

Chapter 13. Livelihoods and Poverty**Coordinating Lead Authors**

Lennart Olsson (Sweden), Maggie Opondo (Kenya), Petra Tschakert (USA)

Lead Authors

Arun Agrawal (USA), Siri Eriksen (Norway), Shiming Ma (China), Tom Mitchell (UK), Sumaya Zakiideen (Sudan)

Review Editors

Etienne Piguet (Switzerland), Rita Sharma (India)

Volunteer Chapter Scientist

Anna Kaijser (Sweden)

Contents

Executive Summary

- 13.1. Scope, Delineations, and Definitions: Livelihoods, Poverty, and Inequality
- 13.2. Livelihoods, Poverty, and Inequality: Salient Features
 - 13.2.1. Livelihoods
 - 13.2.1.1. Dynamic Livelihoods
 - 13.2.1.2. Multiple Stressors
 - 13.2.2. Dimensions of Poverty
 - 13.2.2.1. Framings
 - 13.2.2.2. Measuring Poverty
 - 13.2.2.3. Geographic Distribution and Trends of the World's Poor
 - 13.2.2.4. Spatial and Temporal Scales of Poverty
 - 13.2.3. Inequality and Marginalization
 - 13.2.4. Interactions between Livelihoods, Poverty, Inequality, and Climate Change
- 13.3. Assessment of Climate Change Impacts on Livelihoods and Poverty
 - 13.3.1. Evidence of Observed Climate Change Impacts on Livelihoods and Poverty
 - 13.3.1.1. Impacts on Livelihood Assets and Human Capabilities
 - 13.3.1.2. Impacts on Livelihood Dynamics
 - 13.3.1.3. Impacts on Poverty Dynamics: Transient and Chronic Poverty
 - 13.3.1.4. Critical Thresholds, Poverty Traps, and Transformations
 - 13.3.1.5. Implications for Inequality
 - 13.3.2. Understanding Future Impacts of Climate Change on Livelihoods and Poverty
 - 13.3.2.1. Anticipated Impacts on Economic Growth, Agricultural Productivity, and Living Space
 - 13.3.2.2. Implications for Livelihood Assets and Poverty Dynamics
 - 13.3.2.3. Critical Thresholds, Poverty Traps, and Impacts on Transient and Chronic Poverty
 - 13.3.3. Implications for Development, Sustainability, and Justice
- 13.4. Assessment of Impacts of Climate Change Responses on Livelihoods and Poverty
 - 13.4.1. Mitigation Responses
 - 13.4.1.1. The Clean Development Mechanism (CDM) – Focus on Reforestation and Carbon Sequestration
 - 13.4.1.2. Reduction of Emissions from Deforestation and Forest Degradation (REDD+)
 - 13.4.1.3. Voluntary Carbon Offsets
 - 13.4.1.4. Biofuel Production and Large-Scale Land Acquisitions

- 13.4.2. Adaptation Responses
 - 13.4.2.1. Insurance Schemes
 - 13.4.2.2. Humanitarian Aid as Part of Climate Change Adaptation
 - 13.4.2.3. Household and Community Responses

13.5. Evidence of the Interaction between Poverty Alleviation Measures, Climate Change, and Climate Change Responses

- 13.5.1. Millennium Development Goals
- 13.5.2. Social Protection Programs
- 13.5.3. Energy Access and Poverty Reduction

13.6. Synthesis and Research Gaps

Frequently Asked Questions

References

Executive Summary

This chapter discusses the concepts of livelihoods, poverty, and inequality, recognizing that poverty and the lives of the poor interact with climate change in multi-faceted and cross-scalar ways. It examines how current and projected impacts of both climate change and responses to climate change affect livelihoods and poverty. The IPCC Fourth Assessment Report stated that poor and marginalized populations are likely to suffer and will continue to suffer disproportionately from the impacts of climate change. The lack of an in-depth assessment justifies this new chapter.

There is ample evidence that poor people’s lives and livelihoods are already affected by climate change. Many of the experienced climate impacts, particularly in terms of increased rainfall and temperature variability, are caused by climatic events not easily detected by standard meteorological observations (high confidence).

- Climate change affects poor people’s lives directly through gradual shifts in seasonality and extreme weather events and impacts on food production, and indirectly by affecting access to food. [13.2.4, 13.3.1]
- However, many changes may be too subtle to be detected by aggregated (e.g. monthly) observations. [13.3.1]
- Experienced changes are in the form of distribution over time and in magnitude. The time series of climatic observations are often short and/or incomplete and geographically sparse. [13.3.11, 13.3.1.2]

Climate change worsens existing poverty and exacerbates livelihood vulnerability among the poor and marginalized while triggering new vulnerabilities as well as some few possible opportunities. Climate change is *very likely* to constitute an additional burden to the poor and act as a threat multiplier, overlaying deep-seated structural causes of poverty and inequality that shape vulnerabilities (high confidence).

- Not all poor people are equally affected by impacts of climate change, and not all vulnerable populations are poor. The interplay between climatic and non-climatic stressors determines vulnerability. [13.2.1.2, 13.3.1]
- Livelihoods of socially and geographically marginalised persons exposed to persistent inequalities at the intersection of age, gender, class, and ethnicity are experiencing disproportionate harm from the impacts of climate change. This includes many women, children, the elderly, and indigenous populations. [13.2.3, 13.3.1.5]
- Very scarce evidence exists that demonstrates positive impacts of climate change on the poor. [13.3.1.4]

Climate change is *likely* to create new poor and make many transient poor become chronic poor. This applies to both low-income countries and middle- to high-income countries (high confidence).

- With the rise of poverty and inequality in middle- to higher-income countries, impacts of climate change on the poor have increased, although comprehensive evidence is absent. [13.2.2.3, 13.2.4, 13.3.1.4, 13.3.1.5]
- Shifts from transient to chronic poverty are likely to occur for individuals, households, and populations that face multiple stressors, chronic deprivation, and successive erosion of livelihood assets. [13.2.2.4, 13.3.1.3, 13.3.1.4]

- 1 • The large majority of poor people lack effective response options, which puts them precariously close to
2 poverty traps, while more affluent and powerful groups may benefit from climate change and policy responses.
3 [13.3.1.5]
4

5 **Future impacts of climate change will likely slow down the pace of poverty reduction in rural and urban areas
6 across the globe, further erode food security, and jeopardize sustainable development (high confidence).**

- 7 • Poor countries are expected to experience even greater poverty as a result of future climatic changes, including
8 large proportions of the urban poor in developing countries shifting into chronic poverty. [13.3.2.1, 13.3.2.2]
9 • Most of the world's poor will live in lower middle-income countries while new poverty pockets emerge in high-
10 income nations, posing new challenges to dual climate change and development solutions. [13.2.2.3, 13.3.2]
11 • Without good governance, there is a risk that climate change response mechanisms promoted as development
12 strategies may exacerbate inequality and multi-dimensional deprivation. [13.3.3]
13

14 **Policy responses aimed at climate change mitigation or adaptation are likely to result in mixed albeit often
15 detrimental consequences for poor and marginalized populations (medium to high confidence).**

- 16 • Mitigation efforts such the CDM, REDD+, and land acquisition for food and biofuel production have shown
17 mostly negative impacts, often concentrated among marginalized groups in poor countries. [13.4.1]
18 • Insurance schemes and social protection programs have the potential to reduce poverty, strengthen adaptive
19 capacities, and enhance livelihood resilience among vulnerable and marginalized populations. [13.4.2, 13.5]
20 • Climate change mechanisms such as the CDM or REDD+ will only have marginal effects on poverty reduction
21 unless the conditions that underlie poor people's marginalization are radically altered. [13.4.1, 13.6]
22
23

24 **13.1. Scope, Delineations, and Definitions: Livelihoods, Poverty, and Inequality**
25

26 A better understanding of the impacts of climate change on livelihoods and poverty requires an examination of the
27 complexities of poverty and the lives of the poor as well as the multi-faceted and cross-scalar intersection of poverty
28 and livelihoods with climate change. This chapter covers three overriding issues. First, it discusses the concepts of
29 livelihoods, poverty, and inequality, as well as the interaction of these three under climate change and emerging
30 threats and opportunities. This section presents the multiple interlinkages and complexities, and structural causes of
31 poverty and inequality that shape climate change impacts. Second, it describes current evidence and expected future
32 impacts of climate change on livelihoods and poverty. Impacts considered include both gradual change and extreme
33 events, on urban and rural poor, in low- and middle- to high-income countries. Third, it discusses the impacts of
34 climate change responses on livelihoods and poverty. This part addresses whether responses such as local to national
35 and international policies and measures aimed at climate change mitigation and/or adaptation (e.g., CDM and REDD
36 initiatives insurance instruments,) reduce or further increase harm among poor and marginalized populations.
37

38 Livelihoods are typically understood as the ensemble of capabilities, assets and activities that are required for a
39 means of living (Chambers and Conway, 1992; Ellis *et al.*, 2003). Livelihoods depend on access to natural, human,
40 physical, financial, social, and cultural capital (assets); the ways in which people combine and transform these
41 assets; the ways people expand their asset base through relationships with other actors; and the ways in which they
42 deploy and enhance their capabilities to be and to act, to make lives meaningful, and to negotiate the rules that
43 govern the control, use, and transformation of resources (Bebbington, 1999; Scoones and Institute of Development
44 Studies, 1998). Livelihoods are dynamic, often pieced together in an attempt to adapt to and change with internal
45 and external stressors, yet their ultimate purpose is to transform assets into income, dignity, and agency that improve
46 living conditions.
47

48 Some livelihoods are directly climate-sensitive, such as smallholder agriculture, seasonal employment in agriculture
49 (tea, coffee, sugar), fishing, pastoralism, and forest dwellers. However, non-resource dependent livelihoods
50 including urban wage laborers and populations in slums and other informal urban settlements can be equally
51 impacted by climate change, both directly through unsafe settlement structure or indirectly through rises in food
52 prices. Moreover, children- and female-headed households and other marginalized populations often suffer multiple
53 deprivations and inequalities that make them particularly vulnerable to climatic and other stressors rather than
54 through their livelihoods *per se*.

Poverty is a complex concept with several and conflicting definitions. We acknowledge the multi-dimensionality of poverty and stress multiple deprivations as most limiting in the pursuit of well-being and responses to climate change impacts. Poverty and multiple deprivations explain how people's livelihoods are exposed and vulnerable to climatic and other stressors. In addition, an understanding of inequality illustrates the reasons why poor people remain in risky or unsustainable livelihoods, often despite poverty reduction and human development efforts. Poverty is a state in which people do not have enough power to voice their concerns and interests and thereby are often excluded from many decision making processes. It is crucial to recognize such marginalization in relation to climate change mitigation and adaptation policies, adaptive capacity, social resilience, and societal transformations.

A number of approaches exist to define poverty, yet there is considerable disagreement in terms of framings, methodologies, and measurements. Different approaches emphasize different aspects of poverty, either at the individual or collective level, including monetary features and accounting methods; capabilities, quality of life, and human development; well-being; social exclusion; and participation and other procedural dimensions (Laderchi *et al.*, 2003). As a counterweight to the income-based poverty measures, the main alternative approaches highlight the relational aspects of poverty (Alkire and Foster, 2011; Chen and Ravallion, 2012; Sen, 1976; UNDP, 2011b) and focus on inequality and social protection (Deacon and Cohen, 2011; Haarstad and St Clair, 2011; UNRISD, 2010).

This chapter examines linkages and gaps between these various approaches as well as their efficacy to responding to the needs of the poor under a changing climate. In addition to poverty in low-income countries, there is a growing concern about rising poverty and income inequality in middle- and high- income countries (Gower *et al.*, 2012; OECD, 2011). This chapter aims to assess climate change impacts on livelihoods and poverty by acknowledging structural causes of persistent poverty and inequalities, and the complex intersections of climate change with other stressors. Finally, it describes the limitations of our understanding between climate change, livelihoods, and poverty.

13.2. Livelihoods, Poverty, and Inequality: Salient Features

This section provides a succinct overview of the salient features of livelihoods, poverty and inequality, as well as the interfaces between these features and climate change. It first describes the dynamics of livelihoods in managing assets and capabilities and the various stressors livelihoods face and respond to, only one of which is climate change. The section then explores the different dimensions of poverty, including its diverse and often contradictory framings, measurements, its geographic distribution, and spatial and temporal scales. Third, it explains how inequality and marginalization perpetuate multi-dimensional poverty, with particular attention to gender and indigenous people. Finally, it shows how livelihoods, poverty, and inequality interact with climate change.

13.2.1. Livelihoods

The concept of livelihoods revolves around the opportunity set afforded by an individual or a household, as defined by their asset endowments and their chosen allocation of those assets across various activities to generate a stream of benefits (Barrett *et al.*, 2001). Livelihoods are often viewed as the main vehicle to satisfy basic human needs. Individual capabilities are crucial for enhancing people's ability to be agents of change, a prerequisite for poverty alleviation (Sen, 1981). Yet basic needs, livelihoods, and capabilities, particularly among poor and disenfranchised populations, are increasingly threatened and eroded by the adverse impacts of climate change and variability, and compounded by other, non-climatic stressors (Adger, 2010; Leary, 2008; Quinn *et al.*, 2011; UNDP (United Nations Development Programme), 2007).

13.2.1.1. Dynamic Livelihoods

A livelihood lens is advantageous for examining dynamic decision-making under climatic and other stressors and identifying processes that may force poor and vulnerable people onto undesirable trajectories, trap them in destitution, or provide escape routes toward enhanced well-being. It allows a multidimensional and grounded

1 analysis of people’s “messy” lives by recognizing the flexibility, or lack thereof, with which they draw upon
2 different asset bases and capabilities to construct their livelihoods, in particular communities and places. An under-
3 standing of the dynamics of livelihood strategies of individuals and households requires an explicit focus on the
4 wider institutional, cultural, and policy context in which livelihoods are embedded as well as shocks, seasonality,
5 trends, and changes that they experience. A key process is livelihood diversification: diversifying activity portfolios
6 and social support capabilities to spread risks and enlarge opportunities by juggling different types of assets with the
7 goal of improving livelihood outcomes and standards of living (Batterbury, 2001; Ellis *et al.*, 2003). The sustainable
8 livelihoods framework (Chambers and Conway, 1992) is powerful for assessing the complexities that surround
9 poverty and the lives of the poor, although it has been criticized for not sufficiently explaining the wider structural
10 processes that constrain livelihoods and well-being (Scoones, 2009). It allows for identifying specific strategies into
11 economic activities that may lead to livelihood improvements or a vicious cycle of impoverishment and the critical
12 thresholds beyond which a certain livelihood is radically transformed (Sabates - Wheeler *et al.*, 2008).

13 14 15 *13.2.1.2. Multiple Stressors*

16
17 Livelihoods rarely face just one stressor or shock at a time. The literature emphasizes the synergistic relationship
18 between climate change as one stressor and a variety of other environmental, social, and political stressors that
19 impinge on livelihoods and well-being and reinforce each other in the process, often negatively (Eakin and Wehbe,
20 2009; Eriksen and Silva, 2009; IPCC, 2007; O'BRIEN *et al.*, 2008; Reid and Vogel, 2006; Schipper and Pelling,
21 2006; Tschakert, 2007; Ziervogel *et al.*, 2010). These include market volatility, changing land tenure systems, rapid
22 urbanization, spread of infectious diseases, declining soil fertility, and poor or absent public services. Climate risks
23 and market integration (‘double exposure’) are together exacerbating the economic marginalization of vulnerable
24 groups while providing opportunities to others (Eriksen and Silva, 2009; O'Brien and Leichenko, 2000). Climatic
25 and other stressors affect livelihoods at different spatial and temporal scales. Impacts, both direct and indirect, are
26 often amplified or weakened when moving from one scale to another. Many of the stressors felt locally are
27 generated through global or regional processes and interact with national and local processes and relations (Paavola,
28 2008; Pouliotte *et al.*, 2009; Reid and Vogel, 2006; Thomas *et al.*, 2007).

29
30 Multiple and successive stressors differentially shape livelihood dynamics and trajectories. More affluent house-
31 holds may be able to capitalize on shocks and crises while poorer households with less flexible and productive asset
32 portfolios tend to erode their asset bases. Weak institutional ties and power positions, often the case for women and
33 other marginalized groups, further restrict effective livelihood responses (Eriksen and Lind, 2009; Eriksen *et al.*,
34 2005; Gotschi *et al.*, 2008). Some coping strategies and autonomous adaptation result in adverse consequences that
35 undermine the long-term sustainability of livelihoods, indicate barriers and limits to adaptation, and result in down-
36 ward mobility, further impoverishment, and poverty traps (Barnett and O'Neill, 2010; Ziervogel *et al.*, 2006).
37 Increasingly, attention is put on ‘feasible solution spaces’ for dealing with multiple stressors (Field *et al.*, 2012).

38 39 40 *13.2.2. Dimensions of Poverty*

41
42 Poverty is multi-faceted and characterized by cultural, social, institutional, political, and religious drivers. It is
43 reflected in food insecurity, uneven and inadequate access to markets, health facilities, and other basic services such
44 as schools, poor urban infrastructure and slum settlements, and resource inequality between rural and urban areas. In
45 addition to material deprivation, poverty encompasses dimensions of belonging, socio-cultural heritage, and control
46 over one’s destiny (O'Brien and Leichenko, 2003). Yet, despite its complexity, many poverty assessments remain
47 restricted to the predominant facet of income, or a combination of the Millennium Development Goals (MDGs),
48 disregarding poverty’s other dimensions and dynamics. This makes measuring climate change impacts challenging.

49 50 51 *13.2.2.1. Framings*

52
53 The way poverty is framed, understood, and incorporated into policy decision-making is essential for assessing the
54 complex direct and indirect impacts of climate change on poverty and the individual and structural response options

1 that are proposed. In climate change debates, poverty and poverty reduction have been predominantly defined
2 through an economic lens. Just as climate change itself, poverty reduction is largely seen as a technical issue best
3 solved through economic growth and external and expert-led policy decision-making. “Mitigation, adaptation, and
4 the deployment of technologies have to happen in a way that allows developing countries to continue their growth
5 and reduce poverty” (World Bank, 2010). Such framing reflects key development discourses, including the balanced
6 growth approach (“The Big Push”) emphasizing foreign aid and large-scale infrastructural investments (Rosenstein-
7 Rodan, 1943; Sachs, 2006) and smaller-scale initiatives led by private actors following an unbalanced growth model
8 (Easterly, 2006; Hirschman, 1988). Targeted are “The Bottom Billion,” approximately one billion persons living in
9 the 58 poorest countries of the world defined by persistent economic growth stagnation (Collier, 2007) and those
10 living in extreme poverty (by World Bank standards, <\$1.25/day), unable to sustain significant economic growth
11 (Sachs, 2006). Most policy prescriptions favor market-based responses and adaptation aid to counter undesirable
12 trends that are *likely* to slow down or even threaten the achievements of the MDGs. This includes sector-specific and
13 economic growth models that estimate climate impacts on the world’s poor.

14
15 Alternative poverty discourses acknowledge poverty as relational, constructed in particular places in relation to
16 wealth and privilege. Drawing upon the capabilities approach (Alkire, 2005; Anand *et al.*, 2005; Nussbaum, 2001;
17 Nussbaum, 2011; Sen, 1999; Sen, 1985), they place the needs, skills, aspirations, and agency of poor people at the
18 center of analysis while tackling deep-seated structural causes of poverty, inequalities, and uneven power relations.
19 Contrary to the technocratic and heavily market-driven development solutions under neo-liberal policies that
20 typically construct the poor as a category outside of social relations, this relational framing of poverty promotes
21 human dignity and security, a culture of solidarity, and the responsibility to protect, to foster resilience and capacity
22 to act and to combat inequality (Gasper, 2010; Lawson and Clair, 2009; O’Brien *et al.*, 2010; Pogge, 2009;
23 UNRISD, 2010). Such a framing allows for addressing not only the adverse outcomes of climate change but also the
24 social and political context that generates both vulnerability and poverty (Bandiera *et al.*, 2005; Leichenko and
25 O’Brien, 2008; McCright and Dunlap, 2000).

26 27 28 *13.2.2.2. Measuring Poverty*

29
30 The most common contemporary measures of poverty focus on a poverty line, defined with reference to income or
31 nutritional levels, or access to a basket of goods and services. Measurements since the 1970s include non-income
32 characteristics such as longevity, literacy, good health, adaptive capacity, ability to make choices, and access to
33 opportunities and power. Today, poverty is recognized as multi-dimensional (UNDP, 1990), including social,
34 cultural, and political forces, requiring efforts to reverse it in multiple domains and dimensions by promoting
35 opportunities, facilitating empowerment, and enhancing security (World Bank, 2001). Increased attention to chronic
36 poverty has shifted the analytical lens to the dynamics of poverty and its institutionalization within social and
37 political norms. The Chronic Poverty Report 2008-2009 (Chronic Poverty Research Centre, 2008) illustrates how
38 millions of people become trapped in poverty for most of their lives. Understanding the causes of movements in and
39 out of poverty can provide a sounder basis for strategies to eradicate poverty than conventional analyses of national
40 poverty (McKay and Lawson, 2003)(Hulme and Shepherd, 2003). Efforts are made to understand multidimensional
41 deprivation – hunger, illiteracy, unclean drinking water, lack of access to health services, sanitation, and electricity,
42 and social isolation (WHO (World Health Organization), 2006).

43
44 Yet, the technical literature has faced difficulties in producing compelling metrics that capture the complexity of
45 poverty. Absolute poverty, characterized by “severe deprivation of basic human needs, including food, safe drinking
46 water, sanitation facilities, health, shelter, education and information” (UN, 1995) allows comparisons across
47 regions while relative poverty measures compare people within the same population. The key yardstick for tracking
48 poverty head counts and progress on the Millennium Development Goals (MDGs) remains the International Poverty
49 Line (IPL), currently set at \$1.25/day. However, the IPL disregards how far above or below this line people live
50 (intensity of poverty) and how poverty is distributed within a country, thus concealing major inequalities. Also, it
51 does not query the statistical assumption between economic growth and poverty reduction (Vandemoortele, 2009).

52
53 To date, progress toward the MDGs shows mixed results. At a global level, indicators for the key seven MDGs
54 (income poverty, primary completion, gender equality in education, nutrition, child mortality, maternal mortality,

1 and water) have all improved since 1990. However, at a country level, only half of all countries are ‘on-track’ for
2 income poverty, education, gender, and water, and even less for nutrition, child and maternal mortality (Table 13-1).
3 For instance, while the proportion of underweight children under 5 years of age has decreased across all regions of
4 the world since 1990, progress in Southern Asia and sub-Saharan has been slower. In sub-Saharan Africa, the
5 mortality rate remains above one in 10, nearly 20 times the number of deaths experienced in developed countries.
6 Moreover, there are considerable disparities across nutrition and health data, particularly across urban-rural
7 estimates and in outcomes between national averages and the poorest (UNICEF, 2010). Gender differences are more
8 complex, reflecting both higher under-five mortality for boys, except for Asia, and higher illiteracy rates among
9 adolescent girls (UNICEF, 2011). Across 15 member states of the Southern African Development Community
10 (SADC), only three were below 0.50 on the Gender Equality Index and only one below 0.4, with an index of zero
11 indicating highest equality (UNDP, 2011a). The number of people living between \$1.25 and \$2 has almost doubled
12 from 648 million to 1.18 billion between 1981 and 2008 (World Bank, 2012).

13
14 [INSERT TABLE 13-1 HERE

15 Table 13-1: Progress toward the MDGs, globally and at the country level.]
16

17 The recent UNDP Multidimensional Poverty Index (MPI) attempts to measure intensity of poverty based on patterns
18 of deprivations in rudimentary services and core human functionings (Alkire and Santos, 2010). It allows for an
19 understanding of deprivations that affect a household simultaneously, and emphasizes the spatial distribution and
20 clustering of poverty. By comparing three dimensions – health, education, and standard of living – the MPI reveals
21 the greatest intensity of poverty to be present in 29 African and four South Asian countries and in Haiti and Yemen.
22 It indicates that 1.7 billion people are poor when the multidimensional nature of poverty is taken into account, a far
23 higher number than indicated by the \$1.25/day IPL. Emerging patterns point towards differential driving forces, e.g.
24 nutritional deprivation versus ill health. Other recent work illustrates decomposition by a country’s administrative
25 units, spatial distributions of poverty, and distance from reaching a poverty line (CIESIN, 2006).

26
27 [INSERT FIGURE 13-1 HERE (placeholder)

28 Figure 13-1: Global distribution of poverty (MPI) as a world map, with other poverty measures; incl. a poverty gap
29 analysis = mean shortfall of the total population from the poverty line (counting the nonpoor as having zero
30 shortfall), expressed as % of the poverty line (reference needed) and illustrating trends over space and time.]
31
32

33 13.2.2.3. Geographic Distribution and Trends of the World’s Poor 34

35 In 1990, most of the world’s \$1.25 poor (93%) lived in low income countries (LIC) where the average income was
36 barely above the international poverty line. However, the majority of the world’s poor (>70%) now live in countries
37 classified by the World Bank as lower middle-income countries (MIC) where average income is generally much
38 higher than the poverty line (Sumner, 2010; Sumner *et al.*, 2012). Multidimensional poverty, malnutrition, and the
39 global disease burden are also concentrated in this lower MIC group (Alkire *et al.*, 2011; Glassman *et al.*, 2011).
40 The regional distribution of global poverty is shifting towards South Asia and sub-Saharan Africa. Almost 30
41 countries attained MIC classification by 2010, reducing the number of LICs from 63 in 2000 to 35 (Moss and Leo,
42 2011). Yet, the world’s poor are surprisingly concentrated: 80% of the world’s extreme (\$1.25) poor live in just 10
43 countries, including several that graduated to lower MIC status such as India, Indonesia, and Nigeria (Sumner *et al.*,
44 2012). When one removes China from the global poverty data, \$1.25 poverty has barely fallen and remains around
45 1 billion people and \$2 poverty has remains around 2 billion people (Chen and Ravallion, 2012). Global poverty is
46 largely rural (IFAD, 2011) and yet, globally, populations are becoming largely urban centered (UN Habitat, 2010).
47

48 The changing distribution of global poverty towards MICs challenges the orthodox view that most of the world’s
49 extreme poor live in the world’s poorest countries (by average per capita income), and it suggests that substantial
50 ‘pockets’ of poverty can persist at higher levels of average per capita income. This has potential implications for the
51 poverty impacts of climate change at various levels. First, climate finance is directed towards LICs were most of the
52 world’s poor do not live anymore. Second, more attention is needed to understand climate impacts and
53 vulnerabilities in MICs. By 2030, the global distribution of poverty will change further so that most of the world’s
54 poor will live in middle-income sub-Saharan Africa, where livelihood impacts are particularly probable.

13.2.2.4. *Spatial and Temporal Scales of Poverty*

Empirical evidence points toward the need to understand the scalar dimensions of poverty and livelihood trajectories over time as critical factors in assessing impacts of climate change and responses to design effective policy support structures (Sabates - Wheeler *et al.*, 2008). A spatial lens allows for tracking cross-scalar processes – from individuals to households and communities to countries and the international level – that perpetuate poverty and inequality and those that contribute to poverty reduction, including power relations, access to and control over resources, resource accumulation, and vertical and horizontal institutional linkages and social structures (Anderson and Broch-Due, 2000; Murray, 2002; O’Laughlin, 2002; Rodima-Taylor, 2011). Poverty and vulnerability can be nested and teleconnected, masking local to regional impoverishment triggered across large geographic distances (Eakin *et al.*, 2009). Moreover, poverty is socially stratified, meaning that not everybody is poor in the same way. Even at the household level, differential poverty between men and women and different age groups is expected to be widespread, yet a systematic analysis is currently not possible due to data constraints (Alkire and Santos, 2010).

A temporal lens allows for distinction between transient and chronic poverty (Sen, 1981; Sen, 1999). Chronic poverty describes an individual deprivation, per capita income, or consumption levels below the poverty line for a long time (Gaiha and Deolalikar, 1993; Hulme and Shepherd, 2003; Jalan and Ravallion, 1998; Jalan and Ravallion, 2000). It is often associated with absolute poverty, characterized by lack of human capital, lack of ownership of physical assets, the demographic composition of households, and low-paid jobs (McKay and Lawson, 2003). Transient poverty denotes a temporary state of deprivation and is frequently triggered by an individual’s or household’s inability to maintain income or consumption levels in times of shocks or crises (Jalan and Ravallion, 1998), resulting in seasonality of hunger and poverty. State dependence explains the relationship between previous deprivation and proneness to poverty over successive time periods (Giraldo *et al.*, 2002), stressing the need to monitor trends rather than snapshots in time.

Individuals and households can fluctuate between different degrees of poverty and shift in and out of deprivation, vulnerability, and well-being (Leach *et al.*, 1999; Little *et al.*, 2008; Sallu *et al.*, 2010). Poor people often get trapped in poverty traps – situations in which escaping poverty (cross the poverty line) becomes impossible due to unproductive or inflexible asset portfolios (Barrett and McPeak, 2006). A poverty trap can also be seen as a “critical minimum asset threshold, below which families are unable to successfully educate their children, build up their productive assets, and move ahead economically over time” (Carter *et al.*, 2007). To Sachs (Sachs, 2006), extreme poverty is itself a trap, since poor persons lack the capital to participate meaningfully in the global market economy. Other examples of poverty traps, at national scales, include the “natural resource curse” (Auty, 2004; Collier, 2007; Hinojosa-Valencia *et al.*, 2012; Le Billon, 2001), denoting diminishing governmental accountability (Khoday and Perch, 2012) while corruption and political violence increase in the case of abundant oil or other valuable natural resources, as well as persistent armed conflict in poor countries (Collier, 2007; Rice *et al.*, 2006; Smith and Vivekananda, 2009), mainly due to reduced national trade and foreign investment, and poor governance (Collier, 2007; Sachs, 2006).

13.2.3. *Inequality and Marginalization*

The fact that the poor and minority people experience and will continue to suffer disproportional harm from climate change impacts is well established (Adger *et al.*, 2007; Brody *et al.*, 2008; Kates, 2000). Inequality is a useful lens for examining why multi-dimensional poverty continues to exist, and in some cases has increased, despite persistent efforts to reduce poverty. Persistent inequalities in access to and control over resources and the uneven power structures that sustain them are systematically related to indigenous and minority status, gender, race, class, ethnicity, and disability, and are at the core of structural causes of poverty and socially-differentiated vulnerability (Field *et al.*, 2012; Sen, 1999). They not only inhibit the poor and marginalized from managing daily risk and effectively coping with climatic and non-climatic shocks (Ayers and Huq, 2009; Barnett and O’Neill, 2010; Boyd and Juhola, 2009; Eriksen and O’BRIEN, 2007; O’Brien *et al.*, 2010; OECD, 2011; Petheram *et al.*, 2010), they also represent significant barriers to escape poverty and enjoy a life in dignity.

