Chapter 13. Livelihoods and Poverty

Coordinating Lead Authors
Lennart Olsson (Sweden), Maggie Opondo (Kenya)

Lead Authors
Arun Agrawal (USA), Siri Eriksen (Norway), Shiming Ma (China), Tom Mitchell (UK), Petra Tschakert (USA), Sumaya Zakieldeen (Sudan)

Review Editors
Rita Sharma (India), Etienne Piguet (Switzerland)

Volunteer Chapter Scientist
Anna Kaijser (Sweden)

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Executive Summary

[to be developed]

13.1. Scope, Delineations, and Definitions of Poverty and Livelihoods

This chapter deals with two overriding issues, firstly climate change impacts on livelihoods and poverty and secondly the impacts of climate change responses on livelihoods and poverty. Climate change responses refer to international to national to local policies and measures (PAM) aimed at climate change mitigation and/or adaptation. Examples of such PAMs are incentives for biofuels and other renewable energy sources; taxes and levies on international transport; REDD+ initiatives, and insurance instruments. Even if attribution is difficult to establish, especially for the first kind of climate change impacts, it is important to assess the indications and evidence at hand. The chapter assesses impacts of climate change and climate change responses on livelihoods and poverty globally, with a stronger emphasis on developing countries where most of the world's poor live.

Poverty is a contentious concept with several and conflicting definitions. We distinguish between four main approaches to defining poverty: the monetary approach, the capabilities approach, social exclusion as defining poverty and the participatory approach {Laderchi, 2003 #2016}. Monetary approaches are the easiest to define and measure, but restrictive when it comes to representing different aspects of quality of life. The capabilities approach considers a wider range of qualities of life, potentially both material and non-material. The focus of both approaches is on the individual rather than the group. Social exclusion and participatory approaches are more encompassing, but also more difficult to define and measure. The two latter approaches focus explicity on the social (or group) rather than the individual. For this assessment we acknowledge the multi-dimensionality of poverty and wherever possible indicate what kind of poverty approach is the most relevant.

Livelihood has been a key concept in the development and poverty discourse for decades. A general definition of livelihood is: a combination of the resources used and the activities undertaken in order to live. When operationalized livelihoods are usually determined by the assets people to which people have acess. Such assets can be categorized as: human assets, such as skills, knowledge, health and ability to work; social assets such as social resources, including informal networks, membership of formalised groups and relationships of trust that facilitate co-operation; natural assets such as land, soil, water, forests and fisheries; physical assets such as roads, water & sanitation, energy, schools, ICT, tools and equipment; financial assets such savings, credit, and income from employment, trade and remittances. Examples of climate-sensitive livelihoods include smallholder agriculture seasonal employment in agriculture (tea, coffee, sugar), seasonal employment non-agriculture (tourism), livelihoods based on ínformal incomes (vendors), urban informal settlements, resource dependent livelihoods (fishing, pastoral, forest), irrigation systems (terraced agriculture), floodplain agriculture, livelihoods of displaced people, children-/female-headed households, livelihoods largely based on remittances.

13.2. Poverty and Livelihoods, Salient Features

(This section may include a graphical framework of the salient features of poverty)

Climate change is expected to worsen poverty and exacerbate livelihood vulnerability among the poor and marginalized as also trigger new vulnerabilities. Although the official message is that the world is on track to reach the Millennium Development Goals (MDG), including reducing poverty and hunger by half, current statistics are disheartening: 1,020 million people are chronically undernourished, 884 million are without access to safe water, 2,500 million have no access to basic sanitation, 2,000 million lack access to essential drugs, 924 million live without adequate shelter, 1,600 million have no electricity, 774 million adults are illiterate, an d 218 million are child laborers (Pogge 2010). A better understanding of the impacts of climate change on livelihoods and poverty requires an examination of the concepts of livelihoods and poverty, the complexities of poverty and the lives of the poor, and the intersection ofpoverty and livelihoods with climate change.

A particularly worrying development is that rural poverty in in some regions is either stagnant (South Asia) or increasing (sub-Saharan Africa) over the last two decades (Figure 13-1) according to IFAD.

[INSERT FIGURE 13-1 HERE
Figure 13-1: Number of rural people living on less than 1.25 USD per day (IFAD Rural Poverty Report, 2011).]

13.2.1. Origin, Measurements, and Framing

The most common and officially popular ways of measuring poverty today focus on a poverty line. Poverty lines are typically defined with reference to income or nutritional levels, or access to a basket of goods and services. Definitions of poverty that establish numeric income or caloric levels below which poverty exists and beyond which people cease to be poor have their origin in Booth's study of London's poor in 1887, widely credited with originating the idea of a line of poverty, and Rowntree's (1901) better-known work on the poor in the city of York. These early measures depended on the ability of a household to secure a basket of goods necessary for survival and the cost to purchase that basket of goods.

By the 1970s sophisticated conceptual refinement had already transformed how to think about poverty. More recent definitions go beyond the purely economic or nutritional dimensions and include non-income characteristics such as longevity, literacy, good health, adaptive capacity, ability to make choices, and access to opportunities and power. Alternatively, notions of vulnerability, lack of access to opportunities, exposure to risk, powerlessness and lack of voice are now also part of how poverty is understood (World Bank 2004). The Human Development Report of 1990 (UNDP 1990) and the World Development Report of 2000 (World Bank 2000) are particularly important official markers of the recognition that poverty is multi-dimensional, and that attempts to reduce itat the household as well as the national levels require efforts in multiple domains and dimensions. An indication of this conceptual shift in poverty thinking is reflected in the poverty reduction strategy paper (PRSP) approach adopted by the World Bank and the IMF. Recognizing the multidimensional nature of poverty, including social, cultural, and political forces, the PRSP approach seeks to reverse poverty by promoting opportunities, facilitating empowerment, and enhancing security (World Bank 2000: 6-12). Such rhetoric signals a major shift from earlier discussions in the 1950s and 1960s which focused almost exclusively on economic dimensions of poverty. At the same time, in relation to climate-poverty linkages, the hegemonic view of poverty reduction as being a matter of economic growth still holds sway in much official literature: “Mitigation, adaptation, and the deployment of technologies have to happen in a way that allows developing countries to continue their growth and reduce poverty. “ (from World Development Report 2010, p. 257)

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Box 13-1. Livelihoods

Livelihoods are typically understood as the ensemble of capabilities, assets and activities that are required for a means of living. The concept revolves around the opportunity set afforded by an individual or a household defined by their asset endowments and their chosen allocation of those assets across various activities to generate a stream of benefits (Barrett et al. 2005). Livelihoods depend on the following components (Bebbington 1999): access to natural, human, physical, financial, social, and cultural capital assets; the ways in which people combine and transform these assets; the ways people expand their asset base through relationships with other actors; and the ways in which they deploy and enhance their capabilities to be and to act, to make lives more meaningful, and to negotiate the rules that govern the control, use, and transformation of resources. Human capital, including individual capabilities, can enhance people’s ability to be agents of change, to challenge the rules of the game, the ways things are done, which is a crucial prerequisite to poverty alleviation (Sen 1981).

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Increased attention to chronic poverty as a critical dimension in thinking about poverty reduction has further shifted the analytical lens to the dynamics of poverty and its institutionalization within social and political norms and

systems. The sustainable livelihoods framework has been influential for assessing and making sense of the complexities that surround poverty and the lives of the poor. The Chronic Poverty Report 2008-2009, prepared by the University of Manchester, focuses less on poverty at national scales and instead illustrates how millions of people become trapped in poverty for most of their lives, as well as changes in well-being that individuals and households experience over time. Understanding the causes of households' movements in and out of poverty can provide a sounder basis for strategies to eradicate poverty than conventional analyses of national trends in poverty (Hulme 2003, McCay and Lawson 2003). What is emphasized is multidimensional deprivation – hunger, undernutrition, unclean drinking water, illiteracy, having no access to health services, social isolation, and exploitation (CPRC 2004).

More critical assessments of chronic poverty portray such multidimensional deprivation and its persistence over time as an inherently political problem that becomes legitimized within political discourses while the poorest groups perpetually fall short of a political voice (Hickey and Bracking 2005). Within this body of literature, the chronically poor have been defined as "those most lacking in the assets required to exercise a political voice" (Hulme and Shepherd 2003) and those "most likely to enter a Faustian bargain whereby they trade away their agency in search of livelihood security" (Wood 2003). Much attention has been paid to poverty traps – situations in which individuals and households that hold highly unproductive asset portfolios trap themselves in chronic poverty despite rational attempts to manage risk (Barrett and McPeak 2004). While debates continue over whether duration is more significant than severity, or vice versa, the poor remain "those whom it is permissible to ignore" (Hossain in Hickey and Bracking 2005), which reflects long standing debates about the unevenness of development. [*possible link to Harvey's accumulation by exploitation, and dispossession*].

Despite progress in policy debates to acknowledge the complexity, multi-dimensionality, and dynamics of poverty, the technical literature has faced difficulties in producing compelling metrics that capture these crucial elements that exceed the basic material dimensions of poverty (income and caloric intake). The International Poverty Line (IPL) continues to function as the main yardstick in tracking poverty and progress on the MDGs. But even if it is practically convenient, the IPL disregards how far above or below this line people are living and how poverty is distributed within a country and households, thereby concealing major inequalities. It accurately presents a head count of how many people are poor but is indifferent to the intensity of poverty. Closer attention to skillful poverty accounting reveals that the current $1.25/day IPL, set at an appallingly low level, will make it likely to reach the triple-revised MDG while a $2.00/day IPL would position the world 59% behind its goals for success (Pogge 2010).

To overcome measurement constraints and limitations of the IPL, recent initiatives have followed Amartya Sen's (1976) axiomatic approach that emphasizes different aspects and dimensions of poverty. A novel UNDP metrics developed by Alkire and Santos (2010) aims to get at intensity of poverty based on patterns of deprivations in very rudimentary services and core human functionings. Their Multidimensional Poverty Index (MPI) is a product of headcounts (percentage of people who are poor) and the average intensity of deprivation (proportion of dimensions in which households are deprived). This accounting system allows for an understanding of deprivations that affect a household at the same time, and emphaszes the spatial distribution and clustering of poverty. By comparing three dimensions - health (child mortality, nutrition), education (years of schooling, child enrollment), and standard of living (electricity, drinking water, sanitation, flooring, cooking fuel, and assets) – the MPI reveals the greatest intensity of poverty tobe present in 29 African and 4 South Asian countriesand in Haiti and Yemen. It indicates that 1.7 billion people are poor if when the multidimensional nature of poverty is taken into account, a far higher number than indicated by the $1.25/day poverty line. Furthermore, emerging patterns point towards differential driving forces, e.g. nutritional deprivation versus ill-health. Other recent work illustrates decomposition by a country's administrative units, spatial distributions of poverty, and distance from reaching a poverty line (CIESIN 2006).

Here we intend to show the global distribution of poverty (MPI) as a world map (probably from CIESIN)

Finally, in order to effectively assess the complex direct and indirect impacts of climate change on poverty and livelihoods, a close examination of how these respective concepts are framed, understood, and incorporated into policy decision-making is needed. The way that a particular issue is framed is fundamental as it provides concrete suggestions for action, and serves as a guide for policy making (Forsyth 2003). In the dominant policy debates including those on climate change, poverty and poverty reduction have been largely defined through an economic

lens . Just as climate change itself, poverty reduction has been predominantly framed as a technical issue that can be best solved through economic growth and external and expert-led policy decision-making. Indeed, most of the chief policy descriptions favor market-based responses and adaptation aid to counter worrisome trends that are likely to slow down or even threaten the achievements of the MDG. They also comprise a variety of sector-specific and economic growth models that estimate climate impacts on the world's poor (e.g. Skoufias et al. 2011). At the same time, such growth-driven discourses and solutions have been criticized as technocratic and dislocated from social interactions, obscuring the processes of wealth creation and accumulation that have produced and perpetuated poverty and exclusion worldwide (St. Clair 2010). While attention has increasingly been focused on pro-poor adaptation among multilateral and bilateral aid agencies, these approaches often involve targeting vulnerable groups but may fall short in actually addressing the relations and structures that create vulnerability and poverty in the first place (ref to WB and aid documents needed). Leichenko and O'Brien (2008) and O'Brien et al., (2009) argue for the need for measures to address not only the adverse outcomes of climate change, but also the social and political context that generates both vulnerability and poverty. A contrasting poverty discourse acknowledges poverty as relational, constructed in particular places in relation to wealth and privilege (The Critical Global Poverty Initiative 2010). It places the needs, skills, aspirations, and agency of poor people at the center of analysis while tackling deep-seated inequalities and uneven power relations as well as promoting human dignity, the responsibility to protect, a culture of solidarity, and global social cohesion (Lawson and St. Clair 2009; St. Clair 2010). Market-based solutions and climate aid leave the poor in the hands of external expert institutions. But an alternative framing of climate change and poverty reduction as issue of rights and human security attempt to preserve the poorest people's resilience and capacity to act (O'Brien et al. 2010; CARE 2009; Pettengell 2010; several OXFAM papers).

Approaches are increasingly linking poverty and climate change through the concept of vulnerability and the mechanisms associated with it, stressing that vulnerability and poverty are not the same. Not all poor people are vulnerable in the same ways. Poor people differ in their livelihood strategies, social and political relations, and the types of stressors to which they are exposed (Coetzee 2002; Eriksen and O'Brien, 2007). Non-poor people can be more vulnerable than poorer groups, depending on for example on the extent of diversification of livelihoods and exposure to climatic and socioeconomic stressors(Eakin, 2006; Ziervogel et al., 2006). The reasons that many poor people may feel the effects of climate change particularly severely also varies between groups. Tanner and Mitchell (2008) point out that adaptation funding, if targeted at the poor, can provide an opportunity out of poverty for some groups. Using the term 'sustainable adaptation', Eriksen and O'Brien (2007) argue that particular attention needs to be paid to three points of intersection between vulnerability and poverty: the particular risks that climate change poses to the livelihoods of the poor; second, the adaptive capacity of the poor; and third, the processes driving vulnerability of the poor. Different development pathways are required from those that currently produce both high emissions and inequity. In order to respond to climate change in ways that address poverty, social inequity and long term environmental integrity, complex local vulnerability contexts and the multiple stressors that drive them must be taken as a starting point, the differing values and interests affecting adaptation outcomes need to be acknowledged; local knowledge and understandings of change must be integrated into adaptation responses, and potential feedbacks between local and global processes considered (Eriksen et al., 2011). The way that climate change affects poverty and livelihoods is highly political in other words, since the interests of poor groups may differ from those of wealthier groups and interests may vary within poor groups. Whether or not the vulnerability, knowledge and responses to climate change of the poorest people count in development and adaptation decisions is a matter of negotiations and competition between different interest groups and, essentially, empowerment.

13.2.2. Scales of Poverty

The issue of scale is critical in understanding how climate change affects poverty and livelihoods. The scale at which poverty is examined

The human security approach highlights that the values and aspirations beyond the mere material, including social belonging and influence over ones own circumstances, are important when considering what constitutes vulnerability, adverse impacts of climate change, and motivating local responses. The issue of scales is critical in that which scale you look at (national level, community, group, household or individual level) is important in determining which causes of poverty are considered, and which relations and structures through which livelihoods

are negotiated. Improvement in some geographic areas may also mask increasing impoverishment among groups in other areas. While examination of aggregate poverty levels, for example at national or regional levels often point to economic growth and linear and uni-dimensional relationships between poverty and vulnerability (Tanner and Mitchell 2008; Skoufias et al. 2011) or economic structures creating poverty and vulnerability (O'Brien et al., 2004), human security and social vulnerability approaches increasingly focus more closely on the adaptive capacity and outcomes of climate stresses of communities, households and individuals. Vulnerability and the potential impacts of climate change are highly differentiated between individuals in a community or even within a household, and outcomes of climate change on poverty and livelihoods similarly differ (Eriksen and Silva 2009).

The assumption that it is the poor in developing countries that are going to be hardest hit by climate change illustrates the importance of scale. The issue of winners and losers of climate change is critically affected by the scale of investigation. Some studies focusing on national level economic indicators suggest that certain developed countries may benefit from climate change, at least in the short term (Aaheim et al). If considering global scale processes and economic linkages between countries however, or local level variations in the effects of climatic and other changes on different groups, the conclusions are very different (O'Brien and Leichenko, 2003).

