both concepts were concerned with the issue of loss and damage: Social vulnerability was concerned primarily with causes of loss and damage, and social resilience was concerned primarily with opportunities to reduce loss and damage. Both concepts required greater scrutiny of the underlying causes of both loss and damage and are also complexly intertwined with the questions of adaptation to climatic stressors and development.

Social vulnerability refers to those characteristics of a society that render its members subject to harm and loss from a stressor. The concept of vulnerability focused attention on those aspects of society that reduce or exacerbate the impact of a stressor or shock. Although the idea of vulnerability had appeared in earlier discussions of flood plain occupation (White, 1964), in the 1970s researchers primarily working in the developing world called for a rethinking of the consequences of flooding from a political economic perspective, based on the high correlation between disaster proneness, chronic malnutrition, low income and famine potential, leading to the conclusion that the root causes of disasters lay more in society than in nature (O'Keefe et al., 1976; Wisner et al., 1977; Hewitt, 1983).

At roughly the same time, ecological science began moving away from the idea of ecosystems as static entities in equilibrium toward systems in which change is a regular feature, asserting that a system will persist (rather than expire) if it is capable of change, and that disturbances increase the chances that a given ecological system will not return to a former state. In other words, it is resilient in the face of disturbances and change (Holling, 1973). The concept of resilience refers to "the capacity of an eco-system to undergo disturbance and maintain its functions and controls and may be measured by the magnitude of disturbance the system can tolerate and still persist." (Wallington et al., 2005: 15). Social scientists soon saw the application of the concept to society framing resilience, as the ability of social groups or individuals to bear or absorb sudden or slow changes and variation without collapsing is social resilience (Holling and Meffe, 1996).

As the resilience and social vulnerability perspectives were developed over the last three to four decades, three key perspectives emerged which are imminently relevant for emerging policies on loss and damage today.

This section offers three perspectives that aim to help policy-makers consider social vulnerability and social resilience in measures to address climate change related loss and damage:

1. First, both vulnerability and resilience required a new perspective on the relationship between society and environment. With the concepts of vulnerability and resilience, both the social and the natural sciences moved from viewing environment and society as a duality to a more mutually constitutive relationship. This mutual constitution becomes abundantly clear in the context of disasters and even more so with climate change.

2. Second, concepts of social vulnerability and social resilience emphasize the centrality of interactions across temporal and spatial scales, particularly the importance of historical analysis in assessing current conditions. This is especially important in projecting and assessing loss and damage.

3. Third, concepts of social vulnerability and social resilience recognize that climatic risks and disturbances are "routine" parts of societal – environment/climate interactions. These stressors are not to be seen as "shocks" which occur, are dealt with, and then society returns to normal. Loss and damage is part of a process – not event – in which interactions of climate change with social processes shape and transform human societies.

Recommendation 3: Recognize that both causes and solutions for loss and damage are found in social-climate interactions

Loss and damage refers to impacts on human systems, which are often channeled through the negative impacts of climate change on natural systems. For example, sea level rise and glacial melt result from climate change stimuli, and these shifts in natural systems in turn result in loss and damage in human systems, such as loss of habitable land or freshwater. Loss and damage related to anthropogenic climate change can arise from a spectrum of biophysical processes affected by higher concentrations of GHGs in the atmosphere. Weather systems driven by temperature changes unleash extreme events as well as changed rainfall and other weather patterns. Temperature change also affects incremental processes like sea level rise, glacial melt, desiccation and desertification, changes in seasonal cycles and ocean acidification.

From this perspective, loss and damage from climate change is essentially an anthropogenic phenomenon, with social roots as well as social solutions. Understanding the causes of loss and damage – anthropogenic climate change and the way climate change impacts interact with elements of human society – is at the foundation of all policy and efforts to address it. Unfortunately, to date, neither the concept of social vulnerability or social resilience has yet led to policies or practices that have significantly reduced losses or damages related to climatic stressors in much of the world. This is in part because of a continuing scientific and policy emphasis on the biophysical processes, rather than how these processes interact with human society. There is a bias in the pervading neoliberal economic regime that privileges economic growth over sustainable development.

The concept of social vulnerability links the relationship that people have with their environment with the social forces and institutions and the cultural values that sustain or contest them (Oliver-Smith, 2004).

