

# Adaptation and the poor: development, resilience and transition

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Risk minimization is no longer a sufficient survival strategy for poor people in livelihood systems increasingly exposed to frequent extreme events. This calls for comprehensive adaptation to climate change. Within the climate change regime, adaptation is as central as mitigation but needs to be much more explicitly addressed at local, national and global levels. There is also a need for policy renewal in other international regimes that are central to adaptation, such as environment, human rights, development and trade. Accordingly, this article addresses poverty-relevant adaptation through the medium of three discourses: development, resilience, and transition theory. *Development*, as a post-war project of theories, strategies and policies, spells out the links between rich and poor countries and offers modernization trajectories but few solutions for adaptation and sustainability transitions. *Resilience*, as an analytical framework emerging in ecology in the 1970s in reaction to ideas of equilibrium, depicts incremental changes and capacity to preserve systems within given frames but does not recognize that social change mainly implies transitions to renewed forms of production, consumption and distribution with new combinations of organization, institutions and technology. *Transition theory* focuses on profound multilevel changes in complex (sub)systems, thereby offering a powerful framework for theorizing empirical findings and promoting adaptation as a transition to sustainability.

*Keywords:* adaptation; climate change; development; insurance; poverty alleviation; resilience; transition theory

*Minimiser les risques n'est plus une stratégie de survie suffisante pour les personnes pauvres dans des systèmes de subsistance de plus en plus exposés à des événements extrêmes fréquents. Cela nécessite une adaptation au changement climatique intégrale. Dans le régime du changement climatique l'adaptation est tout aussi centrale que l'atténuation mais a besoin d'être abordée de manière plus explicite aux niveaux local, national et mondial. Il y a aussi un besoin de renouvellement des politiques dans d'autres régimes internationaux qui sont centrales à l'adaptation, y compris l'environnement, les droits de l'homme, le développement et le commerce. Par conséquent cet article aborde l'adaptation des pauvres à travers trois types de discours: le développement, la résilience, la théorie des transitions. Le développement, en tant que projet de théories, stratégies et politiques de l'après-guerre, révèle les liens entre les pays riches et les pays pauvres et propose des trajectoires de modernisation, mais ne propose que peu de solutions de transitions en adaptation et durabilité. La résilience, en tant que cadre analytique écologique qui a émergé dans les années 70 en réponse aux idées sur l'équilibre, décrit les changements par étapes et la capacité de préservation des systèmes à l'intérieur de cadres particuliers, mais ne reconnaît pas que le changement social implique surtout une transition vers des formes renouvelées de production, de consommation et de distribution selon de nouveaux groupements organisationnels, institutionnels et technologiques. La théorie des transitions se concentre sur le changement multi-niveaux profond dans des (sous)systèmes complexes offrant de ce fait un cadre puissant pour établir les données concrètes dans un cadre théorique et promouvoir l'adaptation en tant que transition vers la durabilité.*

*Mots clés:* adaptation; assurance; changement climatique; développement; lutte contre la pauvreté; résilience; théorie des transitions

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## 1. Introduction

The climate change regime, with the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (KP) as its main components, is primarily concerned with mitigation of climate change, i.e. reductions in greenhouse gas (GHG) emissions. We argue that adaptation is as central to the Convention as mitigation and that the regime allows for this, but the UNFCCC needs to be elaborated in terms of adaptation. Without reducing the urgency of mitigation, the potentials of adaptation must be addressed more specifically and strongly in research and action. This is especially so in the context of the poorest of the poor who, for the reasons discussed below, suffer the most, not only from the general weight of poverty but also from climate vulnerability (IPCC, 2007b).

This article suggests how adaptation can be addressed at different levels and within various international regimes. For that purpose, adaptation is discussed through the lenses of three major discourses: development, resilience and transition theory. We define adaptation as the adjustment of ecological and socio-economic systems to current or projected climate changes (Verheyen, 2002). Following the IPCC (IPCC, 2007b) we define vulnerability to climate change as the degree to which natural and social systems are susceptible to, and unable to cope with, adverse impacts. We define discourse as a system of thoughts composed of ideas, beliefs, attitudes, actions and practices (Lessa, 2006).

The need for adaptation is urgent in the context of developing countries, where adaptation must be coupled with efforts to improve rural and urban livelihoods, especially for the poorest and most vulnerable (UNHABITAT, 2003). Development, as theory, strategy and practice, advocates and promotes profound change to eradicate poverty. But despite its policy-oriented and problem-solving capacity (Meier, 1995), development fails to deliver economic and social inclusion, especially in sub-Saharan Africa, where levels of poverty and inequality are still significant and even increasing within many countries (World Bank, 2006). Consequently, transition processes that offer social change in terms of sustainable livelihoods (Ellis, 2000), equality and freedom (Sen, 1999) are urgently needed.