Recent events have demonstrated that there are many groups that are vulnerable to climate impacts in wealthy countries as well. In Europe, heatwaves, likely to become more common with climate change, have worsened the health and mortality of the elderly in particular (Wolf et al., 2010). Hurricane Katrina in New Orleans showed that climatic events can have both immediate and long term consequences in terms of displacement and loss of livelihoods among poor groups. Although risk from hurricanes are well known, measures to protect the population of New Orleans had not been sufficiently prioritized by decision makers. These examples illustrate that climate change and its effects on livelihoods and poverty are global issues of empowerment and development, not just the concerns of developing country populations.

An increasing body of literature emphasizes that linkages and processes across scales are critical in understanding vulnerability and poverty, especially the processes through which people become vulnerable and the relationship to poverty. The livelihoods approach has been criticized for describing how people experience loss of entitlements, but not explaining the processes that bring about such outcomes. Political economy and political ecology literatures explain poverty and changes in poverty in terms of uneven power relations, asymmetries in access to resources and capitals, and processes of accumulation and political change at the national and global levels (Murray, 2002; O'Laughlin, 2002; Watts). Another body of literature focuses on the role of institutions and social capital in creating vulnerability or facilitating adaptation (Dodman and Satterthwaite 2008; Adger) For example, the institutional framework may determine if poor people have access to resources or strategies required to adapt to climate change. Vertical and horizontal social and institutional linkages and forms of organization are important for the flexibility in the face of climate change. Informal institutions and linkages are often assumed to be more important in poor societies since formal institutions of support are often weaker (and the poor typically politically marginalized), but the interaction between formal and informal relations and social organization is important for the adaptive capacity of households and communities in developed countries, too (Rodima-Taylor, 2012; Eriksen and Selboe, 2012). In some contexts (Marin 2010) social capital may be fundamental to allow adaptation and most people invest in it (in kinship and reciprocity networks) but it is not always clear what is needed to transform it into economic capital. Impoverishment can occur through loss of kinship and neighborhoods by for example displacement (Sharp and Speigel 1985) and conversely, generalized poverty may lead to a weakening of the kinship networks and institutions of redistribution and reciprocity (Marin and Eriksen 2011). But these circumstances may be idiosyncratic and variable within a country, and even within one and the same community at different points in time (ibid.) Decentralization has been suggested as a potential solution to adaptive (co-)management; however, this assumption can be questioned by the tendency that local formal institutions, knowledge and management are being simultaneously eroded by economic and political globalization (Marin 2010, Keskitalo 2008) as well as management cultures for natural resources based on New Public Management (Eakin, Eriksen et al 2011) and New Governance (Keskitalo 2009). 5).

Although the local patterns can only be understood by studying linkages and processes across scales, local scales hold the key to understanding the mechanisms for vulnerability creation and adaptation, including exposure to climatic conditions and events that are specific in space and time. Patchiness, onset of rains, length of rainy season,

distribution of rainfall during the rainy season, intensity of rainfall and temperatures are often more important than change in the total annual rainfall or annual average temperatures. There is very little climate data available at the spatial and temporal scale necessary (the resolution of GCMs is too coarse), as illustrated by a study of Ethiopia (Meze-Hausken, 2004).

Local scales also illustrate how impoverishment takes place in the face of climate stressors. Here, time scales are also important. Individuals and households may shift in and out of poverty as a result of climate-related events. Case studies have looked at how households and individuals shift in and out of poverty (e.g. Barrett, McPeak, Little, Smith – poverty in pastoral areas in East Africa); also shifting in and out of resilience and vulnerability (Sallu et al. 2010) in Botswana. For example, drought may lead to a loss of livestock, deterioration of capital and alternative sources of income. Repeated droughts put stress on the local coping strategies and systems of mutual support making it difficult to restock. Nomadic pastoralism is a system well adapted to climatic variations and herds can recover with improvement of ecological and social conditions, shifting people back out of poverty (Scoones et al). Pastoralism provides a good example of large fluctuations in wealth over time. They also illustrate shifts in livelihoods over time, becoming more or less reliant on pastoralism (compared to trade and agriculture) as an adaptation in the long term (e.g. Khazanov 1995, Blench ?etc.). Different pastoral systems follow contrasting pathways of destitution and adaptation, however. In eastern African pastoralist societies, the poor tend to leave pastoralism for other livelihoods, with serious social, cultural and identity consequences for those who are excluded. Absolute poverty resulting in social exclusion is most visible in times of stress, such as with rapid loss of livestock due to drought or conflicts. Such changes can also take place as a gradual process over longer time scales, however. In contrast, in many pastoral societies elsewhere in Africa, the poor are accommodated within pastoralism through inegalitarian social structures (Broch-Due and Anderson 1999)

Rural households in poor countries without formal insurance mechanisms have been observed to shift in and out of poverty, unable to meet basic needs such as nutrition, health and education during times of harvest failure, but recovering once rains return (Eriksen et al., 2005, Glantz). However, climate-related events such as droughts may also contribute to long term impoverishments, as has been observed among pastoralists (Lind and Eriksen 2006). Animal deaths and herd losses process can be reinforced by loss of key grazing areas to private investors, making it difficult to sustain the minimum viable herd size. This may push people out of pastoralism and into destitution, switching to marginal livelihoods such as collection of forest products or migration to cities (Marin and Eriksen, 2011). A common pathway of impoverishment is the loss of mobility for example due to conflict and insecurity, making people unable to face droughts and floods. Processes of loss of drought grazing areas to agricultural processes, conflict and insecurity, and adverse terms of trade may together make people highly vulnerable to the slightest stressor, with high sensitivity to even small meteorological events (Fraser 2007). In the case of farmers, Ziervogel et al. (2006) distinguish between responses that allow households to succeed in the long term, and those that merely allow survival. Eriksen and Silva (2009) studying villages in Mozambique show that among the most vulnerable households with unfavourable market relations, livelihood activities become increasingly marginal during a drought, with many households being locked into marginal activities such as casual employment in the long term, contributing to impoverishment. The poor often diversify in less advantageous markets than the better off, meaning that the outcomes are also differentiated (Sabates-Wheeler et al. 2008). Time scales are particularly important because, as Sabates-Wheeler et al (2008) point out, different adaptation support is required for the transient poor compared to the chronically poor. Hence, climate factors and other changes together lead to destitution, but the exact contribution of climate change may be difficult to distinguish since these changes interact both with climatic variability and social processes of change.

While studies indicate inequities within households (individual as unit of analysis), such as based on age and gender, systematic analysis currently not possible due to data constraints (Alkire and Santos 2010). Gender is case in point for the complexity of poverty and causal links shaping who becomes poor and why. An improvement in household incomes does not necessarily lead to improvement in the well-being of all members of the household. It has been suggested that redressing gender imbalance in access to and control of productive resources will significantly reduce poverty, and that equity will foster economic growth and poverty reduction. Some research quantifies the effect of gender equality (rights to resources etc) on poverty (Jones, 1993, Udry 1996 in O'Laughlin 2007, Morrison et al 2007). Others argue that unless the general vulnerability context created by processes such as market liberalism, individual property rights, and commodification of resources, improvements in poverty levels at the community

level may be very small (O'Laughlin 2007). Carney (1996) also shows how gender inequalities and poverty (generalized this time not only for women) have actually been exacerbated (in Gambia) by development interventions such as irrigation schemes and the 'drought-proofing of the economy'. Such measures are increasingly proposed as climate change adaptations in national policies, suggesting that national level adaptation may increase vulnerability and impoverishment among some groups. Other studies (e.g. Peters 2010) show that men can also be discriminated against and hold much weaker tenure rights (in Malawi) but that again, policies aimed at strengthening women's tenure by formalization may in fact weaken women's rights. Even though local responses such as community based adaptation can help livelihoods adapt to climate change and alleviate poverty (Sabates-Wheeler et al. 2008), addressing inequities generating the root causes of vulnerability require structural measures (Lemos and Tompkins 2008).

The issue of livelihoods and their changes in time are relevant also in the discussion of adaptation (not only on poverty). One aspect is livelihoods diversification as an adaptation strategy. Numerous studies show that diversification may indeed reduce vulnerability by spreading risk. Yet there are exceptions showing that diversification may in fact be maladaptation when the logistical and organizational costs of combining different livelihoods (pastoralism and agriculture) become too high (Benjaminsen 2008) and other livelihood transformations, such as intensification may be more effective (Eriksen et al, 2005; Sabates-Wheeler et al., 2008). Another study also showed that livelihood diversification may in fact be limited by cultural aspects related to identity and value systems (e.g. valuing the perceived 'freedom' inherent in pastoralism as opposed to the 'slavery' of agricultural work) (Nielsen and Reenberg 2010).

Distribution within a household (individual as unit of analysis), would be great to compare poverty between men and women and between different age group, but systematic analysis currently not possible due to data constraints (Alkire and Santos 2010, Sen 1987 (Wider Working Paper)).

Case studies that look at how households and individuals shift in and out of poverty (e.g. Barrett, McPeak, Little, Smith – poverty in pastoral areas in East Africa); also shifting in and out of resilience and vulnerability (Sallu et al. 2010) in Botswana.

Need to say something about poverty in the North as well!

13.2.3. Inequality and Marginalization (Gender, Political, Economic, Social, Geographical)

Poverty as a multi-dimensional and dynamic state reflects deep-seated inequalities in access to and control over resources and the uneven power structures that sustain inequalities and curtail participation in decision-making. These persistent inequalities 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. They not only inhibit the poor and marginalized from managing risk on a daily basis and effectively coping with climatic and no-climatic stressors and shocks, they also represent significant barriers to escape poverty and enjoy well-being and a life in dignity. Such systemic inequalities lower the opportunity to meet material and resource needs; exercise rights and express voice; maintain health and basic levels of education; and freely practice and share cultural and social practices (Eriksen and O'Brien 2007; OECD 2001; Petheram et al. 2010).

Addressing the "structural inequalities that create and sustain poverty, constrain access to resources, and threaten their long-term sustainability" (Lemos et al. 2007: 2) has been recognized as a crucial entry point to both climate change adaptation and development (Huq et al. 2005; Schipper 2007; Boyd et al. 2009; and many more). At the global scale, much of the impacts work has overlooked the spatial geographies of inequalities, overemphasizing indigenous communities and small island populations in colder and coastal regions and while underrating vulnerabilities among the rural and urban poor in drylands and tropical ecosystems (Liverman 2009).

The prevailing economic solution (e.g. adaptation aid and market-based mechanisms) to the fact that the poor and minority people experience and will continue to do so disproportional harm from climate change impacts (IPCC 2001; Adger et al. 2007 AR4) aims to adjust income levels to rectify economic deficiencies and ease the poor's

suffering (examples and references needed here). At the same time, this framing portrays poverty, the enduring existence of the poor, and their vulnerability as largely unrelated from inequality and outside of social relations that upheld uneven power structures (Pogge 2009; St. Clair 2010). Ignoring uneven social relations that allow disproportionately burdening the most vulnerable with the brunt of negative impacts of climate change has been identified as one of five major types of maladaptation (Barnett and O'Neil 2010).

A growing literature on poverty and climate change attempts to unpack pre-existing inequalities, marginalization, dispossession, structural violence, and disempowerment that undermine the potential for adaptive capacity to climate change, as well as human development and social justice. The majority of these contributions stem from research on indigenous peoples and gender and climate change.

Indigenous People

From a legal perspective, precipitated by petitions from the Inuit of Canada (2005) and the Maldives (2007), the Office of the High Commission for Human Rights (OHCHR 2009:21-41) reports that specific rights, such as the right to life, adequate food, water, health, adequate housing, and the right to self-determination, are directly implicated by the impacts of climate change, and that violations of these rights are linked to geographic vulnerabilities, such as those of small island states, as well as poverty and existing vulnerabilities and inequalities (Limon 2009). Yet, indigenous peoples, comprising 350 million persons of 5,000 different Aboriginal tribes in more than 70 countries (Davis 2010) continue to be marginalized in local, national, and international debates with their rights, needs, and knowledge unheard (Davis 2010; Petheram et al. 2010; see also Schroeder 2010).

Persistent exclusion and devaluation of indigenous values and connections to place and landscapes, lack of voice, and miscommunication perpetuate their marginalization and disempowerment. For instance, Petheram et al. 2010 describe how the impaired health of the natural landscape impacts mental and physical health among people, threatening an overall sense of belonging among Yolngu people in North East Arnhem Land, Australia. Among the island communities of the Torres Strait, sea level rise adds an additional layer of stress and anxiety to persistent marginalization, and relocation is likely to result in a loss of their "cultural point of reference" (Hunter 2009: 448). "Place identity" (Proshansky et al. (1983:58), particularly among those working and living on the land, allows for a symbolic extension of self embedded in and interacting with the environment, which becomes threatened in landscapes transformed by long-term or repeated droughts, also observed among marginalized smalls-scale farmers in Northern Ghana (Tschakert et al. 2011). Stress disorders, depression, anxiety, feelings of sadness and loss, and other negative health outcomes as a result of lived and anticipated climatic changes are also reported for Alaska Natives (Bell et al. 2010).

[more on indigenous people, esp. Arctic communities and small island states (e.g. Ford; Salick and Ross 2009)]

The compounded effect of continued marginalization of indigenous and other minority people and the lack of recognition of their values, worldviews, and practices, mirrors wider concerns about the "systematic undervaluation of involuntary loss of places and culture" that has also been identified as a critical limit to adaptation (Adger et al. 2009: 339). Such loss in rurality is not limited to indigenous communities but signals how rural places increasingly embody loss, of people, natural resources, and visions of long-term viability (Kelly 2009), which is likely to be exacerbated under climate change. Whose values and worldviews and associated priorities count in the search for mitigating options depends on who holds the power in decision-making and not necessarily on who is most vulnerable (O'Brien 2009). Examples from small-scale mountain farmers and herders in the Andes and the Himalayas (Orlove 2009) as well as farmers in the Murray-Darling Basin in Australia (Alston 2011) demonstrate how rural water needs are sacrificed to more powerful urban demands.

Gender

Research and empirical work on gender and climate change provides further evidence that specific configurations of uneven social relations of power, social and cultural norms that determine division of labor, inequality in economic

and political positions, and discriminatory institutional practices all shape unequal access to and control over household and community decision-making processes, and hence result in gender-differentiated impacts of climate change (Nightingale 2009; Drinkwater 2009; Terry 2009; Arora-Jonsson 2011; MacGregor 2010; Resurreccion 2011). There is mounting evidence, both from research and NGO experiences on the ground, that men and women are impacted differently by climate change, due to their different roles within the household, their communities, and wider socio-political and institutional networks (Magrath and English 2009; Dankelman 2010; Vincent et al. 2009; Nelson and Lambrou 2009; Buechler 2009; Alston 2011; and many more). Adger et al. 2007 (AR4, Ch 17) note higher vulnerability of women than men to weather-related disasters, including higher numbers of death and disproportionate amount of burden in recovery and rehabilitation, due to broader patterns of structural gender inequality. However, more cent work suggests that mortality during natural calamities is tied to socially constructed vulnerabilities such as discrimination, lower caste and lower class, and social conditioning and expected gender roles, rather than being a woman *per se* (Arora-Jonsson 2011). More concerted efforts are emerging to understand the underlying reasons for gendered impacts and the role social differentiation plays in assessing and potentially remedying the very processes and conditions that perpetuate gender and other inequalities and those that reduce harm through enhanced adaptive capacities (Tschakert and Machado 2012; Tuana et al. 2013).

This more recent focus on endemic social drivers of marginalization and discrimination in gender and climate change research, equally relevant to other inequalities resulting from ethnicity, class, caste, age, and disability, is in stark contrast to earlier work that diagnosed women's universal vulnerability to climatic change, including extreme events, particularly among poor women in the Global South. More in-depth analyses unpack and reject such simplistic generalizations, for several reasons. First, the construction of poor women as vulnerable victims in a one-dimensional narrative perpetuates the negative stereotype of Southern women as helpless, voiceless, passive, and depended on external help. It denies women's agency and positions their vulnerability as their intrinsic problem (MacGregor 2010b; Manzo 2010; Arora-Jonsson 2011). Second, it implies that women need special attention because they are the poorest of the poor, mixing and simplifying two distinct forms of disadvantage. The resulting and problematic use of the term "feminization of poverty" (the poor being mainly women) distracts attention from the more important understanding that poverty is a gendered experience, and that more income does not necessarily eradicate discrimination (Jackson 1996; Kabeer 2008; Chant 2010). Third, it masks the complex and intersecting power relations and other fundamental structural causes of inequality, which suggests certain disadvantages for women and for women alone, hence further obscuring the role of gender rather than making it evident and tangible (Arora-Jonsson 2011). Fourth, it implies that, despite their vulnerability, women are also crucial caretakers during times of crises, thus increasing their already long list of household responsibilities and exacerbating the "feminization of responsibility" (Resurreccion 2011; MacGregor 2010b; Arora-Jonsoon 2011). Fifth, this focus on women's universal vulnerability portrays women's roles as homogeneous and static, reinforces differences between women and men as given and unchangeable, and further deflects attention from inequalities in decision-making (Nightingale 2009; Arora-Jonsson 2011). Sixth, it overlooks specific cultural norms that enhance gender-specific vulnerability among men, including male risk-taking (machismo) under Hurricane Mitch in Nicaragua (Bradshaw 2010) and other dangerous search and rescue efforts during floods (Oxfam and UN Vietnam 2009) and hazardous boat routes into Europe taken predominantly by African young men (Terry 2009). Seventh and finally, it constitutes a simplistic and problematic binary between the alleged vulnerability of poor women and the scientific and technological debates and discourses of climate change driven predominantly by men (Alaimo 2009; Seager 2009; MacGregor 2010a).