Social vulnerability is one of the features of risk, defined as the latent probability of future loss and damage associated with the occurrence of a physical event and the exposure of social elements to its impacts (Lavell, 2011).

The climate change literature in general takes a different approach to social vulnerability than disaster research. The IPCC definition is concerned with "the degree to which a system is susceptible to and unable to cope with adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity" (IPCC, 2007b). This approach constitutes a return to an emphasis on exposure to physical processes rather than the social construction of risk (Kelman and Gaillard, 2010). Although the probability of more extreme events is significant, it is likely that most of the effects of climate change will be gradual, incrementally affecting communities that are already dealing with high levels of social vulnerability, thus turning creeping, chronic disaster into rapid-onset disaster (Lavell, 2011).

Loss and damage includes the effects of the full range of climate change related impacts, from increasing (in number and intensity) extreme weather events to slow onset processes and combinations thereof. Addressing loss and damage requires an understanding of the kinds of events and processes that are associated with the adverse impacts of climate change. Throughout this document the terms "weather extremes" (usually discrete temporal events) and "slow onset climatic processes" (non-discrete continuous processes) are used. Climate stimuli interact with human systems in complex ways, thereby causing loss and damage in vulnerable exposed communities.

Negative climate change impacts that cause loss and damage are also linked to the ability of human systems to adapt to changes in the climate. Characteristics of human systems (development policy, poverty, etc.) affect the dependency of human systems on natural systems. Human choices about these social systems – particularly choices that affect vulnerability and resilience to biophysical processes – determine the degree of loss and damage related to climate change. For example, policy choices about GHG reductions (mitigation) and investments in measures that help society adjust to the negative impacts of climate change (adaptation) that lead to a reduction of climate change impacts that, through mitigation and adaptation will, in turn, lead to a reduction of loss and damage.

Vulnerability refers to the social construction of risk, to those socially constituted conditions in which people live that undermine their capacity to resist or absorb the impact of a climate stressor without major disruptions and losses. Considering vulnerability demands understanding of and approach to climate change impacts because it leads to the recognition that the loss and damage related to these climate impacts are not caused by a single agent but by the complex interaction of both environmental and social features and forces (Oliver-Smith 2004). Vulnerability integrates political economic and environmental forces in terms of both biophysical and socially constructed risk, tracing how social systems generate the conditions that place different kinds of people, often differentiated along axes of class, race, ethnicity, gender or age, at different levels of risk from the same hazard and damage, loss and suffering from the same event. By incorporating specific political, economic and social variables in combination with specific environmental features, the cause and impact of climatic stressors is situated in the intersection of society and environment. Climate change-related impacts and outcomes are socially produced at the intersection of a range of biophysical processes and vulnerability patterns that are tied to underlying social, economic, territorial and political processes.

Societal resilience to climatic stressors addresses two fundamental questions: resilience of what or whom? Resilience to what? Like vulnerability, social resilience is embedded in social structures that govern the interaction of human systems and the natural world. Resilience refers to the ability to prepare and plan for, absorb, recover from or more successfully adapt to actual or potential adverse events (National Research Council, 2012). It is not the opposite of vulnerability, but a separate concept providing the path for moving from disaster risk reduction to sustainability. Social resilience can be manifest at an individual level (such as a person, household or an individual structure such as a house), at the group level (e.g., the elderly, the private sector or an infrastructure such as levees) or in spatial dimensions such as communities, cities or ecosystems. Since resilience refers to the capacity of a community to withstand the effect of a stressor, it is based in and fundamentally a function of a socio-cultural system.

Recommendation 4: Evaluate loss and damage considering social processes across temporal and spatial scales

Loss and damage is reflected in historical and present (observed and occurring) interactions between human society and the bio-physical processes of climate change. The concept also includes potential future loss and damage, the forecasting of which relies on assumptions of parameters such as emissions, vulnerability and the exposure variables of the affected human (or natural) system.

Social conditions constitute the forms of ongoing features of society that render people susceptible to environmental and climatic disturbances (Lavell, 2011). Considering social vulnerability widens the scope of loss and damage analysis by embedding the consequences of climate change impacts in deeper historical and broader spatial scales. Vulnerability must be understood as the outcome of processes that have been underway in a society historically, sometimes for centuries. Moreover, many of the drivers of vulnerability are non-local and derived from larger socio-economic forces at work nationally and internationally over varying lengths of time (Oliver-Smith, 2004).