1
2 Global inequality is a persistent phenomenon. In 2007, the top quintile of the world's population received 83% of
3 total world income whereas the bottom quintile took in exactly 1% (Ortiz and Cummins, 2011). Similar to Collier
4 (Collier, 2007), Ortiz and Cummins (Ortiz and Cummins, 2011) argue that inequality itself inhibits economic
5 growth, taking the bottom billion 272 years to achieve 10% of global income under rates adjusted for PPP. UNDP
6 (UNDP, 2011a) states that, although health and educational achievement gaps have narrowed, income inequality has
7 increased in most countries. UNRISD (UNRISD, 2010) illustrates that economic activity and growth is often
8 restricted to certain economic sectors in highly unequal countries, which constrains the productive capacity of the
9 poor. Furthermore, the bottom income groups in unequal countries are far more *likely* to bear the externalities of
10 economic growth, such as environmental degradation (UNDP, 2011a; UNRISD, 2010). A focus on inequality also
11 highlights growing poverty in middle- and high-income countries, comparing the role of social protection, as well
12 part of climate change responses, under the welfare state model with neo-liberal policies (Gough, 2012).
13

14 Socially and geographically marginalized populations around the world, often at the intersection of gender, class,
15 caste, ethnicity, and age, including indigenous people, women, children, the elderly, and disabled people, are
16 particularly vulnerable to climatic risks and other stressors due to the underlying patterns of inequality that hinder
17 effective preparation and responses. For instance, data for the U.S. highlights significant disparities along ethnic and
18 racial lines (Lewis *et al.*, 2010), particularly in relation to access to critical services. According to an assessment of
19 financial fragility in the U.S., almost 50% of persons surveyed would not be able to come up with an extra USD
20 2,000 in 30 days for an emergency, and 1/5 would need to pawn or sell possessions to do so (Lusardi *et al.*, 2011).
21 Indigenous peoples, comprising 350 million persons of 5,000 different groups in more than 70 countries (Davis,
22 2010) experience persistent exclusion and devaluation of their values and connections to place and landscapes, lack
23 of voice, and miscommunication, perpetuating their disempowerment (Davis, 2010; Petheram *et al.*, 2010;
24 Schroeder, 2010). The compounded effect of continued marginalization of indigenous and other minority people and
25 low recognition of their rights, mirrors concerns about the “systematic undervaluation of involuntary loss of places
26 and culture” that also constitutes a critical limit to adaptation (Adger *et al.*, 2009).
27

28 In terms of gender inequality, significant gaps remain, despite important improvements in women's lives over recent
29 decades. The World Bank (World Bank, 2012) reports that 3.9 million women from birth to age 60 are “missing”
30 due to higher mortality rates compared to men in low- and middle-income countries. Specific configurations of
31 uneven social relations of power, social and cultural norms that determine division of labor, inequality in economic
32 and political positions, and discriminatory institutional practices all shape unequal gendered access to and control
33 over household and community decision-making processes (Carney, 1996; Jackson, 1993; Kandioti, 1998;
34 Rocheleau *et al.*, 1997). These factors, in turn, result in gender-differentiated impacts of climate change (Aguilar,
35 2007; Dankelman, 2008; MacGregor, 2010; Resurreccion, 2011; Terry, 2009; UNFPA, 2009; Williams, 2010).
36
37

38 **13.2.4. Interactions between Livelihoods, Poverty, Inequality, and Climate Change**

39

40 More than any other factors, poverty and persistent inequalities determine vulnerability to climate change as well as
41 opportunities for adaptive action. Poverty and inequality mean that people have few livelihood assets to fall back on
42 in times of hard-ship, including little savings and limited access to credit (Mearns and Norton, 2010). Unsustainable
43 short-term coping strategies as well as longer-term adaptive action in response to incremental changes, heightened
44 variability, and extreme events such as droughts, floods, and extreme temperatures can erode assets and lead to
45 poverty traps. Poor and marginalized people typically have the least buffer to face even modest changes of climate
46 hazards and suffer most from successive events that provide little time for recovery. They are the first to experience
47 barriers and limits to adaptation. There is a bi-directional relationship between climate change and poverty. Climate
48 change is *very likely* an additional burden to the poor; it is also *likely* to create new poor and forces some poor from
49 transient into chronic poverty. Addressing the structural inequalities that create and sustain poverty is vital for both
50 climate change adaptation and development (Boyd and Juhola, 2009; Huq *et al.*, 2005; Lemos *et al.*, 2007; Schipper,
51 2007; Williams, 2010) (Perch, 2011). Ignoring uneven social relations that burden the poorest disproportionately
52 with the brunt of negative impacts of climate change is a key factor of maladaptation (Barnett and O'Neill, 2010).
53

1 It is essential to highlight the complex interactions between climate change, dynamic livelihoods, multi-dimensional
2 poverty and deprivation, and persistent inequalities across temporal and spatial scales. It is the intersection of these
3 multi-faceted elements that provides an ever shifting context of risk and makes certain people vulnerable to stressors
4 and shocks. Climate variability, gradual climatic changes, and extreme events synergistically add on to and often
5 reinforce other environmental, social, and political calamities. A focus on multiple deprivations explains how and
6 why people’s livelihoods are vulnerable. For instance, in the Caribbean Small Island Development States (SIDS),
7 poverty is more broadly defined in terms of real ‘living conditions’ – social vulnerability that exemplifies the nexus
8 of low economic well-being, poor health, housing in disaster-prone areas, and female-headed households (Kambon,
9 2005; Perch and Roy, 2010). Multiple deprivations interact with each other to create conditions for chronic poverty.

10
11 Attention to livelihood dynamics that interact with climate stressors allows for identifying processes that force poor
12 and vulnerable people onto undesirable trajectories, trap them in chronic poverty and destitution, constitute critical
13 thresholds beyond which a certain livelihood is no longer feasible, or offer transformative routes toward enhanced
14 well-being. Figures 13-2 illustrates some of these complexities, both in impacts and analysis. While rich evidence
15 exists of differential impacts on livelihoods and particular dimensions of poverty, there is a paucity of data that show
16 the complexity of impacts, gradual shifts over time, critical thresholds, and abrupt changes in coupled social-
17 ecological systems, and factual poverty traps. Yet, these are central for defining solutions to eliminate poverty.

18
19 [INSERT FIGURE 13-2 HERE

20 Figure 13-2: Livelihood dynamics under increasing frequency and severity of climatic stressors combined with
21 unequally distributed socio-economic stressors, leading to differential trajectories (pos. transformation and traps).]

22
23 This chapter is an important contribution in this direction. It reveals, through a systematic review of the literature,
24 why a thorough understanding of livelihood and poverty dynamics across spatial and temporal scales is vital to bring
25 to light the highly unequal impacts of climate change. It builds upon new insight from the 2012 SREX that highlight
26 “addressing the underlying causes of vulnerability, including the structural inequities that create and sustain poverty
27 and constrain access to resources” as “a prerequisite for sustainability in the context of climate change” (Field et. al.,
28 2012). Acknowledging the changing distribution of global poverty towards MICs (Sumner, 2010; Sumner *et al.*,
29 2012) and rising poverty and income inequality in middle- and high- income countries (Gower et. al., 2012; IEA
30 (International Energy Agency), 2011), this chapter opens its analytical lens from a conventional focus on poor
31 developing countries being the prime victims of climate change to a broader understanding of inequalities across the
32 globe that determine climate change impacts, today and in the future, as well as the impacts of climate change
33 policies designed to correct uneven outcomes.

34 35 36 **13.3. Assessment of Climate Change Impacts on Livelihoods and Poverty**

37
38 This section is a systematic review of empirically-found relationships between climate change on the one hand and
39 livelihoods and poverty on the other. It first describes current and observed impacts (13.3.1.) and then future and
40 projected impacts (13.3.2.). By focusing explicitly on effects on assets and livelihood dynamics, it demonstrates how
41 climate change interacts with multiple stressors people face. It also highlights the mechanisms by which climate
42 change impacts trigger shifts from transient to chronic poverty, and contribute to the creation of poverty traps and
43 livelihood transformations. Finally, it assesses implications for sustainability, development, and justice (13.3.3).

44 45 46 **13.3.1. Evidence of Observed Climate Change Impacts on Livelihoods and Poverty**

47
48 Climate change is already taking place, and further changes are inevitable. These include gradual changes in
49 temperature and sea level but also increased climate variability and extremes, including more intense floods,
50 droughts, and storms. They are already having major impacts on the economic performance of developing countries
51 and on the lives and livelihoods of millions of poor people around the world. Even minor changes in precipitation, in
52 terms of amount and distribution in time, as well as short periods of extreme temperatures, can have serious impacts
53 on livelihoods. Many of these climatic events remain ‘hidden’, not captured by standard climate observations,
54 typically reported as means or accumulations over a month, a season, or a year (Barron *et al.*, 2003; Salack *et al.*,

1 2012; Tennant and Hewitson, 2002; Usman and Reason, 2004). At the same time, little analysis captures the
2 combined effect of multiple events in a given year, such as 46 events in Haiti and 41 in the Dominican Republic
3 between 1990 and 2009 (Perch, Forthcoming). This difficulty in observation and attribution is compounded by a
4 lack of continuous and dense networks of climate data in many low-income countries.
5

6 There are several geographic areas where climate change has direct impacts on poverty, although higher impacts do
7 not necessarily equate with higher vulnerabilities. Of particular concern are regions with high vulnerability due to
8 exposure to sea-level rise and extreme events overlaid with high concentrations of multi-dimensional poverty,
9 including pockets of poor people in middle-income countries. These include mega-deltas in Bangladesh, Thailand,
10 Myanmar, and Vietnam (Eastham *et al.*, 2008; Wassmann *et al.*, 2009); major rivers emanating from the Himalayas
11 (Xu *et al.*, 2009); many river deltas (85%) in the world subject to removal of oil, gas and water from the ground
12 (Syvitski *et al.*, 2009), and marginalized coastal areas such as those in eastern and southern Africa, also experiencing
13 severe deterioration of ecosystem resources (Bunce *et al.*, 2010a; Bunce *et al.*, 2010b). Sea level rise may be most
14 detrimental in countries like Vietnam, Egypt, and Mauritania where 8-10% of the population and 6-10% of the GDP
15 are at risk (Dasgupta *et al.*, 2007) and the Philippines and Indonesia, two new MICs with high poverty numbers. In
16 the Caribbean SIDS, the estimated costs of just one hurricane season (2004) on national GDP ranged from 4.5% in
17 Haiti to 212% in Grenada (Kambon, 2005). South East Asia experiences the combined effects of climate change
18 impacts, deep poverty, and large disparities between the rich and the poor (Jasparro and Taylor, 2008). Among the
19 top three countries in terms of poverty head counts, Nigeria's extreme poor (<\$1.25/day) have increased by 40% in
20 less than 20 years to now > 100 billion, many of them in the semi-arid north and urban slums (Sumner *et al.*, 2012).
21 China counts roughly 400 million of people living on \$2/day and India twice as many (Sumner *et al.*, 2012). The
22 high Arctic, although less densely populated, has a significant record of climate change impacts on traditional
23 fishing and hunting livelihoods. The coincidence of poverty pockets in high-income nations with extreme events has
24 been most explicit under Hurricane Katrina in the U.S. (Bullard and Wright, 2009; Colten *et al.*, 2008; Verchick,
25 2010), the European heat waves affecting elderly residents (Vandentorren *et al.*, 2006), and poor farmers under the
26 Australian drought.
27
28

29 *13.3.1.1. Impacts on Livelihood Assets and Human Capabilities*

30

31 Climate change and its consequences interact with numerous aspects of people's livelihoods, including their assets,
32 their capabilities, and the strategies they undertake to cope with a multitude of other stressors, often amplifying the
33 impacts of climate change. There is abundant evidence in the literature that people's assets (natural, physical,
34 financial, human, social, and cultural) have already been eroded by climate change. Some data exist that show how
35 people's capabilities have been undermined. Examples of livelihood asset accumulation in relation to climate change
36 are comparatively rare. This section presents empirical evidence of impacts on six types of assets.
37

38 Impacts on *natural assets* such as water, fish stocks, land, and livestock, are well documented (ActionAid, 2006;
39 Bunce *et al.*, 2010a; Bunce *et al.*, 2010b; D'Agostino and Sovacool, 2011; Nelson and Stathers, 2009; Osbahr *et al.*,
40 2010; Thomas *et al.*, 2007). Water-scarce regions such as the Middle East and North Africa (MENA) experience
41 dwindling water resources due to climate change, combined with steep increases in demand due to population and
42 economic growth. This is resulting in rapidly decreasing water availability per person, expected to be 30-70 % less
43 in 2025 (Sowers *et al.*, 2011). Water scarcity and drought have also been noted for many Caribbean states and sub-
44 Saharan Africa (IFAD, 2011). Under increasing water scarcity, policy allocation often favors more affluent urban
45 consumers, in MENA (Sowers *et al.*, 2011), the Andes and Himalayas (Orlove, 2009), and Australia (Alston, 2011),
46 at the expense of less powerful rural and/or poor users. Similar reports exist from the Caribbean region (Cashman
47 *et al.*, 2010). It also is an almost universal problem in cities (Satterthwaite, 2011).
48

49 Fisheries have also been affected by changing river and lake dynamics due to climate change, often in combination
50 with other human influences (Keskinen *et al.*, 2010; Nuorteva *et al.*, 2010; Palmer *et al.*, 2008). In Lake Tanganyika,
51 for instance, increasing water temperatures and decreasing winds are responsible for a 20% decrease in primary
52 production, implying a 30% decrease in fish yields. This exceeds the effects of overfishing and other human impacts
53 (O'Reilly *et al.*, 2003). Climate change also affects marine fisheries (Badjeck *et al.*, 2010). Many of the poorest
54 countries are highly dependent on fishing as both subsistence and national economic activities, including Senegal,

1 Guinea, Malawi, and Uganda in Africa, Peru and Colombia in South America, and Bangladesh, Cambodia, Pakistan,
2 and Yemen in Asia (Allison *et al.*, 2009) and the Caribbean (KUSHNER *et al.*, 2011). Ocean acidification also poses
3 serious threats to fisheries in high-income countries, including the U.S. and Scandinavia (Cooley and Doney, 2009).
4

5 The most extreme form of erosion of natural assets is the complete disappearance of people's land in low lying
6 islands and coastal regions (McGranahan *et al.*, 2007; Perch and Roy, 2010; Solomon *et al.*, 2009). Nevertheless,
7 persistent inequalities result in differential impacts on the poor and rich. In the Maldives, for instance, islands with
8 tourism development have low incidence of poverty (3%) and access to financial resources for building protective
9 infrastructure while other islands show high incidence of poverty (30%) with few resources for adaptive responses
10 (Sovacool, 2012). While having received less attention, densely populated coastal cities with high poverty counts
11 such as Cotonou in Benin (Dossou and Glehouenou-Dossou, 2007), Alexandria and Port Said in Egypt (El-Raey *et*
12 *al.*, 1999), and Lagos and Port Harcourt in Nigeria (Abam *et al.*, 2000; Fashae and Onafeso, 2011) are at risk. The
13 Mekong River Delta, the Limpopo River, and Inner Mongolia prepare for resettlement (de Sherbinin *et al.*, 2011).
14

15 There is abundant evidence of climatic change eroding farming livelihoods, especially among subsistence farmers
16 and herders around the globe. This includes declining crop yields (Alston, 2010; Apata *et al.*, 2009; Ford *et al.*,
17 2007; Hassan and Nhemachena, 2008; Pouliotte *et al.*, 2009; Pradhan *et al.*, 2007; Renton, 2009; Sissoko *et al.*,
18 2011), sometimes as a result of pathogens and insect attacks (Byg and Salick, 2009), as well as reduced availability
19 of and access to non-timber forest products (Hertel and Rosch, 2010) and other eco-system services such as
20 biodiversity and medicinal plants (Van Noordwijk, 2010). Livestock, of high importance in most smallholder
21 agriculture, particularly in sub-Saharan Africa (Kabubo - Mariara, 2008; Thornton *et al.*, 2007) are negatively
22 affected by extreme high temperatures. An upper critical threshold of about 25 degrees for cattle was found by Hahn
23 (Hahn, 1997), above which cattle showed signs of disrupted behavior and impaired immunity and physiology.
24 Livestock in already hot areas are therefore more *likely* to suffer from warming due to climate change (Renaudeau *et*
25 *al.*, 2010), although small-scale livestock enterprises are less sensitive than large-scale ones (Kabubo - Mariara,
26 2008; Seo and Mendelsohn, 2008).
27

28 Damage to *physical assets* due to climate change impacts is especially well documented for poor urban settlements,
29 typically built in risk-prone areas such as floodplains and hillsides susceptible to erosion and landslides. Frequent
30 impacts include destroyed homes by flooding water, mudslides or landslides, disrupted water and sanitation services,
31 and outbreaks of cholera and dysentery. Recent cases show adverse impacts of flooding in large African cities (e.g.,
32 Maputo, Accra, Nairobi, Lagos, Kampala), mainly due to inadequate drainage and dense settlements in catchment
33 areas (Douglas *et al.*, 2008) and poor urban agglomerations in many of Latin America's big cities (Burke *et al.*,
34 2011; Hardoy and Pandiella, 2009). Loss of physical assets in poor areas after disasters is often followed by looting
35 (Hardoy and Pandiella, 2009) and displacement due to loss of property (Douglas *et al.*, 2008).
36

37 Erosion of people's *financial assets* during periods of increased climate stress result from loss of farm income and
38 jobs (Alderman, 2010; Alston, 2011; Hassan and Nhemachena, 2008; Iwasaki *et al.*, 2009; Jabeen *et al.*, 2010) and
39 increasing costs of living (Gabrielsson *et al.*, 2012 (forthcoming)). These income losses are compounded by
40 expenses for agricultural inputs (seeds, equipment), school tuition, uniforms, and books, and health expenses
41 throughout the year (Thomas *et al.*, 2007).
42

43 Of particular importance, albeit frequently overlooked, is the damage to *human assets* as a result of climate change.
44 This is most evident in increased food security, undernourishment, and chronic hunger due to failed crops (Funk *et*
45 *al.*, 2008; Misselhorn, 2005; Patz *et al.*, 2005; Renton, 2009); or spikes in food prices most severely felt among poor
46 urban populations (Ahmed *et al.*, 2009; Hertel and Rosch, 2010). Also, various health impacts are recorded,
47 including dehydration, heat stroke, and heat exhaustion resulting from exposure to extreme temperatures (Kakota *et*
48 *al.*, 2011; Semenza *et al.*, 1999). In India the frequency, persistence, and spatial extent of heat waves have increased
49 significantly (Dash and Kjellstrom, 2011) undermining people's ability to carry out physical work both outdoors and
50 indoors in industries (Ayyappan *et al.*, 2009; Balakrishnan *et al.*, 2010). Other health impacts that curtail human
51 capital are illnesses such as hepatitis, malaria, and dengue, and injuries and drowning (Githeko and Ndegwa, 2001;
52 Hardoy and Pandiella, 2009; Pradhan *et al.*, 2007; Renton, 2009; Zhou *et al.*, 2004). More evidence now suggests
53 psychological effects from climatic changes, ranging from sleeplessness to anxiety and depression (Byg and Salick,

1 2009; Renton, 2009), loss of belonging and a sense of place (Tschakert *et al.*, 2011), mental disorders (Berry *et al.*,
2 2010; Kaiser *et al.*, 2001) and suicide (Alston, 2011; Caldwell *et al.*, 2004).

3
4 Finally, climate change also impacts *social and cultural assets*. Exposure to a series of climatic and non-climatic
5 stressors and shocks has been shown to be particularly harmful to social networks of the poorest, elderly, and often
6 female-headed households as further erosion prevents adequate mobilization of labor and reciprocal gifts (Osbah *et al.*,
7 2008). Climate-related disasters have also disrupted formal social networks, including social assistance programs
8 (Douglas *et al.*, 2008). Changes in seasonality have triggered a sense of loss and bewilderment, particularly with
9 respect to farming identities who feel losing their culturally sustained compass (Renton, 2009).

10 11 12 *13.3.1.2. Impacts on Livelihood Dynamics*

13
14 In addition to impacts on livelihood assets, climatic changes, often in conjunction with other, cross-scalar socio-
15 economic, institutional, or political stressors, affect dynamics in livelihood strategies. These typically range from
16 seasonal to interannual fluctuations as well as entire shifts in livelihoods. These fluctuations often shape the periodic
17 shifting in and out of vulnerability and well-being, or permanent transformations, both desirable and undesirable.

18
19 On a seasonal basis, shifting in and out of hardship is not uncommon. To a large extent, these shifts from coping and
20 hardship to recovery are driven by annual and inter-annual climate variability. Figure 13-3 illustrates an annual
21 “wheel of hardship” for the Lake Victoria Basin in East Africa, reflective of coinciding stress from rainfall and
22 temperature patterns, specific farming activities, disease emergence, and household expenses through the course of a
23 year (Gabrielsson *et al.*, 2012 (forthcoming)). Both gradual changes in planting and harvesting seasons as well as
24 extreme weather events can exacerbate these times of hardship. Selling household assets is a common strategy to
25 deal with temporary hardship such as crop failure or disease (Meze-Hausken, 2000; Nelson and Stathers, 2009).

26
27 [INSERT FIGURE 13-3 HERE

28 Figure 13-3: ‘Wheel of hardship’ – a generalized seasonal calendar illustrating livelihood conditions and stress
29 based on participatory exercises with smallholder farmers from four communities in the Lake Victoria Basin in
30 Kenya and Tanzania (Gabrielsson *et al.*, 2012).]

31
32 On an interannual basis, dynamics in livelihood strategies become more pronounced, often as a response to a series
33 of environmental, climatic, and political shocks and stresses. Evidence from rural communities in Botswana reveals
34 that poor hunter gatherers and destitute laborers become more dependent on governmental support and drought
35 relief, having sold most of their productive assets during highly variable rainfall and several drought events, while
36 more diversified agro-pastoralists and commercial business owners displayed fluctuating trajectories, encountering
37 asset losses yet able to diversify their way out of temporary crisis and vulnerability (Sallu *et al.*, 2010). More subtle
38 shifts are evident among Kenyan farmers who switch from maize to potatoes, and millet and sorghum, as a response
39 to erratic rainfall and droughts in 2003 and 2009, creating new nutritional gaps (Kamadi, February 9, 2011).

40
41 In other cases, people adopt entirely new livelihoods. Thomas *et al.* (Thomas *et al.*, 2007) find that climate-induced
42 increases in precipitation uncertainty resulted in 80% of households interviewed in the Limpopo, North West, and
43 Kwazulu-Natal provinces of South Africa shifting to managing livestock and poultry rather than relying on cropping
44 alone. Migration from climate-sensitive inland farming regions to coastal areas have resulted in shifts from farming
45 to over-specialization in artisanal fisheries (Bunce *et al.*, 2010a; Bunce *et al.*, 2010b; Coulthard, 2008). Such shifts
46 to marine livelihoods are one example of stressed communities abandoning farming-related incomes (Eakin and
47 Wehbe, 2009). Evidence from pastoral systems in Africa illustrate dynamic struggles (Thébaud and Batterbury,
48 2001), also suggesting that droughts and conflicts can push herders into migration to cities and destitution (Eriksen
49 and Marin, 2011). Around a drying Lake Faguibine in northern Mali, livelihoods shifted from water-based to agro-
50 sylvopastoral systems, as a direct impact of lower rainfall coupled with more frequent and more severe droughts
51 (Brockhaus and Djoudi, 2008).

13.3.1.3. Impacts on Poverty Dynamics: Transient and Chronic Poverty

There are few studies and little concrete evidence on the extent of poverty dynamics impacted by climate change. Yet, substantial agreement in the literature suggests that shifts from transient to chronic poverty are occurring, even if they are depicted only implicitly. In most cases, these shifts are related to multiple deprivation. For instance, Hardoy and Pandiella (Hardoy and Pandiella, 2009), assessing impacts of climate change on >70 million urban poor in Latin America, note the high odds of many transient poor to become chronic poor after one or a series of disasters; this is particularly true for those who had been displaced and now experience even higher vulnerability than the chronic poor in urban centers. Migrant low-income groups, people in informal settlements, female-headed households, political and environmental refugees, women and children, and native communities are particularly at risk from sliding into chronic poverty, mainly as a result of extreme events combined with an array of other stressors such as widespread poverty, unemployment, lack of urban infrastructure, governmental support, and formal tenure, and inadequate building regulations in areas prone to flooding and landslides (Hardoy and Pandiella, 2009).

Other shifts from transient to chronic poverty are suggested for livelihoods and households that, unlike more affluent ones, lack appropriate response options to climatic changes and, consequently, are squeezed out of alternatives, ending up as chronically poor with constrained solution spaces to reverse this trend. Among fisher communities in Subarnabad, Bangladesh, gradual sea-level rise combined with barrages and other big infrastructure has resulted in salt water intrusion and waterlogging in previous rice and vegetable fields, triggering a significant shift to shrimp farming; however, only the richer and more powerful community members benefit from this shift while the large majority suffers from the loss of livelihood options associated with the disappearance of common resources – food, fuel, fodder, dung, and building material – as well as the erosion of social networks around these resources, slipping deeper into poverty (Pouliotte *et al.*, 2009). Such shifts are also reported by (Demetriades and Esplen, 2008), drawing attention to the elderly poor women and socially and economically oppressed class strata worldwide who, due to irregular access to critical assets and insufficient rights, are unable to cope with unpredictable seasons and extreme events such as floods and droughts and, hence, are increasingly at risk from shifting into chronic poverty.

Those dependent on natural resources as a supplement to climate-sensitive cropping may also slip from transient to chronic poverty, for instance when access to forests is restricted, e.g., through conservation efforts or conflicts, and alternative income-generating resources such as non-timber forest products become unavailable, particularly for women-headed households (Hertel and Rosch, 2010; Shackleton *et al.*, 2007). According to De Merode *et al.* (De Merode *et al.*, 2004), poor households in the Democratic Republic of Congo obtain 90% of their income from bush meat and fish and 25% from harvesting wild plants. So far, studies on climatic impacts, having emphasized crops, have ignored impacts on forest resources, underestimating socio-economic and political drivers that may make these resources unattainable.

Further shifts from transient to chronic poverty are already occurring as a response to food price increases. Urban poor are particularly at risk since they are almost exclusively net buyers of food (Cranfield *et al.*, 2007; Cudjoe *et al.*, 2010; Ruel *et al.*, 2010). Ahmed *et al.* (Ahmed *et al.*, 2009), simulating the impacts of a one-time 30-year extreme productivity shocks (extreme wet, extreme dry, extreme hot) on staple grains in 16 developing countries, find that the poor urban laborers are particularly affected, growing by 110% in Malawi, 102% in Zambia, and 95% in Mexico, yet poverty vulnerabilities are highly heterogeneous across different population segments, with sub-Saharan Africa overall as hit hardest. However, differences depend on the character of shocks; under covariate shocks that affect large geographic areas, elastic farm level demand for produce, and small share of expenses directed toward food, some rural house-holds benefit (Hertel and Rosch, 2010). At the country level, Zambia may have lost US\$4.3 billion GDP due to the impacts of climate variability of crop yields over a period of 10 years, affecting both rural and urban poor, with a predicted increase in the national poverty rate by 8% under particularly severe drought years (Thurlow *et al.*, 2009)

Even gradual changes in landscapes of everyday life, triggered by shifts in rainfall patterns, can lead to loss of crop yields and income, outmigration to urban centers, and deteriorating social networks at home, making the rural poor even poorer with little hope for improvement (Tschakert *et al.*, 2011). Similar evidence is reported from Australia, highlighting feelings of loss of sense of place, grief, hopelessness, and helplessness among rural albeit not uniformly poor residents and farmers in New South Wales resulting from a ten-year drought (Sartore *et al.*, 2008; Stain *et al.*,

1 2008; Stain *et al.*, 2011), increasing suicide rates among young men in remote rural regions (Alston, 2011). Many of
2 these shifts remain hidden, incompletely captured in poverty statistics. The bulk of attention is oriented toward
3 extreme events and rapid-onset disasters and subsequent impacts on livelihoods and the poor while these creeping,
4 incremental changes occur largely under any official radar, which makes quantification exceedingly difficult.

7 13.3.1.4. Critical Thresholds, Poverty Traps, and Transformations

8
9 Given this new attention to multiple stressors combined with multi-dimensional poverty and deprivation, identifying
10 critical thresholds (tipping points) that denote a shift from transient to chronic poverty or a plunge into poverty traps
11 becomes increasingly important. Such thresholds seem to result from the convergence of various factors, many of
12 which are not directly related to climate change. First, to protect themselves from the negative impacts of gradual
13 changes and rapid-onset events, the poor are increasingly reliant on social networks, including reciprocal gifts and
14 exchanges. However, given limited assets and ability to mobilize labor and food, particularly for smaller and female-
15 headed households, and the elderly, the exhaustion of these reciprocal ties often indicates an imminent slipping into
16 chronic poverty or poverty traps (Hardoy and Pandiella, 2009; Pradhan *et al.*, 2007). Second, injuries, disabilities,
17 death, and other impacts on human capital, for instance from destroyed property and accidents following flood
18 events, critically lower poor people's main asset – labor – thus playing particularly important yet overlooked role in
19 poverty dynamics (Douglas *et al.*, 2008). Third, the poor tend to sell off their assets, such as livestock, at knock-
20 down prices after climate-induced disasters, shown for the Uganda 2007 floods, then foregoing meals, medicine, and
21 school fees, hence further eroding their human capital (Renton, 2009). Fourth, rising disease levels and
22 psychological distress may plunge poor individuals and households deeper into deprivation; unable to cope, those
23 affected are *likely* to cross a critical threshold into chronic poverty (Renton, 2009), particularly among indigenous
24 groups who risk losing their cultural point of reference due to sea-level rise and other climatic stressors (Green *et al.*,
25 2010), or due to psychological stress and anxiety due to perturbed spirituality (Byg and Salick, 2009).

26
27 However, there is also evidence of critical thresholds into new poverty, in areas without previous poverty head
28 counts. For instance, as a result of a ten-year drought in Australia combined with devastating bush fires, white
29 farmers along the main river, the Murray-Darling, suffering declining water availability for irrigation, dying
30 orchards and vineyards, as well as unfavorable water policies, experienced a sharp increase in rural poverty among
31 farming families, farm workers, and contractors, followed by social disruption and depression and large-scale
32 movements of people, dubbed Australia's first 'climate change refugees' (Alston, 2011):63).

33
34 Several of the above may well lead to an increasing number of poor stuck in poverty traps. Among urban dwellers,
35 poverty traps have been reported especially for those in informal settlements that are highly exposed to floods and
36 landslides, who have nowhere else to go and receive no governmental support (Hardoy and Pandiella, 2009) and for
37 urban wage laborers who erode their financial capital to increases in food prices as a consequence of climatic
38 stresses (Ahmed *et al.*, 2009; Hertel and Rosch, 2010). In rural areas, poverty traps emerge when poverty impacts of
39 climate change persist over generations, particularly due to lasting stress on ecological systems and environmental
40 degradation, such as in the Sahel (Hertel and Rosch, 2010; Kates, 2000; Sissoko *et al.*, 2011; UNCCD, 2011) as well
41 as the inability to rebuild assets after a series of encountered stresses due to marginal activities and unproductive
42 asset portfolios (Eriksen and O'BRIEN, 2007; Sabates - Wheeler *et al.*, 2008; Sallu *et al.*, 2010). Poverty traps and
43 destitution are also reported from pastoralist systems, triggered through a combination of drought events, restricted
44 mobility due to conflict and insecurity, adverse terms of trade, and the conversion of grazing areas to agricultural
45 land, including land for biofuel production (Eriksen and Lind, 2009; Eriksen and Marin, 2011).

46
47 Other poverty traps result from the erosion of social networks and the inability of the poorest to mobilize food and
48 labor (Hardoy and Pandiella, 2009), heavy debt loads due to the inability to repay loans and distress sales (Renton,
49 2009), the slow erosion of human assets due to insufficient caloric intake and foregoing the purchase of medicine
50 (Renton, 2009), and persistent discrimination through legal structures and formal institutions, particularly for
51 women and other marginalized groups (Campbell *et al.*, 2009). Culturally-induced poverty traps may also play a role
52 in perpetuating poverty under climate change. (Di Falco and Bulte, 2010) argue that forced solidarity among kin in
53 farming communities in Ethiopia discourages effective protection from climate shocks, e.g., through soil fertility
54 management – a culturally-induced poverty trap.