13.2.4. Agency, Structure, and Structuration

The scientific debate on causes and remedies of poverty has always been about structures and agency. Even if the structuration theory {Giddens, 1986 #2021} solved the problem of structures OR agency, development theories and practices are contested. The graph in Figure 13-1 shows clearly that rural poverty has declined dramatically in East Asia (and to a lesser extent in Southeast Asia). These changes are very much due to societal reforms enabling people to exercise their agency. On the contrary, in the case of sub-Saharan Africa, we see a dramatic increase in poverty between 1988 and 1998, a period characterized by the structural adjustment programs. These programs were aimed at structural change in favour of free markets through public sector reforms, devaluation, and elimination of marketing boards {Herbst, 1990 #2026}.

Poverty has individual as well as social causes and consequences. Thus, the challenge of poverty is both structural with implications for society and personal with implications for individuals. A person who is poor may describe poverty as a downward spiral of decreasing income because of unemployment, ill-health, rising food prices and increasing fees for education, health care, transport and so on. In contrast, an observer may describe that person's situation with reference to social structures, institutions and culture (Hulme 2004). Moreover, poverty is socially stratified in the sense that not everyone who is poor is poor in the same way. In many instances women as a category may be poorer than men as a category and concerning the spatial dimension poverty in rural areas maybe more widespread or deeper that in urban areas. In addition, poverty has a time dimension and may be chronic or it may be transient in the sense that people who are poor may be seasonally or temporarily poor or more or less poor over the life cycle (Sen 1981, 1999).

As causal factors, some would argue that poverty is persistent because people who are poor do not or cannot for various reasons take individual action to overcome their own poverty (Lister 2004). Others would argue that people who are poor can take action if only they are given the right conditions and opportunities (de Soto 2000). Thus, concerning the political aspects of poverty it can be discussed whether poverty should be overcome through individual initiatives, collective action or societal action.

In the development discourse there has been a focus on large scale initiatives such as foreign official aid or large scale investments in employment, health, infrastructure and technology especially in agriculture a so called Big Push or balanced growth (Rosen-Stein Rodan 1943?, Sachs 2005). This is meant to pave the way out of vicious poverty circles (Nurkse 1953). In contrast, there has also been a focus on unbalanced growth with dispersed and small scale initiatives (Hirschman 1958, Easterly 2006) or as of late also on global partnerships (Collier 2007).

In essence, it can be argued that poverty is a matter of mal-distribution. It is a matter of inequality in terms of access to material and immaterial resources ranging from productive resources such as land, livestock and financial means but also of health, human capital, and life opportunites (see Nussbaum 2000, Sen 1999, Sen 20xx). As of late, UNDP emphasizes (UNDP Human Development Report 2010) that economic growth and development is a matter also of formulating and implementing politics of redistribution.

Concerning equality and inequality, there is long-term debate on equal opportunities, or equity, in terms of a correction of the natural lottery of where you were born (Rawls 1999). The World Bank (2005) has propagated the concept of equity for the sake of improving equality and in its extension for alleviating poverty. In the discussion, the World Bank followed John Rawls' (1999) argument on the need to correct the natural lottery in favor of equal opportunities as well as Martha Nussbaum's and Amartya Sen's (1999, 2000) ideas on life opportunities. Yet, the critiques underline that the term is so vague and wide and calls for so encompassing policies that it may even counteract efforts on poverty alleviation (Cling et al 2006). From a critical view point, power will shift opportunities in favour of better situated groups which in turn will counteract the intentions of the equity policies (Lakoff 2006).

Petengell 2010

- Move adaptation beyond building resilience towards making the transformational changes needed to move communities from being victims of CC to actively pursue opportunities and alley the negative consequences of CC;
- Concept of human security – how to strengthen people's ability to withstand the impacts of CC and emerge from poverty; people vulnerable to shocks are agents of their own destiny, with a series of rights that need to be fulfilled

Examples from Oxfam and CARE (2009, 2010)

- Get away of framing of poverty as combination of powerlessness and material deprivation – overlooks assets and positive strategies people use to overcome obstacles in their lives (Oxfam Poverty in the UK)
- Poverty reduction measures should aim to preserve the poorest people's general resilience and capacity to act! (CARE 2009 Water)

Focus on agency, skills, and human voices in gender and climate change studies (Alaimo 2009; MacGregor 2010b)

13.2.5. Dimensions of Poverty (Markets, Food Insecurity, Health, Access to Basic Services)

More than just material deprivation, poverty also encompasses dimensions of belonging, socio-cultural heritage, and control over one's destiny (O'Brien et al. 2004). More than any other factor, poverty determines vulnerability to climate change and limits adaptive capacity; poverty means people have few assets to fall back on in times of increased hardship, incl. little or no savings, and generally limited access to credit; their options often include unsustainable short-term coping strategies that can erode assets; people living in poverty are often forced to occupy the least productive or most disaster-prone lands; even modest changes of climate hazards will quickly push poor households and communities beyond their abilities to cope (Petengell 2010)

Markets

[can smallholding peasantry be called a key economic sector in Ch 10?]

Food Insecurity

[coordinate with Food chapter (Ch 7)]

One of the most salient features of poverty is food (in)security. In a comprehensive review, Maxwell and others {Maxwell, 1992 #2022} found around 200 definitions of food (in)security but these boiled down to four key aspects: 1) sufficiency of food, defined mainly as the caloric need for an active healthy life; 2) access to food defined by a bundle of entitlements; 3) security defined by the balance between vulnerability, risk and insurance; 4) time where food insecurity can be chronic, transitory or cyclical. According to the FAO report on The State of Food Insecurity 2001, food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life {Clay, 2002 #2024}.

[INSERT FIGURE 13-2 HERE
Figure 13-2: World map of hunger expressed as percentage of children age 0-5 who are underweight (CIESIN, 2005).]

There are several reasons why we can expect hunger to persist: increasing food prices (ref), increased competition for water (ref), climate change (Lobell 2011). One reason why poor people are particularly vulnerable to food prices increases is that a very large share of their food consumption is the agricultural product itself and very little due to value added processing of the food.

Health

[coordinate with the Health chapter (Ch 11)]

Access to Basic Services

Perhaps this should also include poor urban infrastructure and slum settlements – good overview of issues in Hardoy and Pandiella for Latin America.

13.2.6. Multiple Stressors

Although systematic analyses may be difficult there are some significant ways in which a scalar approach may contribute, not the least in reference to multiple stressors (different stressors may enter the system at different spatial and temporal scales, and further create impacts by simply trickling down, or by being reinforced or diminished, when moving from one scale to another).

The literature on multiple stressors emphasises the synergistic relationship between climate change and other stressors; that is, climate change and other environmental and social changes reinforce each other, often negatively. At the same time, the nature of impacts on local livelihoods and responses are cross-scalar, many of the stressors felt locally are generated through global or regional processes and interact with national and local processes and relations (Reid and Vogel 2006; Fabricius and Folke 2007; Thomas et al. 2007; Paavola 2008). Hence environmental and social processes other than climate change also threaten people's livelihoods and quality of life. Studies in both Africa and Latin America show that most individuals and communities rarely respond to a single source of stress at any one time; instead, they are adapting to multiple stressors, in addition to climate variability, extremes and the risk of disaster (Eakin, 2006; Reid and Vogel, 2006; Schipper and Pelling, 2006; Ziervogel et al., 2006; O'Brien et al., 2008; Eakin and Wehbe 2009; Eriksen and Silva 2009; Eriksen and Watson 2009; O'Brien et al. 2009). Climate variability and change interact with market volatility, changing land tenure systems, spread of infectious diseases, declining soil fertility and poor or absent public services. In the horn of Africa, severe weather events come on top of the closure of markets/bans on trade due to disease and political processes. Climate risks and market integration are together exacerbating the economic marginalization of vulnerable groups living in semi-arid rural areas in Mozambique, for example, though the same processes represent economic opportunities for others (Eriksen and Silva 2009). Women small-holders in Mozambique and Kenya, especially those with few assets, marginal alternative livelihood opportunities and who have weak positions and claims in local social and power relations, are vulnerable to droughts, deteriorating market conditions and conflicts (Eriksen et al.2005; Eriksen and Lind 2009; Gotschi et al. 2008). Inequities may result from multiple stressors. Livelihoods may change towards less adaptive ones when exposed to multiple stressors and successive shocks, forcing people into strategies for survival rather than strategies for success (Ziervogel et al. 2006). This may lead to impoverishment in the long term.

Studies of pastoralists reveal two types of adaptations - buffering and tracking: both facilitated or constrained by other variables. Thus, buffering (through livelihood diversification, state-provided insurance and /or stable marketing schemes, or livestock banks) depends on factors that can always be affected by various stressors (e.g. international markets for livestock, global financial markets, national development plans). Secondly, adaptation through tracking (rapid stocking and destocking, increased mobility to track pasture resources) is also often affected by intervening stressors such as encroachment from other land uses, sedentarisation plans, development and infrastructure plans and projects (irrigation schemes, dams, road development) or conflicts with other pastoralists or agriculturalists, etc.

It is important in this context to look at how for example recent food crises, such as in Mongolia and Ethiopia, led to a rhetoric of 'food sovereignty' and increased plans to allocate pasture land to grain production, potentially leading to significant maladaptations. These strategies based on technological innovations may lead to dependency on imported inputs and spare parts and further exclude populations from land resources on which their livelihoods are based (Carney 1996; Marin and Eriksen 2011).

13.3. Discourses on Development and Poverty

Policies are not made by poor and marginalised people, at best they are made for poor people by others who believe they understand and/or represent poor people's preferences and aspirations. This is particularly problematic because both reasons and remedies of poverty are highly contested in the social sciences. The poorest and socially most marginalised people are notoriously difficult to reach, thus the need to design policies in ways that prevent cooptation by other not so poor groups. Policy processes affecting poor and marginalised people should as far as possible enable poor people's participation in preparation, implementation, monitoring and adaptation of such policies.

The consistent representation of uncertainty to be used in IPCC AR-5 is based on the assessment of two main aspects of the scientific findings: the evidence and agreement of different evidence. In a contested field like development studies, agreement and disagreement might be more dependent on ideology than scientific. For example, large scale land acquisitions in developing countries by developed countries (or companies based in developed countries) may be viewed as beneficial (foreign direct investment) from a poverty alleviation point of view based on modernization theory. But based on dependency theory the same phenomenon may be viewed as detrimental to poor people (land grabbing or neo-colonialism).

From Tschakert and Machado (2012) – copied and pasted from our manuscript – needs to be re-written!
*Research on climate change adaptation has much to learn from **development ethics and rights**. A rights-based approach to development has proven highly useful in addressing power relations that sustain and perpetuate the very inequalities that are at the heart of larger endemic social problems such as poverty and marginalization. Several development scholars, including Alyson Symington (2002), Joanna Wheeler and Jethro Pettit (2005), and Andrea Cornwall and Maxine Molyneux (2006), describe a rights perspective as advantageous for pinpointing structural causes of poverty and inequality, identifying material and political constraints and unequal power relations that prevent the securing of rights, and opening spaces for participation and good governance. Sam Hickey and Diana Mitlin (2009) emphasize that rights are essentially about securing structural change, addressing and rectifying power inequalities, and protecting the poor. They further argue that, very similar to the adaptation debate, 'recipients' of development are in fact rights-bearing actors with legitimate claims to duty bearers and, therefore, the ultimate target needs to be one of social justice, not just freedom. Such a relational claim is directly relevant to vulnerable people with rights not just needs, with knowledge, skills, and agency not just passive survival strategies. Other lessons from RBA in development point toward the efficacy of engaged grassroots actors who approach the state (duty bearer) not with confrontational demands but with innovative and tested strategies that address their needs, from a position of autonomy (Patel and Mitlin 2009). In climate change, such creative autonomous adaptation also serves as 'precedent setting' by demonstrating that communities can strengthen their local adaptive capacity through self-organization, despite the absence of national adaptation plans specifically targeted to the poor and marginalized.*

Human security discourse (see Des Gasper, Asun St. Clair)

From Tschakert and Machado (2012) – copied and pasted from our manuscript – needs to be re-written!
Des Gasper (2007) has proposed the concept of human security, a rights-based framework, as a complement and enrichment to the language of rights and development, including human development, basic human rights, and capabilities approaches. Distinct from an environmental (and national) security approach, human security refers to the security of "basic needs life-areas" (Gasper, 2010) and, hence, constitutes an implicit basic rights claim. Based on the definition advanced by the 1994 Human Development Report (UNDP 1994), human security is understood as distinctly people-centered with an explicit emphasis on people's "options necessary to end, mitigate or adapt to threats to their human, environmental and social rights; … the capacity and freedom to exercise these options; and actively participate in pursuing these options" (GECHS 2009). The Canadian Global Change Program taps into this relatively new conceptual language to emphasize the normative claim that human beings a) are relatively free from disease; b) have access to environmental resources to enable sustainable livelihoods, c) are secure from physical violence and threats, d) experience cultural integrity; e) are protected in terms of their basic human rights and freedoms, f) are assured of basic income, and g) have physical and economic access to food. Despite some critique, largely based on the allegedly militaristic connotation of the term (Hartmann 2010), the concept holds the potential for an integrated agenda of social justice, gender and race equality, and an ethical and emancipatory lens that focuses on those most in need, and the protection of essential environmental resources and services, both locally and globally (Matthew et al. 2010).

Gledwill. 2009. In Hickey and Mitlin.

- Neoliberalism = 'market society' embrace the production of person hood, identity, and social life [*against solidarity*], has replaced obligation and social citizenship

- Rights-based development not only about individualizing ethos, but oriented toward cultivation of a sense of social responsibility to and for others; neo-liberalism has made poor responsible for themselves; detachment of other classes from any inclusive social project; social fragmentation

Asun St. Clair. 2010. (in O'Brien, St. Clair, Kristoffersen. 2010 Climate Change, Ethics, and Human Security): **the responsibility to protect**; solidarity; against neo-liberal premises that construct poor people as a category outside of social relations and ignore process of accumulation and wealth creation that have produced and perpetautaed situations of poverty across the globe.

Asun St. Clair and Desmond McNeill.2009. Global Poverty, Ethics and Human Rights: The Role of Multilateral Organizations. Routledge

T. Pogge. 2010. Politics as Usual: What lies behind the pro-poor rhetoric.

13.4. Assessment of Observed Relationships between Climate Change and Livelihoods and Poverty

This section will be a systematic review and assessment of empirically found relationships between climate change on the one hand and livelihoods and poverty on the other. This work is ongoing. We are systematically searching the scientific and the grey literature on this. Below we have inserted some of the important references we have found so far and we have also inserted key messages from som e of these sources. Sometimes these key messages have been directly copied into our text.

13.4.1. Climate Change Impacts on Livelihoods and Poverty

Climate change is already taking place, and further changes are inevitable. Developing countries, and particularly the poorest people in these countries, are most at risk. The impacts result not only from gradual changes in temperature and sea level but also, in particular, from increased climate variability and extremes, including more intense floods, droughts, and storms. These changes are already having major impacts on the economic performance of developing countries and on the lives and livelihoods of millions of poor people around the world.