The consequences of loss and damage related to climate-related biophysical stressors can set back socio-economic development and reinforce cycles of poverty across the world. The Fourth Assessment Report of the IPCC (2007) noted that the areas already vulnerable to environmental change and a number of environmental-societal shifts are also the most likely to experience the most negative impacts of climate change. Some of those impacts will contribute to loss of and damage to life, property and other assets important for the sustainable development of the countries which need such resources the most, including impacts that contribute to constraints on economic production and non-economic losses.

Development, climate change and social vulnerability

For example, disaster risk and social vulnerability are the products of historical and existing processes of social and economic development. The ideologies and practices of development play a strong role in the construction of vulnerability and the resilience of the world for the last half century, indeed, for the last half millennium. Development continues to be defined by those with the power to implement their ideas as the process through which the productive forces of economies and supporting infrastructures are improved through economic growth based on public and private investment.

Conventional models of development distribute benefits of intensified production stimulated by industrial market economies through participation in markets for labor, services, commodities, and other resources. The conventional economic growth agenda asserts that such approaches are the best means to combat poverty and raise standards of living on a global scale. However, many of the processes that also drive risk and vulnerability are standard development strategies (Cannon and Muller-Mahn, 2010). For example, costs occasioned by productive development have been externalized, to be absorbed either by the environment in terms of resource exploitation and waste processing or by the general population when social, cultural and economic disadvantages, such as increased risk and disasters, occur.

Clearly, among those disadvantages are the conditions that emerge from the inconsistencies, imbalances and inequalities engendered by the dominant development model that increase the social vulnerability of large numbers of people who are increasingly exposed to an expanding number of hazards, now often in a concatenating series of linked calamities. Despite recent calamities in the industrialized world, it is generally clear that in terms of mortality, development has reduced vulnerability and enhanced resilience in those nations. However, in the United States, for example, that reduced social vulnerability is distributed in unequal ways. Hurricane Katrina revealed that much of the flooding and dislocation of minority communities was due largely to strategies of urban development begun in the 1920s that urbanized flood-prone areas.

Recommendation 5: Assess social vulnerability and monitor progress in social resilience

It is important to consider that loss and damage do NOT exclusively represent a biophysical phenomenon, but its interaction with the society expands the need to rethink and address social vulnerability and its capacity to build resilience. Avoiding doing so will conceptualize loss and damage as an event and not as part of societal transformations to reality.

Assessing vulnerability. The empirical basis for assessing social vulnerability has lagged behind its conceptual development. It has only been within the past decade that systematic measurements of what and who is vulnerable have been made (Birkmann, 2006; Cardona et al., 2012). This is due to a variety of reasons, among them availability of data; differing methodological approaches; and most fundamentally, disagreements over the basic drivers and indicators of social vulnerability and the scale at which they should be measured (Birkmann, 2007). For example, national level indicators monitor disaster risk through the intersection of population exposure, vulnerability and hazards (Peduzzi et al., 2009; Dilley et al., 2005; Dilley, 2006; Birkmann, 2011) by comparing countries to one another. At the regional scale, specific measurements often take a development-oriented paradigm of risk and vulnerability in creating a more holistic disaster risk management system that includes disaster risk exposure and susceptibility to create the prevalent vulnerability index, providing a measure of vulnerability conditions targeted to Latin America (Cardona, 2008; Carreño et al., 2007). At the subnational level, there are fewer empirically based social vulnerability assessments, but the most well known is the Social Vulnerability Index (SoVI®) developed by Cutter and colleagues (Cutter et al., 2001; Cutter and Finch, 2008; Cutter and Morath, 2012) and applied to the United States context.

Monitoring progress in resilience. Increasingly, there is a focus on the examination of community resilience to natural hazards in understanding how to reduce risk and losses from these events. In this conceptualization, communities are viewed as a system of systems that require understanding of the intersection between natural systems, human systems and the built environment. Such a system is embedded in the historical social and cultural constructions of the place, which govern social interactions and the material development of communities with their attendant institutions that govern growth and services.