1
2 Only scant evidence exists that illustrates successful transformations as a result of climatic and other environmental
3 stress. While the long-term viability of these transformations remains to be seen, the key question revolves around
4 how well they are distributed or accessible throughout the social and cultural strata. Evidence from Botswana
5 suggests that roughly 10% of rural households, engaged in livestock in combination with permanent employment or
6 business ventures, manage to take advantage of shocks through highly specialized activities, hence accumulating
7 assets, spreading risks, and making their livelihoods more resilient (Sallu *et al.*, 2010). In Northeastern Bangladesh,
8 autonomous adaptation of rural communities may result in improved economic and food security situations, hence
9 an example for financial and physical capital accumulation (Anik and Khan, 2011). Transformative change may
10 even emerge where it is least expected: evidence from the Lake Victoria Basin in East Africa reveals that, in the face
11 of ill-health (HIV/AIDS) and climate change, new forms of collective action as a form of social asset accumulation
12 may prove beneficial (Gabrielsson and Ramasar, 2012). Perhaps equally unexpected yet welcome is improved
13 hygiene due to more frequent bathing under higher temperatures in Eastern Tibetan villages (Byg and Salick, 2009).
14
15

16 *13.3.1.5. Implications for Inequality*

17

18 Current evidence suggests that climate change increases inequality, both in urban and in rural areas, in low-, middle-
19 and high income countries. The literature further shows that increasing inequality is not just a side effect of climate
20 change impacts but of the interaction of these impacts with multiple deprivation at the intersection of race, class,
21 gender, ethnicity, age, and disability, also known as intersectionality (Nightingale, 2011). For instance, even in low-
22 income countries, such as Bangladesh, the more affluent and more powerful tend to benefit from climate change, or
23 more precisely the responses undertaken (e.g., shift from rice farming to shrimp farming) while the poor, lacking
24 physical and financial assets and political voice, are conspicuously absent from decision-making processes over land
25 and water use (Pouliotte *et al.*, 2009). In urban areas, such as most major cities in Latin America, upper middle- and
26 high income neighborhoods may also be constructed in flood-prone areas or high-risk slopes yet, unlike poor
27 residents, they can afford insurance and lobby for protective policies (Hardoy and Pandiella, 2009). Increasing harm
28 from negative climate change impacts is also expected in combination with modified social policies and fiscal
29 regimes in northern welfare states, in the aftermath of the financial crisis (Gough, 2012). Such inequalities remain
30 largely unaddressed under dominant disaster discourses, neglecting unequal access to resources and broader policy
31 frameworks that tackle habitat improvement. This section reports primarily on climate impacts on gender, age, and
32 indigenous communities, as they have received most attention in the existing climate and inequality literature.
33

34 Abundant evidence points toward increased *gender inequality* as a result of climate change, intertwined with a host
35 of socio-economic, institutional, cultural, and political drivers that perpetuate structural gender inequality (Alston,
36 2011; Arora-Jonsson, 2011; Brouwer *et al.*, 2007; Buechler, 2009; Carr, 2008; Dankelman, 2010; Demetriades and
37 Esplen, 2008; Galaz *et al.*, 2008; Hardoy and Pandiella, 2009; Lambrou and Paina, 2006; MacGregor, 2010;
38 Nightingale, 2009; Osbahr *et al.*, 2008; Renton, 2009; Resurreccion, 2011; Shackleton *et al.*, 2007; Terry, 2009).
39 While earlier studies have tended to highlight women's quasi-universal vulnerability in the context of climate
40 change (Denton, 2002), this general thrust can mask the complex and intersecting power relations and other
41 fundamental structural causes of inequality (Arora-Jonsson, 2011; Nightingale, 2009; UNFPA, 2009). Moreover, the
42 construction of poor women as vulnerable victims in a one-dimensional narrative perpetuates the negative stereotype
43 of Southern women as helpless, voiceless, and depended on external help; it denies women's agency and places their
44 vulnerability as their intrinsic problem (Arora-Jonsson, 2011; MacGregor, 2010; Manzo, 2010). More recent studies
45 aim to unravel these complexities around a number of axes – gendered livelihood impacts, occupational hazards,
46 social networks around reciprocity, nutrition, emotional and psychological distress, and domestic violence.
47

48 _____ START BOX 13-1 HERE _____
49

50 **Box 13-1. Gendered Impacts of a 10-Year Drought on Australian Farmers in the Murray-Darling Basin** 51 **(Source: Alston, 2011)** 52

53 Men and women are differently impacted because of their different roles with agriculture and rural communities.
54 The social impacts are not homogeneous but denote different levels of disruption, from patchy to profound. The

1 latter, referring to areas with almost total reliance on agriculture, no alternative employment, and limited service
2 infrastructure, are the most socially depressed.

3
4 Impacts noted among men: attending to heartbreaking and physically demanding tasks of feeding livestock, carting
5 water, destroying frail animals, and coping with realities of barren and eroding landscape; locked into farms, socially
6 isolated and depressed, crises to their identity and masculinity, increased stress, impacts response capacity, high
7 suicide levels; feel demonized (farmers responsible for crisis), loss of political power.

8
9 Impacts noted among women: assisting with farm tasks and working off the farm for additional income; interact
10 more at community level, taking care of others' health, at the expense of their own, also stressed, see no end to their
11 working lives.

12
13 _____ END BOX 13-1 HERE _____
14

15 Recent work demonstrates that both men and women are impacted by climate change, albeit differentially. Case
16 studies from Vietnam, for instance, demonstrate these differences. Campbell et al. (2009) and Resurreccion (2011)
17 (Campbell *et al.*, 2009; Resurreccion, 2011) draw attention to increased workloads for both partners, contingent on
18 socially accepted gender roles, although men tend to work longer hours during extreme events while women take on
19 extra responsibilities during disaster preparation and recovery (storing food and water, taking care of the children,
20 the elderly, and the sick, moving household belongings to elevated areas) as well as when their husbands migrate. In
21 the case of Cambodia, as a reflection of shifting cropping patterns in rice paddies, due to increased temperatures and
22 more irregular rainfalls, Khmer men even accepted culturally-taboo income-generating activities such as cutting
23 trees and trading of charcoal while women worked as wage laborers, raised livestock, and produced rice wine
24 (Resurreccion, 2011).

25
26 As for occupational hazards, women tea pickers in Malawi, Kenya, India, and Sri Lanka suffer and die from heat
27 stress as they are paid per hour (Renton, 2009) while emerging evidence points to increasing death cases among
28 male workers on sugar cane plantations, mainly in central America, due to kidney failure (Peraza *et al.*, 2012). In
29 case of high male-outmigration as a consequence of unsustainable rural livelihoods, women in Bangladesh face
30 unsafe working conditions, exploitations, and loss of respect (Pouliotte *et al.*, 2009). During floods, poor women's
31 mobility is constrained as many have not been allowed to learn how to swim (Demetriades and Esplen, 2008) while
32 such social conditioning forced middle-class women to stay in risk-prone houses during Hurricane Mitch in
33 Nicaragua (Bradshaw, 2010). However, the claim that more women die in disasters is disputed (Arora-Jonsson,
34 2011). While there is evidence that more women die when they are socio-economically disadvantaged and when
35 disasters exacerbate existing patterns of discrimination (Neumayer and Plümper, 2007; Ray - Bennett, 2009),
36 combined with lower class and caste during flooding in India shaping location patterns close to swelling rivers,
37 evidence from Hurricane Mitch and other disasters shows a higher mortality rate among men due to culturally-
38 imposed roles as heroes (machismo) (Campbell *et al.*, 2009; Resurreccion, 2011; Röhr, 2006).

39
40 Several case studies report the 'feminization of responsibilities' (Arora-Jonsson, 2011; Kakota *et al.*, 2011;
41 MacGregor, 2010; Nelson and Stathers, 2009; Petrie, 2010; Resurreccion, 2011), adding tasks to the already long list
42 of women's productive and reproductive duties due to climatic changes and extreme events. Internalized gendered
43 roles of agricultural subsistence production can be strengthened, at the detriment of women producers and the well-
44 being of entire households, to maintain existing social orders, including men's authority – a case of a culturally-
45 induced poverty trap during gradually shifting rainfall seasonality, as shown by Carr (Carr, 2008) for Ghana.

46
47 In terms of impacts on livelihood assets, women-headed households, in the absence of sufficient financial, physical,
48 and human capital, often rely heavily on social networks of reciprocal gifts and friendship; yet, they are most
49 harmed when these networks are exhausted (Osahr *et al.*, 2008). Negative impacts of climate change such as food
50 shortages make women consume less, but expose them more to water-borne diseases and reproductive tract
51 infections following floods (Campbell *et al.*, 2009). Moreover, there seems to be a disproportionate impact on
52 women's mental health due to emotional and psychological distress following climate-related disasters or even
53 gradual environmental and social deterioration, primarily because of their caring roles for others (Alston, 2011;
54 Campbell *et al.*, 2009; Demetriades and Esplen, 2008). Evidence shows that marital conflict and domestic violence

1 have increased as a social consequence of climatic changes and extreme events, translated into increasing stress on
2 livelihoods and the difficulties in securing of well-being, both in high-income countries such as Australia (Alston,
3 2011) and low-income countries such as Bangladesh (Pouliotte *et al.*, 2009) or Vietnam (Campbell *et al.*, 2009) and
4 across the globe in general (Demetriades and Esplen, 2008).

5
6 Recent evidence is emerging that highlights climate-related impacts on the *elderly, children, and disabled*, so far
7 largely overlooked. An Oxfam study in Vietnam highlights that those least resilient, in addition to single mothers
8 and female-headed households with small children, are disabled family members, widows, the elderly, and men who
9 drink excessively (Campbell *et al.*, 2009). Children in urban slums suffer lack of access to water and sanitation as
10 well as poor housing standards, resulting in health impacts at an early age (Bartlett, 2008). Flood-related mortality in
11 Nepal was twice as high for girls as for women (1.33% versus 0.6%) and also higher for boys than for men, and for
12 children in general six times higher than before the flood (Pradhan *et al.*, 2007). Less caloric intake due to climate
13 variability and price shocks affect poor children disproportionately, resulting in physical stunting and reduced life-
14 time earnings (Alderman, 2010). A study in Mali showed that the incidence of child food poverty increased from 41
15 to 52 percent since the food price increases in 2006 with the largest incidence (percentage of poor children) in urban
16 areas but the largest severity (i.e. the gap between poverty line and actual poverty) in rural areas (Bibi *et al.*, 2010).

17
18 Urban poor affected by climate change in marginal city areas in Latin America also include *race* (Afro-Latinos) and
19 indigenous communities displaced by guerilla activities (Hardoy and Pandiella, 2009) while urban poverty in urban
20 areas in Africa also carries a female and a child's face, making them doubly vulnerable (Douglas *et al.*, 2008).
21 Intersecting indigenous status and class make poor people in the highlands of Bolivia particularly vulnerable
22 (Andersen and Verner, 2009). Only limited evidence exists that relates religious beliefs, such as the angering of gods
23 and lack of spiritual protection in Tibet (Byg and Salick, 2009), to increase in poverty levels, anxiety and
24 psychological stress, rising temperatures, and changes in precipitation patterns.

25
26 Poverty also intersects *old age, ethnicity, and social isolation* when it comes to health impacts of climate change
27 (Frumkin *et al.*, 2008). In Australia, older citizens have shown feelings of distress and loss as a result of uncertain
28 connection to their lands, combined with social isolation and eroding leisure and retirement activities such as home
29 gardening as well as physical harm related to heat stress and wild fires (Horton *et al.*, 2010; Pereira and Pereira,
30 2008). Elderly citizens in the UK, contrary to their own perceptions, may experience higher exposure and
31 vulnerability to heat waves due to misinformation propagated through bonding networks (Wolf *et al.*, 2010). A
32 meta-analysis of 15 European cities shows that 2% of deaths during summer months are attributable to heat, with the
33 largest impact among people 75+ years of age and heat-attributable deaths rising markedly under future warming
34 scenarios (Baccini *et al.*, 2008). Heat-related mortality in the U.S. UK, Japan, and New Zealand is also shown to
35 affect primarily the elderly, infants, and persons of lower socio-economic status (Basu and Samet, 2002).

36
37 Palpable climate change impacts on livelihoods are seen in the arctic regions. Inuit livelihoods, for example, are
38 based on a climate cold enough for ice and snow to provide them with hunting grounds and means of transportation.
39 Over 70% of the northern Aboriginal adults depend on harvesting natural resources for their living (Furgal and
40 Seguin, 2006) and due to rapid warming their entire lifestyle and culture is threatened (Ford, 2009a; Ford, 2009b;
41 Osofsky, 2006; Salick and Ross, 2009; Tsosie, 2007). Stress disorders, depression, anxiety, feelings of sadness and
42 loss, and other negative health outcomes among Alaska Natives (Bell *et al.*, 2010) and Aborigines in Australia
43 (Norton, 2009) are seen as a result of lived and anticipated climatic changes. Also, high latitude livelihoods
44 experience contaminant concentrations in marine mammals and new regulations related to climatic changes affect
45 (McCarthy *et al.*, 2005).

46 47 48 **13.3.2. Understanding Future Impacts of Climate Change on Livelihoods and Poverty**

49
50 Climate change, climate variability, and extreme events already impact livelihoods and poverty across the globe.
51 However, there is a strong likelihood that future climate change, as simulated through a variety of models, will
52 further affect poor people in rural and urban areas, both in the Global North and South, and alter livelihoods and
53 their strategies. Projected impacts will almost certainly make efforts to reduce poverty more difficult. The literature
54 reveals a broad range of anticipated impacts, depending on the mix of climatic, agro-economic, and demographic

1 models employed, the time frame specified (ranging from 2016-2100), the spatial scale delineated (from a country's
2 agro-ecological zones to global impacts), and the key categories of concern (such as rise in food prices and
3 associated shift in poverty levels, crop yields and food security, health effects, and other impacts).

4
5 Existing studies emphasize the complexity and heterogeneity of climate impacts, including winners and losers in
6 close geographic proximity; they also highlight the importance of local and context-sensitive response mechanisms
7 that adequately address these differential impacts, via a 'quilt' rather than a 'blanket' approach (Seo *et al.*, 2009).
8 Future impacts of climate change, just as past and current ones, are expected to interact with other stressors, most
9 notably social vulnerability (Iglesias *et al.*, 2011), low adaptive capacity and subsistence constraints under extreme
10 poverty (Liu *et al.*, 2008), natural resource dependence (Adano *et al.*, 2012), population increase (Müller *et al.*,
11 2011), weak institutional support (Menon, 2009; Skoufias *et al.*, 2011a; Skoufias *et al.*, 2011b; Xu *et al.*, 2009)
12 ethnic conflict and political instability (Adano *et al.*, 2012; Challinor *et al.*, 2007), large-scale land conversions
13 (Assuncao and Cheres, 2008; Assuncao and Cheres, 2008; Thornton *et al.*, 2008), and inequitable international trade
14 relations (Challinor *et al.*, 2007; Jacoby *et al.*, 2011).

15
16 Precise estimates on poverty impacts of climate are elusive, though substantial analyses have been performed. The
17 extensive dataset of outlines climate risks and coping ability by countries. The 20 countries most at risk of extreme
18 weather in 2015 will include countries with considerable poverty: MICs (China, India, the Philippines, Sri Lanka,
19 Vietnam, Honduras, Thailand, and Zambia) and LICs (Kenya, Somalia, Djibouti, Mozambique, Bangladesh,
20 Ethiopia, Bolivia, Cuba, Madagascar, Colombia, Zimbabwe). Most of the world's poor live in ten countries, many of
21 who are listed here: China and India (half of the world's poor), Bangladesh, Kenya and the Philippines. Ethiopia and
22 Vietnam also contain a large proportion of the global poor. Not all those poor people in India, China, and other
23 countries will be at risk of climate impacts. Of the top 20 most vulnerable countries to climate change, a total of 11
24 are MICs, four are LICs and the remaining are members of the OECD.

25 26 27 *13.3.2.1. Anticipated Impacts on Economic Growth, Agricultural Productivity, and Living Space*

28
29 The large majority of future and projected impact studies focus on the anticipated consequences of climatic changes
30 and shocks on agricultural productivity, mainly in Africa, Asia, and South America. Among these studies, most
31 attention is paid to anticipated consequences for economic growth, changes in food prices, consumption patterns and
32 food security, and, subsequently, extrapolated changes in poverty head counts and policy goals to eradicate poverty.

33
34 Stern (Stern, 2009), based on United Nations estimates, projects that by 2080, climate change could produce 600
35 million more people affected by malnutrition and an additional 1.8 billion without enough water. Skoufias *et al.*
36 (Skoufias *et al.*, 2011b), based on predictions for 2055, state that under business as usual and optimal abatement,
37 poverty (measured at \$2/day) could be reduced by 800 million people, although lower probability extreme events
38 would reverse this trend and increase poverty. The anticipated reduction in poverty is expected to occur due to
39 annual, global, and real per capita growth rate of 2.2% up to 2055. However, Skoufias *et al.* (Skoufias *et al.*, 2011b)
40 note that mitigation under optimal abatement typically excludes the poor. On a specific country level, Thurlow *et al.*
41 (Thurlow *et al.*, 2009) estimate that Zambia's poverty headcount would increase by 300,000 people under conditions
42 of average climate variability, by 650,000 under a worst ten-year rainfall sequence, and by a maximum of 836,000
43 people under a one-year extreme drought.

44
45 Looking at projected impacts of future climate change on GDP also reveals differential patterns. Mendelsohn *et al.*
46 (Mendelsohn *et al.*, 2006), simulating climate impacts between rich and poor countries by using a mix of climate
47 scenarios and market response functions for 2100, estimate that impact losses in poor nations in low latitudes that
48 already experience high temperatures, mainly in Africa and Southeast Asia, will amount to US\$1.2-140.7 billion per
49 year (0.2-23.8% reduction in GDP); richer countries, in contrast, would encounter both positive and negative effects,
50 ranging from US\$ 11.7 billion of losses to US\$148.7 billion of gains per year (-0.1% to +0.9% GDP), with clearest
51 winners in Russia, Mongolia, Kazakhstan and eastern Europe. Changes in GDP reflect climate-sensitive economic
52 sectors, especially water and energy. An individual country like Zambia would experience US\$4.3 billion in
53 foregone GDP during 2006-2016, due to economic losses triggered by climate variability (Thurlow *et al.*, 2009). The

1 same study concludes that GPD loss for the country could be as high as US\$7.1 billion for the same ten-year period,
2 projecting a worst sequence, and as high as US\$6.6 billion in just one year under an extreme drought scenario.
3

4 A growing body of literature estimates changes in agricultural production and subsequently food prices as a result of
5 future climatic changes and extreme events, often with a specific lens on Africa, Asia, and Latin America (Assuncao
6 and Cheres, 2008; Burke *et al.*, 2011; Slater *et al.*, 2007; Thomas *et al.*, 2007). The scenarios used project mixed
7 results in, typically declines for wheat and both increases and decreases for millet, rice, and maize, for Africa up to
8 2030 (Challinor *et al.*, 2007; Kurukulasuriya *et al.*, 2006; Liu *et al.*, 2008; Lobell *et al.*, 2008) and Latin America up
9 to 2049 (Assuncao and Cheres, 2008; Feng *et al.*, 2010; Skoufias *et al.*, 2011b). Heat stress will be most detrimental
10 to well-fertilized seeds (Schlenker and Lobell, 2010), which will justify policies in support of traditional seeds.
11 Müller *et al.* (Müller *et al.*, 2011) state that “all African agriculture runs some risk to be negatively affected by
12 climate change”, although some parts will benefit. Estimates for Asia and the Middle East also reveal mixed trends
13 (Jacoby *et al.*, 2011; Wang *et al.*, 2009; Xu *et al.*, 2009) and so do studies for Europe (Bindi and Olesen, 2011;
14 Olesen *et al.*, 2011). In the North American Corn Belt, declines in corn production are expected to increase 5-year
15 net outmigration by 3.7% for those aged 15-59 from 2020-49 (Feng *et al.*, 2010). For 2050, losses in agricultural
16 productivity are projected to be highest in all of Africa, ranging from 10% in East Africa to 20% in Central Africa
17 compared to 2008, and 10-13.5% for Asia and the Middle East (Wheeler, 2011). By 2080, a significant decrease in
18 land productivity is expected for sub-Saharan Africa (-14% to -17%) and Southeast Asia (-18% to -32%), coupled
19 with increase in water demand, while lowest risk profiles are projected for North America, Europe, East Asia,
20 Russia, and Australia (Iglesias *et al.*, 2011).
21

22 As for future impacts of sea level rise on living space for the worlds’ poor, India and Indonesia (MICs) are projected
23 to experience dramatic increases in the size of the population vulnerable to sea level rises –80% and 60%,
24 respectively –, housing a combined total of over 58 million of the most vulnerable people by 2050. A further six
25 million people in China will also be exposed to sea level rises to make the total in that country 22 million. Nigeria,
26 the Philippines and Egypt will also see the size of their vulnerable populations more than double between 2008 and
27 2050, exposing many of the future 6-14 million to sea level rise. Of the LICs, the size of Bangladesh’s vulnerable
28 population is, unsurprisingly set to grow to 27 million people – more than double the 2008 size (Wheeler, 2011).
29

30 [INSERT FIGURE 13-4 HERE

31 Figure 13-4: Map from Wheeler’s data set. Direct risks from sea-level rise (without adaptive responses).]
32
33

34 13.3.2.2. Implications for Livelihood Assets and Poverty Dynamics 35

36 Although changes in crop yields typically do not indicate direct implications for poverty and livelihoods, changes in
37 food prices and price-induced earnings associated with impacts on agricultural production do (Schmidhuber and
38 Tubiello, 2007). Simulations for over a dozen developing countries (Ahmed *et al.*, 2009; Hertel *et al.*, 2010) indicate
39 that urban and wage-labor dependent households will be most affected. Changes in price-induced earnings will
40 lower the welfare of low-income households since they will have to use a larger income share to purchase staple
41 crops, particularly rice, wheat, and coarse grains. Yet, impacts will be highly heterogeneous. A one-time 30-year
42 maximum extreme dry event is expected to affect the urban wage population most severely in Bangladesh, Mexico,
43 Zambia, and Malawi, increasing poverty for this socio-economic stratum by 30-110%, while self-employed farming
44 households will face the smallest increase in vulnerability due to asset consolidation (Ahmed *et al.*, 2009). Similarly,
45 poverty among the agricultural self-employed, especially in the Chile, Thailand, Indonesia, and the Philippines may
46 drop sharply due to benefits from selling surplus production at higher prices (Hertel *et al.*, 2010). Welfare decline in
47 South Africa by 55%, in Malawi by 40%, as well as in China and the United States by 20-25% may result from high
48 sensitivity of crops to rapid temperature increase by 2030, leading to higher food prices (Hertel and Rosch, 2010).
49 The key point is that in most developing countries the poverty headcount will decline in some socio-economic strata
50 while increase in others; only in the large majority of African countries are yield impacts expected to be too severe
51 to allow any benefits (Hertel and Rosch, 2010). Yet, even in the most promising cases, cumulative poverty is
52 expected to increase, despite reductions in the percentage poverty headcount. It should be noted that country-based
53 simulations typically overlook variations within states, e.g., the fact that most poor people already live in areas that
54 tend to be drier and hotter, without access to capital and other resources to purchase food (Mendelsohn *et al.*, 2006).

1
2 Decline in crop yields is also expected to increase outmigration, especially from developing countries in which rural
3 livelihoods depend on climate-sensitive crops. In the case of Mexico, climate change is projected to result in a
4 decline in crop yields, which, mainly among rural states where agricultural livelihoods are expected to become
5 increasingly difficult to maintain, may induce 1.4-6.7 million of adult Mexicans (2-10% of its current adult
6 population) to emigrate, the large majority to the United States (Feng *et al.*, 2010)
7

8 In terms of impacts on livelihood assets, projections tend to highlight the erosion of financial capital due to increases
9 in food prices (Ahmed *et al.*, 2009; Hertel *et al.*, 2010; Jacoby *et al.*, 2011; Seo *et al.*, 2009; Skoufias *et al.*, 2011b;
10 Thurlow *et al.*, 2009)), reduction in human assets due to decline in nutritional status (Liu 2008), increasing
11 infectious disease transmission rates (Green *et al.*, 2010), loss of labor due to outmigration (Feng *et al.*, 2010), and
12 impacts on natural capital due to lower agricultural productivity (Jones and Thornton, 2009; Skoufias *et al.*, 2011b;
13 Thurlow *et al.*, 2009). Projections show a substantial increase in future heat-related mortality (Huang *et al.*, 2011).
14 Certain risk factors, such as age, cardiovascular and respiratory illness, and socioeconomic status fuel vulnerability
15 to summer heat stress (Basu and Samet, 2002; McGregor *et al.*, 2006). Knowlton *et al.* (Knowlton *et al.*, 2007),
16 simulating premature heat-related deaths in the 1990s and 2050s in the northeastern U.S., show an increase in cases
17 by 47-95% by the 2050s, with urban counties depicting higher elevated risk factors than less-urbanized counties.
18 Among residents over the age of 65 in Californian metropolitan areas, future heat-related mortality will increase 10-
19 fold from 2000 to 2099, mainly due to a rising and aging population (Sheridan *et al.*, 2012). In comparison, impacts
20 on social and cultural assets have received little attention. Exceptions refer to impacts on the social identity and
21 cultural connections with land and sea among indigenous populations threatened by sea level rise and potential
22 relocation (Green 2010) and conflicts between ethnic and/or religious groups (Adano *et al.*, 2012). Poor households
23 with limited social networks or governmental assistance will be worst off, as shown for Nepal (Menon, 2009) and
24 Indonesia (Skoufias *et al.*, 2011a).
25

26 Climate change is also projected to cause shifts from one livelihood to another. As shown for marginal cropping
27 areas in Africa, based on simulated probabilities of failed seasons projected for 2050, shifts from cropping to higher
28 dependence on livestock are identified (Jones and Thornton, 2009; Thomas *et al.*, 2007). In pastoralist systems in
29 Africa, subtle shifts are expected from mixed crop-livestock livelihoods to those based exclusively on pasture
30 livestock, as a result of increasing water scarcity, up to 20% reduction in the length of the growing period for crops,
31 and loss in stovers due to maize substitution (Thornton *et al.*, 2007). Yet, the same study highlights new and
32 undesirable challenges for live-stock-depend livelihoods resulting from decreasing livestock biodiversity, land
33 encroachment for biofuel production, expanding vector populations affecting both people and animals, all of which
34 may exceed local adaptive abilities. High summer temperatures in Kenya will be detrimental to the livestock sector
35 (Kabubo-Mariara, 2009).
36
37

38 *13.3.2.3. Critical Thresholds, Poverty Traps, and Impacts on Transient and Chronic Poverty*

39

40 There is a high likelihood that poor countries will experience even greater poverty as a result of climatic changes
41 and extreme events: based on their location and low-latitudes high temperatures (Mendelsohn *et al.*, 2006), their
42 anticipated further decline in adaptive capacity combined with reductions in agricultural productivity (Iglesias *et al.*,
43 2011), greater inequality and deep-rooted poverty (Jones and Thornton, 2009), and lower levels of education and
44 large numbers of young dependents (Skoufias *et al.*, 2011c). A disproportionate impact will continue to fall on
45 developing countries (Nordhaus, 2010; Smith and Vivekananda, 2009), with between 22 and 32 thousand additional
46 child deaths per year, and 12 to 17 million additional people living on less than \$2/day among already poor
47 populations in sub-Saharan Africa and South Asia (Anderson, 2006). Households in developing countries dependent
48 on urban wage labor are *highly likely* to find themselves in a poverty trap due to extreme exposure to food price
49 increases (Ahmed *et al.*, 2009; Hertel *et al.*, 2010). In Zambia alone, this could mean 2/5 of all increases in poverty
50 by 2016 (Thurlow *et al.*, 2009).
51

52 Lessons from the prolonged Ethiopian drought of 1998-2000 and Hurricane Mitch in Nicaragua in 1998 demonstrate
53 that poorer households tend to engage in asset smoothing, which may dip their consumption to painfully low levels,
54 while wealthier households typically sell assets and smooth consumption (Carter *et al.*, 2007; Jacoby *et al.*, 2011).

1 Hence, it is the poor who further erode nutritional levels and human health while desperately holding on to their
2 limited yet precious assets. This trend is expected to become more severe, given the compounded impacts of climate
3 change and multi-dimensional poverty and the difficulty to escape poverty traps, especially without external support.
4

5 Projections suggest a climate-induced change threshold for most natural-resource-dependent communities, beyond
6 which catastrophic shocks to livelihoods and poverty are *likely* to occur, unless drastic adaptation and/or mitigation
7 policies are implemented in a timely manner. Smith et al. (Smith and Vivekananda, 2009) (2009: 4137) show
8 “growing evidence that even modest increases in GMT [global mean temperature] above levels circa 1990 could
9 commit the climate system to the risk of very large impacts on multiple-century time scales.” Similarly, for the
10 greater Himalayas, such livelihood thresholds are assumed, but empirical evidence is still lacking (Xu *et al.*, 2009).
11 The potential need to relocate due to sea level rise would constitute a critical threshold for indigenous groups such as
12 the Torres Strait Islanders between Australia and Papua New Guinea as it would affect their social identity and
13 cultural connection to specific lands and the sea (Green *et al.*, 2010) . Transitions from cropping to livestock due to
14 climate change are expected in marginal crop areas and high probabilities of failed seasons, coupled with high
15 population densities and persistent poverty (Jones and Thornton, 2009).
16

17 Existing projections do not provide sufficient evidence to estimate whether shifts from transient to chronic poverty
18 are expected to occur as a result of climate change, and to what extent. However, a predictable increase among the
19 urban poor, especially urban wage laborers, due to food price-induced earning changes, suggests that a large number
20 of urban poor in developing countries may shift from transient to chronic poverty, especially under scenarios with
21 long-duration climatic shifts and prolonged droughts. For sub-Saharan Africa and South Asia, a shift from poverty
22 to severe poverty is projected for additional tens of thousands of people by 2100 (Anderson, 2006). Also anticipated
23 are shifts in and out of poverty, as projected for small-scale coffee farmers in Mesoamerica by 2050, due to areas no
24 longer suitable for coffee and other, higher-altitude locations to become suitable, as well as differential access to
25 technical and climatic information and cultural constraints with respect to shifting crops (Laderach *et al.*, 2011).
26
27

28 *13.3.3. Implications for Development, Sustainability, and Justice*

29

30 Evidence from observed impacts of climate change on livelihoods and poverty, as well as anticipated future impacts
31 from a variety of projections suggest that development for poorer nations and long-term sustainability of social
32 systems and resilience of livelihoods embedded in functioning ecosystems and their services are already undermined
33 and will continue to be eroded into the future. Using the definition of vulnerability employed in the SREX (Field *et*.
34 *al.*, 2012), the propensity or predisposition of poor people around the world to be adversely affected by the impacts
35 of climate change is very high. However, these detrimental impacts are only partially attributable to climate change
36 itself. As demonstrated through a variety of case studies, climate-related impacts on marginalized livelihoods and
37 poor populations, both in rural and urban areas, in low-, middle-, and high-income countries, are intimately tied to
38 deep-rooted structural causes of poverty and inequality and a multitude of socio-economic, institutional, political,
39 and cultural stressors (cross-reference to Ch1). As stated by Pouliotte *et al.* (Pouliotte *et al.*, 2009), as long as the root
40 causes of poverty, entrenched in persistent inequalities and uneven access to resources and institutions, remain an
41 ‘elephant in the corridor’, all adaption efforts and policies will be nothing more than ‘stop-gaps’. At the same time,
42 there is consensus that poverty alleviation in itself, particularly if perceived through an economic lens, will not lead
43 to more equality, neither for disenfranchised women nor men, nor to enhanced livelihood resilience and well-being.
44

45 The current literature indicates that livelihood resilience – the ability to withstand disturbances – among poor people
46 is further threatened by negative impacts of climate change, and this for several reasons. First, increasing frequency
47 and severity of hazards undermine livelihood strategies of already struggling individuals and communities (Hardoy
48 and Pandiella, 2009) . Second, while poor countries are hit disproportionately harder by climate-related catastrophes
49 (e.g., storms and floods) and human costs (death) are much higher – the five top ranked in the 2009 Global Climate
50 Risk Index were Honduras, Bangladesh, Nicaragua, the Dominican Republic, and Haiti (followed by five additional
51 developing nations) –, these countries rank much lower in terms of damage costs than countries affected in Europe
52 and North America, given that land, property, and lives in the poorer nations are valued much less, while social
53 support measures are much cheaper (Renton, 2009) . Third, poorer households often cannot afford to take up
54 insurance (Hertel and Rosch, 2010). Fourth, policy priorities typically favor more powerful constituencies (Alston,

1 2011). Fifth, persistent marginalization due to gender, class, race, and age exacerbate inter-secting inequalities
2 (Demetriades and Esplen, 2008; Galaz *et al.*, 2008)). Sixth, the poor are typically excluded from decision-making
3 processes over vital assets and, hence, have little ability to shape outcomes (Pouliotte *et al.*, 2009). Seventh,
4 emphasis on rapid-onset events, sectoral impacts, and poverty statistics has diverted attention from the more
5 incremental changes that define growing loss and poverty in rurality (Kelly, 2009; Petheram *et al.*, 2010; Tschakert
6 *et al.*, 2011). Finally, desirable livelihood transformations and trajectories towards increased well-being tend to be
7 reserved to more affluent and powerful members of society while poorer households find themselves increasingly
8 squeezed out of ‘feasible solution space’, especially livelihood diversification (Pouliotte *et al.*, 2009; Skoufias *et al.*,
9 2011a). These factors perpetuate the vicious cycle of poverty, multi-dimensional deprivation, and inequality.