The consequences of such changes include decreased water availability and water quality in many arid and semiarid regions; an increased risk of floods and droughts in many regions; reduction in water regulation in mountain habitats; decreases in reliability of hydropower and biomass production in some regions; increased incidence of vector- and waterborne diseases such as malaria, dengue, and cholera; increased heat stress mortality; threats to nutrition in developing countries; increased damages and deaths caused by extreme weather events; decreased agricultural productivity with almost any warming in the tropics and subtropics; adverse impacts on fisheries; and adverse effects on many ecological systems

The following section dealing with adaptation must be coordinated with the chapters on adaptation (Ch 14-17)
The National Adaptation Programme of Action (NAPA) of least developed countries (LDCs) were prepared under the guidance of the United Nations Framework Convention on Climate change (UNFCCC) clearly showed that climate change extreme events particularly drought and flood have impacted the livelihoods (Ethiopia NAPA, 2007; Malawi NAPA, 2006; Uganda NAPA, 2007; Sudan NAPA, 2007; Sierra Leone NAPA,2007;Tanzania NAPA,2007; and Zambia NAPA, 2007). The studies showed that in costal areas most damaging effects of climate change are tropical cyclones, coastal erosion, salinity intrusion and drought. These have been noted to affect crops, fruit trees and different human livelihoods (Gambia NAPA, 2007; Samoa NAPA, 2005 & Tuvalu NAPA, 2007). The current challenges vulnerable communities are facing at present in different parts of the world are exacerbated by climate change these are:

i) Coastal erosion, saltwater intrusion and increasing vector and water borne diseases due to sea level rise;
ii) Inadequate potable water due to less rainfall and prolonged droughts;
iii) salinisation due to saltwater intrusion; and

iv) Decreasing fisheries population.

Rural communities in many developing countries represent the majority of people, who are predominantly engaged in subsistence rain-fed agriculture (and in many instances they depend on single commodity); most of them are food insecure on a year-round-basis (Ethiopia NAPA, 2007; Malawi NAPA, 2006; Uganda NAPA, 2007; Sudan NAPA, 2007; Sierra Leone NAPA,2007;Tanzania NAPA,2007; and Zambia NAPA, 2007). Female- and children-headed households, elderly and women are the most vulnerable, a situation that has been exacerbated by increasing poverty and population pressures on a limited land resource base, low economic productivity of the land, labour and capital, and extreme weather events due to climate variability, and low capacity to adapt to the adverse impacts of climate change.

It has been stated that the decreasing rainfall and devastating droughts in the African Sahel region during the last three decades of the 20th century are among the most undisputed and largest recent climate changes recognized by the climate research community (Aiguo et. al. 2004). The African sahelian zone is a home to millions traditional agriculturalists (both pastoralists and farmers) who depend on livestock herding and subsistence farming for survival. In recent decades the sahel's climate became even drier, resulting in repeated droughts and spread of desert. The United Nations Environment Programme (UNEP, 2007) stated that climatic changes have greatly stressed sahelian countries.

The adverse impacts on livelihoods did not only cause suffering of vulnerable communities but it also triggered migration as well as conflict between tribes (Gambia NAPA, 2007; Uganda, 2007; Sudan, 2007). The high cost of living and inadequate opportunities for income diversification are likely to remain major factors behind permanent migration to urban areas. In Uganda various forms of incursion into the protected areas are experienced because of drought. Pastoralists drive their cattle into the Protected Areas in search of pasture and water. In Lake Mburo National Park, over 300,000 cattle entered the park to access water from river Rwihizi, thus degrading over 100sq km of park (Uganda NAPA, 2007). In the pastoral communities where livestock is the major source of food, migration of the men (family leaders) with the livestock herds in search of water and pasture often leaves the family behind more vulnerable to famine (Uganda NAPA).

The unreliable nature of the rainfall, together with its concentration into short growing seasons, heightens the vulnerability of rainfed agricultural systems. Recent studies in Sudan showed that for the period 1971-2000, the rainfall amount was found to decrease and rainfall isohyets (200 and 500 mm) were found to shift southward. Over the same period of time the coefficient of rainfall variability (or the percentage deviation from the norm) was found to increase (Zakieldeen, 2009). Declining and uncertain rainfall makes life very difficult for traditional farmers and herders and severely affects their livelihoods (Sudan NAPA, 2007). It has been found that drought had led to displacement of some tribal groups from northern and central to southern parts of certain states. The migrating groups were looking for drinking water and agricultural lands in areas that have more rainfall. The altered livelihoods systems, combined with more permanent migration by people in North Darfur (western Sudan) looking for viable land for subsistence, has even led to conflict (Scott, 2008). In Tanzania climate change is expected to further shrink the rangelands which are important for livestock keeping communities. Shrinkage of rangelands is likely to exacerbate conflicts between livestock keepers and farmers in many areas. Vulnerability Assessment of Tanzania indicated that civil conflicts have been occurring between livestock keeper and farmers (competing livelihoods) over grass and water for the animals in Morogoro, Mara and Kilimanjaro regions (Tanzania NAPA, 2007).

The loss of human, natural, financial, social and physical capital, caused by the adverse impacts of climate change, especially floods, drought and landslides, among many other natural disasters and calamities, is of great concern to many countries , as they strives to ensure sustainable livelihoods. Vulnerable communities are struggling with very difficult circumstances. Cultivation patterns and choice of crops has been altered under increasing pressure to cope with changes. In some places, traditional cereal crops are replaced by water melon (Citrulus vignata), which fetches a higher price per unit area cultivated. Most of the coping strategies adopted in different sectors are unsustainable in the long run. Seasonal migration, change in target species etc. all fails to address issues of sustainability and livelihood security (Gambia's NAPA, 2007 & Sudan's NAPA, 2007).

climate change is not just an environmental problem but a serious challenge to sustainable development and the livelihoods. It has been recognized that detrimental impacts of climate change are not limited to crop yields, but extend to social welfare, and population dynamics, increase food insecurity, rural poverty and hardship. Climatic hazards, caused by climate change and extreme weather events represent a serious challenge to almost all the LDCs. Droughts and floods, in particular, adversely impacted food, fresh water, health, fisheries, energy, and the sustainable livelihoods of rural communities. With great percentage of population living below the poverty line, the vulnerable communities do not have sufficient capacity to cope with, or adapt to, the adverse impacts of extreme weather events. Thus, the need to develop adaptation measures for urgently adapting to climate change was considered of high priority for these countries. The NAPA documents of the least developing countries (49 particularly vulnerable countries) came up with adaptation options for facing the most urgent and immediate vulnerabilities of wide range of sectors. The identified adaptation options gave major emphasis to food security and sustainable livelihoods as well as poverty reduction. The implementation of NAPA options/activities are expected to reduce poverty, enable vulnerable rural communities to cope with the adverse effects of climate change.

van Aalst, Maarten, and Shardul Agrawala. 2005. "Analysis of Donor-Supported Activities and National Plans." In Bridge over Troubled Waters, Linking Climate Change and Development, ed. Shardul Agrawala. Paris: Organisation for Economic Co-operation and Development.

Agriculture:

Hertel and Rosch. 2010.

- focus on agriculture as a primary means by which the impacts of climate change are transmitted to the poor
- they ask: What are the likely impacts of rising temperatures and changing rainfall patterns on agriculture and poverty? Of these changes, can we deduce which effects will have the largest implications for poverty?
- **understand different approaches**: crop growth simulation models, statistical studies, and hedonic (or Ricardian) approaches - *various new literature worth checking!*
- Tubiello and Rosenzweig (2008) survey the rather extensive literature on the agricultural impacts of climate change and offer a useful synthesis.
- maize and other coarse grains most affected (low responsiveness of C_4 crops to increased CO_2 concentrations)
- impacts on household wellbeing depend importantly on the degree to which the household is integrated into product and factor markets. If totally self-sufficient, 10% productivity reduction - 10% reduction in consumption; for other cases, look at impacts on household consumption, impacts on producer income, indirect impacts through factor markets, and impacts through non-priced goods;
- actor markets and nonfarm HHs: impact on wages and labor markets = complex; there is a clear scalar effect to impacts, also timing of event, its severity, and length of runoff; Hertel et al 2009 study with15 countries (similar to above); also cited here the Ahmed et al 2009 study (see above) stressing the impact from extreme events
- Non-priced goods: wild foods, medicine, construction material, etc. likely significant impacts on the poor; income from env goods = 24-40%; contribution of income from env goods can be as high as income from cash crop production, unskilled wage labor, and small businesses and craft (Cavendish 2000); reliance depends on LH strategies (remittances, children living away…), but lower income HHs depend proportionally more on wild foods;
- CC can alter path of economic growth: impact of climate variability on crop yields - reduction of rate of GDP growth = 0.4% per year over 3 decades = loss of US$4.3 billion over 10 year period = will keep additional 300,000 individuals below poverty line by 2016; Thurlow et al 2008);

Ahmed and Diffenbaugh et al. 2009.

- They assess the poverty impacts of climate volatility for seven socio-economic groups in 16 developing countries. They find that extremes under present climate volatility increase poverty across our developing country sample—particularly in Bangladesh, Mexico, Indonesia, and Africa—with urban wage earners the most vulnerable group.
- Analysis: 30 year periods from 1971 to 2000 in the 20th century simulations and 2071 to 2100 in the simulations under the IPCC's A2 scenario; uses AR4 distinct ag. productivity stressors (extreme wet, extreme dry, extreme hot); for economic analysis: they examine the poverty impacts of the current climate's once-in-30-year productivity shocks using a modified version of the comparative static computable general equilibrium

(CGE) simulation model GTAP (Hertel 1997) and generate economic changes that are attributable only to the extreme climate impacts in that country.

- poverty analysis through special poverty modules (see Hertel et al. 2009a); Within each country, poverty is broken down into socioeconomic strata based on primary source of income (95% or more of income from the following sources): agricultural self employed (farm income), non-agricultural (non-agricultural self-employment earnings), urban labor (urban household, wage labor income), rural labor (rural household, wage labor income), transfer payment dependent, urban diverse, and rural diverse (Hertel *et al* 2004).
- focus on HH expenditure shares, esp. food; shares range 41-67% in these countries; any rise in food prices will impact income (changes in earnings and in the real cost of living at the poverty line) and hence poverty
- results of current C volatility and poverty via fluctuations in staple grain productivity (on 2001 poverty data) show **tremendous heterogeneity in poverty vulnerability across different segments of population**; most vulnerable group is urban, wage-labor-dependent stratum (extreme exposure to food price increases), pushing them below poverty threshold of consumption; esp. Mexico, Malawi, Zambia; agricultural HHs less exposed, partially insulated because benefits also possible;
- with projected decrease of rural pop, C extremes greater national-scale poverty impacts because more people in more sensitive urban strata;
- C extremes exert substantial stress on low income populations, international heterogeneity
- largest C-induced poverty response in Africa; irrigation would help, but institutional barriers (access to credit and information)

[INSERT TABLE 13-1 HERE
Table 13-1: Percent change in poverty due to once-in-30-year-climate extreme by stratum and country.]

Paula Nuorteva, Marko Keskinen and Olli Varis, Water, livelihoods and climate change adaptation in the Tonle Sap Lake area, Cambodia: learning from the past to understand the future, Journal of Water and Climate Change, 01.1, 2010

It is concluded that while climate change is likely to pose a remarkable challenge to people's livelihoods in the longer term, climate change adaptation activities should also take into account other environmental changes. Equally critical is the understanding of the broader socio-political context and its dynamics in increasing—and decreasing—livelihood resilience.

With the current climate change scenarios, the wet-season water level in the Tonle Sap Lake is likely to get higher and as a result the seasonally flooded area and the height of the flood peak will increase. In addition, the timing and duration of the flood pulse is estimated to change: the flood is likely to start several days earlier and end a few days later than currently. These changes may lead to more intense flood pulses and are estimated to cause harm for agriculture, infrastructure and floodplain vegetation as well as to decrease the fertile land area. The changes may, however, also result in positive impacts, by for example boosting the ecosystem productivity and enhancing dry-season water availability (Västilä et al. 2010).

Dryland agriculture:

Keffing Sissoko, Herman van Keulen, Jan Verhagen, Vera Tekken, Antonella Battaglini, Agriculture, livelihoods and climate change in the West African Sahel, Reg Environ Change (2011) 11 (Suppl 1):S119–S125

The West African Sahel is a harsh environment stressed by a fast-growing population and increasing pressure on the scarce natural resources. Agriculture is the main source of livelihood of the majority of the people living in the area. Increases in temperature and/or modifications in rainfall quantities and distribution will substantially impact on the natural resource on which agriculture depends. The vulnerability of livelihoods based on agriculture is increased and most likely exacerbate and accelerate the current 'downward spiral' of underdevelopment, poverty and environmental degradation. Notably, droughts, a short rainy season and/or very low rainfall will be felt by current systems (Sissoko et al, 2011).

Economy (growth models) [not based on empirical findings but modeling!]

Skoufias, E., Rabassa, M., Olibieri, S. And M. Brahmbhatt (2011). The poverty impacts of climate change. World Bank. Economic Premise (51). 1-5.

- 3 approaches: growth models to see impacts of poverty; sector-specific impacts; impacts of current climate variability on poverty and then impacts of increased variability;
- Integrated Assessments: RICE model (regional integrated model of climate and the economy) developed by Nordhaus 2010; Olivieri et al. 2010 translate implications of different growth scenarios for poverty, using growth-poverty elasticities; they assume constant within-country distribution of per capita income over time [*which is very questionable!*]; focus is on expected or mean value of probability distribution of damage from CC; table also shows just headcounts
- Most emphasis so far on agricultural productivity, but geographic location matters, and so do HH characteristics
- Existing economic models: Jacoby, Rabassa, and Skoufas (2001) India (WB); Ahmed et al (2009), Hertel et al (2010)
- CC will slow the pace of global poverty reduction; but expected poverty impacts modest; but concentrated in Africa and S-Asia; but larger poverty increases if we consider more extreme CC scenarios; considerable heterogeneity in outcomes based on geographic location, assets, income earnings.

Gender

Alston (2011): describes multiple dramatic social consequence of the 10-year drought in Australia, incl. increasing poverty in agriculture, marital conflict, separation, social isolation, loss of social capital, distrust, feelings of alienation, depopulation. These go beyond the typical livelihood impacts of climate change often associated with farming, fishing, and herding in rural communities. Also, they demonstrate that climate impacts on poor farmers are not limited to the developing world but can affect even those that are generally considered well buffered.

- mapping of impacts: patchy, significant, profound (socially depressed) - last category perhaps Australia's first 'CC refugees'
- Alston's work also demonstrated clear gendered impacts: men and women differently impacted because of their different roles with agriculture and rural communities
  - men: attending to heartbreaking and physically demanding tasks of feeding livestock, carting water, destroying frail animals, and coping with realities of barren and eroding landscape - locked into farms, socially isolated and depressed, crises to their identity and masculinity, increased stress, impacts response capacity, high suicide levels; feel demonized (farmers responsible for crisis), loss of political power
  - women: assisting with farm tasks and working off the farm for additional income - interact more at community level, taking care of others' health, at the expense of their own, also stressed, see no end to their working lives

Similarly gendered impacts, triggered by both slow and rapid onset climate events, are described by Oxfam and UN Vietnam (2009) and Cambodia (cited in Resurreccion 2011)

Oxfam and UN Vietnam 2009:

- Key indicators for HH R: ability of and access to HH labor; support through social networks and kin relationships; ability to earn extra income and diversity of income sources, K and experience in dealing with disasters, savings to reinvest in ag and general economic situation;
- many of the least resilient HHs: single mothers, widows, female-headed HHs with small children, disabled family members, men who drink excessively, elderly;
- detailed gender dimensions of CC impacts on types of assets/capitals:
  human: disproportionate impacts on women's mental health, violence against women, less food, increased workloads for both, more men dying (risky activities search & rescue and protection of fields)
  financial and economic: more workloads for both, but more on women when male outmigration
  natural: loss of animals, women weaker tenure security

- key factors shaping resilience include: life cycle stage of households, previous experience of dealing with disasters, the strength of a local self-protection ethos, social support through kin and community networks, and relative strength of livelihoods (diverse strategies and entitlements)
- women face discrimination with legal structures and formal institutions
- evidence of feminization of agriculture, with more men undertaking seasonal outmigration
- Climate change livelihood impacts are clearly gendered. Violence against women increases following disasters and women can suffer greater psychological impacts because of their on-going traditional roles of caring for others. Women eat less and become weaker in periods of prolonged food shortages and stress compared to men because of gender differentiated allocation of household food supplies. Health impacts are gender and age-differentiated, with children and (pregnant) women particularly at risk from water-borne diseases and psychological impacts and the elderly are most at risk from heat stress. Women also tend to be most affected by reproductive tract infections following floods. All of these impacts are likely to increase as climate changes are felt more strongly. Workloads for both women and men are increased by DRM activities, although men have more work during extreme events, compared to women who, generally speaking, have extra responsibilities in preparatory work and in recovery activities (caring for the sick etc). Mortality amongst men is higher during disasters according to villagers, partly because men are more involved in Search and Rescue (S&R), although more information is required.