As with vulnerability, it is difficult to measure all aspects of community resilience, yet the development of proxy indicators has seen considerable improvement over the past decade. Vulnerability takes different forms (natural, physical, economic, social, political, technical, ideological, cultural, educational, ecological and institutional (Wilches-Chaux, 1989), as does resilience. Resilience applies to different aspects of the community: social (those social characteristics that enhance access to resources, the capacity to prepare for, respond to, recover from and reduce or mitigate the adverse impacts of disasters) (Morrow, 2008; Norris et al., 2008; Tierney, 2009); economic (economic vitality, role of financial resources in loss reduction) (Rose, 2007, 2009); institutional (planning, how organizations respond to changing conditions, governance) (Burby et al., 2000; Berke and Campanella, 2006); infrastructure (physical systems, interdependence, redundancies, cascading impacts) (Flynn, 2007); community competence (sense of community functioning, community ties, engagement with governing bodies, attachments to place, social capital) (Norris et al., 2008; Vale and Campanella, 2005); and environmental (biodiversity, ecosystem health, natural resources management, wetlands preservation, environmental stewardship) (Gunderson, 2009). As noted earlier, communities comprise interrelated systems and to adequately capture the concept of disaster resilience requires holistic thinking about the interactions of these systems with one another, as well as mechanisms for measuring them.

Because of its dynamic qualities and fundamental differences in community systems including their goals and aspirations, measuring resilience poses difficult challenges. Aside from the collective challenge of community-based goal setting on what resilience means for that place, baseline measurements on the current level of resilience are lacking. Assessing programmes and policies to see if they are enhancing resilience becomes moot without some starting point or baseline metrics. How effective is the programme five years after its implementation, if the community or nation has no understanding of where the community was prior to the programme? Despite this critical piece of information, there is no systematic measurement of resilience for nations and/or their communities. There are some notable attempts at developing subnational resilience indicators in the United States, for example, based on quantitative data (Peacock et al., 2010; Sherrieb et al., 2010; Cutter et al. 2010), and self-reports from communities (Sempier et al., 2010). However, at present there are no consistent standards for measuring resilience at any spatial scale, from community to nation, nor is there agreement on what should be measured.

Limitations in measuring resilience and vulnerability

The difficulty in producing resilience metrics is overshadowed by the lack of consistent national and international data on disaster losses – fatalities, injuries, displacements and economic damage. The monitoring and collection of disaster loss data is fragmented globally and lacking in standardized procedures (Gall et al., 2009). Further, there is no examination of the international databases (MunichRe, SwissRe, Emergency Events Database [EM-DAT]), regional (DesInventar) or national databases (SHELDUS-Special Hazards Events and Losses Database in the United States) as to their limitations. These limitations lead to common misperceptions about hazard events and loss information. There are at least six limitations in measuring resilience and vulnerability, represented in loss databases today:

1. Every hazard type is not represented in loss estimates (hazard bias). This produces an uneven representation and distribution of losses between hazard types that is more a function of what was included in the database rather than reflecting all the hazards that lead to losses.

2. Losses are not comparable over time (temporal bias). Not all databases cover the same time period, so assessing trends over time becomes a problem. Further, there are less reliable loss data in the past than in the present.

3. Not all losses are counted (threshold bias). For some databases, notably EM-DAT, only large events are included. Such inclusion thresholds result in an under-representation of minor hazard events and those that are more chronic, which could, over time, add considerably to the loss total.

4. Not all types of losses are included (accounting bias). Many databases only include direct loss such as building damages, not indirect losses such as lost employee wages. Some include deaths, injuries and displacement, while others only focus on monetary losses. Further, some of the databases only include insured losses, although they may estimate uninsured losses. The accounting bias underreports indirect and uninsured monetary losses, as well as human losses including displacement and loss of livelihoods.

5. Not all hazard losses are comparable across geographic units (geographic bias). This bias leads to a spatially distorted picture of losses by under or overrepresenting certain locales. The geographic bias is especially prominent when country (or subnational) boundaries change and there is interest in looking at the past level of losses, not just the present year.

6. Losses are not the same across different databases (systemic bias). This bias makes it difficult to compare losses among the databases due to the different estimation and reporting techniques. As a consequence of these biases in disaster loss information, policymakers and practitioners have no true understanding of disaster losses for their community or nation – they only have partial estimations. Achieving resilient communities requires disaster loss information as the foundation for disaster risk management in addition to resilience metrics to monitor progress towards risk reduction.