10
11 Looking into the future, poorer countries will experience continued decline in adaptive capacity, which will hamper
12 development. An adaptive capacity index, similar to a Gini coefficient, illustrates increasing inequality with more
13 and more severe climate change scenarios (Iglesias *et al.*, 2011). It reflects natural and economic capacity, social
14 capital, and farming innovation. Just comparing land productivities for 2080, declines will range from 17- 32% in
15 the Near East, sub-Saharan Africa, and Southeast Asia while producing clear winners in Europe and North America
16 (+6-15%) (Iglesias *et al.*, 2011). Besides, there is significant agreement in the literature that currently poor and food-
17 insecure regions will continue to be disproportionately affected into the future (Adano *et al.*, 2012; Anderson, 2006;
18 Assuncao and Cheres, 2008; Burke *et al.*, 2011; Challinor *et al.*, 2007; Jacoby *et al.*, 2011; Jones and Thornton,
19 2009; Liu *et al.*, 2008; Lobell *et al.*, 2008; Menon, 2009; Nordhaus, 2010; Skoufias *et al.*, 2011a; Thornton *et al.*,
20 2008) While these studies stress the heterogeneity of future impacts on poverty, few consider more diverse climate
21 change scenarios (Skoufias *et al.*, 2011b) or the potential of four degrees and beyond (New *et al.*, 2011).

22
23 Given existing projections ranging from the sub-national to the global level, it is *highly likely* that climate change
24 will slow down the pace of poverty reduction, further erode food security, and jeopardize sustainable
25 development (Hope Sr, 2009; Iglesias *et al.*, 2011; Skoufias *et al.*, 2011b; Stern, 2009; Thurlow *et al.*, 2009). It
26 should be noted, though, that the top MDG (halving the prevalence of hunger by 2015) is *unlikely* to be realized
27 before 2020-30, with or without climate change (Tubiello *et al.*, 2008). This is particularly the case for newly
28 emerging hotspots of hunger by 2030, including nations such as Tanzania, Mozambique and the Democratic
29 Republic of Congo (Liu *et al.*, 2008).

30
31 Little knowledge exists to date regarding how future poverty will intersect with various types of inequality due to
32 gender, ethnicity, or class, and effect social justice. Among the few are global projections until 2080 that highlight
33 gender inequality not only as a key component of socio-economic vulnerability but also as perpetuating inequalities
34 and injustices, which, subsequently, will lower adaptive capacity while increasing poverty and undermining
35 sustainable development (Iglesias *et al.*, 2011). Climate change may also aggravate marginalization of indigenous
36 populations, magnifying their remoteness and insufficient access to health care and infrastructure (Green *et al.*,
37 2010). However, experiences from Hurricane Katrina and the 2011 Tsunami in Japan demonstrate the additional and
38 multiplier effect of a disaster on top of underlying structural inequalities; their persistence years later, as in the case
39 of Katrina (Schwartz, 2007), further stresses the need for expanded analyses beyond the events themselves.

40 41 42 **13.4. Assessment of Impacts of Climate Change Responses on Livelihoods and Poverty**

43
44 This section assesses the observed and potential impacts that climate change responses have on livelihoods and
45 poverty. Evidence of current impacts of climate change on livelihoods and poverty suggests that the large majority
46 of poor and marginalized people is already disproportionately affected by climatic changes and will continue to be
47 affected in the future, in addition to new and higher numbers of poor in middle-and high income countries. This
48 section assesses whether climate change responses are likely to amplify or reverse this trend. It first reviews the
49 impacts on livelihoods and poverty of the institutionalized mitigation mechanisms under the UNFCCC (CDM and
50 REDD+). Second, it surveys various international and national policy initiatives that are directly or indirectly aimed
51 at mitigating climate change, such as the voluntary carbon market and bio-fuels. Third, it assesses the impacts of
52 various climate change adaptation initiatives on livelihoods and poverty.

13.4.1. Mitigation Responses

Many potential synergies between climate change mitigation policies and poverty reduction have been identified and described in the literature (Klein *et al.*, 2005; Ürge-Vorsatz and Tirado Herrero, 2012) but concrete evidence of positive synergies is scarce. Instead there are rising concerns and evidence that policies aimed at mitigating climate change can be detrimental to poor people and their livelihoods (Collier *et al.*, 2008; Hertel and Rosch, 2010).

13.4.1.1. The Clean Development Mechanism (CDM) – Focus on Reforestation and Carbon Sequestration

The UNFCCC secretariat showcases a number of CDM project to highlight their development benefits. Projects as diverse as low cost energy services in India, micro-hydro projects in Bhutan and Peru, efficient firewood use in Nigeria, and biogas digesters in China are expected to generate livelihood benefits and employment, and reduce poverty among beneficiaries (cdm.unfccc.int/about/ccb/index.html). However, most of the statistical information reported in the official reports on CDM is based either on project documents or on surveys of projects. The assessment of CDM in the peer-reviewed literature is more cautious and pessimistic than UNFCCC when highlighting obstacles and ethical dilemmas associated with carbon trading (Liverman, 2009), difficulties associated with its implementation (Borges da Cunha *et al.*, 2007; Gong, 2010), its procedural limitations (Boyd and Goodman, 2011; Kiss *et al.*, 2002), and its failure to achieve poverty alleviation in a meaningful or effective manner (Olsen, 2007; Pfaff *et al.*, 2007; Sirohi, 2007).

Studies focusing on the institutional or ethical aspects of CDM as well as studies examining specific projects have expressed concerns about its effectiveness in addressing poverty. For example, Boyd and Goodman (Boyd and Goodman, 2011) p 848 suggest that CDM is likely to accentuate uneven development unless local populations are integrally involved in the implementation of CDM projects. A number of studies discuss low community capacity as a pervasive barrier to the trickling of material benefits from CDM projects to the rural poor (Minang *et al.*, 2007; Perez *et al.*, 2007).

Recent reviews of benefits of CDM projects that focus on poverty reduction are starkly negative in their assessment. Michaelowa and Michaelowa (Michaelowa and Michaelowa, 2011) : 259 argue, “hardly any of the CDM projects can be considered as strongly pro-poor.” An earlier careful review of more than 200 studies of CDM reaches a conclusion that is almost exactly the same when it suggests, “left to market forces, the CDM does not significantly contribute to sustainable development” (Olsen, 2007).

13.4.1.2. Reduction of Emissions from Deforestation and Forest Degradation (REDD+)

Over the past few years, discussions about REDD+ constitute one area of optimism in relation to climate change mitigation (Agrawal *et al.*, 2011). Extensive donor investments to prepare developing countries to implement REDD+, commitments by six developed countries to provide \$4.5B by 2012 for REDD+, and projections that REDD+ investments may reach \$30B a year by 2020 suggest that REDD+ has the potential to deliver substantial emissions reductions, in particular because costs of reducing terrestrial emissions may be much lower than those of energy use-related emissions (Stern, 2009). But this potential is likely to be realized only with additional financial flows from donors, or through the involvement of non-government actors in the wake of credible official commitments for emissions reductions.

The use of forests to manage emissions raises important questions about whether carbon forestry will adversely affect the livelihoods of poor people. Some studies show favorable results in terms of poverty alleviation from forest protection (Ferraro *et al.*, 2011), some are optimistic that REDD+ can work (Kanowski *et al.*, 2011; Rahlao *et al.*, 2012) while many have voiced concerns about negative impacts on poor households (Larson, 2011; McDermott *et al.*, 2011; Neupane and Shrestha, 2012; Phelps *et al.*, 2010; Rahlao *et al.*, 2012; Van Dam, 2011). The potential negative impacts include the risk that local populations become excluded from using these forests and that national and global level MRV mechanisms will undermine the role of communities and households in information gathering and documentation of the state of forests.

1 The Cancun Agreements highlight a number of safeguards that governments should observe during REDD+
2 implementation, including the interests of local communities and indigenous peoples, the importance of participatory
3 processes, and the need to attend to the sustainability of local livelihoods. The extent to which these safeguards will be
4 observed in practice is unclear because of the early state of REDD+ implementation in most countries. The fact that there
5 is no global REDD+ mechanism means that progress on REDD is likely to occur as much through voluntary bilateral and
6 public-private processes as through multi-lateral, regulatory requirement. Without a global agreement and mandated
7 emissions reductions, the price of carbon is likely to remain low and vary substantially across different carbon forestry
8 projects, thereby strengthening the hands of buyers of carbon credits, and weakening local interests.
9

10 The existing experience of REDD+ implementation is inadequate to permit broad generalizations about the effects of
11 REDD+ on rural livelihoods and poverty (Cotula *et al.*, 2009; Hayes and Persha, 2010). Nevertheless, most current
12 writings on REDD+ highlight the weak hand of local communities (Basnet, 2009; Osborne, 2011). In a study of 20
13 REDD+ projects in Latin America, Africa and Asia, only five had conducted some form of assessment of the outcomes or
14 impacts, and the conclusion was that there was a severe lack of rigor and consistency in the implementation and evaluation
15 of REDD+ projects (Caplow *et al.*, 2011).
16

17 Based on past experiences of forestry projects in a number of countries as well as through studies of ongoing REDD+
18 implementation in countries such as Brazil, Indonesia, Mexico, Tanzania, Nepal and Madagascar, the following six factors
19 are viewed as critical for improving the livelihood contributions of REDD+ projects for the rural poor: 1) recognition of
20 the rights of local communities; 2) participation of local peoples in decision making; 3) involvement of local stakeholders
21 in monitoring and enforcement; 4) creation and provision of alternative livelihood options; 5) transition payments and
22 compensation for reduced emissions; and 6) transparency of decision making and accountability of decision makers
23 (Springate-Baginski *et al.*, 2010).
24
25

26 *13.4.1.3. Voluntary Carbon Offsets* 27

28 The voluntary carbon offset (VCO) market enables companies and organizations that are not regulated as well as
29 countries that have not ratified the Kyoto Protocol to offset their emissions. The VCO market grew exponentially
30 from less than 10 MT CO₂ in the early 2000s to 127 MT in 2008, but dropped significantly in 2009 (Hamilton *et al.*,
31 2010; Lovell, 2010). Activities under the VCO are generally more diverse and flexible than the highly regulated
32 Kyoto Protocol compliant market. The voluntary market is small compared to the regulated market (about 1%) but
33 still significant from a livelihoods and poverty perspective because it typically target smaller projects and may
34 therefore potentially be better at reaching poor communities and people are willing to pay for carbon offsets with co-
35 benefits such as poverty alleviation (MacKerron *et al.*, 2009). Instead of the legal rules and regulations under the
36 Kyoto protocol, most VCO activities are governed by a voluntary certification, some of which require environmental
37 and/or social co-benefits (Kollmuss *et al.*, 2008).
38

39 Activities under VCO are dominated by methane destruction in landfills (31%) but forestry projects (20%) and small
40 scale renewable energy projects (15%) are also important (Hamilton *et al.*, 2010). It is too early to tell whether these
41 VCO projects are successful or not in terms of poverty alleviation and other social goals. The results to date are
42 highly mixed with some successes and many more problems (Estrada and Corbera, 2012; Jindal *et al.*, 2008; Jindal
43 *et al.*, 2010; Swallow and Meinzen-Dick, 2009). Reported benefits include increased disposable income and
44 diversification of livelihoods, conservation of existing biodiversity, and strengthening of local organizations while
45 known negative impacts include exacerbated inequalities and loss of access to local resources (Estrada and Corbera,
46 2012). A comprehensive study of three soil carbon sequestration projects in Kenya, Peru and Senegal, conclude that
47 even if soil carbon projects are beneficial for reducing the loss of soil carbon from agriculture, the impacts on
48 poverty are marginal and that the poorest farmers are unable to participate due to the same factors inhibiting more
49 productive practices in the first place (Antle and Stoorvogel, 2009).
50
51
52

13.4.1.4. Biofuel Production and Large-Scale Land Acquisitions

The global production of ethanol for fuel increased by 327% from 2000 to 2009 and the production of biodiesel increased by 2,725% in the same time period (Chum *et al.*, 2011). Views on this development differ considerably among different interest groups. Reports from corporate interests are mainly positive and assessment from environmental and developmental NGOs are generally negative, while intergovernmental and independent research institutes as well as academia remain ambivalent (White and Dasgupta, 2010). There are mainly two kinds of concern from the perspective of livelihoods and poverty with respect to the increasing global interest in biofuels: food price increase through competition for land, and dispossession of people's land and power.

The increasing demand for biofuels has resulted in a notable shift from the production of food to the production of fuels which in turn may increase food prices (Collier *et al.*, 2008). High food prices are detrimental to poor people who are net buyers of food, i.e. nearly all urban poor people and currently most of the rural poor people (Ruel *et al.*, 2010; Von Braun and Ahmed, 2008). People who are poor spend a very high proportion of their disposable income on food and, hence, are highly vulnerable to high food prices (Ruel *et al.*, 2010). The link between increasing biofuels production and food prices has been the subject of intensive debate since the food price hike in 2007/08 (Ruel *et al.*, 2010). Even if most studies agree that increasing biofuels production plays a role in increasing food prices there is little consensus on the current size of this influence. Estimates of the influence of biofuels on the 2007/08 food price increases have ranged from 70% (Mitchell, 2008) to 30% (Von Braun and Ahmed, 2008). Reports based on top-down economic modeling seem to agree that the biofuels were less influential (< 30%) as a direct cause of food price increases (Ajanovic, 2011; Aksoy and Isik-Dikmelik, 2008; Baffes *et al.*, 2010; Elobeid and Hart, 2008). Nonetheless, the emergence of biofuels as a means to reduce the dependence on fossil fuel has altered the land use dynamics which may influence the food prices in more than one way (Hertel and Rosch, 2010; Rathmann *et al.*, 2010). Several studies relate the increasing food prices in 2007/08 to speculation in agricultural futures markets (Ghosh, 2010; Gilbert and McLeman, 2010; Runge and Senauer, 2007) which may very well be driven by expectations of future profits from biofuels (Trostle *et al.*, 2011). The recent IPCC special report on renewable energy highlighted the uncertainties around biofuels' role in food price increases and expressed a general concern over the risk of deteriorating food security with future deployment of bioenergy (Edenhofer *et al.*, 2011).

The second concern with increasing demand for biofuels is the competition for land that may risk a rush for land as a commodity in low-income countries. Large scale trans-national land acquisitions (LSLA) have soared since 2008. In 2009 IFPRI estimated that about 20 million ha had been subject to LSLA (Von Braun *et al.*, 2009) while the World Bank in 2011 estimated the area to be 45 million ha (Deininger *et al.*, 2011). The most comprehensive inventory of LSLA so far, the Land Matrix Project, has compiled a dataset covering totally over 200 million ha of LSLA (corresponding to almost half the size of EU) of which about 70 million hectares were verified in March 2012 (Anseeuw *et al.*, 2012). Most studies discussing LSLA assume that the rapid increase in LSLA since 2008 is partly and indirectly linked to climate change. The production of bio-fuels is considered the main reason for LSLA but the link to climate change may also be through increasing food prices (Daniel, 2011), concerns about future food insecurity (Robertson and Pinstrup-Andersen, 2010; Rosset, 2011; Sulser *et al.*, 2011) as well as the anticipation that carbon markets, e.g. REDD, may increase prices of land (Anseeuw *et al.*, 2012; Cotula *et al.*, 2009; Zoomers, 2010). According to (Anseeuw *et al.*, 2012), the purpose of LSLA globally is primarily biofuels (40%), food (25%) and forestry (3%) but with substantial regional differences.

Whether LSLA are beneficial or detrimental to poor people is contested although most studies show great concerns that that LSLA may cause dispossession of smallholders, competition with food production and environmental degradation (Borras Jr *et al.*, 2011). Another strong reason for concern is that the expansion of bioenergy in general and biofuels in particular increases the corporate power of international actors over governments and local actors with detrimental effects on local agricultural and food policies (Dauvergne and Neville, 2009; Fortin, 2011; Glenna and Cahoy, 2009; Hollander, 2010; Jarosz, 2011; Mol, 2010) and increasing marginalization of smallholders (Ariza-Montobbio *et al.*, 2010; Neville and Dauvergne, 2012). Gender issues are particularly important to consider since access to land and other resources are highly gendered (Arndt *et al.*, 2011; Molony, 2011). So far, however, there is a lack of in-depth research on gender implications of the biofuels expansion in general and LSLA in particular (Behrman *et al.*, 2012). The concerns also differ to some extent between regions and there seems to be more

1 apprehension about negative consequences for smallholders in Africa than in Latin America (Borras *et al.*, 2011) or
2 Southeast Asia (Borras Jr and Franco, 2011).

3
4 Through the lens of mainstream economic modeling there is optimism that biofuels may boost investment and
5 economic growth in low-income countries such as Mozambique (Arndt *et al.*, 2009) and India (Gopinathan and
6 Sudhakaran, 2011). However, only scant empirical evidence suggests that the potential benefits are actually realized.
7 Poverty and inequalities have not been reduced in the Brazilian ethanol production and international trade in
8 biofuels may exacerbate the existing disparities through increasing competition (Hall *et al.*, 2009; Peskett and
9 Institute, 2007). Biofuel in itself will not transform living conditions in rural areas without being integrated into
10 development policies that generate equitable social and economic benefits for the poor (Hanff *et al.*, 2011).

11 12 13 **13.4.2. Adaptation Responses**

14
15 Adaptation is arguably the most important priority for low-income countries, although the importance and urgency
16 of adaption has only slowly been recognized by international climate change policy (Pielke Jr *et al.*, 2007). After
17 adaption has been widely accepted in the international negotiations (e.g. the Copenhagen Accord) the financial
18 means to facilitate adaptation are gradually building up. Even if the funds available for adaption have been estimated
19 to cover less than 10% of all needs (Smith *et al.*, 2011), there are significant adaptation activities with implications
20 for poor communities. Such activities are assessed below as well as local responses.

21 22 23 **13.4.2.1. Insurance Schemes**

24
25 Insurance, including both public and private systems, has been proposed by the UNFCCC and others as an
26 adaptation strategy, serving to reduce, share, and spread climate change induced risk and smooth consumption,
27 especially among poor households (Akter *et al.*, 2011; Hertel and Rosch, 2010; Mechler *et al.*, 2006). Poor people
28 tend to be uninsured, at least in the formal sense, though social networks and informal strategies (risk spreading,
29 drawing on social networks, local credit, asset markets, transfers from local households, dividing herds between kin
30 etc) do act as informal risk management mechanisms (Barnett *et al.*, 2008; Hertel and Rosch, 2010). In the case of
31 flooding in South Western Nigeria in 2008 which affected 65 % of fish farms, for example, the majority of the farms
32 were uninsured, and the few that were insured received untimely and inadequate compensation, and very few
33 obtained any compensation from the government. This both affected people's income and productivity and lead to
34 poor health and starvation (Adebo and Ayelari, 2011).

35
36 Access to formal insurance schemes can potentially provide a way out of poverty traps (Barnett *et al.*, 2008). It often
37 takes several years for a household to rebuild assets after a climate shock such as drought, meaning that an increase
38 in frequency of such events can trap people into poverty (Dercon, 2006; Hertel and Rosch, 2010). Also, poor people
39 who have no insurance are often forced to invest only in low-risk, low-return production, which prevents them from
40 accumulating enough assets to escape chronic poverty (Barnett *et al.*, 2008; Elbers *et al.*, 2007). Insurance markets
41 may also provide an opportunity for risk-averse farmers to evade culturally-induced poverty traps that bound them
42 to kinship obligation through the moral imperative of sharing which also reduces their incentive for self-motivation
43 against climate shocks (Barnett *et al.*, 2008; Di Falco and Bulte, 2011).

44
45 In high-income countries, insurance plays a role for poor people and their livelihoods (Dawson *et al.*, 2011). In a
46 study of a 2008 flooding event in a community in Queensland, Australia, it was found that only 32% of residents
47 and 43% of businesses were insured, in part due to the high cost of insurance on flood plains. Instead, social and
48 institutional networks initiated emergency responses to reduce flood damage; however, relying exclusively on such
49 responses may not be viable in the long run since the burden on these mechanisms will increase with climate change
50 (Keogh *et al.*, 2011). Few studies exist of whether uninsured groups in high-income countries can be pushed into
51 poverty or experience a shift from transient to chronic poverty, as a result of climatic events. Under some socio-
52 economic scenarios (such as for the UK), climate change may raise premiums, for example in flood-prone areas,
53 meaning some people are unable to afford insurance (Dawson *et al.*, 2011).

1 Particular types of insurance have been proposed to reduce poverty, in particular micro-insurance which is directed
2 at low-income people (Biener and Eling, 2012). The costs of micro-insurance are typically low because local
3 providers perform all operational and field-level administration, compared to conventional insurance where the
4 company provides all the services (Akter *et al.*, 2011). Although the microinsurance industry has grown over the
5 past few years (10% per year), only 5% of the potential market is covered (Biener and Eling, 2012). Some of the
6 barriers regarding micro-insurance include the randomness of loss occurrence, information asymmetry, and the
7 uneven affordability of insurance premiums. Index-based insurance has been suggested to address these obstacles,
8 for example through lower transaction costs and simpler contract designs. Weather or crop index insurance is paid
9 out when conditions reach a particular predetermined threshold where significant losses are likely to occur –
10 particular weather conditions such as excessively high or low cumulative rainfall or temperature peaks affecting
11 average crop yields or revenues (Barnett *et al.*, 2008). Systems of insuring animals have also existed for decades in
12 Mongolia (Mahul *et al.*, 2009) and have been tested in Kenya (Matsaert *et al.*, 2011). Livestock are insured against
13 bad weather such as droughts and storms. Specific formats include weather-based insurance and mortality index
14 insurance. Both can promote proactive responses: if payout is made immediately, people can afford to respond by
15 buying supplementary feed, moving to better pastures, and fattening animals. Index-based (livestock mortality)
16 insurance is paid any time the mortality rate of adult animals exceeds a certain historical threshold and, hence, is
17 more reactive. Index-based risk transfer products are meant to transfer risks outside a low-income rural community.
18 This format is particularly relevant for climatic events that strike whole villages or areas, thwarting the capacity of
19 community-based risk management options such as social networks
20

21 However, livestock insurance is not without problems. Accurate weather and livestock data required for weather-
22 and mortality-based systems are seldom available in low-income countries. It can be difficult to establish which
23 particular weather condition causes losses, while weather conditions also vary greatly between adjacent areas.
24 Consequently, basing repayment policies on meteorological stations in a different area, even if relatively close in
25 distance, is problematic. Late payouts can also hamper recovery of premium holders. With shifting pasture lands
26 under climate change, background data for calculating relevant indices may become obsolete.
27

28 Insurance has been described as a low-regrets climate change adaptation option, for instance in Ethiopia where
29 mechanisms for drought risk financing, including crop insurance, are part of new social protection programmes
30 (Conway and Schipper, 2011). Insurance may be particularly appropriate in areas in which the direction of future
31 rainfall (increase or decrease) is uncertain. However, the viability of insurance systems in the context of climate
32 change is not undisputed. For instance, (Phelan *et al.*, 2011) using a broad conceptualization of insurance including
33 both social insurance (state-provided universal health care) and commercial forms of insurance, argue that the
34 feasibility of insurance systems is dependent on dramatic reductions in emissions as climate change threatens the
35 capacity of insurance systems to pool and spread financial risk on the basis of known probabilities.
36

37 To many poor communities, private insurance systems are often unattractive, with claims frequently exceeding
38 premiums, as witnessed in agricultural/crop insurance programmes in India and Bangladesh (McCord and Churchill,
39 2005; Raju and Chand, 2009) and costly reinsurance for disasters (Akter *et al.*, 2011). Evidence from flood
40 insurance schemes in Bangladesh suggests that illiteracy and poverty lower the demand for insurance due to limited
41 understanding of its potential benefits and sheer lack of financial assets (Akter *et al.*, 2011). Few farmers or herders
42 in low-income countries insure their productive resources – a tendency particularly pronounced among the poor
43 either because of absent or poorly developed insurance markets or amount and timing of premium payments (Giné *et*
44 *al.*, 2008; Hertel and Rosch, 2010; Pierro and Desai, 2008). There are institutional problems, too: the collaboration
45 between insurers and micro-credit providers is often hampered by incongruous motivations and unequal power
46 relations between the different actors in the insurance market (Akter *et al.*, 2011). Options that are financially more
47 viable and socially equitable entail public provision, collaboration between private actors, civil society, and
48 governments in the provision of insurance, making it compulsory for all, and favoring macro rather than micro
49 insurance products (Akter *et al.*, 2011; Giné *et al.*, 2008; Pierro and Desai, 2008).
50

51 Insurance mechanisms may not help poor people to adapt unless the underlying forces that make certain poor people
52 vulnerable, such as economic marginalization, are addressed. Only when insurance is promoted within the context of
53 a broader set of measures to strengthen and diversify livelihoods can it overcome maladaptation, for example
54 through encouraging more risky behavior such as switching to less drought-resistant crops (Hertel and Rosch, 2010).

1 Otherwise, people may find themselves locked in livelihoods suffering increasing risks under climate change or
2 overexploiting a variable natural resource, such as restocking fishing fleets after a hurricane with new and efficient
3 vessels, at the backdrop of declining fish stocks (Jerneck and Olsson, 2008; Pauly, 2005).

6 *13.4.2.2. Humanitarian Aid as Part of Climate Change Adaptation*

7
8 The IPCC special report on extreme events (Cooney, 2012) documents the implications of disasters for poor people,
9 their livelihoods, and poverty dynamics, though the concrete effects on human lives, ecosystem services, the
10 informal economy, and other key aspects of poor people's vulnerability remain poorly explored. Evidence from
11 Honduras and Ethiopia suggests that poor people's coping strategies can undermine their well-being both in the
12 short and long term, trapping people in poverty (Carter *et al.*, 2007). To counteract this tendency, disaster risk
13 management is increasingly proposed and tested as an adaptation measure, for example through community-based
14 climate risk reduction ((Meenawat and Sovacool, 2011a; Meenawat and Sovacool, 2011b; Sovacool *et al.*, 2012)).
15 One example of community based adaptation in disaster risk reduction is the innovative 'Triple F' model of
16 Forestry, Fisheries and Food and community-based micro hydro plants (Sovacool, 2012).

17
18 Disaster risk reduction includes both short-term humanitarian aid and disaster management approaches as well as
19 longer-term measures to reduce exposure and vulnerability to disasters resulting from climate change (Cooney,
20 2012). Shorter (practical) and longer term (structural) measures can be synergistic (Cooney, 2012; Tompkins *et al.*,
21 2008). The IPCC SREX emphasizes low-regrets measures, such as poverty reduction schemes as part of risk
22 management and adaptation in flood-prone informal settlements that offer benefits now and lay the foundation for
23 addressing projected changes (Cooney, 2012). Such examples are documented for Honduras, Brazil, and the
24 Cayman Islands (McSweeney and Coomes, 2011; Tompkins *et al.*, 2008). The integration of such approaches into
25 development planning can provide a window of opportunity to address the structural inequalities that shape socio-
26 environmental vulnerability and multi-dimensional poverty (Tompkins *et al.*, 2008). Risk reduction may be more
27 successful in facilitating deep structural transformation than past development initiatives and anti-poverty
28 interventions, though complementing efforts aimed at enhancing people's adaptive capacity and their livelihood
29 resilience with macro-level, long-term policy responses is essential (Gippner *et al.*, 2012; Mertz *et al.*, 2009;
30 Nuorteva *et al.*, 2010; Rawlani and Sovacool, 2011; Sovacool *et al.*, 2012; Sovacool, 2012; Tompkins *et al.*, 2008).

31
32 However, integrating short-term and longer-term measures is not unproblematic. Some short-term measures can
33 increase longer-term exposure and vulnerability; in addition, short-term impacts of hazards may differ from long-
34 term impacts and, consequently, require alternative actions (Conway and Schipper, 2011). For example, in Ethiopia,
35 key institutions dealing with disaster prioritize the targeting of transient food insecurity under short-term climate
36 variability; in contrast, a long-term perspective implies emphasizing vulnerability reduction and livelihood security.
37 In the Sahel, improved capacity to manage droughts, prevent famine, and safe lives has been partly successful in
38 reducing emergencies over the past 35 years (United States. Congress. Office of Technology Assessment, 1986).
39 Nevertheless, results in terms of poverty reduction and transformation of vulnerable livelihood systems have been
40 highly mixed (Batterbury and Warren, 2001; Kates, 2000; Olsson *et al.*, 2005; Reij *et al.*, 2009). Measures that
41 increase poverty and inequity and undermine livelihoods and adaptive capacity could be considered maladaptive, as
42 defined by Barnett and O'Neill (Barnett and O'Neill, 2010).

45 *13.4.2.3. Household and Community Responses*

46
47 Responses to climate risks and threats, particularly when it comes to coping with risks, have often been classified as
48 reactive vs. proactive (Burton *et al.*, 2006; Smithers and Smit, 1997), spontaneous vs. planned (Smit *et al.*, 1999), or
49 individual vs. collective. Although fuzzy, the distinctions are useful for disentangling different kinds of adaptation
50 responses and their impacts on poverty and inequality (Füssel, 2007).

51
52 Agrawal and Perrin identify five types of autonomous responses reflecting links to different categories of risks
53 (Agrawal and Perrin, 2009). The first four are: a) mobility, which helps address risks across space (McLeman and
54 Smit, 2006; Tacoli, 2009); b) storage, which helps smooth temporal fluctuations in resource availability, thereby

1 reducing risk over time (Howden *et al.*, 2007; Smit and Skinner, 2002); c) diversification, which reduces risks to
2 benefit flows from various household assets (Mertz *et al.*, 2009; Smith *et al.*, 2000), and d) communal pooling which
3 permits households to pool risks across the entire portfolio of income-generating assets and skills (Linnerooth-Bayer
4 and Mechler, 2006). When households lack access to markets, the above classes of adaptation practices constitute a
5 full set of analytically distinct, yet collectively exhaustive forms of adaptation. In case markets are accessible,
6 climate risks can also be reduced through exchange, making market exchange the fifth type of risk reduction and
7 adaptation practices (Halstead and O'shea, 2004).

8
9 Early research presented some evidence about the direction of the impacts of these different adaptation strategies on
10 poverty distribution and dynamics (Kates, 2000). Several scholars highlight the fact that such strategies can have
11 positive effects on poverty reduction when they are supported by policy measures, and if institutional links are
12 available to enable access to resources during scarcity (Adger *et al.*, 2003; Stringer *et al.*, 2009; Urwin and Jordan,
13 2008). For example, migration in response to predictable climate variability is a well-developed coping mechanism
14 that can allow migrants to maintain assets, and protect livelihoods (Barnett and Webber, 2010). However, when
15 migration occurs because of unexpected, unpredictable, and sudden shocks, it is highly disruptive to livelihoods,
16 even if it constitutes the only available option (Gilbert and McLeman, 2010).