Case studies show dynamic roles of men and women during climatic crisis

Resurreccion (2011), drawing upon Norm 2009, case study Cambodia)(p10-11)
Temperature increase 32 degree C in 1982 to 35-35 degree C in 2005-06;
Farmers in Kors Krolar district; hotter days during dry and rainy season; tremendous impact on rain-fed rice cultivation; no longer transplantation from seedlings to seedbed; now sowing seeds and harvesting directly from the paddy fields to take advantyage of shorter and more irregular rainy season May-October; 2nd crop no longer possible; BUT now, men cut trees in forest, collect fuelwood for charcoal production, cur bamboo, and collect non-timber forest products; first reluctant to do so, but wives urged them to do so; Khmer men usually do not undertake trading activities; but in the face of climate variability they needed to earn money for their household; men also took temporary jobs (motorcycle taxi driving, maize harvesters on other fields); women worked as wage laborers (bush clearning, maize planting); collection of forest products (vegetables, wild mushrooms), dug wild potatoes, raised livestock near house and made rice wine. Sons went to forest to cut trees, many dropped out of school;

Resurreccion 2011, case study Vietnam (in fact the Oxfam and UN Vietnam program):
Men and women responded to disasters caused by floods and fierce typhoons in alternately similar and different ways, contingent on gender norms that influence social behavior, as well as exigencies of disasters;
In preparation for flood: men ensured resilience of paddy fields; men and women jointly decided on early harvest, women prepared HH (food and water stock piling, moving belongings to elevated areas); men strengthened houses and livestock shelters;
Immediately after flood: men and women restored paddy fields, irrigation systems and wells, men cleared public areas, women caretaking of children and elderly; men and women rebuilt houses and livelihoods; more men than women migrated seasonally; women who migrated went to remote places and hardly ever returned 9p13)

Carr, Edward. 2005. Placing the environment in migration: environment, economy, and power in Ghana's Central Region. Environment and Planning A **37**(5) 925 – 946

Multiple impacts on the poor:
There is excellent detailed impacts work described in another Oxfam study (Renton et al. 2009 “Suffering the science: Climate change, people, and poverty”). It draws from various case studies and is structured around the themes of hunger (crops), health, and disasters. I have detailed notes in “Comment on readings” posted on Knowledge Tree.

Forest dependent livelihoods:

Olufunso A. Somorin, Climate impacts, forest-dependent rural livelihoods and

adaptation strategies in Africa: A review, African Journal of Environmental Science and Technology Vol. 4(13), pp. 903-912, December 2010 Special Review, Available online at http://www.academicjournals.org/AJEST

Coastal/fishing communities Bunce, M., S. Rosendo, et al. (2010).

Poor coastal communities in low-lying coastal areas Tanzania and Mozambique

- identification of livelihoods and stressors, changes over time, indications of stress;
- results show overwhelmingly negative perceptions and deteriorating trends in LHs, ecosystem resources, and quality of life;
- climate among the top 5 stressors; ranked climate-related stressors as the most important in terms of social–ecological change affecting their lives and livelihoods; changes in onset, erratic rainfall, raising temperature; village elders at all sites refer to an increasing frequency and severity of such climate related natural hazards, ranking them additionally to temperatures and rains (p421)
- human illness related to CC: raises in malaria, cholera, typhoid, diarrhea
- detailed table on events/changes, sources, and impacts/consequences - some specifically related to CC change
- Links between stressors: 'vicious cycle'; complexity of interlinked stressors and their shifting nature over space and time; 'double exposure' examples mental models (see graphs); (p428)
- climate stressors are mediated and interact with site-specific characteristics to produce different impacts and different patterns of responses; circular synergies and feedbacks in these linkages (p429)
- Migration from hinterland to coast: Where people had reached the coast we noted rising risks of overspecialisation in artisanal fisheries at our coastal sites, as seen in rural Asia and elsewhere (Coulthard 2008). Such shifts in coping strategies towards marine resources and livelihoods are reported widely in Africa, and extend to fish stocks, reefs, mangroves and other sources of ecological goods and services. Stressed communities often shift out of farming-related incomes (Eakin and Wehbe 2009) (p432)

Very detailed table on household perceptions, stressors, and impacts

[INSERT TABLE 13-2 HERE
Table 13-2: Perceived changes at the four sites.]

[INSERT TABLE 13-3 HERE
Table 13-3: Ranking of events and changes.]

Marie-CarolineBadjeck, EdwardH.Allison, AshleyS.Halls, NicholasK.Dulvy, Impacts of climate variability and change on fishery-based livelihoods, Marine Policy, journal homepage: www.elsevier.com/locate/marpol, ARTICLE IN PRESS

> This paper synthesizes the pathways through which climate variability and change impact fisherfolk livelihoods at the household and community level. We identify current and potential adaptation strategies and explore the wider implications for local livelihoods, fisheries management and climate policies. Responses to climate change can be anticipatory or reactive and should include: (1) management approaches and policies that build the livelihood asset base, reducing vulnerability to multiple stressors, including climate change; (2) an understanding of current response mechanisms to climate variability and other shocks in order to inform planned adaptation; (3) a recognition of the opportunities that climate change could bring to the sector; (4) adaptive strategies designed with a multi-sector perspective; and (5) a recognition of fisheries potential contribution to mitigation efforts.

Health impacts (coordinate with Health chapter, Ch 11)

Those exacerbated by climate change: hunger/malnutrition; malaria, diarrhea, schistosomasis, tick-borne diseases, dengue; psychological and emotional harm/mental health (anxiety, lethargy, depression, solastalgia, suicide); heat stress

Link to negative impacts on health of Indigenous communities (e.g. Petheram et al. 2010; Braaf, 1999; Green, 2006)

Several arguments can be made that link climate change with psychological and emotional health effects, although they are not limited to poor farmer;

Sartore et al. (2008) examine the perceived impact of the extended Australian drought on emotional and social well-being of two rural communities involved in cereal cropping and sheep and cattle rearing in New South Wales. Results indicate feelings of loss, grief, and hope- and helplessness due to lack of water and the subsequent restricted possibilities to provide for family and fulfill expected roles, concerns for the children's future, and decline in personal and community morale. This is substantiated by Stain et al. (2008, 845) who report the critical role of connectedness – connection to the land as expressed through a sense of place and connection to others through social support networks and community belonging – as mediating and moderating the effects of stress triggered through drought, also in New South Wales. Suicide rates appear to be particularly high among young men in Australia's rural and remote regions (Dudley et al. 1998; Caldwell et al. 2004; Judd et al. 2006).

In the specific context of climate change, loss in rural communities and effects on mental health have only recently received notable attention. For instance, Pereira (2008, 927) applies the concept of "occupational deprivation" (Townsend and Ebden 2006, 3) to examine how climatic and other environmental changes affect what one does in the environment on a daily basis that brings meaning and purpose to life. He shows how farmers can lose their role and sense-of-self when rains fail. Also, distress and loss are likely to affect older citizens connected to their land, especially in combination with social isolation and the loss of leisure and retirement activities such as home gardening, on top of the physical risks of heat waves and wild fires (Pereira 2008; Horton et al. 2010). Pereira (2008, 3) refers to such negative health outcomes as a "previously unaddressed, unique, and debilitating emotional disorder" distinct from what is known as depression. Albrecht (2005) and Albrecht et al. (2007) as well as others (e.g. Horton et al. 2010; Pereira 2008; Kelly 2009; Sortore et al. 2008) describe cases of white farmers, fisherfolk, and other rural residents heavily committed to their land and community whose lived experiences with profound changes have triggered severe emotional distress.

Urban environments (coordinate with the Urban chapter (Ch 9)

Hardoy, J. and G. Pandiella (2009)
who within the urban population of Latin America is most at risk from the likely impacts of climate change over the next few decades. It also considers how this risk is linked to poverty and to the inadequacies in city and municipal governments.

- problem: old paradigm thinking which see disasters as occasional "natural" extreme events rather than as caused by the lack of attention to risk reduction prior to the extreme event
- key argument: urban expansion in flood plains or mountain slopes, or areas prone to flooding; these are the sites low-income groups occupy, dangerous; these areas left vacant for good reasons = vulnerable env. conditions, lack of infrastructure; poor have no formal tenure, face env risks and risk of eviction. houses built with inadequate materials, little or no scope for citizen participation.
- The lack of attention to the risks faced by large sections of the urban population from extreme weather puts many people at high risk from the likely impacts of climate change, including storms, flooding, landslides, heat waves and drought, and overloaded water, drainage and energy supply systems. (p204)
- CC adds another level of stress, adding to inadequacies…
- very poor = 13.4% (71 million, half in urban, half in rural areas) in extreme poverty in 2006 in Latin America; twice as many poor in urban areas (total 194 million)

They look at 6 aspects of vulnerability (and impacts):
1) locations most exposed to hazards related to impacts of CC:
- heavy rainfall , floods; paving of sidewalks has increased run-off; accumulated uncollected wastes blocks drains
- examples from various reported floods (Santa Fe, Buenos Aires; 24 floods 1990-1998; 35 floods 1985-2003; most at risk: informal settlements in low-lying areas; Quito; Caracas; high death tools from 100-year rainfall with landslides in 1999, esp. low-income neighborhoods on slopes and low-lying lands; Viachia/Bolivia 2006 floods, 51%of urban population poor;

2) Who lives/works in locations lacking infrastructure that reduces risk?
- poor neighborhoods even more vulnerable due to lack of infrastructure and services; even if infrastructure is there, false sense of security

3) Who lacks knowledge, capacity, opportunities to take short-term measures to limit impacts?
- in informal settlements, risks associated from moving away from houses - loosing valuables to looters, uncertainty about provisioning in other places, worry about not allowed back; lack of appropriate information and official evacuation measures - people don't want to evacuate [*so, not necessarily just lack of knowledge!*]
- slums El Salvador: people recognized risks, took measures, BUT individualistic HH investments, lack of community organization, lack of support from governments (more hindrance); lack of advance warning in Buenos Aires,
- lack of knowledge among migrant low-income populations, e.g. Brazil; lack of personal K of local risk, appropriate building techniques hinder safer practices, crime and violence inhibit social cohesion;

4) Whose homes and neighborhoods face highest risks when impacts occur?
- informal settlements: no control, overcrowding, rapid deterioration, inadequate foundations, no air-conditioning or insulation; heat waves northern Mexico and Buenos Aires ; snow in Buenos Aires in 2007

5) Who is least able to cope?
- people in informal settlements where gov refuses to work; 2003 Santa Fe floods - good statistics (60 no health insurance, 41% in informal settlements, 80% in informal economy, 41$ female head of HH); refugees; Columbia: women, children, Afro-Americans and native communities most affected/displaced by guerilla activity - move to marginal city areas

6) Who is least able to adapt to avoid impacts?

7) increasing water stress, even more reduced access without strong political commitment, glacier retreat; e.g. Guadalajara and Andean cities

Case studies on poor in the NORTH!

Wolf, J., Adger, W.N., Lorenzoni, I. (2010) "Heat waves and cold spells in the UK: An analysis of policies and perceptions with reference to the elderly", *Environment and Planning A* 42(11): 2721-2734. DOI

Studies of the 2003 heat wave in France; 2010 heat wave in Russia,

13.4.2. Impacts of Climate Change Responses on Livelihoods and Poverty

Although the negative impacts of climate change and shocks on the poor have received considerable attention in the recent literature, there is increasing concern and some evidence that policies aimed at both climate change mitigation and adaptation can exacerbate immiseration, inequalities and injustices, or create new ones, (Ackerly and Vandenbergh 2008; Collier et al. 2008; Hertel and Rosch 2010). Indeed, Hertel and Rosch (2010: 376) argue that poverty consequences of climate policies could "rival in importance the poverty impacts of climate change itself", and, in some developing countries have even greater impacts. Such policies include environmental services projects such as reforestation under the Clean Development Mechanism (CDM) and REDD+ initiatives (check out Gong et al. 2010, cited in Hertel and Rosch, Sandbrook et al, 2010, Phelps et al. 2010). Climate adapation and mitigation policies that do not explicitly incorporate poverty alleviation – eg. Geoengineering or biofuel plantations -- may have highly adverse consequences for the poor. Indeed, even projects explicitly designed to reduce poverty, eg., through environmental service provision in Latin America, have had only limited success, and at times exacerbated inequalities between poorer and richer farmers and land managers (Pagiola et al. 2005; see work by E. Boyd).

Collier et al. (2008: 351) suggest that African countries will be affected the most adversely by mitigation efforts undertaken elsewhere. These adverse effects could include the development of biofuel production, reduced food miles and other changes in consumption patterns that lower carbon footprints, or through the development of more efficient, green technologies that disadvantage African producers. In a similar vein, Ackerly and Vandenbergh (2008) argue that the interlinkages between poverty and climate change, and the existing policy approaches through which the two goals are being pursued illustrate the inadequacy of existing systems of global governance in addressing inequalities independent of whether global climate change inequalities are considered unjust.

Clean Development Mechanism

From Ackerly and Vandenbergh (2008: 568, footnote 78)
The Clean Devepment Mechanism, developed under the Kyoto Protocol, allows Annex 1 countries to meet their emissions reduction obligations by supporting emissions reduction projects in developing countries. The resulting "carbon credit" can be used against the caps that Annex 1 countries are expected to meet under the Kyoto Protocol. By 2010, more than 2000 CDM projects had been approved by the CDM executive board with anticipated emissions reduction of 2.5GT of CO2e. CDM projects include a large variety, focusing for the most part on industrial and energy emissions rather than terrestrial emissions.

The Clean Development Mechanism has been criticized on a number of grounds, including for support of projects that increase inequities, replace low carbon technologies in places in the global South, and destabilize entitlements to land. Although CDM projects may have enhanced capacity for emissions management (Hart 2008), it may also be the case that implementation problems related to CDM have drawn resources away from the clean mechanisms they are intended to encourage more broadly (Yang 2008). ; also In this context, it is important to distinguish between concerns that CDM projects are not well designed or implemented from those that are critical of offsets in general.

REDD+

REDD+ is a proposed performance-based mechanism in which developed country donors, corporations, NGOs and individuals will compensate developing country governments for forest emissions reductions, including through market mechanisms (Miles et al. 2008, Angelsen and Wertz-Kanounikoff 2008). Payments will require demonstrated emissions reductions through improved forest protection, sustainable forest management, and/or enhancement of carbon stocks. REDD+ is a key emissions mitigation strategy as evidenced by 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 (Agrawal et al. 2011).

Under REDD+, recipient governments will devise strategies for national land-use and forest sector planning, stakeholder negotiations, carbon brokering, national-level carbon accounting, and providing funds and services to local actors. A national approach is considered integral to the success of REDD+ projects: it can help avoid leakage, ensure permanence, and provide reliable monitoring, reporting, and verification (MRV). This approach effectively converts national governments into the principal forest stakeholders.

Although there are efforts to promote community involvement in REDD+, funding and requirements for REDD+ may undermine ongoing efforts at promoting local involvement in forest governance, and more equitable distribution of benefits from forest management. Generous, long-term REDD+ funding will considerably reduce past financial burdens that motivated decentralization. A conservative 10-year market value estimate of $1.2 billion per year for avoided deforestation (Niles et al. 2002) dwarfs current global investment for forest conservation. For example, the market value of avoided deforestation for Indonesia $110M per year exceeds the entire 2005 Department of Forestry budget of $105M.

REDD+ implementation will place new demands on national forest managers: detailed carbon-oriented forest management plans; reliable baseline data and subsequent quantitative MRV of emissions reductions at the national level; and resources for brokering deals between buyers and sellers. These demands would impose prohibitive costs for small-scale initiatives (Cacho et al. 2005), but a centralized system would benefit from economies of scale (Ostreicher et al. 2009) and standardization. Communities may participate in collecting forest-specific data, but carbon accounting, a major REDD+ component, will require centralized management.

By monetizing forest carbon, REDD+ will substantially increase the market value of forests, including those previously considered marginal, incentivizing central governments to increase control. Under a performance-based payment mechanism, governments will be pressured to avoid the risk of non-payment resulting from local-level failures. Evidence suggests that central governments affirm control over forests considered "critical" to national welfare for conservation,

protection of ecosystem services, or national economic interests (Peluso and Vandergeest 2001). With billions of dollars at stake, governments could justify recentralization by portraying themselves as more capable and reliable than local communities at protecting national interest. This could even involve evictions of users, as in some national parks (Brockington 2002), or through excessive requirements (Ribot et al. 2006).