However, as has been shown for social capital measurements, developing resilience metrics with robust predictive results may prove difficult (de la Peña, 2008). It is clear that direct losses from natural hazards are on the rise with the climate-related hazards contributing much of the total, especially in the United States (Gall et al., 2011). Climate change will alter the frequency and magnitude of meteorological and hydrological disasters, and thus increase both the human and monetary losses, which can be expected to climb globally.

Recommendation 6: Address potential loss and damage as part of risk reducing anticipatory, resilience building social processes

It is important to consider social vulnerability and social resilience processes in efforts to address loss and damage, which is now and will become a more prominent feature as climate change impacts intensify. Undertaking policy and measures to manage loss and damage is generally presented in a social scientific context in terms of strategies of a sociocultural nature adopted by individuals and groups to cope with conditions presented by their physical and cultural environments in a way that enables them to survive and/or prosper. In order to survive, ensure maintenance, demographic replacement and social reproduction, human beings interact with nature through a set of material practices that are socially constituted and culturally meaningful (Patterson, 1994). All are accomplished through social arrangements; all modify the natural and social world in ways that enable to some degree the persistence of the society over time. In a sense, an adaptation is a form of belief, behaviour or technology that has become part of the overall "toolkit" of a society, enabling its members to survive and reproduce in its total environment. In sum, the sociocultural system is seen as the primary means by which a human population adjusts to its environment in which adjustment options are largely determined by social, and more specifically, power relations. Through cultural means, humans perceive environmental changes, consider their implications and possible responses through a grid of individually interpreted cultural knowledge and meanings, make decisions and elaborate responses that may reflect a variety of value positions, including the deployment of technology.

The concept of social vulnerability rejects the view that a collapse of the productive functions of the social order is caused by the impact of a biophysical process alone. As Hewitt argued, most natural disasters are more explainable in terms of the "normal" order of things, that is, the conditions of inequality and subordination in the society rather than the accidental geophysical features of a place. This perspective shifts the focus away from the biophysical even or process and towards the "ongoing societal and man-environment relations that prefigure [disaster]" (Hewitt, 1983: 24–27). Factors such as the lack of access to resources, lack of political power and representation, inadequate housing and infrastructure, poor sanitary conditions, lack of access to education and health care and density of settlement have been cited as most frequently associated with high vulnerability (Wisner et al., 2004; Cutter et al., 2001).

This view – that climate change impacts including climatic hazards interact with social vulnerability to create patterns of loss and damage – is highlighted in some of the findings presented in the box (IPCC SREX).

Key points from the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (IPCC SREX)

- Extreme and non-extreme weather or climate events affect vulnerability to future extreme events by modifying resilience, coping capacity and adaptive capacity.
- Economic losses from weather- and climate-related disasters have increased, but with large spatial and inter-annual variability.
- Climate change will pose added challenges for the appropriate allocation of efforts to manage disaster risk.
- Understanding the multi-faceted nature of both exposure and vulnerability is a prerequisite for determining how weather and climate events contribute to the occurrence of disasters, and for designing and implementing effective adaptation and disaster risk management strategies.
- In many regions, the main drivers of future increases in economic losses due to some climate extremes will be socioeconomic in nature.
- National systems are at the core of countries' capacity to meet the challenges of observed and projected trends in exposure, vulnerability and weather and climate extremes.
- Given shortcomings of past disaster risk management and the new dimension of climate change, greatly improved and strengthened disaster risk management and adaptation will be needed as part of development processes, in order to reduce future risk.
- Effective risk management generally involves a portfolio of actions to reduce and transfer risk and to respond to events and disasters, as opposed to a singular focus on any one action or type of action.

Source: IPCC (2012b).

In adaptation to climate change processes and effects, there is an important distinction between what Bennett calls adaptive strategies and adaptive processes. Adaptive strategies involve coping behaviour, immediate problem solving and decision-making. Coping essentially refers to decision-making in novel situations for which there is no ready culturally integrated institutionalized response. It involves improvisation and creativity (Bennett, 1996). Adaptive processes are changes introduced over long periods of time by repeated use of particular strategies that have become part of the fund of general knowledge and practice in a culture, part of the overall "toolkit" for life in a particular environment.