17
18 In contrast to migration which is often a last resort option and typically a reactive strategy, both diversification and
19 storage are more proactive adaptation strategies (Smithers and Blay-Palmer, 2001). They are also typically used by
20 those with some resources or surplus at hand. Diversification of income sources, productive asset holdings,
21 consumption, and investments can effectively address uncorrelated risks (Osbahr *et al.*, 2008; Seo, 2010), albeit
22 often in exchange for some loss of income (Alpizar *et al.*, 2011). As a consequence, poorer households simply lack
23 the cushion in their earnings or sufficient assets to diversify. Pooling, savings, and credit societies as risk-reduction
24 strategies are widespread in most poor societies and play an important role in helping members tide over difficult
25 times (Andersson, E., Gabrielsson, S., 2012). To the extent they are developed and managed by communities
26 themselves, they are likely to be low cost, well targeted, and efficiently administered, even though not necessarily
27 fair. Despite these advantages of supporting livelihoods, caution is needed to identify and rectify gaps in coverage,
28 vulnerability to widespread risks, and potential elite capture (Bhattamishra and Barrett, 2010).

31 **13.5. Evidence of the Interaction between Poverty Alleviation Measures, Climate Change, and Climate** 32 **Change Responses**

33
34 This section provides an overview of interactions between climate change, climate change responses and poverty
35 alleviation measures. Because climate change interacts in a myriad way with livelihoods and poverty it is important
36 to assess how this interaction relates to ongoing and future policies for poverty alleviation in order to capture
37 synergies and avoid conflicts. The section covers three broad areas of poverty alleviation, the Millennium
38 Development Goals (MDG), social protection programs and energy access programs.

39 40 41 **13.5.1. Millennium Development Goals**

42
43 In 2000, 189 nations pledged to free people from extreme poverty and multiple deprivations through a human
44 development-centred approach. This became the eight MDGs, to be achieved by 2015. Countries renewed their
45 commitment to these goals in 2010. The IPCC Fourth Assessment Report (Yohe, G.W., Lasco, R.D., Ahmad, Q.K.,
46 Arnell, N.W., Cohen, S.J., Hope, C., Janetos, A.C., and Perez, R.T., 2007), highlighted that – with *very high*
47 *confidence* – climate change will impede nations' ability to achieve sustainable development pathways as measured,
48 for example by long-term progress towards the MDGs. While climate change may undermine efforts to reach the
49 MDGs, the failure to reach these goals in due time has significant non-climatic causes (e.g. (Hellmuth and
50 International Research Institute for Climate and Society, 2007; UNDP (United Nations Development Programme),
51 2007)). However, empirical assessments of the impact of climate change on MDG attainment are limited
52 (Fankhauser and Schmidt-Traub, 2011) and estimates of the costs of achieving the MDGs (Bourguignon *et al.*,
53 2008) do not include the additional requirement for adaptation or provisions for a more hostile climate. Similarly,

1 sectoral analyses of the cost of achieving individual MDGs, commonly do not include the additional cost of adapting
2 to the impacts of climate change (Jones *et al.*, 2003).

3
4 Despite a growing body of literature and experience, there remains *limited evidence* to suggest that either observed
5 or projected climate change impacts are being systematically integrated into poverty reduction programming or that
6 such programming results in substantial increases in resilience to covariate and idiosyncratic shocks and stresses
7 (Bene *et al.*, 2012). However, some notable cases exist, such as the Productive Safety Net Programme in Ethiopia,
8 which has sought to consider the impact of climate change and disasters on outcomes, including on high school
9 graduation levels (Gilligan *et al.*, 2009).

10 11 12 **13.5.2. Social Protection Programs**

13
14 Social protection describes all public and private initiatives that provide income or asset transfers to the poor, protect
15 the vulnerable against livelihood risks, and enhance the social status and rights of the marginalized (Devereux and
16 Sabates-Wheeler, 2004). These initiatives have the overall objectives of extending the benefits of economic growth,
17 and reducing the economic and social vulnerability of poor, vulnerable and marginalized groups. They are primarily
18 considered to provide ‘protection’ for poverty reduction measures and other social programs, not poverty reduction
19 measures in themselves. Social protection can be divided into *core* interventions, such as asset transfers, income
20 transfers and public works, and *complementary* interventions, such as micro-credit services, social development,
21 skills training and market enterprise programs. Social protection has risen significantly up the international policy
22 agenda in recent years, partly due to the impacts of the global financial crises in the late 1990 and early and late
23 2000s on poor and marginalized people (Davies and McGregor, 2009)

24
25 It is increasingly recognized that social protection can play an important role in supporting pro-poor climate change
26 adaptation and disaster risk reduction for vulnerable populations in developing countries by strengthening their
27 resilience to shocks (Heltberg *et al.*, 2010; Stern, 2007). However, little research exists on social protection and
28 policies for poor people in middle- to high-income countries. There is growing consensus among practitioners and
29 researchers that social protection can be an important approach to helping the chronically poor reduce risk and
30 minimize their need to erode valuable and scarce assets when faced with shocks (Barrientos, 2011; Dercon, 2011;
31 Devereux, S., Davies, M., McCord, A., Slater, R., Freeland, N., Ellis, F., White, P., 2010). Table 13-2 provides a
32 summary of the social protection measures and instruments, and associated adaptation and disaster risk reduction
33 benefits (Davies *et al.*, 2009)

34
35 [INSERT TABLE 13-2 HERE

36 Table 13-2: Types of social protection. Adapted after Arnall *et al.* (2010) and Davies and McGregor (2009).]

37
38 As Table 13-2 indicates, social protection offers a wide range of benefits for adaptation and DRR, both in response
39 to short-term climate disasters, as well as long-term risks posed by climate change, though much of the literature
40 remains at a normative level. The concepts of Adaptive Social Protection (ASP) (Davies *et al.*, 2007; Davies and
41 McGregor, 2009) and Climate Responsive Social Protection (CRSP) (Kuriakose *et al.*, 2012) both provide a
42 framework for the integration of climate change adaptation and disaster risk reduction that goes beyond traditional
43 social protection such as food-for-work programs. In spite of these conceptual advancements, there are only a few
44 detailed studies on the effectiveness of social protection implementation for responding to and preparing for climate
45 events and climatic changes. Of the studies that do exist, most have been conducted in South Asia (Arnall *et al.*,
46 2010; Heltberg *et al.*, 2009), although a number have also been completed in relation to individual safety net
47 programmes in sub-Saharan Africa (Devereux *et al.*, 2006; Slater *et al.*, 2006).

48
49 Social protection approaches are increasingly used in post-disaster situations to avoid long-term increases in poverty
50 as a result of lost assets. In the post-disaster environment, preliminary lessons from Ethiopia’s nation-wide
51 Productive Safety Net Programme (PSNP), which assists the most chronically impoverished with cash transfers and
52 cash-for-work schemes, reveal a positive effect on household food consumption (Devereux *et al.*, 2006) and a
53 reduction in ‘distress selling’ of assets as well as the protection of household assets (Slater *et al.*, 2006). Other social
54 protection instruments used occasionally in the global south are conditional cash transfers, near-cash instruments

1 such as vouchers and fee waivers, social funds, and specific services such as child protection, orphanages, and
2 rehabilitation for persons with disabilities (Heltberg *et al.*, 2009). In Bangladesh, recent experiences of asset
3 restocking following disasters (Devereux and Coll-Black, 2007; Marks, 2007; Tanner *et al.*, 2007) demonstrate that
4 such approaches can contribute to reducing vulnerability to climate shocks by providing liquidity and alternative
5 sources of income during times of household stress (Davies *et al.*, 2009). In addition, starter packs and seed fairs
6 have revealed success in boosting food production at the national and household level (Devereux and Coll-Black,
7 2007). These have been more commonly used in Africa, although concern has been expressed that inputs sourced
8 through commercial seed and fertilizer companies are sometimes inappropriate to local cropping patterns and agro-
9 ecological conditions (Davies *et al.*, 2009).

12 **13.5.3. Energy Access and Poverty Reduction**

14 There is a strong correlation between energy consumption, which accounts for the majority of global greenhouse gas
15 emissions, and per capita income (Edenhofer *et al.*, 2011; Modi *et al.*, 2005). Lack of access to adequate energy
16 limits economic and human development (AGECC (Advisory Group on Energy and Climate Change), 2010) and
17 access to modern energy services is a recognized prerequisite for achieving the MDGs (AGECC (Advisory Group
18 on Energy and Climate Change), 2010; GNESD (Global Network on Energy for Sustainable Development), 2007;
19 Modi *et al.*, 2005). Globally, 1.4 billion people do not have access to electricity and thus have no light in the
20 evening, poor access to modern communication technologies, inadequate education and health facilities, and limited
21 power for economic activities (IEA (International Energy Agency), 2011). The 3 billion people dependent on
22 traditional solid fuels for cooking energy (IEA (International Energy Agency), 2011), suffer the ill-effects of indoor
23 air pollution, which leads to 2 million premature deaths each year (Jerneck and Olsson, 2011), and spend a
24 significant amount of time collecting fuel (Jerneck, A., Olsson, L., 2012). Under business as usual scenarios, these
25 numbers will have changed little by 2030 (AGECC (Advisory Group on Energy and Climate Change), 2010; IEA
26 (International Energy Agency), 2011).

28 Access to affordable and reliable modern energy services can reduce household expenditure on energy, reduce the
29 opportunity cost of time spent collecting fuel, improve productivity and increase livelihood strategy options by
30 widening opportunities for productive activity (Practical Action, 2010). However, there is limited evidence that
31 access to modern energy directly or indirectly reduces income poverty. Access to modern fuels for cooking
32 improves health status, especially for women and children (Jerneck, A., Olsson, L., 2012; WHO (World Health
33 Organization) and UNDP (United Nations Development Programme), 2009), while access to electricity improves
34 people's sense of security and provides opportunities for lifestyle changes.

36 Renewable energy technologies can be used to increase access to modern energy services in developing countries
37 and minimize GHG emissions from the increased energy consumption associated with poverty reduction (Edenhofer
38 *et al.*, 2011). Their potential varies according to local geography and context (IEA (International Energy Agency),
39 2011). Apart from low GHG emissions, benefits from the use of renewable energy can be in cost-savings relative to
40 the use fossil fuels, in reduced dependency on imported fuels and in employment creation in the provision of
41 renewable energy services (Edenhofer *et al.*, 2011). Renewable electricity can be competitive under existing market
42 conditions, particularly for rural mini-grid and off grid schemes (IEA (International Energy Agency), 2011). The
43 competitiveness of renewable energy is improving as the cost of some renewable energy technologies falls (e.g.
44 solar PV and wind) (IEA (International Energy Agency), 2011) and the real cost of oil increases (Edenhofer *et al.*,
45 2011; IEA (International Energy Agency), 2011). However, renewable energy consumption by low-income
46 households will have a marginal impact on fuel imports. Currently, there is limited evidence to suggest that
47 renewable energy technologies have the potential to create more employment than conventional energy systems
48 (Akella *et al.*, 2009; Karakezi *et al.*, 2004).

51 **13.6. Synthesis and Research Gaps**

53 A growing body of literature addresses the linkages between poverty and climate change. However, there still exist
54 important gaps that make assessing the multi-scalar impacts of climate change on livelihoods and poverty a truly

1 daunting task. The most prevalent measurements of poverty focus on income or a combination of the MDGs, often
2 disregarding other dimensions of poverty and its inherent dynamics. Too little is known about the intensity of
3 poverty below the standard of the International Poverty Line, the distribution of poverty at lower levels of analysis
4 such as within households, poverty dynamics over time, and critical thresholds to long-lasting poverty traps that will
5 inhibit beneficial livelihood transformations under climate change. An appreciation of the multi-dimensional nature
6 of poverty is fundamental for understanding the complex poverty-livelihood-climate change nexus.

7
8 An assessment of current impacts of climate change on livelihoods and poverty has revealed the following key gaps.
9 First, there remains a lack of rigorous data collection and analysis, particularly with respect to ‘small’ disasters in
10 poor people’s lives that often go unnoticed (Ahmed *et al.*, 2009; Hardoy and Pandiella, 2009), leading to significant
11 underestimation of embodied experiences with climate change through the fabric of everyday life where loss and
12 harm remain largely undetected (Tschakert *et al.*, 2011). Hence, there is a need for more climatological research
13 informed by the needs of vulnerable livelihoods, for instance on the effects of changing winds as a combined result
14 of climate change and land cover change and their effects on increasing evaporation with implications for water
15 availability as well as changing diurnal temperature ranges important for various vector borne diseases, wellbeing
16 and heat stress on people, plants and livestock. Second, too few efforts have been made to understand the power
17 imbalances and the discriminatory institutional mechanisms that perpetuate inequality, particularly those linked to
18 gender, race, and ethnicity, and make certain groups of people particularly harmed by climate change (Alston, 2011;
19 Arora-Jonsson, 2011; Demetriades and Esplen, 2008). Third, very scant evidence exists on the impacts of climatic
20 changes on children (Bartlett, 2008; Pradhan *et al.*, 2007) and people with disabilities, both physical and mental.
21 Fourth, more research is needed to systematically assess shifts from transient to chronic poverty as a response to
22 climatic and non-climatic stressors. Many of these shifts remain hidden, incompletely captured in poverty statistics
23 and dominant disaster discourses. Fifth, there is a growing need to identify poverty traps and critical thresholds
24 triggered by climatic changes that push transient poor into a chronic state of poverty. Sixth, very limited research
25 exists to date that investigates the impacts of climate change and extreme events on poor people and livelihoods in
26 middle- to high-income countries, despite mounting examples of observed impacts, including the European heat
27 wave, Hurricane Katrina in the U.S., and the ten-year drought in Australia, as well as increasing evidence of rising
28 poverty and inequality in the global North (Gower *et al.*, 2012; New *et al.*, 2011). The large majority of current
29 research on the nexus between poverty and climate change is conducted in developing countries, mainly in the
30 poorest regions. Seventh, the complex linkages of climate change responses, livelihood trajectories, and poverty
31 dynamics deserves more concentrated attention. Finally, only scarce evidence exists that illustrates successful
32 livelihood transformations as a result of climatic and other environmental stresses.

33
34 Equally important are the gaps identified with respect to future climate impacts on livelihoods and poverty. First, it
35 is exceedingly difficult to foresee poverty levels for 2030 and beyond (Hertel *et al.*, 2010). Key assumptions in
36 economic analyses, such as constant within-country distribution of per-capita income over time and non-adjusted
37 agricultural prices, technology, and inputs, are restrictive when projecting poverty in the distant future (Seo *et al.*,
38 2009; Skoufias *et al.*, 2011b). Second, no prediction exists as to individual poverty trajectories, although higher
39 individual burden than aggregate national projections would be expected (Mendelsohn *et al.*, 2006). Third, not
40 enough consideration is given to extreme shock events that exceed historical evidence (Ahmed *et al.*, 2009) and
41 more diverse, low-probability-high impact scenarios (Burke *et al.*, 2011; New *et al.*, 2011; Nicholls *et al.*, 2011),
42 resulting in an underestimation of impacts on the lives and livelihoods of poor and marginalized people. Fourth,
43 projections across space and time make detection and attribution difficult as model parameters tend to vary
44 significantly. Fifth, the large majority of projections leave out adaptive and mitigative measures, including climate
45 change risk management tools, to reduce negative impacts on the poor (e.g., (Assuncao and Cheres, 2008; Iglesias *et*
46 *al.*, 2011; Jacoby *et al.*, 2011; Jones and Thornton, 2009; Liu *et al.*, 2008; Xu *et al.*, 2009)). Sixth, climate change
47 impacts are often projected onto estimates for agricultural production and economic growth, portraying a linear
48 relationship with poverty headcounts while omitting potentially more vital facets of multi-dimensional poverty.
49 Seventh, there is a lack of systematic research on the direct and indirect effects climate change instruments such as
50 the CDM and REDD on livelihoods and poverty, and how such research can inform policy formulation and
51 implementation processes. Finally, policy responses, especially when involving capital intensive and high-tech
52 agriculture for increasing agricultural production, need to be scrutinized for their impacts on the poor.

Frequently Asked Questions

FAQ 13.1: How important are climate change-driven impacts on poverty and livelihoods in comparison to other drivers and causes of poverty?

Poverty is a multi-faceted phenomenon, and climate change interacts with poverty in many different ways. There is clear evidence that direct impacts of climate extremes, such as floods, droughts, heat-waves, and hurricanes, are having profound effects on people who are poor and, consequently, less protected in terms of housing and infrastructure and less able to participate in decision-making on adaptation. People who are poor and are net buyers of food, particularly the urban poor, have been severely affected by increasing food prices. This is a major reason for the large number and even increasing number of food-insecure people across the world. Climate-related drivers often co-exist and amplify other drivers of poverty, such as lack of access to markets, credits, health services, unequal power structures, and political influence. Unfavorable natural conditions in terms of soils, climate, and geographical location also play important roles in combination with climate change impacts.

FAQ 13.2: What livelihoods are particularly vulnerable to climate change impacts?

Livelihoods that are closely intertwined with climate-sensitive natural resources, such as rain-fed agriculture, pastoralism, and fishing are particularly vulnerable to impacts of climate change. Livelihoods in climate-sensitive locations, such as low lying coastal areas, flood plains, dry-lands, and mountainous regions are also highly vulnerable. In urban areas, poor people are often forced to inhabit hazardous areas such as areas prone to floods and landslides. Urban slums are acutely vulnerable to combinations of heat-waves and high levels of air-pollution. Moreover, children- and female-headed households and other marginalized populations often suffer multiple deprivations and inequalities that make them exceedingly vulnerable to climatic and other stressors rather than their particular livelihood *per se*.

FAQ 13.3: Are there unintended and negative consequences of climate change policies for people who are poor?

Several climate change policies may be detrimental to people who are poor. For example, the production of biofuels such as ethanol and bio-diesel to replace petrol and diesel compete for agricultural land with food production. It is clear that many poor people across the world are suffering from exceptionally high food prices since 2008. There is most likely a link between biofuels and soaring food prices but the strength of it is unclear. The recent rapid increase in large scale land acquisitions, often detrimental to poor people, may also be to some extent linked to food and energy policies in the developed world. The construction of dams for hydro-electrical development is in many cases detrimental to poor people who may suffer from eviction or degradation of their livelihoods.

FAQ 13.4: What kind of climate change policies and instruments would best promote poor people's ability to move out of poverty?

Climate policies that not only address mitigation or adaptation but also the underlying structural causes of poverty and inequality will be most successful for enhancing livelihood resilience and poverty reduction. This includes adaptive social protection programs that foster asset protection and promotion as well as more inclusive participation in decision-making. On the mitigation front, provision of clean energy for cooking has a large potential for reducing emissions of both greenhouse gases and aerosols (soot) from burning of biomass, coal, or animal dung. Such mitigation policies would alleviate the reproductive hardship particularly for women and provide a range of other social, environmental, and economic co-benefits.

References

- Abam, T., C. Ofoegbu, C. Osadebe, and A. Gobo, 2000: Impact of hydrology on the Port-Harcourt–Patani-Warri road. *Environmental Geology*, **40**(1), 153-162.
- ActionAid, 2006: Climate Change and Smallholder Farmers in Malawi: Understanding Poor People's Experiences in Climate Change Adaptation, London, 8 pp.
- Adano, W.R., T. Dietz, K. Witsenburg, and F. Zaal, 2012: Climate change, violent conflict and local institutions in Kenya's drylands. *Journal of Peace Research*, **49**(1), 65-80.

- 1 Adebo, G.M. and T.A. Ayelari, 2011: Climate change and vulnerability of fish farmers in southwestern nigeria.
2 *African Journal of Agricultural Research*, **6(18)**, 4230-4238.
- 3 Adger et al., 2007: Chapter 17: Assessment of adaptation practices, options, constraints and capacity. In:
4 *Climate change 2007: Synthesis report. contribution of working groups I, II and III to the fourth assessment*
5 *report of the intergovernmental panel on climate change*. [IPCC (ed.)]. IPCC, Geneva, Switzerland.
- 6 Adger, W.N., 2010: Climate change, human well-being and insecurity. *New Political Economy*, **15(2)**, 275-292.
- 7 Adger, W.N., S. Dessai, M. Goulden, M. Hulme, I. Lorenzoni, D.R. Nelson, L.O. Naess, J. Wolf, and A. Wreford,
8 2009: Are there social limits to adaptation to climate change? *Climatic Change*, **93(3)**, 335-354.
- 9 Adger, W.N., S. Huq, K. Brown, D. Conway, and M. Hulme, 2003: Adaptation to climate change in the developing
10 world. *Progress in Development Studies*, **3(3)**, 179-195.
- 11 AGECC (Advisory Group on Energy and Climate Change), 2010: *Energy for a Sustainable Future: Summary*
12 *Report and Recommendations*, The United Nations, New York, .
- 13 Agrawal, A., D. Nepstad, and A. Chhatre, 2011: Reducing emissions from deforestation and forest degradation.
14 *Annual Review of Environment and Resources*, **36(1)**.
- 15 Agrawal, A. and N. Perrin, 2009: Climate adaptation, local institutions and rural livelihoods. *Adapting to Climate*
16 *Change: Thresholds, Values, Governance*, 350-367.
- 17 Aguilar, L., 2007: *Climate change briefing: Gender and climate Change–Women as agents of change*. The World
18 Conservation Union.
- 19 Ahmed, S.A., N.S. Diffenbaugh, and T.W. Hertel, 2009: Climate volatility deepens poverty vulnerability in
20 developing countries. *Environmental Research Letters*, **4**, 034004.
- 21 Ajanovic, A., 2011: Biofuels versus food production: Does biofuels production increase food prices? *Energy*, **36(4)**,
22 2070-2076.
- 23 Akella, A., R. Saini, and M. Sharma, 2009: Social, economical and environmental impacts of renewable energy
24 systems. *Renewable Energy*, **34(2)**, 390-396.
- 25 Aksoy, A. and A. Isik-Dikmelik, 2008: Are low food prices pro-poor? Net food buyers and sellers in low-income
26 countries.
- 27 Akter, S., R. Brouwer, P.J.H. van Beukering, L. French, E. Silver, S. Choudhury, and S.S. Aziz, 2011: Exploring the
28 feasibility of private micro flood insurance provision in bangladesh. *Disasters*, **35(2)**, 287-307.
- 29 Alderman, H., 2010: Safety nets can help address the risks to nutrition from increasing climate variability. *The*
30 *Journal of Nutrition*, **140(1)**, 148S-152S.
- 31 Alkire, S., 2005: *Valuing freedoms: Sen's capability approach and poverty reduction*. Oxford University Press,
32 USA.
- 33 Alkire, S. and J. Foster, 2011: Understandings and misunderstandings of multidimensional poverty measurement.
34 *Journal of Economic Inequality*, 1-26.
- 35 Alkire, S., J.M. Roche, M.E. Santos, and S. Seth, 2011: Multidimensional poverty index 2011: Brief methodological
36 note. *OPHI Website*.
- 37 Alkire, S. and M.E. Santos, 2010: Acute Multidimensional Poverty: A New Index for Developing Countries. UNDP.
38 Human Development Research Paper 2010/11, United Nations Development Program.
- 39 Allison, E.H., A.L. Perry, M.C. Badjeck, W. Neil Adger, K. Brown, D. Conway, A.S. Halls, G.M. Pilling, J.D.
40 Reynolds, and N.L. Andrew, 2009: Vulnerability of national economies to the impacts of climate change on
41 fisheries. *Fish and Fisheries*, **10(2)**, 173-196.
- 42 Alpizar, F., F. Carlsson, and M.A. Naranjo, 2011: The effect of ambiguous risk, and coordination on farmers'
43 adaptation to climate change--A framed field experiment. *Ecological Economics*.
- 44 Alston, M., 2010: Rural male suicide in australia. *Social Science & Medicine*.
- 45 Alston, M., 2011: Gender and climate change in australia. *Journal of Sociology*, **47(1)**, 53-70.
- 46 Anand, P., G. Hunter, and R. Smith, 2005: Capabilities and well-being: Evidence based on the Sen–Nussbaum
47 approach to welfare. *Social Indicators Research*, **74(1)**, 9-55.
- 48 Andersen, L. and D. Verner, 2009: Social impacts of climate change in Bolivia: A municipal level analysis of the
49 effects of recent climate change on life expectancy, consumption, poverty and inequality.
- 50 Anderson, D.M. and V. Broch-Due, 2000: *The poor are not us: Poverty and pastoralism in eastern Africa*. James
51 Currey Ltd.
- 52 Anderson, E., 2006: Potential impacts of climate change on \$2 a day poverty and child mortality in sub-Saharan
53 Africa and South Asia. Unpublished manuscript. *Overseas Development Institute.UK*.

- 1 Andersson, E., Gabrielsson, S., 2012: 'Because of poverty, we had to come together': Collective action for improved
2 food security in rural Kenya and Uganda. *International Journal of Agricultural Sustainability*, **in press**.
- 3 Anik, S.I. and M.A.S.A. Khan, 2011: Climate change adaptation through local knowledge in the north eastern region
4 of bangladesh. *Mitigation and Adaptation Strategies for Global Change*, 1-18.
- 5 Anseeuw, W., L.A. Wily, L. Cotula, and M. Taylor, 2012: Land Rights and the Rush for Land: Findings of the
6 Global Commercial Pressures on Land Research Project, International Land Coalition, Rome, 74 pp.
- 7 Antle, J.M. and J.J. Stoorvogel, 2009: Payments for ecosystem services, poverty and sustainability: The case of
8 agricultural soil carbon sequestration. *Payment for Environmental Services in Agricultural Landscapes*, 133-
9 161.
- 10 Apata, T.G., K. Samuel, and A. Adeola, 2009: Analysis of climate change perception and adaptation among arable
11 food crop farmers in south western Nigeria. In: Proceedings of Contributed paper prepared for presentation at
12 the international association of agricultural economists' 2009 conference, Beijing, China, August 16.
- 13 Ariza-Montobbio, P., S. Lele, G. Kallis, and J. Martinez-Alier, 2010: The political ecology of jatropha plantations
14 for biodiesel in Tamil Nadu, India. *The Journal of Peasant Studies*, **37(4)**, 875-897.
- 15 Arnall, A., K. Oswald, M. Davies, T. Mitchell, and C. Coirolo, 2010: Adaptive social protection: Mapping the
16 evidence and policy context in the agriculture sector in South Asia. *IDS Working Papers*, **2010(345)**, 01-92.
- 17 Arndt, C., R. Benfica, F. Tarv, J. Thurlow, and R. Uaiene, 2009: Biofuels, poverty, and growth: A computable
18 general equilibrium analysis of Mozambique. In: pp. 102008.
- 19 Arndt, C., R. Benfica, and J. Thurlow, 2011: Gender implications of biofuels expansion in Africa: The case of
20 mozambique. *World Development*.
- 21 Arora-Jonsson, S., 2011: Virtue and vulnerability: Discourses on women, gender and climate change. *Global
22 Environmental Change*.
- 23 Assuncao, J.J. and F.F. Cheres, 2008: Climate change, agricultural productivity and poverty. *Background Paper for
24 De La Torre, A., P.Fajnzylber, and J.Nash (2009), Low Carbon, High Growth—Latin American Responses to
25 Climate Change: An Overview.* Washington, DC: World Bank.
- 26 Auty, R.M. (ed.), 2004: *Resource abundance and economic development*. Oxford University Press, New York, pp.
27 356.
- 28 Ayers, J. and S. Huq, 2009: Community-based adaptation to climate change: An update. *IIED, London, UK*.
- 29 Ayyappan, R., S. Sankar, P. Rajkumar, and K. Balakrishnan, 2009: Work-related heat stress concerns in automotive
30 industries: A case study from Chennai, India. *Global Health Action*, **2**.
- 31 Baccini, M., A. Biggeri, G. Accetta, T. Kosatsky, K. Katsouyanni, A. Analitis, H.R. Anderson, L. Bisanti, D.
32 D'Ippoliti, and J. Danova, 2008: Heat effects on mortality in 15 European cities. *Epidemiology*, **19(5)**, 711.
- 33 Badjeck, M.C., E.H. Allison, A.S. Halls, and N.K. Dulvy, 2010: Impacts of climate variability and change on
34 fishery-based livelihoods. *Marine Policy*, **34(3)**, 375-383.
- 35 Baffes, J., T. Haniotis, and W. Bank, 2010: *Placing the 2006/08 commodity price boom into perspective*. World
36 Bank.
- 37 Balakrishnan, K., A. Ramalingam, V. Dasu, J.C. Stephen, M.R. Sivaperumal, D. Kumarasamy, K. Mukhopadhyay,
38 S. Ghosh, and S. Sambandam, 2010: Case studies on heat stress related perceptions in different industrial
39 sectors in southern India. *Global Health Action*, **3**.
- 40 Bandiera, O., I. Barankay, and I. Rasul, 2005: Cooperation in collective action*. *Economics of Transition*, **13(3)**,
41 473-498.
- 42 Barnett, B.J., C.B. Barrett, and J.R. Skees, 2008: Poverty traps and index-based risk transfer products. *World
43 Development*, **36(10)**, 1766-1785.
- 44 Barnett, J. and S. O'Neill, 2010: Maladaptation. *Global Environmental Change*, **20(2)**, 211-213.
- 45 Barnett, J. and M. Webber, 2010: Accommodating migration to promote adaptation to climate change. *World Bank
46 Policy Research Working Paper no.5270*.
- 47 Barrett, C., M. Bezuneh, D. Clay, and T. Reardon, 2001: Heterogeneous constraints, incentives and income
48 diversification strategies in rural Africa.
- 49 Barrett, C. and J. McPeak, 2006: Poverty traps and safety nets. *Poverty, Inequality and Development*, 131-154.
- 50 Barrientos, A., 2011: Social protection and poverty. *International Journal of Social Welfare*, **20(3)**, 240-249.
- 51 Barron, J., J. Rockström, F. Gichuki, and N. Hatibu, 2003: Dry spell analysis and maize yields for two semi-arid
52 locations in east africa. *Agricultural and Forest Meteorology*, **117(1-2)**, 23-37.
- 53 Bartlett, S., 2008: Climate change and urban children: Impacts and implications for adaptation in low-and middle-
54 income countries. *Environment and Urbanization*, **20(2)**, 501-519.