Biofuel

Another approach to mitigation that has the potential to compromise the livelihoods of many resource and land dependent poor popualtions concerns biofuels, Analyzing the impact of combined EU and U.S. biofuel mandates on world markets and on poverty in a sample of 18 developing countries, Hertel and Taheripour (2009) show that these policies consistently reduce poverty headcount rates for agriculture specialized households, while boosting them for both wage labor and non-agricultural, selfemployed households. Indeed, the fundamental problem with biofuel production may be mostly that "production subsidies in some OECD countries are causing inappropriate biofuel crops to be grown in the wrong places." (Coller et al. 2008:351). In a similar vein, De Hoyos and Medvedev (2009) estimate the impact of the growth in biofuel production from 2004–10 and find that it boosts the global poverty headcount by about 30 million people—mostly in South Asia." The impact of such subsidies is lower in African countries because they are less integrated into the global economy.

Three additional critiques of biofuels focus on how they enable the shifting of the environmental costs of excessive energy consumption in rich countries and by elite in all countries to lower income countries and the poor in these countries (White and Dasgupta 2010: 595). In addition to the shifting of environmental costs, the production of biofuels also replaces the fuel burden of middle classes by passing on the costs of these to poorer populations who are often dependent on so-called marginal or empty lands for a variety of their own cooking and fuel needs. In sum, resorting to biofuels to reduce energy related carbon emissions, particularly by bringing new lands under biofuel cultivation in tropical countries has a high likelihood of serious abuses of both customary and formal land rights held by the poor, loss of livelihood benefits to rural poor families, and formalization of land tenure in a manner that is disadvantageous to the poor (Rao 2008, .Geoengineering

From Ackerly and Vandenbergh 2008 (p559):
geoengineering doesn't avoid challenge of global governance, it triggers new set of justice questions (several important questions that need to be asked)

Insurance Markets

Although insurance could be a useful strategy to diversify risk and smooth consumption among poor households, evidence suggests that the poor often reluctant to sign up for insurance, either because of absent or poorly developed insurance markets or amount and timing of premium payments (Hertel and Rosch 2010; see also Kiviat 2008; FGine et al. 2008 cited for examples).

Insurance markets may also provide an opportunity for risk-averse farmers to escape culturally-induced poverty traps through which they are bound to kinship obligation through the moral imperative of sharing which also reduces their incentive for self-motivation against climate shocks (Di Falco and Bulte 2009). From Jerneck & Olsson 2010: Take the example of fishing communities facing increasing risks of loss of vessels to hurricanes. An insurance scheme could compensate for the increasing risks due to climate change, but would be detrimental in the long term if the fish stock is declining due to other stressors. In the aftermath of the great tsunami in 2004 a renowned marine ecologist, Daniel Pauly (2005), asked the international relief community to invest in long-term alternative livelihoods with a more secure future instead of rebuilding the fishing fleets in the impoverished fishing communities. His underlying argument was that a restored fishing fleet with new and efficient vessels would result in a complete collapse of the fisheries (Pauly 2005).

Private Equity Offsets and Other Voluntary Offset Mechanisms

These are interesting ideas. Instead of counting on our political leaders and governments to address global wealth inequality, private equity offsets provide an opportunity for individuals to reduce their carbon footprint at home while being sensitive to inequities within and between countries and supporting equity-enhancing projects, such as community-based emission reduction plans (e.g. Barefoot College Engineers in India who provide solar grid power stations) (Ackerly and Vandenbergh 2008). The authors argue that increased expenditures in energy efficient technologies particularly targeted towards people in poverty will boost demand and thus production, which then will results in lower costs and prices.

13.4.3. Interaction between Poverty Alleviation Measures and Climate Change and Climate Change Responses

Adaptive Social Protection Programs

Social protection (SP) describes all public and private initiatives that provide income or consumption transfers to the poor, protect the vulnerable against livelihood risks, and enhance the social status and rights of the marginalised (Devereux and Sabates-Wheeler, 2004). These initiatives have the overall objectives of extending the benefits of economic growth, and reducing the economic and social vulnerability of poor, vulnerable and marginalised groups. These can be divided into *core* SP interventions, such as asset transfers, income transfers and public works, or *complementary* interventions, such as micro-credit services, social development, skills training and market enterprise programmes.

SP has risen significantly up the international policy agenda in recent years, partly due to the impacts of the global financial crises in the late 1990 and early and late 2000s on poor and marginalised people ((Davies and McGregor, 2009)(G20, 2009)). It is now becoming increasingly recognised that SP can play an important role in the delivery of pro-poor climate change adaptation and disaster risk reduction (DRR) assistance to vulnerable populations in developing countries ((Heltberg *et al.*, 2010)(Stern, 2007; Stern, 2007)). Table 13-4 provides a summary of the SP measures and instruments, and associated adaptation and DRR benefits ((Davies *et al.*, 2009a)).

[INSERT TABLE 13-4 HERE
Table 13-4: Social protection measures and instruments, and associated adaptation and disaster risk reduction (DRR) benefits (Davies *et al.*, 2009a).]

As Table 13-4 shows, SP offers a wide range of benefits for adaptation and DRR, both in response to short-term climate disasters, as well as long-term risks posed by climate change. The concept of Adaptive Social Protection (ASP) provides a framework for the integration of SP, climate change adaptation and DRR into one coherent approach ((Davies and Leavy, 2007)). However, in spite of these conceptual advancements, there are only a few studies on the implications of SP implementation for dealing better with climate events. Of the studies that do exist, most have been conducted in South Asia ((Arnall *et al.*, 2009; Heltberg *et al.*, 2009)), although a number have also been completed in relation to individual safety net programmes in sub-Saharan Africa ((Devereux *et al.*, 2006)(Slater *et al.*, 2006)). According to Heltberg ((Heltberg *et al.*, 2009)), SP has formed an important part of the World Bank's disaster response in several major recent climate-related disasters in south Asia. Such support included direct cash to affected households, and workfare (cash-for-work). In Africa, preliminary lessons from Ethiopia's nation-wide Productive Safety Net Programme (PSNP), which assists the most chronically impoverished with cash transfers and cash-for-work schemes, reveal a positive effect on household food consumption ((Devereux *et al.*, 2006)) and a reduction in 'distress selling' of assets as well as the protection of household assets ((Slater *et al.*, 2006)). In these situations, proactive safety nets in the form of cash transfers and work programmes appear to present a viable alternative to traditional post-disaster relief responses. However, it is important to have such programmes in place before the onset of disasters, with flexible targeting, financing and implementation arrangements for scaling up as appropriate ((Alderman and Haque, 2006)), and prevention and risk management measures already integrated in ((Bockel *et al.*, 2009)).

Other social protection instruments used occasionally in disasters in south Asia are conditional cash transfers, near-cash instruments such as vouchers and fee waivers, social funds, and specific services such as child protection, orphanages, and rehabilitation for persons with disabilities ((Heltberg *et al*., 2009)). In Bangladesh, recent experiences of asset restocking following disasters ((Marks, 2007)(Devereux and Coll-Black, 2007);(Tanner *et al*., 2007)) demonstrate that such approaches can contribute to reducing vulnerability to climate shocks by providing liquidity and alternative sources of income during times of household stress ((Davies *et al*., 2009b)). In addition, starter packs and seed fairs have revealed success in boosting food production at the national and household level ((Devereux and Coll-Black, 2007)). These have been more commonly used in Africa, although concern has been expressed that inputs sourced through commercial seed and fertiliser companies are sometimes inappropriate to local cropping patterns and agro-ecological conditions ((Davies *et al*., 2009b)). Microcredits are another social protection measure (Ray-Bennett, 2010).

Livelihood resilience and people-centered resilience + poverty reduction programs (Oxfam, CARE, etc.)

Big emitters paying index-based insurance payments for poor in the Global South

Carbon sequestration programmes among peasant farmers (Gereigikh project in Sudan, ViAgroforestry in Kenya etc. etc.)

13.5. Future Risks and Opportunities

Informed by the assessment of past and current evidence of links between climate change and L&P we will here review and assess the literature trying to **project** future risks and opportunities.

13.5.1. Future Risks and Opportunities of Climate Change Impacts on Livelihoods and Poverty

Climate change and existing climatic variability are likely to have a negative impact on poverty and will almost certainly make the process of eradicating it more difficult through the:

Likely negative effect on economic growth – the rate and pattern of which is critical to eradicating poverty;
Direct effect on poor people's livelihoods and the assets upon which they depend; and the increasing level of risk to which countries and people already extremely vulnerable to shocks are likely to be exposed.

The recent studies by WHO, (2003); Lemmen and Warren, (2004); Haines et al. (2006); Ebi et al. (2006) and Confalonieri, et al. (2007) revealed that the actual and virtual vulnerability to climate change depends on various factors and future projections, major of them are as follows:

- Economic development condition
- Income level and distribution
- Food availability
- Population density
- Local environmental condition
- Geographical position
- Quality and availability of public health care provision.

Mobility and flexible use of diverse and variable ecological resources may become more important in future due to climatic uncertainty brought about by climate change. If current trends constraining mobility continue, such as privatization of key drought grazing resources and agricultural development in pastoral areas, several livelihood systems may be so severely affected by climate change as to become unviable.

Peter G. Jones, Philip K. Thornton, Croppers to livestock keepers: livelihood transitions to 2050 in Africa due to climate change, environmental science & policy (2008), available at www.sciencedirect.com

The impacts of climate change are expected to be generally detrimental for agriculture in many parts of Africa. Overall, warming and drying may reduce crop yields by 10–20% to 2050, but there are places where losses are likely to be much more severe. Increasing frequencies of heat stress, drought and flooding events will result in yet further deleterious effects on crop and livestock productivity. There will be places in the coming decades where the livelihood strategies of rural people may need to change, to preserve food security and provide income-generating options. These are likely to include areas of Africa that are already marginal for crop production; as these become increasingly marginal, then livestock may provide an alternative to cropping. We carried out some analysis to identify areas in sub-Saharan Africa where such transitions might occur. For the currently cropped areas (which already include the highland areas where cropping intensity may increase in the future), we estimated probabilities of failed seasons for current climate conditions, and compared these with estimates obtained for future climate conditions in 2050, using downscaled climate model output for a higher and a lower greenhouse-gas emission scenario. Transition zones can be identified where the increased probabilities of failed seasons may induce shifts from cropping to increased dependence on livestock. These zones are characterised in terms of existing agricultural system, current livestock densities, and levels of poverty. The analysis provides further evidence that climate change impacts in the marginal cropping lands may be severe, where poverty rates are already high. Results also suggest that those likely to be more affected are already more poor, on average. We discuss the implications of these results in a research-for-development targeting context that is likely to see the poor disproportionately and negatively affected by climate change

Stern. 2009.

- The United Nations estimates that by 2080, climate change could lead to an extra 600 million people affected by malnutrition and an additional 1.8 billion without enough water. In a world ravaged by climate change, the struggle against poverty would become still more difficult for hundreds of millions of people (p7)
- ignoring climate change would result in an increasingly hostile environment for development and poverty reduction; but to try to deal with climate change by shackling growth and development over the next 2 or 3 decades would damage, probably fatally, the cooperation between developed and developing countries that is vital to success. Developing countries cannot ‘put development on hold’ while they reduce emissions and change technologies (p7)
- new approach for defining global targets: use absolute numbers rather than framing targets as a percentage reduction on a particular base year. Absolute numbers are preferable to percentages for two reasons: they allow us to keep a check on the basic arithmetic of the targets (so that they ‘add up’) and they avoid having to argue a theoretical reference baseline for percentages (p7)

Ahmed and Diffenbaugh et al. 2009.

- Same study as current impacts of C volatility, now with future simulations
- used the climate volatility metrics as proxies for changes in future staple grain productivity under extreme events. To do so, we scale the current climate-related grains productivity decline under a 1-in-30 scenario by the simulated changes in intensity of a given type of climate extreme, thus obtaining an estimate of future adverse grains productivity shocks that can be used as input to the economic model (p6)
- this includes adjustment of once-in-30years productivity decline to changes in intensity of extreme events; this yields additional vulnerability and impoverishment 1.4-4.6%; self-employed ag households will see smallest increase and urban wage earners highest increase;
- not included in this framework: impact of alternative sequences of climate shocks - really extreme shocks;
- Table 13-5 shows the response of national-level poverty when the current once-in-30-year productivity decline is adjusted based on changes to the intensity of the 30-year-maximum extreme dry events under the A2 scenario, determined as national averages weighted by the value of grains production by AEZ.
- Bangladesh, Mexico, and Zambia have the greatest additional vulnerability, with an additional 1.4, 1.8, and 4.6% of their populations being impoverished by future extreme climate, respectively. While the pattern of the vulnerabilities across strata and countries do not change and all strata become more vulnerable, self-employed agricultural households will tend to see the smallest increase in their vulnerability, while
- urban wage earners will see the greatest. (p6-7)

[INSERT TABLE 13-5 HERE
Table 13-5: Changes in the grains production weighted national averages of extreme dry events and the additional shares of national populations impoverished by simulated future extreme dry event.]

Hertel, Burke et al. 2010.

Abstract (p577):
Here we consider three scenarios of agricultural impacts of climate change by 2030 (impacts resulting in low, medium, or high productivity) and evaluate the resulting changes in global commodity prices, national economic welfare, and the incidence of poverty in a set of 15 developing countries. Although the small price changes under the medium scenario are consistent with previous findings, we find the potential for much larger food price changes than reported in recent studies which have largely focused on the most likely outcomes. In our low-productivity scenario, prices for major staples rise 10-60% by 2030. The poverty impacts of these price changes depend as much on where impoverished households earn their income as on the agricultural impacts themselves, with poverty rates in some non-agricultural household groups rising by 20-50% in parts of Africa and Asia under these price changes, and falling by significant amounts for agriculture-specialized households elsewhere in Asia and Latin America. The potential for such large distributional effects within and across countries emphasizes the importance of looking beyond central case climate shocks and beyond a simple focus on yields - or highly aggregated poverty impacts.

- critique of existing work: most existing research has focused on the likely direct climate impacts on crop yields and agricultural output (Jones and Thornton, 2003; Funk et al., 2008; Lobell et al., 2008), but direct crop impacts in a given area provide only partial understanding of the consequences for human livelihoods; different HHs are affected by price changes in different ways (e.g. those selling surplus production could benefit if prices rise)
- existing studies that quantify livelihood impacts rely on coarse country or regional level aggregates, often don't span plausible range of impacts;
- this article: various pathways by which CC might affect agricultural incomes and food prices, and effects on welfare of low-income HHs; incorporates model from Global Trade Analysis Project and economic activities; productivity shocks are simulated for macro economy and understand how transmitted to HHs near poverty line; 5 HH groupings based on income (agricultural self employed, urban labor etc)
- simulated low- and high productivity scenarios for 2030, also central cases; these climate scenarios imposed on 2002 base year economy
- maize and other coarse grain largest potential negative outcome (1-45% yield decline)
- emphasis on magnitude of lower probability outcomes = larger than anything previously reported (price change under low probability scenario up until >60% higher!)
- macro-economic effects: welfare change; highest losses in Sub-Saharan Africa (esp South Africa!), with relatively large losses in US and China
- poverty effects: increase in world prices for staple commodities - reduction in real income - increase in poverty (HH spending large share of income on staple grains); poverty increases from changes in cost of living, largest for urban wage labor HHs; highest dispersion in poverty impacts in low and high productivity scenarios
- most Africa countries: yield impacts of CC are severe, no stratum significant poverty reduction
- enormous variation in poverty impacts

Conclusions:

- global cereal price changes could be considerable at the tails of distribution, well outside the range of changes predicted in AR4;
- some countries will gain from higher commodity prices (e.g. Brazil)
- yield changes are not good predictors, price-induced earnings changes can be more important driver of HH poverty
- magnitude of poverty changes in some strata potentially large, esp. urban wage labor (Malawi, Zambia, Uganda), but poverty likely to fall in ag self-employed (esp. Chile, Indonesia, Thailand, Philippines)

13.5.2. Future Risks and Opportunities of Impacts of Climate Change Responses on Livelihoods and Poverty

[to be developed]

13.5.3. Future Risks and Opportunities of Interactions between Poverty Alleviation Measures and Climate Change and Climate Change Responses

The origin of the sustainable energy development and its transfer emerged from Articles 4.3 and 4.5 of the United National Framework Convention on Climate Change (UNFCCC), where industrialized countries promised to promote, facilitate and finance the transfer of technologies related to energy efficiency and alternative sources to developing countries. Negotiations in Bali, in 2007, saw 187 countries agree to a roadmap with a goal to secure a deal within the international community for a climate change policy post 2012. The Bali Action Plan (BAP), although disappointing to many, helped steer the discussions on Low Carbon Development (LCD) towards developing countries, and placing the focus how they could leapfrog traditional technologies towards adopting clean technologies. This change in discourse and emphasis enabled the announcement of national climate change targets (albeit non-binding) by emerging economies including India, China and Brazil. The BAP requires developed countries to enter into cooperative arrangements with developing countries to facilitate the latter in taking nationally appropriate mitigation actions and achieving sustainable development without impeding their growth aspirations. It was thought that the nature of these agreements would be primarily technological and financial assistance from the developed countries in a "measureable, reportable and verifiable" (MRV) manner (Houser, 2010, REF).