In terms of adaptive success, depending on the perspective employed, resilience to climatic stressors can be viewed as an outcome (Bruneau et al., 2003; Tierney and Bruneau, 2007) and be used to measure the robustness, recovery and redundancy of systems such as communications, economic systems or organizations. This view is especially salient in measuring the performance of engineered systems or the ability of economic systems to recover from disturbances. Another perspective examines resilience as a process – one that enhances the empowerment of individuals and communities in responding to disasters (Norris et al., 2008), especially in the domains of information and communication, social capital, economic development and community problem solving skills. In this conceptualization, there are no measureable endpoints; rather, community resilience is a constantly evolving process of learning and adaptation to new knowledge, information and disaster risks. A third perspective views disaster resilience as both an outcome and a process, where there are inherent vulnerabilities and resilience in the community prior to an event and these influence the ability of the community to absorb the impacts, which results in either rapid or slow post-disaster recovery – the measureable outcome (Cutter et al., 2008). In this conceptualization, there are constant feedbacks to preparedness and loss reduction activities, as well as social learning, which occur as a means for enhancing resilience over longer time frames.

Recommendation 7: Focus on addressing system vulnerabilities and increasing social resilience and equity in the face of loss and damage decisions and subsequent international and national policy discussions on loss and damage

Today, countries and communities are facing an increasing pace of climate change – manifest in changing magnitude and frequency of extreme events. These events already impose loss and damage which are difficult to deal with by the most vulnerable communities due to uncertainty and volatility of such extreme weather. In the future, even more notable impacts from combinations of extreme weather and slow onset climatic processes are expected to bring more loss and damage.

Literature captured in meta-reviews such as the IPCC Assessment Reports focus rather on climate change impacts than on how these impacts are managed today. This trend may change in the 5th Assessment Report due out in 2014, but for now there are gaps in knowledge about how communities, countries and regions currently manage many of the climate impacts experienced. Some of these impacts are also expected, rather than actual, so that documentation of actual experiences and approaches to address them is limited. Here, many countries throughout the world are investing in institutional, legislative and management practices to prepare themselves to manage negative climate change impacts.

There are further imbalances in current knowledge and experience about approaches to address loss and damage. Relatively more is known about the management of extreme weather events and related loss and damage. Disaster risk management has been documented and actively promoted by United Nations processes such as the International Strategy for Disaster Reduction (UNISDR) and is well-represented in the English literature surveyed. For example, the literature review focused on both disaster risk reduction for natural hazards (including weather extremes) and approaches that reduce climate change impacts (including both weather extremes and slow onset climatic processes). This result from our review of the recent meta-analyses included the IPCC Special Report on Extreme Events (IPCC, 2012a) and the UNISDR's Global Assessment Report (GAR) 2011 (UNISDR, 2011).

Similarly, relatively more literature and policy space are devoted to particular concepts of "adaptation" to biophysical impacts – such as building sea wall protections or increasing the height of infrastructure like bridges or dykes – than to concepts that consider adjusting to stressors that are derived from social characteristics rather than biophysical ones. Orlove (2009) questions how "adaptation" has been conceptualized (often as projects to manage biophysical impacts of climate stressors), and accepted as such as a key dimension of climate change policy. Such a simplified idea of adjusting to climate change does not capture the full impacts of climate change (such as secondary and indirect impacts, non-economic values, etc.), nor does it represent either the perceptions of the people affected by these impacts or the range of alternatives open to them.

Framing the management of climatic stressors only in terms of biophysical impacts does not fully engage the issue of systemically imposed, socially-constructed vulnerability: the outcome of the way resources, wealth and security are distributed in a society. For example, research has for many years illustrated the impact of "underdevelopment" on the poor, women, children and the marginalized, in the health, education, agriculture, transportation, water and sanitation sectors. This research has analysed the cost of all the dimensions of social vulnerability in terms of disease and sickness, illiteracy, malnutrition, unemployment, inadequate shelter, lack of access to safe drinking water, sanitation facilities and public transportation. Such research has increased understanding about the burdens to countries when these sectors are unable to fulfill their obligations to their populations. But even when faced with these realities, development continues to perpetuate the imbalances between the beneficiaries of those policies and those who pay the costs in increased vulnerability and risk (Frerks and Bender, 2004).