- 1 Basnet, R., 2009: Carbon ownership in community managed forests. *Journal of Forest and Livelihood*, **8(1)**, 77-83.
- 2 Basu, R. and J.M. Samet, 2002: Relation between elevated ambient temperature and mortality: A review of the
3 epidemiologic evidence. *Epidemiologic Reviews*, **24(2)**, 190-202.
- 4 Batterbury, S., 2001: Landscapes of diversity: A local political ecology of livelihood diversification in south-western
5 niger. *Cultural Geographies*, **8(4)**, 437-464.
- 6 Batterbury, S. and A. Warren, 2001: The African Sahel 25 years after the great drought: Assessing progress and
7 moving towards new agendas and approaches. *Global Environmental Change*, **11(1)**, 1-8.
- 8 Bebbington, A., 1999: Capitals and capabilities: A framework for analyzing peasant viability, rural livelihoods and
9 poverty. *World Development*, **27(12)**, 2021-2044.
- 10 Behrman, J., R. Meinzen-Dick, and A. Quisumbing, 2012: The gender implications of large-scale land deals.
11 *Journal of Peasant Studies*, **39(1)**, 49.
- 12 Bell, J., M. Brubaker, K. Graves, and J. Berner, 2010: Climate change and mental health: Uncertainty and
13 vulnerability for Alaska natives. *CCH Bulletin no*, **3**.
- 14 Bene, C., S. Devereux, and R. Sabates-Wheeler, 2012: *Impacts of covariate and idiosyncratic shocks on household
15 resilience: Analysis from Ethiopia's productive safety net programme. Manuscript in review.*
- 16 Berry, H.L., K. Bowen, and T. Kjellstrom, 2010: Climate change and mental health: A causal pathways framework.
17 *International Journal of Public Health*, **55(2)**, 123-132.
- 18 Bhattamishra, R. and C.B. Barrett, 2010: Community-based risk management arrangements: A review. *World
19 Development*, **38(7)**, 923-932.
- 20 Bibi, S., J. Cockburn, M. Coulibaly, and L. Tiberti, 2010: The impact of the increase in food prices on child poverty
21 and the policy response in mali. *Child Welfare in Developing Countries*, 247-296.
- 22 Biener, C. and M. Eling, 2012: Insurability in microinsurance markets: An analysis of problems and potential
23 solutions. *The Geneva Papers on Risk and Insurance-Issues and Practice*, **37(1)**, 77-107.
- 24 Bindi, M. and J.E. Olesen, 2011: The responses of agriculture in Europe to climate change. *Regional Environmental
25 Change*, **11**, 151-158.
- 26 Borges da Cunha, K., A. Walter, and F. Rei, 2007: CDM implementation in Brazil's rural and isolated regions: The
27 amazonian case. *Climatic Change*, **84(1)**, 111-129.
- 28 Borrás Jr, S. and J. Franco, 2011: Political dynamics of land grabbing in Southeast Asia: Understanding Europe's
29 role. *Amsterdam: Transnational Institute.*
- 30 Borrás Jr, S.M., R. Hall, I. Scoones, B. White, and W. Wolford, 2011: Towards a better understanding of global land
31 grabbing: An editorial introduction. *The Journal of Peasant Studies*, **38(2)**, 209-216.
- 32 Borrás, J., J. Franco, C. Kay, and M. Spoor, 2011: Land grabbing in Latin America and the Caribbean in broader
33 international perspectives. *Image [Node-Id]*.
- 34 Bourguignon, F., C. Diaz-Bonilla, and H. and Lofgren, 2008: *Aid, Service Delivery, and the Millennium
35 Development Goals in an Economy-Wide Framework*, The World Bank, Washington DC.
- 36 Boyd, E. and M.K. Goodman, 2011: The clean development mechanism as ethical development?: Reconciling
37 emissions trading and local development. *Journal of International Development*, **23(6)**, 836-854.
- 38 Boyd, E. and S. Juhola, 2009: Stepping up to the climate change: Opportunities in re - conceptualising development
39 futures. *Journal of International Development*, **21(6)**, 792-804.
- 40 Bradshaw, S., 2010: Women, poverty, and disasters: Exploring the links through Hurricane Mitch in Nicaragua. In:
41 *The international handbook of gender and poverty: Concepts, research, policy*. [Chant, S. (ed.)]. Edward Elgar
42 Pub, Cheltenham, UK, pp. 627.
- 43 Brockhaus, M. and H. Djoudi, 2008: Adaptation at the interface of forest ecosystem goods and services and
44 livestock production systems in northern Mali. *Center for International Forestry Research (CIFOR) Information
45 Brief.Bogor, Indonesia: CIFOR. [Http://www.Cifor.Cgiar.org/publications/pdf_files/Infobrief/019-
46 Infobrief.Pdf](http://www.Cifor.Cgiar.org/publications/pdf_files/Infobrief/019-Infobrief.Pdf)>. Accessed April, **19**, 2010.*
- 47 Brody, A., J. Demetriades, and E. Esplen, 2008: Gender and climate change: Mapping the linkages; A scoping study
48 on knowledge and gaps BRIDGE, institute of development studies, Brighton. *England. June.*
- 49 Brouwer, R., S. Akter, L. Brander, and E. Haque, 2007: Socioeconomic vulnerability and adaptation to
50 environmental risk: A case study of climate change and flooding in Bangladesh. *Risk Analysis*, **27(2)**, 313-326.
- 51 Buechler, S., 2009: Gender, water, and climate change in Sonora, Mexico: Implications for policies and programmes
52 on agricultural income-generation. *Gender & Development*, **17(1)**, 51-66.
- 53 Bullard, B.D. and B. Wright (eds.), 2009: *Race, place, and environmental justice after Hurricane Katrina: Struggles
54 to reclaim, rebuild, and revitalize New Orleans and the Gulf Coast*. Westview Press, Boulder, CO.

- 1 Bunce, M., S. Rosendo, and K. Brown, 2010a: Perceptions of climate change, multiple stressors and livelihoods on
2 marginal African coasts. *Environment, Development and Sustainability*, **12(3)**, 407-440.
- 3 Bunce, M., K. Brown, and S. Rosendo, 2010b: Policy misfits, climate change and cross-scale vulnerability in coastal
4 africa: How development projects undermine resilience. *Environmental Science & Policy*, **13(6)**, 485-497.
- 5 Burke et al., 2011: *Reefs at risk revisited* World Resources Institute, Washington, D.C.
- 6 Burke, M., J. Dykema, D. Lobell, E. Miguel, and S. Satyanath, 2011: Incorporating climate uncertainty into
7 estimates of climate change impacts, with applications to US and African agriculture. *NBER Working Paper no.*
8 *17092*.
- 9 Burton, I., E. Diringer, and J. Smith, 2006: *Adaptation to climate change: International policy options*. Pew Center
10 on Global Climate Change Arlington, VA.
- 11 Byg, A. and J. Salick, 2009: Local perspectives on a global phenomenon--climate change in eastern Tibetan villages.
12 *Global Environmental Change*, **19(2)**, 156-166.
- 13 Caldwell, T.M., A.F. Jorm, and K.B.G. Dear, 2004: Suicide and mental health in rural, remote and metropolitan
14 areas in Australia. *Medical Journal of Australia*, **181(7)**, 10.
- 15 Campbell, B., S. Mitchell, and M. Blackett, 2009: Responding to climate change in Vietnam. Opportunities for
16 improving gender equality. *Oxfam-UNDP Vietnam. Hanoi*.
- 17 Caplow, S., P. Jagger, K. Lawlor, and E. Sills, 2011: Evaluating land use and livelihood impacts of early forest
18 carbon projects: Lessons for learning about REDD. *Environmental Science & Policy*, **14(2)**, 152-167.
- 19 Carney, J., 1996: Converting the wetlands, engendering the environment. *Liberation Ecologies: Environment,*
20 *Development, Social Movements*, 165-186.
- 21 Carr, E.R., 2008: Between structure and agency: Livelihoods and adaptation in Ghana's central region. *Global*
22 *Environmental Change*, **18(4)**, 689-699.
- 23 Carter, M.R., P.D. Little, T. Mogue, and W. Negatu, 2007: Poverty traps and natural disasters in Ethiopia and
24 honduras. *World Development*, **35(5)**, 835-856.
- 25 Cashman, A., L. Nurse, and C. John, 2010: Climate change in the Caribbean: The water management implications.
26 *The Journal of Environment & Development*, **19(1)**, 42-67.
- 27 Challinor, A., T. Wheeler, C. Garforth, P. Craufurd, and A. Kassam, 2007: Assessing the vulnerability of food crop
28 systems in Africa to climate change. *Climatic Change*, **83(3)**, 381-399.
- 29 Chambers, R. and G. Conway, 1992: Sustainable rural livelihoods: Practical concepts for the 21st century.
- 30 Chen and Ravallion, 2012: an Update to the World Bank's Estimates of Consumption Poverty in the Developing
31 World. World Bank, Washington, D.C.
- 32 Chronic Poverty Research Centre, 2008: The Chronic Poverty Report 2008-09: Escaping Poverty Traps, Belmont
33 Press Limited, Northampton, U.K..
- 34 Chum, H., A. Faaij, J. Moreira, G. Berndes, P. Dhamija, H. Dong, B. Gabrielle, A. Goss Eng, W. Lucht, M.
35 Mapako, O. Masera Cerutti, T. McIntyre, T. Minowa, and K. Pingoud, 2011: Bioenergy. In: *IPCC special*
36 *report on renewable energy sources and climate change mitigation*. [Edenhofer, O., R. Pichs-Madruga, Y.
37 Sokona, K. Seyboth, P. Matschoss, S. Kadner et al.(eds.)]. Cambridge University Press, New York, pp. 209-
38 330; 2.
- 39 CIESIN, 2006: Where the Poor are: An Atlas of Poverty, Center for International Earth Science Information
40 Network, New York.
- 41 Collier, P., 2007: *The bottom billion*. Cambridge Univ Press.
- 42 Collier, P., G. Conway, and T. Venables, 2008: Climate change and Africa. *Oxford Review of Economic Policy*,
43 **24(2)**, 337-353.
- 44 Colten, C., R. Kates, and S. Laska, 2008: Community resilience: Lessons from New Orleans and hurricane Katrina.
45 *CARRI Research Report*, **3**.
- 46 Conway, D. and E.L.F. Schipper, 2011: Adaptation to climate change in Africa: Challenges and opportunities
47 identified from Ethiopia. *Global Environmental Change*, **21(1)**, 227-237.
- 48 Cooley, S.R. and S.C. Doney, 2009: Anticipating ocean acidification's economic consequences for commercial
49 fisheries. *Environmental Research Letters*, **4**, 024007.
- 50 Cooney, C.M., 2012: Managing the risks of extreme weather: IPCC special report. *Environmental Health*
51 *Perspectives*, **120(2)**, a58.
- 52 Cotula, L., S. Vermeulen, R. Leonard, and J. Keeley, 2009: *Land grab or development opportunity?: Agricultural*
53 *investment and international land deals in Africa*. IIED.

- 1 Coulthard, S., 2008: Adapting to environmental change in artisanal fisheries—insights from a south Indian lagoon.
2 *Global Environmental Change*, **18(3)**, 479-489.
- 3 Cranfield, J.A.L., P.V. Preckel, and T.W. Hertel, 2007: *Poverty analysis using an international cross-country*
4 *demand system*. World Bank Publications.
- 5 Cudjoe, G., C. Breisinger, and X. Diao, 2010: Local impacts of a global crisis: Food price transmission, consumer
6 welfare and poverty in Ghana. *Food Policy*, **35(4)**, 294-302.
- 7 D’Agostino, A.L. and B.K. Sovacool, 2011: Sewing climate-resilient seeds: Implementing climate change
8 adaptation best practices in rural Cambodia. *Mitigation and Adaptation Strategies for Global Change*, 1-22.
- 9 Daniel, S., 2011: Land grabbing and potential implications for world food security. *Sustainable Agricultural*
10 *Development*, 25-42.
- 11 Dankelman, I., 2010: Introduction: Exploring gender, environment, and climate change. In: *Gender and climate*
12 *change: An introduction*. [Dankelman, I. (ed.)]. Earthscan, London; Sterling, VA, pp. 1.
- 13 Dankelman, I., 2008: Gender, climate change and human security: Lessons from Bangladesh, Ghana and Senegal.
14 *Year: 2008*, 1.
- 15 Dasgupta, S., B. Laplante, C. Meisner, D. Wheeler, and D. Jianping Yan, 2007: The impact of sea level rise on
16 developing countries: A comparative analysis.
- 17 Dash, S. and T. Kjellstrom, 2011: Workplace heat stress in the context of rising temperature in India. *CURRENT*
18 *SCIENCE*, **101(4)**, 496.
- 19 Dauvergne, P. and K.J. Neville, 2009: The changing north–south and south–south political economy of biofuels.
20 *Third World Quarterly*, **30(6)**, 1087-1102.
- 21 Davies, M., B. Guenther, J. Leavy, T. Mitchell, and T. Tanner, 2009: Climate change adaptation, disaster risk
22 reduction and social protection: Complementary roles in agriculture and rural growth? *IDS Working Papers*,
23 **2009(320)**, 01-37.
- 24 Davies, M. and J.A. McGregor, 2009: Social protection: Responding to a global crisis. *IDS Bulletin*, **40(5)**, 68-77.
- 25 Davies, M., K. Oswald, and T. Mitchell, 2007: Climate change adaptation, disaster risk reduction and social
26 protection. *IDS in Focus Policy Briefing*, (2).
- 27 Davis, S.H., 2010: Indigenous peoples and climate change. *The International Indigenous Policy Journal*, **1(1)**, 2.
- 28 Dawson, R.J., T. Ball, J. Werritty, A. Werritty, J.W. Hall, and N. Roche, 2011: Assessing the effectiveness of non-
29 structural flood management measures in the Thames estuary under conditions of socio-economic and
30 environmental change. *Global Environmental Change*.
- 31 De Merode, E., K. Homewood, and G. Cowlshaw, 2004: The value of bushmeat and other wild foods to rural
32 households living in extreme poverty in Democratic Republic of Congo. *Biological Conservation*, **118(5)**, 573-
33 581.
- 34 de Sherbinin, A., M. Castro, F. Gemenne, M. Cernea, S. Adamo, P. Fearnside, G. Krieger, S. Lahmani, A. Oliver-
35 Smith, and A. Pankhurst, 2011: Preparing for resettlement associated with climate change. *Science*, **334(6055)**,
36 456-457.
- 37 Deacon, B. and S. Cohen, 2011: From the global politics of poverty alleviation to the global politics of social
38 solidarity. *Global Social Policy*, **11(2-3)**, 233-249.
- 39 Deininger, K.W., D. Byerlee, J.C.O.N. Lindsay, A.C.O.N. Norton, and H.C.O.N. Selod, 2011: *Rising global interest*
40 *in farmland: Can it yield sustainable and equitable benefits?* World Bank Publications.
- 41 Demetriades, J. and E. Esplen, 2008: The gender dimensions of poverty and climate change adaptation. *Ids Bulletin*,
42 **39(4)**, 24-31.
- 43 Denton, F., 2002: Climate change vulnerability, impacts, and adaptation: Why does gender matter? *Gender and*
44 *Development*, **10(2)**, 10-20.
- 45 Dercon, S., 2006: Vulnerability: A micro perspective. *Securing Development in an Unstable World*, 117-146.
- 46 Dercon, S., 2011: Social protection, efficiency and growth.
- 47 Devereux, S., Davies, M., McCord, A., Slater, R., Freeland, N., Ellis, F., White, P., 2010: Social protection in
48 Africa: Where next? Brighton.
- 49 Devereux, S. and S. Coll-Black, 2007: Review of evidence and evidence gaps on the effectiveness and impacts of
50 DFID-supported pilot social transfer schemes. *DFID Social Transfers Evaluation*.
- 51 Devereux, S. and R. Sabates-Wheeler, 2004: *Transformative social protection*. Institute of Development Studies.
- 52 Devereux, S., R. Sabates-Wheeler, M. Tefera, and H. Taye, 2006: Ethiopia’s productive safety net programme
53 (PSNP): Trends in PSNP transfers within targeted households. *Final Report for the Department for*

- 1 *International Development.DFID, Ethiopia and the Institute of Development Studies (IDS), University of*
2 *Sussex.Brighton and Addis Ababa.*
- 3 Di Falco, S. and E. Bulte, 2010: Social capital and weather shocks in Ethiopia: Climate change and culturally-
4 induced poverty traps. In: Proceedings of Centre for the study of African economies conference, Edinburgh,
5 UK.
- 6 Di Falco, S. and E. Bulte, 2011: The dark side of social capital: Kinship, consumption, and investment. *Journal of*
7 *Development Studies.*
- 8 Dossou, K.M.R. and B. Glehouenou-Dossou, 2007: The vulnerability to climate change of Cotonou (Benin) the rise
9 in sea level. *Environment and Urbanization*, **19(1)**, 65-79.
- 10 Douglas, I., K. Alam, M.A. Maghenda, Y. McDonnell, L. McLean, and J. Campbell, 2008: Unjust waters: Climate
11 change, flooding and the urban poor in Africa. *Environment and Urbanization*, **20(1)**, 187-205.
- 12 Eakin, H., A. Winkels, and J. Sendzimir, 2009: Nested vulnerability: Exploring cross-scale linkages and
13 vulnerability teleconnections in Mexican and Vietnamese coffee systems. *Environmental Science & Policy*,
14 **12(4)**, 398-412.
- 15 Eakin, H.C. and M.B. Wehbe, 2009: Linking local vulnerability to system sustainability in a resilience framework:
16 Two cases from Latin America. *Climatic Change*, **93(3)**, 355-377.
- 17 Easterly, W., 2006: *The white man's burden: Why the west's efforts to aid the rest have done so much ill and so little*
18 *good.* Penguin Group USA.
- 19 Eastham, J., F. Mpelasoka, M. Mainuddin, C. Ticehurst, P. Dyce, G. Hodgson, R. Ali, and M. Kirby, 2008: Mekong
20 river basin water resources assessment: Impacts of climate change. *Australian Commonwealth Scientific and*
21 *Research Organization: Water for a Healthy Country National Research Flagship.* Canberra, Australia.
- 22 Edenhofer, O., R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G.
23 Hansen, and S. Schlömer, 2011: *The IPCC special report on renewable energy sources and climate change*
24 *mitigation* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- 25 Elbers, C., J.W. Gunning, and B. Kinsey, 2007: Growth and risk.
- 26 Ellis, F., M. Kutengule, and A. Nyasulu, 2003: Livelihoods and rural poverty reduction in Malawi. *World*
27 *Development*, **31(9)**, 1495-1510.
- 28 Elobeid, A. and C. Hart, 2008: Ethanol expansion in the food versus fuel debate: How will developing countries
29 fare? *Journal of Agricultural & Food Industrial Organization*, **5(2)**, 1-21.
- 30 El-Raey, M., K. Dewidar, and M. El-Hattab, 1999: Adaptation to the impacts of sea level rise in Egypt. *Mitigation*
31 *and Adaptation Strategies for Global Change*, **4(3)**, 343-361.
- 32 Eriksen, S. and J. Lind, 2009: Adaptation as a political process: Adjusting to drought and conflict in Kenya's
33 drylands. *Environmental Management*, **43(5)**, 817-835.
- 34 Eriksen, S. and A. Marin, 2011: Pastoral Pathways. Climate Change Adaptation Lessons from Ethiopia, Department
35 of International Environment and Development Studies, Norwegian University of Life Sciences, Aas, Norway.
- 36 Eriksen, S. and J.A. Silva, 2009: The vulnerability context of a savanna area in Mozambique: Household drought
37 coping strategies and responses to economic change. *Environmental Science & Policy*, **12(1)**, 33-52.
- 38 Eriksen, S.H., K. Brown, and P.M. Kelly, 2005: The dynamics of vulnerability: Locating coping strategies in Kenya
39 and Tanzania. *The Geographical Journal*, **171(4)**, 287-305.
- 40 Eriksen, S.H. and K. O'BRIEN, 2007: Vulnerability, poverty and the need for sustainable adaptation measures.
41 *Climate Policy*, **7(4)**, 337-352.
- 42 Estrada, M. and E. Corbera, 2012: The potential of carbon offsetting projects in the forestry sector for poverty
43 reduction in developing countries. *Integrating Ecology and Poverty Reduction*, 137-147.
- 44 Fankhauser, S. and G. Schmidt-Traub, 2011: From adaptation to climate-resilient development: The costs of
45 climate-proofing the millennium development goals in Africa. *Climate and Development*, **3(2)**, 94-113.
- 46 Fashae, O.A. and O.D. Onafeso, 2011: Impact of climate change on sea level rise in Lagos, Nigeria. *International*
47 *Journal of Remote Sensing*, **32(24)**, 9811-9819.
- 48 Feng, S., A.B. Krueger, and M. Oppenheimer, 2010: Linkages among climate change, crop yields and Mexico-US
49 cross-border migration. *Proceedings of the National Academy of Sciences*, **107(32)**, 14257-14262.
- 50 Ferraro, P.J., M.M. Hanauer, and K.R.E. Sims, 2011: Conditions associated with protected area success in
51 conservation and poverty reduction. *Proceedings of the National Academy of Sciences*, **108(34)**, 13913-13918.
- 52 Field et. al., 2012: Summary for Policymakers. in: *Managing the Risks of Extreme Events and Disasters to Advance*
53 *Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on*
54 *Climate Change*, IPCC, Cambridge University Press, Cambridge, U.K. and New York, N.Y., USA.

- 1 Ford, J., T. Pearce, B. Smit, J. Wandel, M. Allurut, K. Shappa, H. Ittusujurat, and K. Qrunnut, 2007: Reducing
2 vulnerability to climate change in the arctic: The case of Nunavut, Canada. *Arctic*, 150-166.
- 3 Ford, J.D., 2009a: Dangerous climate change and the importance of adaptation for the Arctic's Inuit population.
4 *Environmental Research Letters*, **4**, 024006.
- 5 Ford, J.D., 2009b: Vulnerability of Inuit food systems to food insecurity as a consequence of climate change: A case
6 study from Igloodik, Nunavut. *Regional Environmental Change*, **9(2)**, 83-100.
- 7 Fortin, E., 2011: Multi-stakeholder initiatives to regulate biofuels: The roundtable for sustainable biofuels.
- 8 Frumkin, H., J. Hess, G. Luber, J. Malilay, and M. McGeehin, 2008: Climate change: The public health response.
9 *American Journal of Public Health*, **98(3)**, 435.
- 10 Funk, C., M.D. Dettinger, J.C. Michaelsen, J.P. Verdin, M.E. Brown, M. Barlow, and A. Hoell, 2008: Warming of
11 the indian ocean threatens eastern and southern African food security but could be mitigated by agricultural
12 development. *Proceedings of the National Academy of Sciences*, **105(32)**, 11081.
- 13 Furgal, C. and J. Seguin, 2006: Climate change, health, and vulnerability in Canadian northern aboriginal
14 communities. *Environmental Health Perspectives*, **114(12)**, 1964.
- 15 Füssel, H.M., 2007: Adaptation planning for climate change: Concepts, assessment approaches, and key lessons.
16 *Sustainability Science*, **2(2)**, 265-275.
- 17 Gabriëlsson, S., S. Brogaard, and A. Jerneck, 2012 (forthcoming): Living without buffers: Illustrating climate
18 vulnerability in the Lake Victoria Basin. *Sustainability Science*, **x(x)**, 1-x.
- 19 Gabriëlsson, S. and V. Ramasar, 2012: Widows: Agents of change in a climate of water uncertainty. *Journal of*
20 *Cleaner Production*.
- 21 Gaiha, R. and A.B. Deolalikar, 1993: Persistent, expected and innate poverty: Estimates for semi-arid rural south
22 india, 1975-1984. *Cambridge Journal of Economics*, **17(4)**, 409-421.
- 23 Galaz, V., F. Moberg, T.E. Downing, F. Thomalla, and K. Warner, 2008: Ecosystem under pressure. *Commission on*
24 *Climate Change and Development. Commission on Climate Change and Development*.
- 25 Gasper, D., 2010: Climate change and the language of human security. *ISS Working Paper Series/General Series*,
26 **505(505)**.
- 27 Ghosh, J., 2010: The unnatural coupling: Food and global finance. *Journal of Agrarian Change*, **10(1)**, 72-86.
- 28 Gilbert, G. and R. McLeman, 2010: Household access to capital and its effects on drought adaptation and migration:
29 A case study of rural Alberta in the 1930s. *Population & Environment*, **32(1)**, 3-26.
- 30 Gilligan, D.O., J. Hoddinott, and A.S. Taffesse, 2009: The impact of Ethiopia's productive safety net programme
31 and its linkages. *The Journal of Development Studies*, **45(10)**, 1684-1706.
- 32 Giné, X., R. Townsend, and J. Vickery, 2008: Patterns of rainfall insurance participation in rural India. *The World*
33 *Bank Economic Review*, **22(3)**, 539-566.
- 34 Gippner, O., S. Dhakal, and B.K. Sovacool, 2012: Microhydro electrification and climate change adaptation in
35 nepal: Socioeconomic lessons from the rural energy development program (REDP). *Mitigation and Adaptation*
36 *Strategies for Global Change*, 1-21.
- 37 Giraldo, A., E. Rettore, and U. Trivellato, 2002: The persistence of poverty: True state dependence or unobserved
38 heterogeneity? some evidence from the Italian survey on household income and wealth. In: Proceedings of 27th
39 general conference of the international association for research in income and wealth, Stockholm.
- 40 Githeko, A.K. and W. Ndegwa, 2001: Predicting malaria epidemics in the Kenyan highlands using climate data: A
41 tool for decision makers. *Global Change & Human Health*, **2(1)**, 54-63.
- 42 Glassman, A., D. Duran, and A. Sumner, 2011: Global health and the new bottom billion: How funders should
43 respond to shifts in global poverty and disease burden.
- 44 Glenna, L. and D.R. Cahoy, 2009: Agribusiness concentration, intellectual property, and the prospects for rural
45 economic benefits from the emerging biofuel economy. *Southern Rural Sociology*, **24(2)**, 111-129.
- 46 GNESD (Global Network on Energy for Sustainable Development), 2007: *Reaching the Millennium Development*
47 *Goals and Beyond: Access to Modern Forms of Energy as a Prerequisite*, Global Network On Energy For
48 Sustainable Development-UNEP.
- 49 Gong, Y., 2010: Integrating social capital into institutional analysis of the Guangxi CDM forest-based carbon
50 sequestration project. *EEPSEA Special and Technical Paper*.
- 51 Gopinathan, M.C. and R. Sudhakaran, 2011: Biofuels: Opportunities and challenges in India. *Biofuels*, 173-209.
- 52 Gotschi, E., J. Njuki, and R. Delve, 2008: Gender equity and social capital in smallholder farmer groups in central
53 Mozambique. *Development in Practice*, **18(4-5)**, 650-657.

- 1 Gough, I., 2012: From financial crisis to fiscal crisis. In: *Social policy in challenging times: Economic crisis and*
2 *welfare systems*. [Farnsworth, K. and Z. Irving (eds.)]. The Policy Press, Bristol, pp. 49.
- 3 Gower et. al., 2012: Left Behind by the G20? Oxfam GB, U.K.
- 4 Green, D., L. Alexander, K. McInnes, J. Church, N. Nicholls, and N. White, 2010: An assessment of climate change
5 impacts and adaptation for the Torres Strait Islands, Australia. *Climatic Change*, **102(3)**, 405-433.
- 6 Haarstad, H. and A.L. St Clair, 2011: Social policy and global poverty: Beyond the residual paradigm? *Global*
7 *Social Policy*, **11(2-3)**, 214-219.
- 8 Hahn, G., 1997: Dynamic responses of cattle to thermal heat loads. *Journal of Animal Science*, **77(suppl 2)**, 10-20.
- 9 Hall, J., S. Matos, L. Severino, and N. Beltrão, 2009: Brazilian biofuels and social exclusion: Established and
10 concentrated ethanol versus emerging and dispersed biodiesel. *Journal of Cleaner Production*, **17**, S77-S85.
- 11 Halstead, P. and J. O'shea, 2004: Bad year economics. *Cambridge Books*.
- 12 Hamilton, K., M. Sjardin, M. Peters-Stanley, and T. Marcello, 2010: Building bridges: State of the voluntary carbon
13 markets 2010. *Ecosystem Marketplace & Bloomberg New Energy Finance*.
- 14 Hanff, E., M. Dabat, and J. Blin, 2011: Are biofuels an efficient technology for generating sustainable development
15 in oil-dependent African nations? A macroeconomic assessment of the opportunities and impacts in Burkina
16 Faso. *Renewable and Sustainable Energy Reviews*, **15(5)**, 2199-2209.
- 17 Hardoy, J. and G. Pandiella, 2009: Urban poverty and vulnerability to climate change in Latin America.
18 *Environment and Urbanization*, **21(1)**, 203.
- 19 Hassan, R. and C. Nhemachena, 2008: Determinants of African farmers' strategies for adapting to climate change:
20 Multinomial choice analysis. *African Journal of Agricultural and Resource Economics*, **2(1)**, 83-104.
- 21 Hayes, T. and L. Persha, 2010: Nesting local forestry initiatives: Revisiting community forest management in a
22 REDD+ world. *Forest Policy and Economics*, **12(8)**, 545-553.
- 23 Hellmuth, M.E. and International Research Institute for Climate and Society, 2007: *Climate risk management in*
24 *Africa: Learning from practice*. International Research Institute for Climate and Society, the Earth Institute at
25 Columbia University.
- 26 Heltberg, R., R. Prabhu, and H. Gitay, 2010: Community-based adaptation: Lessons from the development
27 marketplace 2009 on adaptation to climate change.
- 28 Heltberg, R., P.B. Siegel, and S.L. Jorgensen, 2009: Addressing human vulnerability to climate change: Toward a
29 'no-regrets' approach. *Global Environmental Change*, **19(1)**, 89-99.
- 30 Hertel, T.W., M.B. Burke, and D.B. Lobell, 2010: The poverty implications of climate-induced crop yield changes
31 by 2030. *Global Environmental Change*, **20(4)**, 577-585.
- 32 Hertel, T.W. and S.D. Rosch, 2010: Climate change, agriculture, and poverty. *Applied Economic Perspectives and*
33 *Policy*, **32(3)**, 355-385.
- 34 Hinojosa-Valencia, L., A. Bebbington, and A. Barrientos, 2012: Social policy and state revenues in mineral-rich
35 contexts.
- 36 Hirschman, A.O., 1988: *The strategy of economic development*. Westview Press.
- 37 Hollander, G., 2010: Power is sweet: Sugarcane in the global ethanol assemblage. *The Journal of Peasant Studies*,
38 **37(4)**, 699-721.
- 39 Hope Sr, K.R., 2009: Climate change and poverty in Africa. *International Journal of Sustainable Development &*
40 *World Ecology*, **16(6)**, 451-461.
- 41 Horton, G., L. Hanna, and B. Kelly, 2010: Drought, drying and climate change: Emerging health issues for ageing
42 australians in rural areas. *Australasian Journal on Ageing*, **29(1)**, 2-7.
- 43 Howden, S.M., J.F. Soussana, F.N. Tubiello, N. Chhetri, M. Dunlop, and H. Meinke, 2007: Adapting agriculture to
44 climate change. *Proceedings of the National Academy of Sciences*, **104(50)**, 19691.
- 45 Huang, C., A.G. Barnett, X. Wang, P. Vaneckova, G. FitzGerald, and S. Tong, 2011: Projecting future heat-related
46 mortality under climate change scenarios: A systematic review. *Environmental Health Perspectives*, **119(12)**,
47 1681.
- 48 Hulme, D. and A. Shepherd, 2003: Conceptualizing chronic poverty. *World Development*, **31(3)**, 403-423.
- 49 Huq, S., F. Yamin, A. Rahman, A. Chatterjee, X. Yang, S. Wade, V. Orindi, and J. Chigwada, 2005: Linking
50 climate adaptation and development: A synthesis of six case studies from Asia and Africa. *IDS Bulletin*, **36(4)**,
51 117-122.
- 52 IEA (International Energy Agency), 2011: *World Energy Outlook 2011*, IEA/OECD, Paris.
- 53 IFAD, 2011: Rural Poverty Report 2011. New Realities, New Challenges: New Opportunities for Tomorrow's
54 Generation, International Fund for Agricultural Development, Rome, Italy.