Whilst the underlying objective for these agreements is to enable LCD models, thus far there seems little agreement on the definition for LCD itself. A majority of the definitions found in the literature are mitigation centric and do not address the issue of adaption, and therefore limit the scope of participation for least developed or low income countries.

Some definitions found in the literature are given below: cite properly

- LCD has been defined more broadly by Skea and Nishioka (as cited in Urban, 2010) as actions that are compatible with the principles of sustainable development, ensuring that the development needs of all groups within society are met, make an equitable contribution towards the global effort to stabilize the atmospheric concentration of CO2 and other greenhouse gases at a level that will avoid dangerous climate change, through deep cuts in global emissions, demonstrate a high level of energy efficiency and use low-carbon energy sources and production technologies, adopt patterns of consumption and behaviour that are consistent with low levels of greenhouse gas emissions".
- Urban, 2010 places Low Carbon Development into four different categories. Green lifestyle and green economy that assume economic growth is compatible with significant reductions in carbon emissions while coexistence and equilibrium economy that assume more naturalistic approach and focus on reducing the demand through altering behaviour and life style is the way to tackle climate change.
- DFID defines low carbon development "as patterns of social and economic development which ensure reductions in greenhouse gas emissions at a level consistent with stabilizing global emissions at safe levels".

LCD can provide a number of opportunities for the low income countries in areas such as energy, agriculture, and forestry (through REDD). In this context, this paper explores some of the risks, opportunities and impacts of clean energy technologies on rural livelihoods and poverty. Our analysis suggests that it is important to frame LCD debates such that they encompass poverty and social development problem as opposed a singular focus on climate change.

Energy security, particularly in developing countries has been identified as an important ingredient in achieving economic growth and human development (Kaygusuz, 2011; Kanagawa and Nakata, 2007). Today, more than 1.5 billion (Urban, 2010) people lack access to electricity, indicating a significant threat to their livelihoods, socio-economic growth and general wellbeing. However, access to electric energy has shown little progress in developing countries due to the high costs associated with the extension of existing grids or the construction of decentralised

power models. The provision of 'affordable, reliable and socially adequate' energy services lie at the forefront of bridging the gap between the North-South divide that facilitates growth in developing economies and also the Urban-Rural disparity based on access to basic amenities such as access to food, shelter, water, transport etc. (Kaygusuz, 2011; Bhattacharya, 2006). The diagram below reflects the inter-relationships between electricity and human development within education, social, environment, livelihoods and health sectors.

[INSERT FIGURE 13-3 HERE
Figure 13-3: Influence of energy on the other components (source?).]

With the recent shift in LCD debates towards one that is developing country-centric the focus on renewable energy (RE) solutions has once again come into the limelight. Empiricists now see these ecologically friendly and benign energy sources as a solution to the long term protection of the global environment and social development. Currently, renewable energy sources provide only 4 percent of the world's energy and most of this share comes from technologies such as hydro, wind and solar (REF). In the reality of rising oil prices, mandates for setting up secure and sustainable energy solutions (i.e. renewable energy, energy efficiency) have become a national priority for countries across the globe. For developing countries, equally importantly, renewable energy systems such as off grid solar, micro-hydro, biomass energy systems etc. have the potential for numerous other benefits such as the reduction of poverty levels, creation of new economic opportunities, supporting the broader adaptation process, increase in energy outreach (provide energy to those communities living in remote rural areas), reduction in the general populace health (Kaygusuz, 2011; Kanagawa and Nakata, 2007; Urban, 2010).

Impacts of Clean Energy on Poverty and Livelihoods

The impact of climate change on structural unemployment and poverty are among the two major concerns in developing countries. With the shift in global debates on mainstreaming climate change within national policies and practices, the lower income economies now face a dual challenge of continuing their efforts to strengthen their overall economic growth and reduce poverty while keeping their overall emissions low. Given that per capita energy consumption and emission of low income counties is very low placing focus on climate change mitigation alone may not have much developmental impact. Increasingly the empiricists are now focusing on the co-benefits of renewable energy systems in rural development, poverty eradication and livelihood creation. Although, the literature highlights a range of benefits of low carbon technologies on human health, environment, and livelihood, the results are still at its nascent stages and long term impacts on rural poverty, labour markets and growth are still unclear.

This interest comes from the fact that renewable energy systems not only provide economic benefits through investments in innovation but create the 'multiplier effect' within the economy through job creation. Decentralised renewable energy models help create opportunities for both skilled and unskilled labour through direct employment in both development of process inputs (e.g. growing energy crops, building hydro dams) and management of the process itself (i.e. the manufacture of pellets, processing biomass waste for biogas digesters, maintenance of solar batteries) and thereby spur grassroots level economic growth. Research conducted by Zhu (2006) in Vietnam highlighted how such projects drove an increase in income from farm activities (e.g. fishery, gardening and noodle making) and off farm activities (e.g. construction, military, shop keeping) in the case of biogas project. Additionally, increase in income through by-products can be quite valuable while adapting to climate change (Claassen & Pelser 2007; Katuwal & Bohara 2009). Studies (Akella et al. 2009; Fankhauser et al. 2008) suggest that renewable energy technologies are more labour intensive than the conventional energy systems. Therefore, depending on the number of production stages, renewable energy technologies have the potential to create more employment locally (i.e. in rural areas) (per dollar invested or per MW) than traditional energy systems (Akella et al. 2009). For example some new generation solar cookers (such as SK14) come prefabricated as high quality products, which create local job opportunities based on the need of their assembly. Analogous to this is the case of developing countries such as Brazil, whose large scale production of ethanol has created a significant number of direct and indirect employment opportunities in the country (Karekezi et al, 2004). Another aspect of RE technologies are their potential to create ancillary income benefits through avoided expenditure on purchase of fossil fuels, generating income through of raw materials (e.g. 'sludge' from biogas), creating local labour markets, income diversification, or co-benefits etc.

While the benefits of decentralised RE systems are clearly many, they also suffer from some barriers. Important among which are high discount rates, competing energy supply prices, high maintenance, high investment costs, feed-in-tariffs etc. that often challenge the participation of poor rural communities (Claassen & Pelser 2007; Katuwal & Bohara 2009). {Do we expand on the barriers?} For instance solar home systems implemented in parts of Kenya, Honduras etc. come with a monthly fee for service of 25,000 ZMK (approximately 5 USD), in a nation where approximately 60% of the population lives on less that 1 USD / day such feed-in-tariffs would eliminate poor communities from becoming direct users for such facilities. The challenge with such systems is that they have to compete with other energy prices. For instance, the monthly expenses for SHS are approximately the same as the monthly cost of kerosene for most families. This would act as a deterrent for small income families who would rather reduce the scale of the decision (thereby adjusting demand based on resources) and buy small quantities of kerosene every day versus making a single large lump sum amount very month.

Low Carbon Development and Markets (Products, Factors - Land, Labor, Capital, Consumption)

Markets

The signing of the Kyoto Protocol in 1997 is marked as a milestone in the timeline of global efforts to reduce carbon emissions. To enable this goal the Kyoto-protocol set out three mechanisms: (i) Clean Development Mechanism (CDM – with the dual objective of achieving sustainable development and carbon sequestration), (ii) Joint Implementation (JI) and, (iii) International Emissions Trading (IET) that allow the Annex I countries (developed countries) to offset carbon in the Non-Annex I countries (Olhoff et al. n.d.; Haites &Yamin, 2000).
From its inception, the dual objectives of the CDM framework have evoked starkly conflicting views among empiricists. A number of studies have concluded that CDM and sustainability are a pairing plagued by tradeoffs that emerge due to the divergent construct of these two concepts (Boyd et al., 2009; Nussbaumer 2009; (Purohit 2009). This dichotomy is exposed through empirical literature on renewable energy, where it has been seen that rural energy projects have fallen short in delivering direct local benefits. In the case of voluntary carbon markets the projects are implemented in the rural areas in exchange for Certified Emissions Reductions (CERs), but people often implementing these projects have no experience in developmental practice (Boyd et al, 2008). In terms of equity, the extent of net regional and sectoral coverage, the focus still remains towards the middle and high income countries, where for example a country like China is amongst the largest emitter of GHG gases (almost equal to USA) but also holds the largest share of carbon financed projects (i.e. 73 percent of the total CER transactions) verses' Sub-Saharan Africa that holds less than 2 percent of the total CDM share (Boyd et al, 2009).

Data from Sutter and Parreno (2007) highlights how stark these disparities are particularly among large and small scale projects – where large scale projects sequester more carbon they lag far behind in achieving social development objectives. Given the transaction cost of CDM, it is logical to assume that there is a preference for larger scale projects as opposed to small scale ones. Empirical studies on small scale CDM projects support this hypothesis, in as much as investments are often inadequate to cover high transaction costs even though small scale community based projects are likely to provide long term sustainable benefits including poverty alleviation and reductions in Green House Gas (GHG).

In response to the Bali action plan, the World Bank launched two Climate Investment Funds (CIFs) of $6.1 billion funded by 12 donor governments to scale up assistance for climate change and sustainable development to the developing countries placing equal emphasis on mitigation and adaptation. The first fund is the clean technology fund (CTF) supports low carbon energy projects in developing countries and the second fund called the strategic climate fund (SCF) supports more adaptive developmental approaches to tackle climate change challenges (Nakhooda, 2009; Ackerman, 2009). However, despite the criticism within literature, these funds too do not place any special focus on ensuring developmental benefits. The CTF fund firstly, does not limit itself to small scale renewable energy projects that may have higher localised benefits that large scale projects. Additionally the fund is open to supporting coal and large hydro projects that may even have detrimental impacts on poverty (i.e. migration and loss of land) and environment (Newell et al., 2009).

In the broadest sense, formal renewable energy programmes have been in existence for over three decades. However, despite the evident socio-economic opportunities for the rural poor, they have not yet been fully accepted in national policies. As indicated above, an often used argument against mass deployment of these technologies particularly in the developing countries is the large investment cost. Market based mechanisms, it is believed, can provide great opportunities to combat rural energy poverty through the provision of additional funds.

CERs have the potential to overcome financial and political barriers through providing additional revenues which either shorten lending periods or convert an economically unviable project into economically attractive one. In the context of CDM the project's investment additionality is judged from the Internal Rate of Return (IRR) in the presence or absence of CERs (Au Yong 2009). This could be proved through a range of examples for instance literature on solar technology suggests that there are a range of potential technical, operational and economic challenges involved in the diffusion of this technology amongst small rural communities. Evaluation of this technological application within a CDM context however does quite significantly shift the economic equation and could in turn assist with the other challenges. To illustrate, a study undertaken in India (Purohit 2009) analysed the financial feasibility of SHS deployment in India. The study posits that at both market and subsidised rates of kerosene, SHSs are unviable to the end user. However when the potential revenue from the sale of CER prices is factored into the equation, the project NPV turns positive. Innovative use of this financial structure, which would be unavailable in a 'traditional' solar project context, has the potential to help in overcoming some of the aforementioned risks (particularly economic) that would hinder adoption, particularly amongst the more disadvantaged groups.

Exploring investment additionality further we explore the debate on hydro-projects. Whilst, large hydro-projects, by virtue of years of construction and contractual expertise tend to have favourable IRRs, small hydro-electric projects on the other hand reflect high sensitivity to CDM benefits. A study (through reviewing PDDs that assessed various additionally tests carried out by 33 SHP) carried out by Purohit (2008) on small scale hydro projects (SHP) that show unfavourable IRRs on a standalone basis and half of them turn viable when CDM was accounted for (Purohit,2008). If we extend this logic to the even smaller mini-hydro projects it is likely that they are deeply unviable on a standalone or post-CDM basis. While this would help prove the additionality of these projects, it does underline the necessity for external funding potentially in the form of a subsidy (i.e. CERs). Clearly the magnitude of the investment additionality is a function of the prevailing fossil fuels prices. In today's context there is an argument to be made that the structural shift over in international oil prices (over the last 24 months) benefits the adoption of selected decentralised RE models.

Low Carbon Development and Food Insecurity

Energy, in terms of its type, source, sustainability, and use is currently high on the international agenda. This started with the prospect of alternate energy production systems e.g. crop-based bio-fuels. However this conversation has rapidly changed direction and now is attempting to confront the ripple effects of this mass production on global food security (Fraiture et al. 2008; Ewing & Msangi 2009; Rosegrant et al., 2008; Gibbs et al, 2008). The growth in production of energy crops (such as maize, cassava, soy, oil palm, rapeseed etc.) coupled with operating agriculture costs and increasing energy prices are driving the world grain production and prices. Whilst, on one hand this new energy market for the first time is believed to have created sustained increase in agricultural commodity prices for farmers, on the other hand it is simultaneously causing significant threat to vulnerable and poor populations in the developing countries, by increasing competition over natural resources, degrading eco-system habitat, depleting oxygen in surface water and alleviating loss of land acquisition (Ewing & Msangi 2009). More simply stated, energy crops in the light of the global climate change come with a number of trade-offs summarised in terms of "4 Fs" - Food, Feed, Fibre, and Fuel. To illustrate, energy crops such as sugarcane, maize, cassava, palm oil, soy and sorghum constitute to about 30 percent of the mean calories consumed by people suffering from chronic poverty and hunger. Countries such as Guatemala, Malawi, and Tanzania that suffer from high malnutrition rates derive one – third of their nutrition from Maize.

Price and Production Crises

Agriculture and energy prices work in tandem through indirect and direct costs and competition over natural resources. However, an increase in energy prices is likely to have a greater impact on food prices than the increase in production of crop based fuels could have on energy prices. Congruently the rise in fossil fuel prices is driving up the agriculture production. US, EU, Canada and some low income countries on bio-fuels have set incentives schemes such as national blending mandates, production tax incentives, and direct credit investment to producers to increase energy crops. The US itself was responsible for a 30 percent increase (between the year 2002-2007) in wheat and feed grain consumption and was directing almost one fourth of its maize production into producing ethanol. Developing countries, also recognising the potential economic opportunity are following this trail e.g. China, now a major player in ethanol production has almost 2 million ha of land directed towards its production. To put this into perspective, if all the national policies were to implement their bio-fuel plans successfully, 30 million additional hectares of agricultural land will be sucked into fuel production (Fraiture et al. 2008). These shifts in supply and demand patterns and the all time high in oil prices have further driven food inflation concerns. Ewing and Msangi (2009) have estimated that world vegetable oil prices could increase by close to 20 percent and maize prices by up to 70 percent by 2020 (on a baseline of 2000) due to the mandates and incentives set by US, EU and Canadian governments alone. The increase in grain and oilseed prices is clearly amplified among the poor population of low income countries given the predominance of low cost dietary staples (such as maize) in their consumption patterns. As an example, low income countries like Sudan, Gambia, and Zambia currently import 80 percent of their food grain. The growing prices of food grain may stop these countries from importing much needed food supplies. On the other hand, if food insecure countries start to export grains to reap the benefits of the high grain prices then malnutrition, hunger will increase rampantly. Estimates suggest that Sub-Saharan Africa by 2020 will increase its exports by double but will reduce its imports of food grains. These scenarios highlight the potential for adverse nutritional impact on local populace, with some estimates suggesting that up to 3 million children could be at risk for malnutrition (Ewing and Msangi 2009).