If the decades-long quest for international agreement regarding the management of and attempt to reduce the impacts of climate change on society is to achieve any semblance of success, then governments must address those policies that continue to drive and even reward the social construction of vulnerability and risk.

Policies for managing loss and damage must focus on changing processes that make people vulnerable to events which fall beyond the capacity of communities to cope, perhaps made even more extreme by climate change processes. Efforts to address loss and damage should be framed and designed to address those social and economic features that render people vulnerable to climatic and other stressors. In that sense, the most effective overall policy for managing loss and damage should focus on addressing systemic vulnerabilities, and increasing social resilience and equity in the face of loss and damage. In the Age of the Anthropocene, the outcomes of choices around social vulnerability and social resilience will be the measure of our collective success or failure to adjust to and survive the profound manifestations of the change human choices have wrought on Earth systems.

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Annex:
Summer Academies 2006–2012:
Topics and respective publications

Year	Focus area	Research project	Publications
2006	**Global water hot spots: water-related social vulnerability and resilience building**	Narrowing the focus to water complements the goals of UNU-EHS and MRF and generated momentum towards high-profile water events such as the fourth World Water Forum (WWF) in Mexico in 2006. The foci of this specific theme included: water-related natural hazards and disasters (floods, droughts); water-induced threats to human security (food, health); water problems of large urban agglomerations (drinking water, sanitation, water supply systems, privatization); and water conflicts. The participants of the 2006 Summer Academy focused on issues such as safeguarding water supplies and waste water facilities, flood and drought, poverty and the lack of risk perception, with the emphasis on interdisciplinary analysis and the quest for sustainable proposals for improvement.	Bohle, H. (2007): Living with Vulnerability. Livelihoods and Human Security in Risky Environments. InterSecTions No. 6. UNU-EHS. Bonn Warner, K. (2007): Perspectives on Social Vulnerability. SOURCE No. 6. United Nations University Institute for Environment and Human Security (UNU-EHS). Bonn. Oswald Spring, U. (2008): Gender and Disasters. Human, Gender and Environmental Security: A Huge Challenge. SOURCE No. 8. UNU-EHS. Bonn.

Year	Focus area	Research project	Publications
2007	**Mega-cities, social vulnerability and resilience building**	Mega-cities simultaneously offer the best of humanity and challenge us with the worst of human security problems. Cities are today home to about half of all humanity and serve as uneasy hosts to a variety of less desirable facets. Cities bursting with millions of people battle crime, unemployment or underemployment, insufficient infrastructure including housing and sanitation, and exposure to natural disasters. In 2007, a group of young scientists and experts gathered from various countries and multiple disciplines to identify the factors of, and analyze the interrelationship between, vulnerability and resilience that characterizes complex urban agglomerations called mega-cities. The outcome of this process was the Megacity Resilience Framework.	Bohle, H. ; Warner, K. (2008) (Eds.): Megacities. Resilience and Social Vulnerability. SOURCE No. 10. UNU-EHS. Bonn.

Year	Focus area	Research project	Publications
2008	**Environmental change, migration and social vulnerability**	During the 2008 Summer Academy, participants discussed the challenges, needs and strategies surrounding the issue of environmentally induced migration. Migration and environmental change are, in and of themselves, complex phenomena. Understanding the relationship between the two, particularly how climate change and environmental degradation drive migration, is a substantial challenge and a critical area for research and policy response.	Oliver-Smith, A. ; Shen, X. (2009) (Eds.): Linking Environmental Change, Migration and Social Vulnerability. SOURCE No. 12. UNU-EHS. Bonn. Oliver-Smith, A. (2009): Nature, Society, and Population Displacement. Toward and Understanding of Environmental Migration and Social Vulnerability. InterSecTions No. 8. United Nations University - Institute of Environment and Human Security (UNU-EHS). Bonn. Oliver-Smith, A. (2009): Sea Level Rise and the Vulnerability of Coastal Peoples. Responding to the Local Challenges of Global Climate Change in the 21st Century. InterSecTions No. 7. UNU-EHS. Bonn.