- 1 Iglesias, A., S. Quiroga, and A. Diz, 2011: Looking into the future of agriculture in a changing climate. *European*
2 *Review of Agricultural Economics*, **38(3)**, 427-447.
- 3 IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth
4 Assessment Report of the Intergovernmental Panel on Climate Change [IPCC, Geneva, Switzerland.
- 5 Iwasaki, S., B.H.N. Razafindrabe, and R. Shaw, 2009: Fishery livelihoods and adaptation to climate change: A case
6 study of Chilika lagoon, India. *Mitigation and Adaptation Strategies for Global Change*, **14(4)**, 339-355.
- 7 Jabeen, H., C. Johnson, and A. Allen, 2010: Built-in resilience: Learning from grassroots coping strategies for
8 climate variability. *Environment and Urbanization*, **22(2)**, 415-431.
- 9 Jackson, C., 1993: Doing what comes naturally? Women and environment in development. *World Development*,
10 **21(12)**, 1947-1963.
- 11 Jacoby, H., M. Rabassa, and E. Skouas, 2011: *Distributional implications of climate change in India*. World Bank.
- 12 Jalan, J. and M. Ravallion, 1998: Transient poverty in postreform rural china. *Journal of Comparative Economics*,
13 **26(2)**, 338-357.
- 14 Jalan, J. and M. Ravallion, 2000: Is transient poverty different? evidence for rural china. *The Journal of*
15 *Development Studies*, **36(6)**, 82-99.
- 16 Jarosz, L., 2011: Growing inequality: Agricultural revolutions and the political ecology of rural development.
- 17 Jasparro, C. and J. Taylor, 2008: Climate change and regional vulnerability to transnational security threats in
18 Southeast Asia. *Geopolitics*, **13(2)**, 232-256.
- 19 Jerneck, A., Olsson, L., 2012: Smoke, soot and sufferings: A gender sensitive call for clean cooking in synergy with
20 cuts in carbon emissions in times of climate change. *Journal of Cleaner Production*, **forthcoming**.
- 21 Jerneck, A. and L. Olsson, 2008: Adaptation and the poor: Development, resilience and transition. *Climate Policy*,
22 **8(2)**, 170-182.
- 23 Jerneck, A. and L. Olsson, 2011: Breaking out of sustainability impasses: How to apply frame analysis, reframing
24 and transition theory to global health challenges. *Environmental Innovation and Societal Transitions*, **1(2)**, 255-
25 271.
- 26 Jindal, R., B. Swallow, and J. Kerr, 2008: Forestry - based carbon sequestration projects in Africa: Potential benefits
27 and challenges. In: pp. 116-130.
- 28 Jindal, R., L. Tacconi, S. Mahanty, and H. Suich, 2010: Livelihood impacts of payments for forest carbon services:
29 Field evidence from Mozambique. *Payments for Environmental Services, Forest Conservation and Climate*
30 *Change: Livelihoods in the REDD?*, 185-211.
- 31 Jones, G., R.W. Steketee, R.E. Black, Z.A. Bhutta, and S.S. Morris, 2003: How many child deaths can we prevent
32 this year? *The Lancet*, **362(9377)**, 65-71.
- 33 Jones, P.G. and P.K. Thornton, 2009: Croppers to livestock keepers: Livelihood transitions to 2050 in Africa due to
34 climate change. *Environmental Science & Policy*, **12(4)**, 427-437.
- 35 Kabubo-Mariara, J., 2009: Global warming and livestock husbandry in Kenya: Impacts and adaptations. *Ecological*
36 *Economics*, **68(7)**, 1915-1924.
- 37 Kabubo - Mariara, J., 2008: Climate change adaptation and livestock activity choices in Kenya: An economic
38 analysis. In: pp. 131-141.
- 39 Kaiser, R., C.H. Rubin, A.K. Henderson, M.I. Wolfe, S. Kieszak, C.L. Parrott, and M. Adcock, 2001: Heat-related
40 death and mental illness during the 1999 Cincinnati heat wave. *The American Journal of Forensic Medicine and*
41 *Pathology*, **22(3)**, 303.
- 42 Kakota, T., D. Nyariki, D. Mkwambisi, and W. Kogi-Makau, 2011: Gender vulnerability to climate variability and
43 household food insecurity. *Climate and Development*, **3(4)**, 298-309.
- 44 Kamadi, G., February 9, 2011: *Erratic rainfall driving switch from maize to potatoes in Kenya* AlertNet.
- 45 Kambon, A., 2005: Assessment of vulnerability and resilience in PRSPs- April 2005 -. also noting the Social
46 vulnerability and PRSPs. presented at launch of the MDGR for Barbados and the OECS and dialogue to review
47 PRSPs and IPRSPs 2005. In: Barbados.
- 48 Kandioti, D., 1998: Gender, power, and contestation: 'Rethinking bargaining with patriarchy. In: *Feminist visions of*
49 *development: Gender analysis and policy*. [Jackson, C. and R. Pearson(eds.)]. Psychology Press, pp. 135-
50 151151.
- 51 Kanowski, P.J., C.L. McDermott, and B.W. Cashore, 2011: Implementing REDD: Lessons from analysis of forest
52 governance. *Environmental Science & Policy*, **14(2)**, 111-117.
- 53 Karakezi, S., K. Lata, and S.T. and Coelho, 2004: *Traditional Biomass Energy: Improving its use and Moving to*
54 *Modern Energy use*, International Conference for Renewable Energies, Bonn, .

- 1 Kates, R.W., 2000: Cautionary tales: Adaptation and the global poor. *Climatic Change*, **45(1)**, 5-17.
- 2 Kelly, U.A., 2009: Learning to lose: Rurality, transience, and belonging (A companion to Michael Corbett). *Journal*
3 *of Research in Rural Education*, **24(11)**, 4.
- 4 Keogh, D.U., A. Apan, S. Mushtaq, D. King, and M. Thomas, 2011: Resilience, vulnerability and adaptive capacity
5 of an inland rural town prone to flooding: A climate change adaptation case study of Charleville, Queensland,
6 Australia. *Natural Hazards*, 1-25.
- 7 Keskinen, M., S. Chinvano, M. Kummu, P. Nuorteva, A. Snidvongs, O. Varis, and K. Västilä, 2010: Climate
8 change and water resources in the lower Mekong River basin: Putting adaptation into the context.
- 9 Khoday, K. and L. Perch, 2012: *Working Paper no 91*. Development from Below: Social Accountability in Natural
10 Resource Management. International Policy Center for Inclusive Growth; United Nations Development
11 Program, Brasilia, Brazil.
- 12 Kiss, A., G. Castro, and K. Newcombe, 2002: The role of multilateral institutions. *Philosophical Transactions of the*
13 *Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences*, **360(1797)**, 1641-1652.
- 14 Klein, R.J.T., E.L.F. Schipper, and S. Dessai, 2005: Integrating mitigation and adaptation into climate and
15 development policy: Three research questions. *Environmental Science & Policy*, **8(6)**, 579-588.
- 16 Knowlton, K., B. Lynn, R.A. Goldberg, C. Rosenzweig, C. Hogrefe, J.K. Rosenthal, and P.L. Kinney, 2007:
17 Projecting heat-related mortality impacts under a changing climate in the New York City region. *American*
18 *Journal of Public Health*, **97(11)**, 2028.
- 19 Kollmuss, A., H. Zink, and C. Polycarp, 2008: Making sense of the voluntary carbon market: A comparison of
20 carbon offset standards. *WWF Germany*.
- 21 Kuriakose, A.T., R. Heltberg, W. Wiseman, C. Costella, R. Cipryk, and S. Cornelius, 2012: *Climate Responsive*
22 *Social Protection*.
- 23 Kurukulasuriya, P., R. Mendelsohn, R. Hassan, J. Benhin, T. Deressa, M. Diop, H.M. Eid, K.Y. Fosu, G. Gbetibouo,
24 and S. Jain, 2006: Will African agriculture survive climate change? *The World Bank Economic Review*, **20(3)**,
25 367-388.
- 26 KUSHNER, B., P. EDWARDS, L. BURKE, and E. COOPER, 2011: Coastal capital: Jamaica.
- 27 Laderach, P., M. Lundy, A. Jarvis, J. Ramirez, E.P. Portilla, K. Schepp, and A. Eitzinger, 2011: Predicted impact of
28 climate change on coffee supply chains. *The Economic, Social and Political Elements of Climate Change*, 703-
29 723.
- 30 Laderchi, C.R., R. Saith, and F. Stewart, 2003: Does it matter that we do not agree on the definition of poverty? A
31 comparison of four approaches. *Oxford Development Studies*, **31(3)**, 243-274.
- 32 Lambrou, Y. and G. Paina, 2006: *Gender: The missing component of the response to climate change*. Food and
33 Agriculture Organization of the United Nations (FAO).
- 34 Larson, A.M., 2011: Forest tenure reform in the age of climate change: Lessons for REDD. *Global Environmental*
35 *Change*, **21(2)**, 540-549.
- 36 Lawson, V. and A.Ó.L.S. Clair, 2009: Global poverty studies and human security. *GECHS Synthesis Human*
37 *Security in an Era of Global Change*, 35.
- 38 Le Billon, P., 2001: The political ecology of war: Natural resources and armed conflicts. *Political Geography*, **20(5)**,
39 561-584.
- 40 Leach, M., R. Mearns, and I. Scoones, 1999: Environmental entitlements: Dynamics and institutions in community-
41 based natural resource management. *World Development*, **27(2)**, 225-247.
- 42 Leary, N., 2008: *Climate change and adaptation*. Earthscan/James & James.
- 43 Leichenko, R.M. and K.L. O'Brien, 2008: *Environmental change and globalization: Double exposures*. Oxford
44 University Press, USA.
- 45 Lemos, M.C., E. Boyd, E.L. Tompkins, H. Osbahr, and D. Liverman, 2007: Developing adaptation and adapting
46 development. *Ecology and Society*, **12(2)**, 26.
- 47 Lewis, K., S. Burd-Sharps, and Social Science Research Council (US). American Human Development Project,
48 2010: *A century apart: New measures of well-being for US racial and ethnic groups*. American Human
49 Development Project of the Social Science Research Council.
- 50 Linnerooth-Bayer, J. and R. Mechler, 2006: Insurance for assisting adaptation to climate change in developing
51 countries: A proposed strategy. *Climate Policy*, **6(6)**, 621-636.
- 52 Little, P.D., J. McPeak, C.B. Barrett, and P. Kristjanson, 2008: Challenging orthodoxies: Understanding poverty in
53 pastoral areas of East Africa. *Development and Change*, **39(4)**, 587-611.

- 1 Liu, J., S. Fritz, C. Van Wesenbeeck, M. Fuchs, L. You, M. Obersteiner, and H. Yang, 2008: A spatially explicit
2 assessment of current and future hotspots of hunger in sub-Saharan Africa in the context of global change.
3 *Global and Planetary Change*, **64(3-4)**, 222-235.
- 4 Liverman, D.M., 2009: Conventions of climate change: Constructions of danger and the dispossession of the
5 atmosphere. *Journal of Historical Geography*, **35(2)**, 279-296.
- 6 Lobell, D.B., M.B. Burke, C. Tebaldi, M.D. Mastrandrea, W.P. Falcon, and R.L. Naylor, 2008: Prioritizing climate
7 change adaptation needs for food security in 2030. *Science*, **319(5863)**, 607-610.
- 8 Lovell, H.C., 2010: Governing the carbon offset market. *Wiley Interdisciplinary Reviews: Climate Change*, **1(3)**,
9 353-362.
- 10 Lusardi, A., D.J. Schneider, and P. Tufano, 2011: *Financially Fragile Households: Evidence and Implications*.
- 11 MacGregor, S., 2010: 'Gender and climate change': From impacts to discourses. *Journal of the Indian Ocean*
12 *Region*, **6(2)**, 223-238.
- 13 MacKerron, G.J., C. Egerton, C. Gaskell, A. Parpia, and S. Mourato, 2009: Willingness to pay for carbon offset
14 certification and co-benefits among (high-) flying young adults in the UK. *Energy Policy*, **37(4)**, 1372-1381.
- 15 Mahul, O., N. Belete, and A. Goodland, 2009: *Index-based livestock insurance in Mongolia*. International Food
16 Policy Research Institute (IFPRI).
- 17 Manzo, K., 2010: Imaging vulnerability: The iconography of climate change. *Area*, **42(1)**, 96-107.
- 18 Marks, M., 2007: Economic impact of cattle transfers during the CLP's asset transfer programme. *Dhaka: Chars*
19 *Livelihood Programme*.
- 20 Matsuert, H., J. Kariuki, and A. Mude, 2011: Index-based livestock insurance for Kenyan pastoralists: An
21 innovation systems perspective. *Development in Practice*, **21(3)**, 343-356.
- 22 McCarthy, J.J., M.L. Martello, R. Corell, N.E. Selin, S. Fox, G. Hovelsrud-Broda, S.D. Mathiesen, C. Polsky, H.
23 Selin, and N.J.C. Tyler, 2005: Climate change in the context of multiple stressors and lead author. *Methods*.
- 24 McCord, M.J. and C. Churchill, 2005: CGAP Working Group on Microinsurance Good and Bad Practices Case
25 Study no. 7, Delta Life, Bangladesh.
- 26 McCright, A.M. and R.E. Dunlap, 2000: Challenging global warming as a social problem: An analysis of the
27 conservative movement's counter-claims. *Soc.Probs.*, **47**, 499.
- 28 McDermott, C.L., K. Levin, and B. Cashore, 2011: Building the forest-climate bandwagon: REDD and the logic of
29 problem amelioration. *Global Environmental Politics*, **11(3)**, 85-103.
- 30 McGranahan, G., D. Balk, and B. Anderson, 2007: The rising tide: Assessing the risks of climate change and human
31 settlements in low elevation coastal zones. *Environment and Urbanization*, **19(1)**, 17-37.
- 32 McGregor, G., M. Cox, Y. Cui, Z. Cui, M. Davey, R. Graham, and A. Brookshaw, 2006: Winter-season climate
33 prediction for the UK health sector. *Journal of Applied Meteorology and Climatology*, **45(12)**, 1782-1792.
- 34 McKay, A. and D. Lawson, 2003: Assessing the extent and nature of chronic poverty in low income countries:
35 Issues and evidence. *World Development*, **31(3)**, 425-439.
- 36 McLeman, R. and B. Smit, 2006: Migration as an adaptation to climate change. *Climatic Change*, **76(1)**, 31-53.
- 37 McSweeney, K. and O.T. Coomes, 2011: Climate-related disaster opens a window of opportunity for rural poor in
38 northeastern honduras. *Proceedings of the National Academy of Sciences*, **108(13)**, 5203.
- 39 Mearns, R. and A. Norton, 2010: *Social dimensions of climate change: Equity and vulnerability in a warming world*.
40 World Bank Publications.
- 41 Mechler, R., J. Linnerooth-Bayer, and D. Peppiatt, 2006: Microinsurance for natural disaster risks in developing
42 countries. *ProVention Consortium*.
- 43 Meenawat, H. and B.K. Sovacool, 2011a: Adapting to climate change in Laos: Challenges and opportunities. *TERI*
44 *Information Digest on Energy and Environment*, **10(4)**, 497-504.
- 45 Meenawat, H. and B.K. Sovacool, 2011b: Improving adaptive capacity and resilience in Bhutan. *Mitigation and*
46 *Adaptation Strategies for Global Change*, **16(5)**, 515-533.
- 47 Mendelsohn, R., A. Dinar, and L. Williams, 2006: The distributional impact of climate change on rich and poor
48 countries. *Environment and Development Economics*, **11(02)**, 159-178.
- 49 Menon, N., 2009: Rainfall uncertainty and occupational choice in agricultural households of rural Nepal. *The*
50 *Journal of Development Studies*, **45(6)**, 864-888.
- 51 Mertz, O., K. Halsnæs, J.E. Olesen, and K. Rasmussen, 2009: Adaptation to climate change in developing countries.
52 *Environmental Management*, **43(5)**, 743-752.
- 53 Meze-Hausken, E., 2000: Migration caused by climate change: How vulnerable are people in dryland areas?
54 *Mitigation and Adaptation Strategies for Global Change*, **5(4)**, 379-406.

- 1 Michaelowa, A. and K. Michaelowa, 2011: Climate business for poverty reduction? the role of the World Bank. *The*
2 *Review of International Organizations*, **6(3)**, 259-286.
- 3 Minang, P.A., M.K. McCall, and H.T.A. Bressers, 2007: Community capacity for implementing clean development
4 mechanism projects within community forests in Cameroon. *Environmental Management*, **39(5)**, 615-630.
- 5 Misselhorn, A.A., 2005: What drives food insecurity in southern Africa? A meta-analysis of household economy
6 studies. *Global Environmental Change Part A*, **15(1)**, 33-43.
- 7 Mitchell, D., 2008: A note on rising food prices. *Banque Mondiale, Cité Dans 'Soaring Food Prices: Facts,*
8 *Perspectives, Impacts and Actions Required', FAO.*
- 9 Modi, V., S. McDade, D. Lallement, and J. Saghir, 2005: Energy services for the millennium development goals.
10 *Energy Services for the Millennium Development Goals.*
- 11 Mol, A.P.J., 2010: Environmental authorities and biofuel controversies. *Environmental Politics*, **19(1)**, 61-79.
- 12 Molony, T., 2011: Bioenergy policies in Africa: Mainstreaming gender amid an increasing focus on biofuels.
13 *Biofuels, Bioproducts and Biorefining*, **5(3)**, 330-341.
- 14 Moss, T. and B. Leo, 2011: *IDA at 65: Heading toward retirement or a fragile lease on life?* Center for global
15 development (CGDev).
- 16 Müller, C., W. Cramer, W.L. Hare, and H. Lotze-Campen, 2011: Climate change risks for African agriculture.
17 *Proceedings of the National Academy of Sciences*, **108(11)**, 4313.
- 18 Murray, C., 2002: Livelihoods research: Transcending boundaries of time and space. *Journal of Southern African*
19 *Studies*, **28(3)**, 489-509.
- 20 Nelson, V. and T. Stathers, 2009: Resilience, power, culture, and climate: A case study from semi-arid Tanzania,
21 and new research directions. *Gender & Development*, **17(1)**, 81-94.
- 22 Neumayer, E. and T. Plümper, 2007: The gendered nature of natural disasters: The impact of catastrophic events on
23 the gender gap in life expectancy, 1981–2002. *Annals of the Association of American Geographers*, **97(3)**, 551-
24 566.
- 25 Neupane, S. and K. Shrestha, 2012: Sustainable forest governance in a changing climate: Impacts of REDD program
26 on the livelihood of poor communities in Nepalese community forestry.
- 27 Neville, K.J. and P. Dauvergne, 2012: Biofuels and the politics of mapmaking. *Political Geography*.
- 28 New, M., D. Liverman, H. Schroder, and K. Anderson, 2011: Four degrees and beyond: The potential for a global
29 temperature increase of four degrees and its implications. *Philosophical Transactions of the Royal Society A:*
30 *Mathematical, Physical and Engineering Sciences*, **369(1934)**, 6-19.
- 31 Nicholls, R.J., N. Marinova, J.A. Lowe, S. Brown, P. Vellinga, D. de Gusmão, J. Hinkel, and R.S.J. Tol, 2011: Sea-
32 level rise and its possible impacts given a 'beyond 4 C world' in the twenty-first century. *Philosophical*
33 *Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, **369(1934)**, 161-181.
- 34 Nightingale, A., 2009: Warming up the climate change debate: A challenge to policy based on adaptation. In:
35 Proceedings of IOP conference series: Earth and environmental science, pp. 9.
- 36 Nightingale, A.J., 2011: Bounding difference: Intersectionality and the material production of gender, caste, class
37 and environment in Nepal. *Geoforum*, **42(2)**, 153-162.
- 38 Nordhaus, W.D., 2010: Economic aspects of global warming in a post-Copenhagen environment. *Proceedings of the*
39 *National Academy of Sciences*, **107(26)**, 11721.
- 40 Norton, C.L., 2009: Ecopsychology and social work: Creating an interdisciplinary framework for redefining person-
41 in-environment. *Ecopsychology*, **1(3)**, 138-145.
- 42 Nuorteva, P., M. Keskinen, and O. Varis, 2010: Water, livelihoods and climate change adaptation in the Tonle Sap
43 lake area, Cambodia: Learning from the past to understand the future. *Journal of Water and Climate Change*
44 *Vol, 1(1)*, 87-101.
- 45 Nussbaum, M.C., 2001: *Women and human development: The capabilities approach*. Cambridge Univ Press.
- 46 Nussbaum, M.C., 2011: *Creating capabilities: The human development approach*. Belknap Press.
- 47 O'BRIEN, G., P. O'KEEFE, H. Meena, J. Rose, and L. Wilson, 2008: Climate adaptation from a poverty
48 perspective. *Climate Policy*, **8(2)**, 194-201.
- 49 O'Brien, K., A.L.S. Clair, and B. Kristoffersen, 2010: *Climate change, ethics and human security*. Cambridge Univ
50 Pr.
- 51 O'Brien, K.L. and R.M. Leichenko, 2000: Double exposure: Assessing the impacts of climate change within the
52 context of economic globalization. *Global Environmental Change*, **10(3)**, 221-232.
- 53 O'Brien, K.L. and R.M. Leichenko, 2003: Winners and losers in the context of global change. *Annals of the*
54 *Association of American Geographers*, **93(1)**, 89-103.

- 1 OECD, 2011: Divided we Stand: Why Inequality Keeps Rising.
- 2 O'Laughlin, B., 2002: Proletarianisation, agency and changing rural livelihoods: Forced labour and resistance in
3 colonial Mozambique. *Journal of Southern African Studies*, **28(3)**, 511-530.
- 4 Olesen, J., M. Trnka, K. Kersebaum, A. Skjelvåg, B. Seguin, P. Peltonen-Sainio, F. Rossi, J. Kozyra, and F. Micale,
5 2011: Impacts and adaptation of European crop production systems to climate change. *European Journal of*
6 *Agronomy*, **34(2)**, 96-112.
- 7 Olsen, K.H., 2007: The clean development mechanism's contribution to sustainable development: A review of the
8 literature. *Climatic Change*, **84(1)**, 59-73.
- 9 Olsson, L., L. Eklundh, and J. Ardö, 2005: A recent greening of the Sahel—trends, patterns and potential causes.
10 *Journal of Arid Environments*, **63(3)**, 556-566.
- 11 O'Reilly, C.M., S.R. Alin, P.D. Plisnier, A.S. Cohen, and B.A. McKee, 2003: Climate change decreases aquatic
12 ecosystem productivity of Lake Tanganyika, Africa. *Nature*, **424(6950)**, 766-768.
- 13 Orlove, B., 2009: The past, the present and some possible futures of adaptation. *Environmental Science and Policy*,
14 *En: Adger, WN; Lorenzoni, I*, 131-163.
- 15 Ortiz, I. and M. Cummins, 2011: Global inequality: Beyond the bottom billion. A rapid review of income
16 distribution in 141 countries. *Social and Economic Policy Working Paper. New York: United Nations Children's*
17 *Fund*.
- 18 Osbahr, H., C. Twyman, W. Neil Adger, and D.S.G. Thomas, 2008: Effective livelihood adaptation to climate
19 change disturbance: Scale dimensions of practice in Mozambique. *Geoforum*, **39(6)**, 1951-1964.
- 20 Osbahr, H., C. Twyman, W.N. Adger, and D.S.G. Thomas, 2010: Evaluating successful livelihood adaptation to
21 climate variability and change in southern Africa. *Ecology and Society*, **15(2)**, 27.
- 22 Osborne, T.M., 2011: Carbon forestry and agrarian change: Access and land control in a Mexican rainforest. *Journal*
23 *of Peasant Studies*, **38(4)**, 859-883.
- 24 Osofsky, H.M., 2006: Inuit petition as a bridge-beyond dialectics of climate change and indigenous peoples' rights.
25 *Am.Indian L.Rev.*, **31**, 675.
- 26 Paavola, J., 2008: Livelihoods, vulnerability and adaptation to climate change in Morogoro, Tanzania.
27 *Environmental Science & Policy*, **11(7)**, 642-654.
- 28 Palmer, M.A., C.A. Reidy Liermann, C. Nilsson, M. Flörke, J. Alcamo, P.S. Lake, and N. Bond, 2008: Climate
29 change and the world's river basins: Anticipating management options. *Frontiers in Ecology and the*
30 *Environment*, **6(2)**, 81-89.
- 31 Patz, J.A., D. Campbell-Lendrum, T. Holloway, and J.A. Foley, 2005: Impact of regional climate change on human
32 health. *Nature*, **438(17 November)**, 310-317.
- 33 Pauly, D., 2005: Rebuilding fisheries will add to Asia's problems. *Nature*, **433(7025)**, 457-457.
- 34 Peraza, S., C. Wesseling, A. Aragon, R. Leiva, R.A. García-Trabanino, C. Torres, K. Jakobsson, C.G. Elinder, and
35 C. Hogstedt, 2012: Decreased kidney function among agricultural workers in El Salvador. *American Journal of*
36 *Kidney Diseases*.
- 37 Perch, L., 2011: *Working Paper 79, Brasilia, International Policy Centre for Inclusive Growth*. 'Mitigation of what
38 and by what? Adaptation by Whom and for Whom? Dilemmas in delivering for the Poor and the Vulnerable in
39 International Climate Policy', Brasilia.
- 40 Perch, L., Forthcoming: *Policy background paper: A viable framework for a green economy in Caribbean states –*
41 *commissioned by the CARICOM secretariat*.
- 42 Perch, L. and R. Roy, 2010: *Social policy in the post-crisis context of small island developing states: A synthesis*.
43 United Nations Development Programme (UNDP). International policy centre for inclusive growth (IPC-IG).
- 44 Pereira, R.B. and R. Pereira, 2008: Population health needs beyond ratifying the Kyoto protocol: A look at
45 occupational deprivation. *Rural and Remote Health*, **8(927)**.
- 46 Perez, C., C. Roncoli, C. Neely, and J.L. Steiner, 2007: Can carbon sequestration markets benefit low-income
47 producers in semi-arid Africa? potentials and challenges. *Agricultural Systems*, **94(1)**, 2-12.
- 48 Peskett, L. and O.D. Institute, 2007: *Biofuels, agriculture and poverty reduction*. ODI.
- 49 Petheram, L., K. Zander, B. Campbell, C. High, and N. Stacey, 2010: [] Strange changes': Indigenous perspectives
50 of climate change and adaptation in NE Arnhem Land (Australia). *Global Environmental Change*, **20(4)**, 681-
51 692.
- 52 Petrie, B., 2010: Gender and Climate Change: Regional Report. Executive Summary. Heinrich Boll Foundation,
53 Cape Town, South Africa.

- 1 Pfaff, A., S. Kerr, L. Lipper, R. Cavatassi, B. Davis, J. Hendy, and G.A. Sanchez-Azofeifa, 2007: Will buying
2 tropical forest carbon benefit the poor? evidence from Costa Rica. *Land use Policy*, **24(3)**, 600-610.
- 3 Phelan, L., R. Taplin, A. Henderson - Sellers, and G. Albrecht, 2011: Ecological viability or liability? insurance
4 system responses to climate risk. *Environmental Policy and Governance*, **21(2)**, 112-130.
- 5 Phelps, J., E.L. Webb, and A. Agrawal, 2010: Does REDD threaten to recentralize forest governance? *Science*,
6 **328(5976)**, 312.
- 7 Pielke Jr, R., G. Prins, S. Rayner, and D. Sarewitz, 2007: Lifting the taboo on adaptation. *Nature*, **445**, 8.
- 8 Pierro, R. and B. Desai, 2008: Climate insurance for the poor: Challenges for targeting and participation. *IDS*
9 *Bulletin*, **39(4)**, 123-129.
- 10 Pogge, T.W., 2009: *Politics as usual: What lies behind the pro-poor rhetoric*. Polity.
- 11 Pouliotte, J., B. Smit, and L. Westerhoff, 2009: Adaptation and development: Livelihoods and climate change in
12 Subarnabad, Bangladesh. *Climate and Development*, **1(1)**, 31-46.
- 13 Practical Action, 2010: *Poor People's Energy Outlook 2010*, Practical Action, Rugby, UK.
- 14 Pradhan, E.K., K.P. West Jr, J. Katz, S.C. LeClerq, S.K. Khatri, and S.R. Shrestha, 2007: Risk of flood - related
15 mortality in Nepal. *Disasters*, **31(1)**, 57-70.
- 16 Quinn, C.H., G. Ziervogel, A. Taylor, T. Takama, and F. Thomalla, 2011: Coping with multiple stresses in rural
17 South Africa. *Ecology and Society*, **16(3)**, 2.
- 18 Rahlah, S., B. Mantlana, H. Winkler, and T. Knowles, 2012: South Africa's national REDD initiative: Assessing the
19 potential of the forestry sector on climate change mitigation. *Environmental Science & Policy*, **17**, 24-32.
- 20 Raju, S. and R. Chand, 2009: Agricultural risk and insurance in India: Problems and prospects. *Agricultural Risk*
21 *and Insurance in India: Problems and Prospects*.
- 22 Rathmann, R., A. Szklo, and R. Schaeffer, 2010: Land use competition for production of food and liquid biofuels:
23 An analysis of the arguments in the current debate. *Renewable Energy*, **35(1)**, 14-22.
- 24 Rawlani, A.K. and B.K. Sovacool, 2011: Building responsiveness to climate change through community based
25 adaptation in Bangladesh. *Mitigation and Adaptation Strategies for Global Change*, 1-19.
- 26 Ray - Bennett, N.S., 2009: Multiple disasters and policy responses in pre - and post - independence Orissa, India.
27 *Disasters*, **33(2)**, 274-290.
- 28 Reid, P. and C. Vogel, 2006: Living and responding to multiple stressors in South Africa--glimpses from KwaZulu-
29 natal. *Global Environmental Change*, **16(2)**, 195-206.
- 30 Reij, C., G. Tappan, M. Smale, D. Spielman, and R. Pandya-Lorch, 2009: Re-greening the Sahel: Farmer-led
31 innovation in Burkina Faso and Niger. *Millions Fed: Proven Successes in Agricultural Development*, 53-58.
- 32 Renaudeau, D., A. Collin, S. Yahav, V. de Basilio, J.L. Gourdine, and R.J. Collier, 2010: Adaptation to tropical
33 climate and research strategies to alleviate heat stress in livestock production. *Advances in Animal Biosciences*,
34 **1(02)**, 378-379.
- 35 Renton, A., 2009: *Suffering the science: Climate change, people, and poverty*. Oxfam International.
- 36 Resurreccion, B.P., 2011: The gender and climate debate: More of the same or new pathways of thinking and doing?
- 37 Rice, S.E., C. Graff, J. Lewis, and Brookings Institution. Global Economy and Development, 2006: *Poverty and*
38 *civil war: What policymakers need to know*. Global Economy and Development, Brookings Institution.
- 39 Robertson, B. and P. Pinstrip-Andersen, 2010: Global land acquisition: Neo-colonialism or development
40 opportunity? *Food Security*, **2(3)**, 271-283.
- 41 Rocheleau, D.E., B. Thomas-Slayter, and E. Wangari (eds.), 1997: *Feminist political ecology: Global issues and*
42 *local experience*. Routledge, London.
- 43 Rodima-Taylor, D., 2011: Social innovation and climate adaptation: Local collective action in diversifying
44 Tanzania. *Applied Geography*.
- 45 Röhr, U., 2006: Gender and climate change. *Tiempo*, **59**, 3-7.
- 46 Rosenstein-Rodan, P.N., 1943: Problems of industrialisation of eastern and south-eastern Europe. *The Economic*
47 *Journal*, **53(210/211)**, 202-211.
- 48 Rosset, P., 2011: Food sovereignty and alternative paradigms to confront land grabbing and the food and climate
49 crises. *Development*, **54(1)**, 21-30.
- 50 Ruel, M.T., J.L. Garrett, C. Hawkes, and M.J. Cohen, 2010: The food, fuel, and financial crises affect the urban and
51 rural poor disproportionately: A review of the evidence. *The Journal of Nutrition*, **140(1)**, 170S-176S.
- 52 Runge, C.F. and B. Senauer, 2007: How biofuels could starve the poor. *Foreign Affairs*, **86:3(3)**.
- 53 Sabates - Wheeler, R., T. Mitchell, and F. Ellis, 2008: Avoiding repetition: Time for CBA to engage with the
54 livelihoods literature? *IDS Bulletin*, **39(4)**, 53-59.