Several studies have suggested methods to combat the issue of land and food security. An emerging theme is the propagation of non-edible energy crops like ‘Jatropha’ that can grow on marginally arable land or land currently used to grow tobacco or flowers etc. However, on deeper exploration there are other, potentially negative, serious social consequences. Firstly in developing countries the non arable land typically caters to local livelihood needs in the form of fuel and fodder for the poor. Such marginal land provides on important source for water resources, biodiversity and wildlife corridors for rural poor and women (Clancy, 2008).

On the other side of the spectrum the argument being made is that bio-fuel expansion will drive an increase in exports, thereby bringing increased foreign exchange inflows and generating large scale employment and increasing farmer income. Integral to this debate is the question of what the distributional structures within bio-fuels would look like (i.e. large versus small farmers, producers versus consumer). As an example, in Indonesia the forest land where the indigenous communities had de-facto rights are now been expropriated for palm oil by large industries. Clearly the challenge for the success of this technology and for it to become pro-poor is twofold (i) the creation of mechanisms that enable equitable management of resources and revenue sharing such that poor and marginal farmers are involved in the profits (particularly for large scale projects) and (ii) the adoption of reliable, cost effective conversion techniques that can still serve traditional uses. A possible way of reducing risk for poor is to look at small / monoculture production models that can create income opportunities through supply chains. For instance, Mauritius provides a model case example of where a share of the benefits from large-scale co-generation plants that flow to low-income farmers have increased over time through direct policy interventions and an innovative revenue sharing mechanism (Johnson and Rosillo-Calle, 2007, Clancy, 2008).

Low Carbon Development and Health

The inter linkages between energy and health are composite issues that place high level policy challenges. Historically, the deployment of cheap fossil fuels for energy (such as kerosene and diesel for lighting) and the use of fuel wood for cooking have contributed to their share health problems particularly amongst rural populace. Today, about 2 billion people, globally, rely on biomass as a primary source of energy (Urban, 2010). Statistics suggest that

every year over one million children die of health complications arising from domestic smoke inhalation (Thakuri, 2009). Other estimates suggest as many as 1.6 million (mostly women and children) premature deaths in Sub-Saharan Africa due to inhalation of smoke from the burning of charcoal and fuel wood. Thakuri (2009) further posits that cost of medical treatment on adults is 1.84 billion per year.

The financial impact of health based issues on rural poverty and livelihoods can be understood through the estimation of the opportunity cost on the poor of the treatment, lost working days etc. To illustrate Parikh (2000 as cited in Thakuri, 2009) through his study (based on an analysis of Net Present Value and an internal rate of return) estimates that time spent on collecting fuel wood and on treatment and sick days in three Indian cities (in the states of Himachal Pradesh, Rajasthan and Uttar Pradesh) can accumulate to about 1 billion work days for 226 million people.

The deployment of clean technologies and health programmes through global policy changes and carbon markets have provided a number of benefits in the developing countries. When designed and executed properly renewable energy systems have help reap positive co-benefits for public health. Particularly where clean technologies (such as solar cooker, modern biomass cook stoves, biogas etc) are used for cooking, significant health benefits can be seen in women and children, reduced use of fossil fuels (such as kerosene and firewood) facilitate in reduction of respiratory illnesses and general health of the families.

Conversely, the rising prospect of bio-fuels has raised the complexity of the relations of energy, food and health. To understand the correlation of food insecurity due to bio-fuels and health - 'hunger' provides a good starting point. Today, 860 million people (Fraiture et al. 2008) suffer from malnutrition worldwide. Firstly, already as a result of climatic changes natural disasters such as droughts, floods etc have driven up the food prices, this coupled with increased competition of natural resources with energy crops has resulted in some 44 million people falling below poverty line (World Bank,). Secondly, with the expansion in production of energy crops and usage of fertilizers, food refinement etc diverse impacts on human health and wellbeing can be witnessed (McMichael et al., 2007).

Low Carbon Development and Access to Basic Services (Education, Shelter, Water, Sanitation)

Despite the worldwide acceptance of low carbon technologies in national plan and policy documents, its realization is a multi-pronged quest. Capacity building and skills deployment work in tandem with technology adoption and transfer. There is a broad interest in literature that focuses on these and other human development implications of RE technologies, and for the most part available research and solutions are new and not proven. There is a prevalence of literature and though on the linkages between energy security and human capital, however this is clearly in a broader context than simply the application of RE technologies. By extension, the disproportionate impact of energy security on women (in the household and community) often results in a gender-disparity centric review.

Amongst the most mature insights in these human development aspects, are those documented in the context of micro-hydro projects. Successful implementation of this genre of projects requires local communities to be educated on sustainable forest management, and often watershed management, practices to ensure a long operational life for the installed assets. There is additional upside to this knowledge transfer in that these skills typically have much broader applications for the overall wellbeing of these communities. For example in Cuba the launch of every micro-hydro project by the government is supported with a sustained programme of ecosystem protection and sustainability education.

Understanding the truest and fullest impact of RE technologies on local communities and human capital will only emerge as appropriate technology transfers and deployments gather pace. The success of technology transfers will rely heavily on the operational appropriateness of the technology, the institutional and political momentum and mechanism supporting its deployment, and a number of other such contextual variables. To date, there has been little operational consideration of how any North-South technology transfer will likely directly meet the needs of rural poor. There are a number of cases, e.g. the inability of local communities to maintain batteries installed within solar home systems deployed in South Africa that highlight this challenge. Clearly rather than a pure transactional transfer

of technologies from the North, low income country institutions need to be an equal participant in discussing needs and providing solutions designs.
What should be the policy responses to this? (one para each on the following)

i. LCD responses
ii. RE – poverty and livelihoods
iii. Carbon markets
iv. Price
v. Health and human capital

13.6. Conclusions

[to be developed]

Frequently Asked Questions

[to be developed]

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Table 13-1: Percent change in poverty due to once-in-30-year-climate extreme by stratum and country.

	Socio-economic strata						
	Agricultural	Non-agricultural	Urban labor	Rural labor	Transfer	Urban diverse	Rural diverse
Bangladesh	***32.1***	***37.8***	***30.7***	11.1	0.8	***29.5***	***17.2***
Brazil	0.1	4.1	5.5	6.2	1.0	9.6	7.0
Chile	7.7	13.8	12.7	9.5	14.7	12.6	14.9
Colombia	0.1	0.4	1.0	1.0	0.6	0.6	0.5
Indonesia	***29.5***	12.1	19.2	***23.9***	5.9	***17.9***	***19.0***
Mexico	***52.2***	***36.7***	***95.4***	***52.1***	***61.8***	***37.4***	***43.2***
Mozambique	4.3	***15.3***	***16.2***	12.4	7.2	***26.6***	***16.0***
Malawi	***15.8***	9.0	***110.5***	***91.0***	11.1	***30.8***	***23.0***
Peru	2.4	1.9	3.6	2.6	0.5	1.5	1.4
Philippines	−17.7	10.2	***32.3***	***25.9***	8.5	6.0	3.8
Thailand	4.9	5.8	7.1	5.8	6.4	5.6	5.8
Tanzania	7.2	11.0	14.9	5.3	6.6	***21.3***	11.9
Uganda	−0.1	1.6	***16.4***	2.9	0.1	1.0	0.6
Venezuela	4.0	5.1	12.1	10.1	0.0	7.2	6.6
Vietnam	5.1	7.0	0.0	0.0	3.9	6.3	6.4
Zambia	0.0	***17.7***	***102.0***	***32.5***	10.9	***41.1***	10.6
Average	9.2	11.8	30.0	18.3	8.8	16.0	11.7

Table 13-2: Perceived changes at the four sites.

Country	Mozambique				Tanzania				Total focus groups (f) citing stressor (Max. 8)
References	M1		M2		T1		T2		
Male/female focus group	m	*f	m	f	m	f	m	f	
Negative change and rank (1 = high)									
Rains infrequent/erratic	2	1	2	5	2	3	2	3	8
Temperature rising	1	1	1	–	3	1	–	2	6
Illness (human)	–	1	–	3	1	2	5	–	5
Food prices	4	1	–	4	5	–	–	–	4
New fishing rules/MPA	–	–	–	–	4	–	4	4	4
Floods frequency/severity	5	–	5	2	–	–	–	–	3
Wind direction/strength	3	1	–	–	–	–	3	–	3
Less fish catch	–	1	–	–		4	–	1	3
Poor trading (quantities/prices)	–	–	–	–	–	5	–	5	2
War impacts	–	–	4	1	–	–	–	–	2
Sea level/tide/surge	–	–	3	–	–	–	–	–	1
Population rise/density	–	–	–	–	–	–	1	–	1

Table 13-3: Ranking of events and changes.

Mozambique (n = 13)	Mentions	Tanzania (n = 15)	Mentions
High food prices (rising)	11	Less fish	12
Less rain (infrequent/ erratic)	8	Less rain	10
River floods (frequency/ severity)	8	Rising illness	9
Rising illness	7	Food prices (rising)	9
Winds stronger	6	Low crop prices	6
Temperature rising/ drought	5	Less crops	5
Less fish catch	4	Fewer jobs	5
Soil salinity (river)	3	Population rise/ density	5
Sea flooding (tide heights/surges)	3	Soil depletion	5
Population rise/density	2	Lower fish prices (sell)	2
War	2	Less credit access	2

Table 13-4: Social protection measures and instruments, and associated adaptation and disaster risk reduction (DRR) benefits (Davies *et al*., 2009a).

SP measure	SP instruments	Adaptation and DRR benefits
Provision (coping strategies)	œsocial service protection œbasic social transfers (food/cash) œpension schemes œpublic works programmes	œprotection of those most vulnerable to climate risks, with low levels of adaptive capacity
Preventive (coping strategies)	œsocial transfers œlivelihood diversification œweather-indexed crop insurance	œprevents damaging coping strategies as a result of risks to weather-dependent livelihoods
Promotive (building adaptive capacity)	œsocial transfers œaccess to credit œasset transfers/protection œstarter packs (drought/flood resistant) œaccess to common property resources œpublic works programmes	œpromotes resilience through livelihood diversification and security to withstand climate related shocks œpromotes opportunities arising from climate change
Transformative (building adaptive capacity)	œpromotion of minority rights œanti-discrimination campaigns œsocial funds	œtransforms social relations to combat discrimination underlying social and political vulnerability

Table 13-5: Changes in the grains production weighted national averages of extreme dry events and the additional shares of national populations impoverished by simulated future extreme dry event.]

		Change in poverty impact of changing extreme dry event intensity (current climate minus 2071–2100 A2 climate)	
	Percentage change in average consecutive dry days in extreme climate year between current and future A2 scenario	Additional share of population impoverished (in percentage points)	Additional number of people impoverished (in millions)
Bangladesh	16.25	1.35	1.79
Brazil	9.55	0.07	0.11
Chile	14.48	0.06	0.01
Colombia	−7.89	−0.00	−0.00
Indonesia	−5.11	−0.11	−0.23
Mexico	26.45	1.76	1.78
Mozambique	10.50	0.42	0.07
Malawi	2.59	0.27	0.03
Peru	3.61	0.01	0.00
Philippines	−2.88	−0.04	−0.03
Thailand	10.28	0.01	0.01
Tanzania	−0.35	−0.01	−0.00
Uganda	−7.57	−0.06	−0.01
Venezuela	8.81	0.07	0.02
Vietnam	4.20	0.01	0.01
Zambia	3.72	4.64	0.48
Average	5.42	0.53	0.25

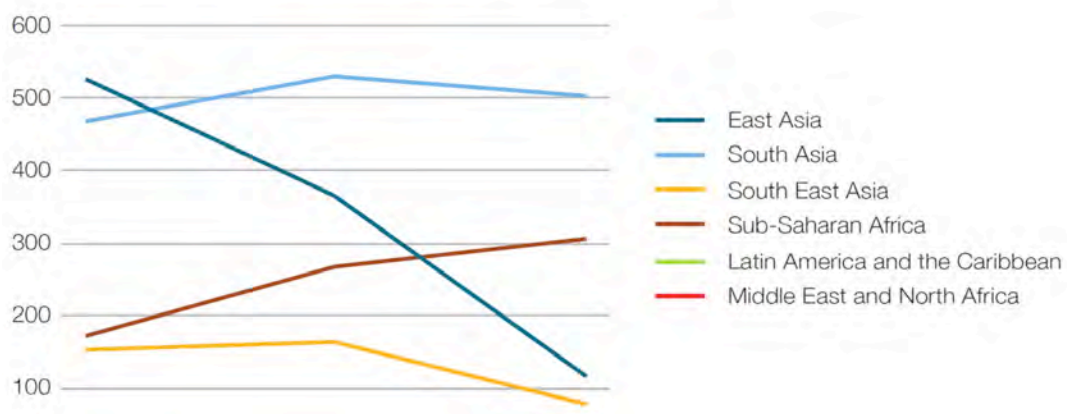

Figure 13-1: Number of rural people living on less than 1.25 USD per day (IFAD Rural Poverty Report, 2011).

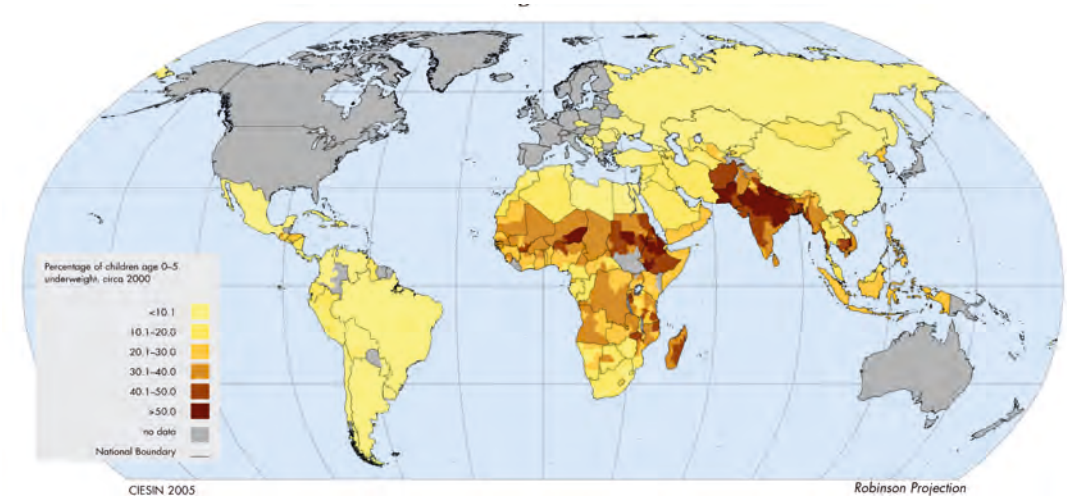

Figure 13-2: World map of hunger expressed as percentage of children age 0-5 who are underweight (CIESIN, 2005).

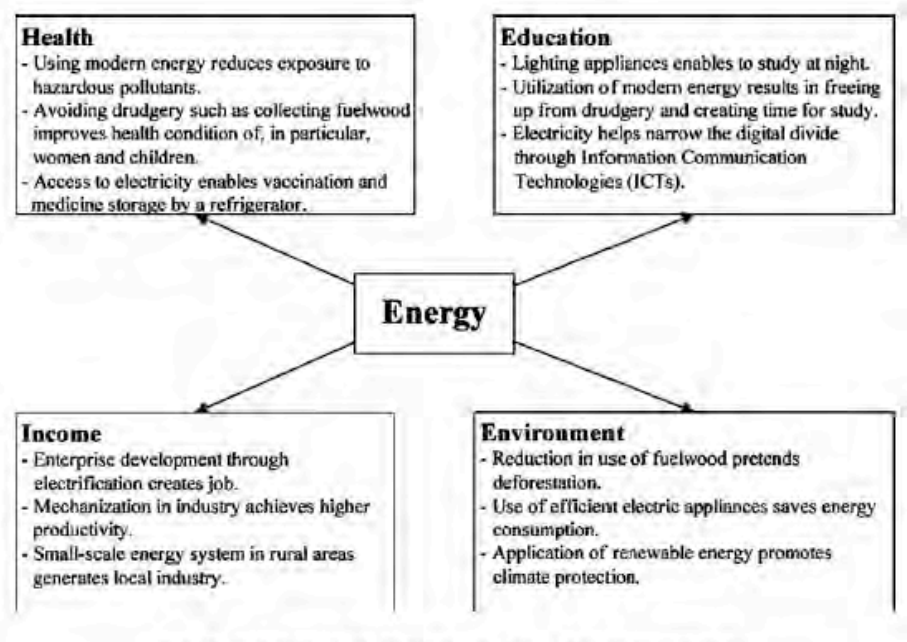

Figure 13-3: Influence of energy on the other components (source?).