Year	Focus area	Research project	Publications
2009	**Tipping points in humanitarian crises**	The goal of the 2009 Summer Academy was to discuss and develop a new way of thinking about climate change, resilience, vulnerability and uncertainty: the "hot" system approach was introduced. Building on the "hot spot" concept developed by ecologists, this system-focused framework considers the consequences of climate change and other perturbations for socio-economic and ecosystem vulnerability in differing geographic locations. The hot system approach investigates the relationships between biophysical and social processes and how combinations of events and conditions in geographically disparate systems can lead to humanitarian crisis. Combined with the concept of tipping points, the hot system approach helps the impact of multiple disturbances to be recognized and enhances prevention of humanitarian crises.	Shen, X. ; Downing, T. (2010) (Eds.): Tipping Points in Humanitarian Crisis: From Hot Spots to Hot Systems. SOURCE No. 13. UNU-EHS. Bonn.

Year	Focus area	Research project	Publications
2010	**Protecting environmental migrants**	There are a number of scenarios in which people could be displaced or forced to migrate due to climate change and extreme weather events. The competition over scarce water supplies, land and jobs that can result from prolonged drought could lead to social upheaval and an increased incidence of violence and ethnic tension. Of growing concern are serious gaps in the protection schemes provided by existing law, including the extent to which persons adversely affected by climate change can cross international borders in search of jobs or otherwise engage in labour migration as a means of survival, or to help build their resilience to future disaster. These gaps in the protection of climate victims displaced or forced to migrate, pose serious issues of human security and implicate human rights and humanitarian norms. The 2010 Summer Academy aimed to develop policy options for decision makers to better address the needs of such environmentally induced migrants	Leighton, M. (2011): Climate Change and Social Vulnerability: Improving Global Protection of Forced Migrants and Displaced Persons. InterSecTions No. 9. UNU-EHS. Bonn. Leighton, M. ; Shen, X. ; Warner, K. (2011) (Eds.): Climate Change and Migration: Rethinking Policies for Adaptation and Disaster Risk Reduction. SOURCE No. 15. UNU-EHS. Bonn. Leighton, M.; Shen, X.; Warner., K et al. (2011): Policy and Institutional Mechanisms to Address the Needs of Climate-Related Migrants. Results of the 2010 Summer Academy on Social Vulnerability. Research Brief Series No. 3. UNU-EHS. Bonn

Year	Focus area	Research project	Publications
2011	**Climate change and fragile states**	Climate change is real, and its effects are particularly severe for the populations of poor countries. This is even truer for the populations of fragile states that often find it even more difficult to adapt to environmental change. Major obstacles mostly include ethnic tensions, corruption and violence. In 2011, the Summer Academy investigated strategies and short-term options designed to explain adaptation measures to the populations of fragile states. They came up with solutions to the various aspects of the "climate change and fragile states" issue.	Hamza, M. and C. Corendea, eds (2012). Climate Change and Fragile States: Rethinking Adaptation. SOURCE No. 16/2012. Bonn: United Nations University Institute for Environment and Human Security (UNU-EHS). Corendea, C., Warner, K., and Kristina Yuzva. (2012). Social Vulnerability and Adaptation in Fragile States. InterSecTions No 9/2012. UNU-EHS, Bonn.
2012	**From social vulnerability to resilience: measuring progress towards disaster risk reduction**	The ability to measure vulnerability is an essential pre-requisite for reducing disaster risk and indicators are the key tools for identifying and measuring vulnerability and related coping activities. The 2012 Summer Academy demonstrated the importance of providing evidence-based support for managing disaster risk and addressed some of the methodological challenges in measuring social vulnerability and resilience. Because hazards and disasters are place-specific, the Academy focused on the hazards of places and examined a number of empirically based approaches for measuring disaster risk (hazard exposure, losses and social vulnerability).	

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About UNU-EHS

The United Nations University (UNU) – the academic arm of the United Nations system – implements research and educational programmes in the area of sustainable development, with the particular aim of assisting developing countries.

The United Nations University Institute for Environment and Human Security (UNU-EHS) addresses risk and vulnerability aspects of human security and the consequences of complex environmental hazards for sustainable development.

The work of UNU-EHS helps to improve the in-depth understanding of the cause – effect relationships to find ways to reduce risks and vulnerabilities.

The Institute aims at scientific excellence in two broad thematic areas: Vulnerability assessment, resilience analysis, risk management and adaptation strategies within linked human-environment systems; and internal displacement and transboundary migration due to environmental push-factors.

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