- 1 Sachs, J., 2006: *The end of poverty: Economic possibilities for our time*. Penguin Group USA.
- 2 Salack, S., B. Muller, A.T. Gaye, F. Hourdin, and N. Cisse, 2012: Multi-scale analyses of dry spells across Niger
3 and Senegal. *Science Et Changements planétaires/Sécheresse*, **23(1)**, 3-13.
- 4 Salick, J. and N. Ross, 2009: Special issue: Traditional peoples and climate change. *Global Environmental Change*,
5 **19(2)**, 137-190.
- 6 Sallu, S.M., C. Twyman, and L.C. Stringer, 2010: Resilient or vulnerable livelihoods? assessing livelihood dynamics
7 and trajectories in rural Botswana. *Ecology and Society*, **15(4)**, 3.
- 8 Sartore, G.M., B. Kelly, H. Stain, G. Albrecht, and N. Higginbotham, 2008: Control, uncertainty, and expectations
9 for the future: A qualitative study of the impact of drought on a rural Australian community. *Rural and Remote*
10 *Health*, **8(2008)**, 950.
- 11 Satterthwaite, D., 2011: How can urban centers adapt to climate change with ineffective or unrepresentative local
12 governments? *Wiley Interdisciplinary Reviews: Climate Change*.
- 13 Schipper, E.L.F., 2007: Climate change adaptation and development: Exploring the linkages. *Tyndall Centre for*
14 *Climate Change Research, UK*.
- 15 Schipper, L. and M. Pelling, 2006: Disaster risk, climate change and international development: Scope for, and
16 challenges to, integration. *Disasters*, **30(1)**, 19-38.
- 17 Schlenker, W. and D.B. Lobell, 2010: Robust negative impacts of climate change on African agriculture.
18 *Environmental Research Letters*, **5**, 014010.
- 19 Schmidhuber, J. and F.N. Tubiello, 2007: Climate change and food security special feature: Global food security
20 under climate change. *Proceedings of the National Academy of Sciences*, **104(50)**, 19703.
- 21 Schroeder, H., 2010: Agency in international climate negotiations: The case of indigenous peoples and avoided
22 deforestation. *International Environmental Agreements: Politics, Law and Economics*, **10(4)**, 317-332.
- 23 Schwartz, J., 2007: A billion dollars later, New Orleans still at risk. *The New York Times*, **August 17, 2007**.
- 24 Scoones, I., 2009: Livelihoods perspectives and rural development. *The Journal of Peasant Studies*, **36(1)**, 171-196.
- 25 Scoones, I. and Institute of Development Studies, 1998: *Sustainable rural livelihoods: A framework for analysis*.
26 Institute of Development Studies Brighton.
- 27 Semenza, J.C., J.E. McCullough, W.D. Flanders, M.A. McGeekin, and J.R. Lumpkin, 1999: Excess hospital
28 admissions during the July 1995 heat wave in Chicago. *American Journal of Preventive Medicine*, **16(4)**, 269-
29 277.
- 30 Sen, A., 1976: Poverty: An ordinal approach to measurement. *Econometrica: Journal of the Econometric Society*,
31 219-231.
- 32 Sen, A., 1981: Ingredients of famine analysis: Availability and entitlements. *The Quarterly Journal of Economics*,
33 **96(3)**, 433-464.
- 34 Sen, A.K., 1999: *Development as freedom*. Oxford University Press.
- 35 Sen, A.K., 1985: *Commodities and capabilities*. Oxford University Press, Oxford.
- 36 Seo, S.N., 2010: Is an integrated farm more resilient against climate change? A micro-econometric analysis of
37 portfolio diversification in African agriculture. *Food Policy*, **35(1)**, 32-40.
- 38 Seo, S.N., R. Mendelsohn, A. Dinar, R. Hassan, and P. Kurukulasuriya, 2009: A Ricardian analysis of the
39 distribution of climate change impacts on agriculture across agro-ecological zones in Africa. *Environmental and*
40 *Resource Economics*, **43(3)**, 313-332.
- 41 Seo, S.N. and R. Mendelsohn, 2008: Measuring impacts and adaptations to climate change: A structural Ricardian
42 model of African livestock management1. *Agricultural Economics*, **38(2)**, 151-165.
- 43 Shackleton, C.M., S.E. Shackleton, E. Buiten, and N. Bird, 2007: The importance of dry woodlands and forests in
44 rural livelihoods and poverty alleviation in South Africa. *Forest Policy and Economics*, **9(5)**, 558-577.
- 45 Sheridan, S.C., M.J. Allen, C.C. Lee, and L.S. Kalkstein, 2012: Future heat vulnerability in California, part II:
46 Projecting future heat-related mortality. *Climatic Change*, 1-16.
- 47 Sirohi, S., 2007: CDM: Is it a 'win-win' strategy for rural poverty alleviation in India? *Climatic Change*, **84(1)**, 91-
48 110.
- 49 Sissoko, K., H. van Keulen, J. Verhagen, V. Tekken, and A. Battaglini, 2011: Agriculture, livelihoods and climate
50 change in the West African Sahel. *Regional Environmental Change*, **11**, 119-125.
- 51 Skoufias, E., B. Essama-Nssah, and R.S. Katayama, 2011a: *Too little too late: Welfare impacts of rainfall shocks in*
52 *rural Indonesia*. World Bank.
- 53 Skoufias, E., M. Rabassa, S. Olivieri, and M. Brahmabhatt, 2011b: The poverty impacts of climate change. *Economic*
54 *Premise*, **(51)**.

- 1 Skoufias, E., K. Vinha, and H. Conroy, 2011c: The impacts of climate variability on welfare in rural Mexico.
2 Slater, R., J. Farrington, and R. and Holmes, 2006: *Linking Agricultural Growth and Social Protection. Inception*
3 *Report*, Overseas Development Institute, London.
- 4 Slater, R., L. Peskett, E. Ludi, and D. Brown, 2007: Climate change, agricultural policy and poverty reduction—how
5 much do we know? *Natural Resource Perspectives*, **109**, 1-6.
- 6 Smit, B., I. Burton, R.J.T. Klein, and R. Street, 1999: The science of adaptation: A framework for assessment.
7 *Mitigation and Adaptation Strategies for Global Change*, **4(3)**, 199-213.
- 8 Smit, B. and M.W. Skinner, 2002: Adaptation options in agriculture to climate change: A typology. *Mitigation and*
9 *Adaptation Strategies for Global Change*, **7(1)**, 85-114.
- 10 Smith, B., I. Burton, R.J.T. Klein, and J. Wandel, 2000: An anatomy of adaptation to climate change and variability.
11 *Climatic Change*, **45(1)**, 223-251.
- 12 Smith, D. and J. Vivekananda, 2009: Climate change, conflict and fragility. *Understanding the Interlinkages,*
13 *Shaping Effective Responses. London: International Alert.*
- 14 Smith, J.B., T. Dickinson, J.D.B. Donahue, I. Burton, E. Haites, R.J.T. Klein, and A. Patwardhan, 2011:
15 Development and climate change adaptation funding: Coordination and integration. *Climate Policy*, **11(3)**, 987-
16 1000.
- 17 Smithers, J. and A. Blay-Palmer, 2001: Technology innovation as a strategy for climate adaptation in agriculture.
18 *Applied Geography*, **21(2)**, 175-197.
- 19 Smithers, J. and B. Smit, 1997: Human adaptation to climatic variability and change. *Global Environmental Change,*
20 **7(2)**, 129-146.
- 21 Solomon, S., G.K. Plattner, R. Knutti, and P. Friedlingstein, 2009: Irreversible climate change due to carbon dioxide
22 emissions. *Proceedings of the National Academy of Sciences*, **106(6)**, 1704.
- 23 Sovacool, B.K., 2012: Perceptions of climate change risks and resilient island planning in the Maldives. *Mitigation*
24 *and Adaptation Strategies for Global Change*, 1-22.
- 25 Sovacool, B.K., A.L. D'Agostino, H. Meenawat, and A. Rawlani, 2012: Expert views of climate change adaptation
26 in least developed Asia. *Journal of Environmental Management*, **97**, 78-88.
- 27 Sowers, J., A. Vengosh, and E. Weinthal, 2011: Climate change, water resources, and the politics of adaptation in
28 the Middle East and North Africa. *Climatic Change*, **104(3)**, 599-627.
- 29 Springate-Baginski, O., O.W. Springate-Baginski, and E. Wollenberg, 2010: *REDD, forest governance and rural*
30 *livelihoods: The emerging agenda*. Cifor.
- 31 Stain, H.J., B. Kelly, V.J. Carr, T.J. Lewin, M. Fitzgerald, and L. Fragar, 2011: The psychological impact of chronic
32 environmental adversity: Responding to prolonged drought in remote Australian communities. *Social Science &*
33 *Medicine*.
- 34 Stain, H.J., B. Kelly, T.J. Lewin, N. Higginbotham, J.R. Beard, and F. Hourihan, 2008: Social networks and mental
35 health among a farming population. *Social Psychiatry and Psychiatric Epidemiology*, **43(10)**, 843-849.
- 36 Stern, N., 2009: Managing climate change and overcoming poverty: Facing the realities and building a global
37 agreement. *Lecture Columbia University, New York*, **21**.
- 38 Stern, N.H., 2007: *The economics of climate change: The stern review*. Cambridge Univ Press.
- 39 Stringer, L.C., J.C. Dyer, M.S. Reed, A.J. Dougill, C. Twyman, and D. Mkwambisi, 2009: Adaptations to climate
40 change, drought and desertification: Local insights to enhance policy in southern Africa. *Environmental Science*
41 *& Policy*, **12(7)**, 748-765.
- 42 Sulser, T.B., B. Nestorova, M.W. Rosegrant, and T. van Rheenen, 2011: The future role of agriculture in the Arab
43 region's food security. *Food Security*, **3**, 23-48.
- 44 Sumner, A., 2010: Global poverty and the new bottom billion: What if Three - quarters of the world's poor live in
45 Middle - income countries? *IDS Working Papers*, **2010(349)**, 01-43.
- 46 Sumner, A., A. Suryahadi, and N. Thang, 2012: POVERTY AND INEQUALITIES IN MIDDLE-INCOME
47 SOUTHEAST ASIA.
- 48 Swallow, B. and R. Meinzen-Dick, 2009: Payment for environmental services: Interactions with property rights and
49 collective action. *Institutions and Sustainability*, , 243-265.
- 50 Syvitski, J.P.M., A.J. Kettner, I. Overeem, E.W.H. Hutton, M.T. Hannon, G.R. Brakenridge, J. Day, C. Vörösmarty,
51 Y. Saito, and L. Giosan, 2009: Sinking deltas due to human activities. *Nature Geoscience*, **2(10)**, 681-686.
- 52 Tacoli, C., 2009: Crisis or adaptation? migration and climate change in a context of high mobility. *Environment and*
53 *Urbanization*, **21(2)**, 513-525.

- 1 Tanner, T., A. Hassan, K.M.N. Islam, D. Conway, R. Mechler, A. Ahmed, and M. Alam, 2007: ORCHID: Piloting
2 climate risk screening in DFID Bangladesh. *Research Report. Institute of Development Studies, University of*
3 *Sussex, Brighton.*
- 4 Tennant, W.J. and B.C. Hewitson, 2002: Intra - seasonal rainfall characteristics and their importance to the seasonal
5 prediction problem. *International Journal of Climatology*, **22(9)**, 1033-1048.
- 6 Terry, G., 2009: No climate justice without gender justice: An overview of the issues. *Gender & Development*,
7 **17(1)**, 5-18.
- 8 Thébaud, B. and S. Batterbury, 2001: Sahel pastoralists: Opportunism, struggle, conflict and negotiation. A case
9 study from eastern niger. *Global Environmental Change*, **11(1)**, 69-78.
- 10 Thomas, D.S.G., C. Twyman, H. Osbahr, and B. Hewitson, 2007: Adaptation to climate change and variability:
11 Farmer responses to intra-seasonal precipitation trends in South Africa. *Climatic Change*, **83(3)**, 301-322.
- 12 Thornton, P.K., P.G. Jones, T. Owiyo, R.L. Kruska, M. Herrero, V. Orindi, S. Bhadwal, P. Kristjanson, A.
13 Notenbaert, and N. Bekele, 2008: Climate change and poverty in Africa: Mapping hotspots of vulnerability.
14 *African Journal of Agriculture and Resource Economics*, **2(1)**, 24-44.
- 15 Thornton, P., M. Herrero, A. Freeman, O. Mwai, E. Rege, P. Jones, and J. McDermott, 2007: Vulnerability, climate
16 change and livestock—research opportunities and challenges for poverty alleviation. *SAT eJournal| Ejournal.*
17 *Icrisat. Org*, **4(1)**, 1-23.
- 18 Thurlow, J., T. Zhu, and X. Diao, 2009: *The impact of climate variability and change on economic growth and*
19 *poverty in Zambia.* International Food Policy Research Institute (IFPRI).
- 20 Tompkins, E.L., M.C. Lemos, and E. Boyd, 2008: A less disastrous disaster: Managing response to climate-driven
21 hazards in the Cayman Islands and NE Brazil. *Global Environmental Change*, **18(4)**, 736-745.
- 22 Trostle, R., D. Marti, S. Rosen, and P. Wescott, 2011: Why have food commodity prices risen again? *ERS, USDA,*
23 *June.*
- 24 Tschakert, P., 2007: Views from the vulnerable: Understanding climatic and other stressors in the Sahel. *Global*
25 *Environmental Change*, **17(3-4)**, 381-396.
- 26 Tschakert, P., R. Tutu, and A. Alcaro, 2011: Embodied experiences of environmental and climatic changes in
27 landscapes of everyday life in Ghana. *Emotion, Space and Society*, .
- 28 Tsosie, R., 2007: Indigenous people and environmental justice: The impact of climate change. *University of*
29 *Colorado Law Review, Vol.78, p.1625, 2007.*
- 30 Tubiello, F., J. Schmidhuber, M. Howden, P.G. Neofotis, S. Park, E. Fernandes, and D. Thapa, 2008: Climate
31 change response strategies for agriculture: Challenges and opportunities for the 21st century. *A-Griculture and*
32 *Rural Development Discussion Paper*, **42**.
- 33 UN, 1995: The Copenhagen Declaration and Programme of Action: World Summit for Social Development 6-12
34 March 1995, United Nations Department of Publications, New York, N.Y., USA, .
- 35 UN Habitat, 2010: State of the World's Cities 2010/2011 - Cities for all: Bridging the Urban Divide, Earthscan,
36 London and Sterling, V.A.
- 37 UNCCD, 2011: Desertification: A Visualsynthesis, United Nations Convention to Combat Desertification, Bonn,
38 Germany.
- 39 UNDP, 1990: Human Development Report 1990, United Nations Development Program, New York, NY.
- 40 UNDP, 2011a: *Human Development Report 2011. Sustainability and Equity: A Better Future for all.* , UNDP, New
41 York.
- 42 UNDP, 2011b: *Towards an 'Energy Plus' Approach for the Poor: A Review of Good Practices and Lessons Learned,*
43 UNDP.
- 44 UNDP (United Nations Development Programme), 2007: *Human Development Report 2007/08.* Palgrave
45 Macmillan, New York.
- 46 UNFPA, 2009: State of World Population, 2009. Facing a Changing World: Women, Population, and Climate',
47 United Nations Population Fund.
- 48 UNICEF, 2010: UNICEF Humanitarian Action: Partnering for Children in Emergencies, United Nations Children's
49 Fund, New York, N.Y., USA.
- 50 UNICEF, 2011: The State of the World's Children 2011: Adolescence - an Age of Opportunity, United Nation's
51 Children Fund, New York, N.Y., USA.
- 52 United States. Congress. Office of Technology Assessment, 1986: Continuing the commitment: Agricultural
53 development in the Sahel. In:

- 1 UNRISD, 2010: Combating Poverty and Inequality: Structural Change, Social Policy and Politics, UNRISD/UN
2 Publications, Geneva.
- 3 Ürge-Vorsatz, D. and S. Tirado Herrero, 2012: Building synergies between climate change mitigation and energy
4 poverty alleviation. *Energy Policy*.
- 5 Urwin, K. and A. Jordan, 2008: Does public policy support or undermine climate change adaptation? exploring
6 policy interplay across different scales of governance. *Global Environmental Change*, **18(1)**, 180-191.
- 7 Usman, M.T. and C. Reason, 2004: Dry spell frequencies and their variability over southern Africa. *CLIMATE*
8 *RESEARCH.*, **26(3)**, 199-211.
- 9 Van Dam, C., 2011: Indigenous territories and REDD in Latin America: Opportunity or threat? *Forests*, **2(1)**, 394-
10 414.
- 11 Van Noordwijk, M., 2010: Climate change, biodiversity, livelihoods and sustainability in Southeast Asia. *In Moving*
12 *Forward: Southeast Asia Perspectives on Climate Change and Biodiversity*. Edited by Sajise PE, Ticsay MV,
13 Saguiguit GC. Laguna (Philippines) and Singapore: Southeast Asian Regional Center for Graduate Study and
14 Research in Agriculture and (TRUNCATED), 55-83.
- 15 Vandemoortele, J., 2009: The MDG conundrum: Meeting the targets without missing the point. *Development Policy*
16 *Review*, **27(4)**, 355-371.
- 17 Vandentorren, S., P. Bretin, A. Zeghnoun, L. Mandereau-Bruno, A. Croisier, C. Cochet, J. Ribéron, I. Siberan, B.
18 Declercq, and M. Ledrans, 2006: August 2003 heat wave in France: Risk factors for death of elderly people
19 living at home. *The European Journal of Public Health*, **16(6)**, 583-591.
- 20 Verchick, R.M., 2010: *Facing catastrophe: Pro-environmental action in a post-Katrina world*. Harvard University
21 Press, Cambridge, Mass., USA.
- 22 Von Braun, J. and A. Ahmed, 2008: *High food prices: The what, who, and how of proposed policy actions*.
23 International Food Policy Research Institute Washington, DC.
- 24 Von Braun, J., R.S. Meinzen-Dick, and I.F.P.R. Institute, 2009: *Land grabbing" by foreign investors in developing*
25 *countries: Risks and opportunities*. International Food Policy Research Institute Washington, DC.
- 26 Wang, J., R. Mendelsohn, A. Dinar, J. Huang, S. Rozelle, and L. Zhang, 2009: The impact of climate change on
27 china's agriculture. *Agricultural Economics*, **40(3)**, 323-337.
- 28 Wassmann, R., S. Jagadish, K. Sumfleth, H. Pathak, G. Howell, A. Ismail, R. Serraj, E. Redona, R. Singh, and S.
29 Heuer, 2009: Regional vulnerability of climate change impacts on Asian rice production and scope for
30 adaptation. *Advances in Agronomy*, **102**, 91-133.
- 31 Wheeler, D., 2011: *Quantifying vulnerability to climate change: Implications for adaptation assistance*. Center for
32 Global Development.
- 33 White, B. and A. Dasgupta, 2010: Agrofuels capitalism: A view from political economy. *The Journal of Peasant*
34 *Studies*, **37(4)**, 593-607.
- 35 WHO (World Health Organization), 2006: *Fuel for Life: Household Energy and Health*, World Health Organization,
36 Geneva.
- 37 WHO (World Health Organization) and UNDP (United Nations Development Programme), 2009: *the Energy*
38 *Access Situation in Developing Countries*, UNDP.
- 39 Williams, M., 2010: *Economic development and the triple Crisis—Gender equality betwixt and between: The impact*
40 *of the economic, climate and food crises on Women's empowerment and wellbeing. Paper prepared for the*
41 *ninth commonwealth Women's affairs ministers meeting on gender issues in economic crisis, recovery and*
42 *beyond: Women as agents of transformation*. Commonwealth Secretariat, Bridgetown, Barbados.
- 43 Wolf, J., W.N. Adger, I. Lorenzoni, V. Abrahamson, and R. Raine, 2010: Social capital, individual responses to heat
44 waves and climate change adaptation: An empirical study of two UK cities. *Global Environmental Change*,
45 **20(1)**, 44-52.
- 46 World Bank, 2001: *The World Development Report, 2000-01: Attacking Poverty*. Oxford University Press;
47 Washington DC: World Bank., New York.
- 48 World Bank, 2010: *World Development Report 2010: Development and Climate Change*, World Bank, Washington,
49 D.C., USA.
- 50 World Bank, 2012: *World Development Report 2012: Gender Equality and Development*, World Bank, Washington
51 D.C.
- 52 Xu, J., R.E. Grumbine, A. Shrestha, M. Eriksson, X. Yang, Y. Wang, and A. Wilkes, 2009: The melting Himalayas:
53 Cascading effects of climate change on water, biodiversity, and livelihoods. *Conservation Biology*, **23(3)**, 520-
54 530.

- 1 Yohe, G.W., Lasco, R.D., Ahmad, Q.K., Arnell, N.W., Cohen, S.J., Hope, C., Janetos, A.C., and Perez, R.T., 2007:
2 Perspectives on climate change and sustainability. *Climate change 2007: Impacts, adaptation and vulnerability.*
3 contribution of working group II to the fourth assessment report of the intergovernmental panel on climate
4 change. In: [M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, (ed.)]. pp. 811-841.
5 Zhou, G., N. Minakawa, A.K. Githeko, and G. Yan, 2004: Association between climate variability and malaria
6 epidemics in the East African highlands. *Proceedings of the National Academy of Sciences of the United States*
7 *of America*, **101(8)**, 2375.
- 8 Ziervogel, G., S. Bharwani, and T.E. Downing, 2006: Adapting to climate variability: Pumpkins, people and policy.
9 In: *Proceedings of Natural resources forum*, pp. 294-305.
- 10 Ziervogel, G., M. Shale, and M. Du, 2010: Climate change adaptation in a developing country context: The case of
11 urban water supply in Cape Town. *Climate and Development*, **2(2)**, 94-110.
- 12 Zoomers, A., 2010: Globalisation and the foreignisation of space: Seven processes driving the current global land
13 grab. *The Journal of Peasant Studies*, **37(2)**, 429-447.
- 14

Table 13-1: Progress toward the MDGs, globally and at the country level.

MDG	GLOBAL MDG PROGRESS				COUNTRY-LEVEL MDG PROGRESS			
	Improvement since 1990? *1	Distance progressed to Goal (100% = goal attained) *2	On Track? *1	Faster Progress? (2003-2008 compared to 1990-2001/12) *3	Percent of countries making progress on targets *4	Percent countries on track *4	Percent countries on track *2	Faster Progress? (2003-2008 compared to 1990-2001/12) *3
Poverty	Y	80	Y	Y	63	49	47	51
Undernourishment	Y	77	N	N	55	34	25	-
Primary Education	Y	90	N	Y	75	46	55	35
Gender Equality **	Y	96	Y	N	61	55	89/82**	46
Child Mortality	Y	69	N	Y	95	38	36	32
Maternal Mortality	Y	57	N	Y	83	19	30	-
Drinking Water	Y	88	Y	N	73	49	66	34

Source: Kenny and Sumner 2011 (*1 Kenny and Sumner (2011); *2 World Bank (year?); *3 Fukuda-Parr and Greenstein (year?); *4 Leo and

** Gender equality for primary and secondary education, respectively.

Table 13-2: Types of social protection.

Time frame	Social protection category	Social protection instruments	Role in crises and climate change adaptation
Short-term	Asset protection (social assistance)	<ul style="list-style-type: none"> • Social service provision • Basic social transfers (food/cash) • Pension and disability schemes 	<ul style="list-style-type: none"> ➤ Provides immediate protection and relief from poverty and deprivation ➤ Protects the most vulnerable to climate risks
	Prevention of asset erosion (insurance and diversification mechanisms)	<ul style="list-style-type: none"> • Safety nets • Social transfers • Public works programmes • Livelihood diversification • Weather-indexed crop insurance 	<ul style="list-style-type: none"> ➤ Prevents damaging coping strategies as a result of risks to weather-dependent and climate-sensitive livelihoods
Long-term	Asset promotion (economic opportunities)	<ul style="list-style-type: none"> • Social transfers • Access to credit • Asset transfers/protection • Starter packs (drought/flood-resistant) • Access to common property resources 	<ul style="list-style-type: none"> ➤ Promotes resilience through livelihood diversification and security to withstand climate-related shocks ➤ Promotes opportunities arising from climate change
	Transformation (addressing underlying social vulnerabilities)	<ul style="list-style-type: none"> • Promotion of minority rights • Anti-discrimination campaigns • Social funds 	<ul style="list-style-type: none"> ➤ Transforms social relations to combat discrimination underlying social and political vulnerability

Adapted after Arnall (2010) and Davies (2009).

Figure 13-1: Global distribution of poverty (MPI) as a world map, with other poverty measures (under construction).

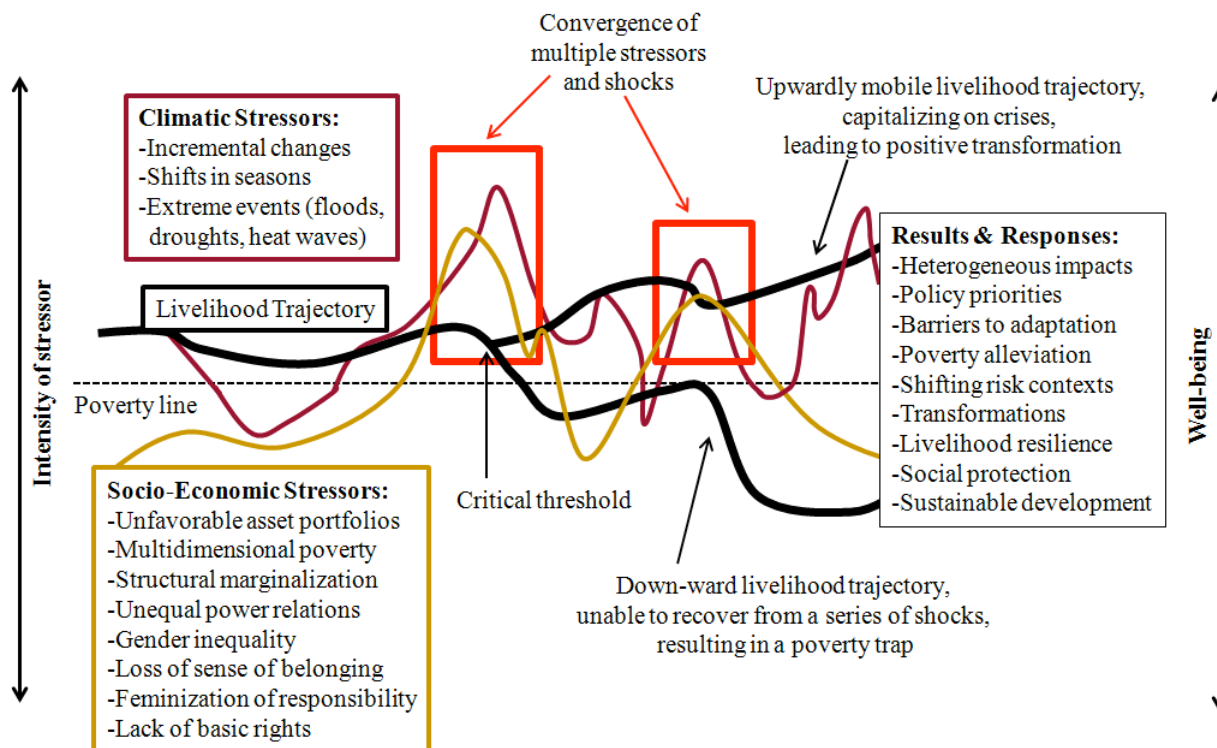


Figure 13-2: Livelihood dynamics under increasing frequency and severity of climatic stressors combined with unequally distributed socio-economic stressors, leading to differential trajectories.

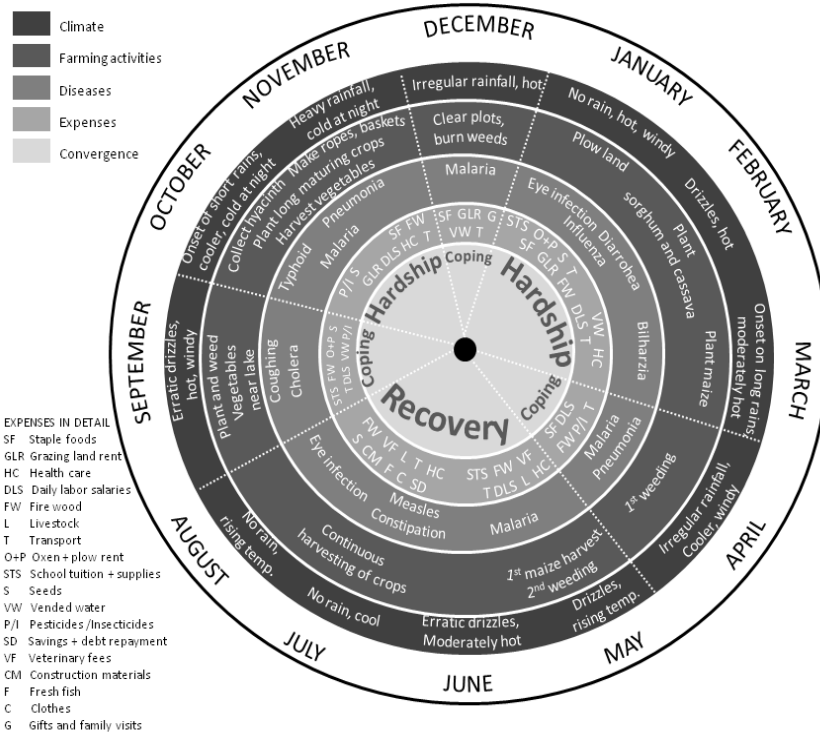


Figure 13-3: Wheel of hardship (in color in later version). Source: Gabriëlsson et al. (2012).

Mapping the Impacts of Climate Change

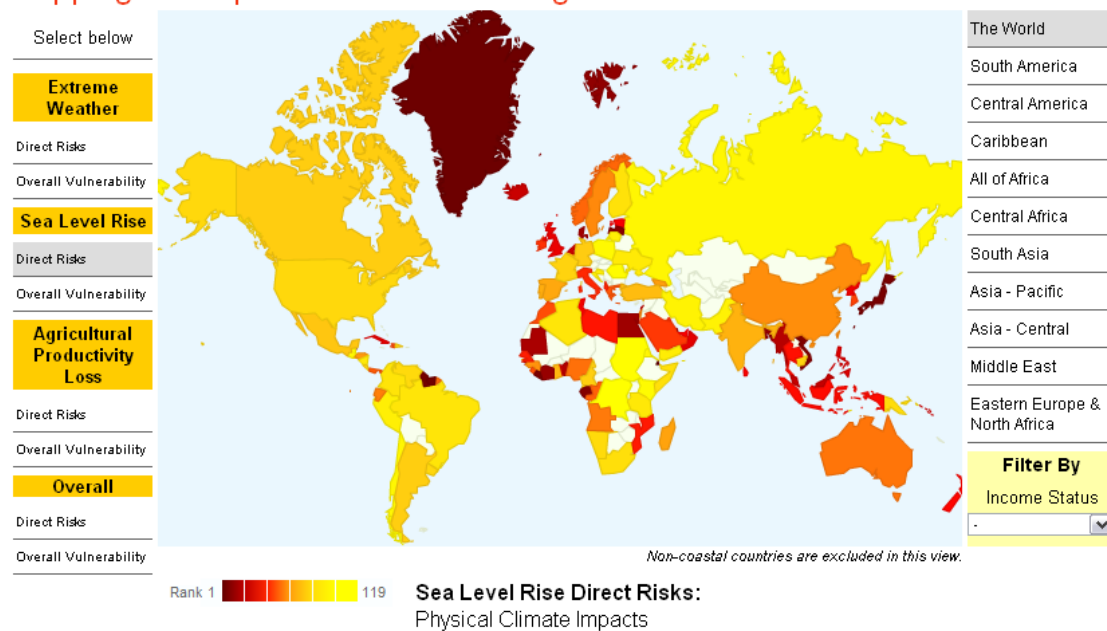


Figure 13-4: Map from Wheeler’s dataset. Direct risks from sea level rise (without adaptive responses). http://www.cgdev.org/section/topics/climate_change/mapping_the_impacts_of_climate_change