The goal of the UNFCCC, according to Article 2, is to stabilize GHG in the atmosphere at levels that prevent *dangerous* anthropogenic interference with the climate system. But the interpretation of 'dangerous' is relative and contextual rather than absolute. What is dangerous in an actual situation is, in the end, often determined by a society's capacity to cope with and to adapt to climate change. To add to the complexity, danger can be interpreted externally by objective measurements such as actual loss of physical property, or internally by perceived danger and subjectively experienced fear (Dessai et al., 2004). And if a society's adaptive capacity is low, even minor climate changes might entail danger. This allows us to conclude that adaptation is as central to the climate change regime as mitigation.

However, as regards binding commitments in the current climate regime, the language on adaptation is vaguer and more ambiguous than on mitigation. In the UNFCCC and the KP, the texts on adaptation focus solely on planning rather than action. The UNFCCC says 'prepare for' (4.1.e) rather than implement, and 'take climate change considerations ... to the extent feasible' (4.1.f) rather than giving them highest priority. The KP says 'strive to' (2.3) rather than implement policies and measures. Hence, we argue that, compared to mitigation, for which there are legally binding commitments and compliance mechanisms, the legal base of adaptation is very weak. Yet, the adaptation agenda is advancing, with the Nairobi Work Programme lasting five years from COP-12 in 2006 and aiming at improved understandings of climate change impacts, vulnerability and adaptation. Nevertheless, there is more focus on improved data and assessment methods than on international commitments.

The vagueness in language and weakness in policy are partly explained by politics in the negotiations of the Convention and partly by the priority given to mitigation over adaptation as a solution to the problem of climate change. When the UNFCCC was negotiated, it was anticipated that climate change effects would have severe social repercussions only in a distant future, thus providing a motive for giving less attention to adaptation as a tool for coping with climate change. Another reason for not giving equal priority to adaptation was the fear that it would distract attention and action from mitigation. Much evidence now indicates that it is time to correct these misunderstandings (IPCC, 2007a, 2007b; UNEP, 2007).

## **2. Reasons for adaptation**

In 2007, the IPCC established that, due to low adaptive capacity and potentially severe climate change impacts, developing countries are more vulnerable to climate change impacts (IPCC, 2007b). This, in combination with certain other factors, makes adaptation particularly important, especially for the poorest of the poor, most of whom depend on agriculture, fisheries or forest-related activities, mainly at subsistence level. Most agricultural systems are very vulnerable to extreme climate events, such as drought, storms and floods (World Bank, 2007). Also, owing to the variability of hydrological regimes, even irrigated agriculture is highly susceptible to climate variability (IPCC, 2007b). Large rural and agricultural populations, many of which are poor, are located in semi-arid areas in Africa, Asia and Latin America or in low-lying coastal and riverine areas, especially in Asia. Since many of the world's poorest people live in sub-Saharan Africa, in places with limited access to food markets (World Bank, 2006), there is further stress on already vulnerable livelihoods in cases of food emergency (Mwabu and Thorbecke, 2004). Hence, we argue that, in particular, the following four factors make adaptation increasingly important.

### **2.1. Accelerating climate change**

The rate of build-up of atmospheric CO<sub>2</sub> was unprecedented in the last decade, thereby increasing the risk of rapid and dangerous climate change. Climate scientists agree that, even in the hypothetical case of immediate stabilization of CO<sub>2</sub> levels, the temperature increase is expected to continue for a century, making substantial climate change unavoidable. (IPCC, 2007b).

### **2.2. Increasing vulnerability to climate variability impacts**

Irrespective of climate change, vulnerability to climate impacts may increase due to rising populations in climate-sensitive areas such as parts of Bangladesh, China, Egypt and Pakistan (IPCC, 2007b), as recently seen in Bangladesh in late 2007.

### **2.3. Increasing vulnerability due to multiple stressors**

In some settings, certain conditions increase the vulnerability to climate impacts, such as (i) low agricultural productivity partly caused by poor or decreasing access to inputs; (ii) malfunctioning markets and distribution systems due to poor or deteriorating infrastructure (World Bank, 2006); and (iii) shortage of labour because of rural–urban migration (Tiffen, 2003; Olsson et al., 2005). In addition, (iv) deterioration of natural and modified ecosystems caused by land-use change may increase the risk and severity of climate impacts, while (v) imports of subsidized food may out-compete local production and exacerbate domestic agricultural conditions (Kates, 2000; O'Brien and Leichenko, 2000; World Bank, 2007).

## 2.4. Deteriorating social conditions and health status

High and increasing burdens of diseases such as HIV/AIDS, malaria and TB contribute to making climate impacts more damaging. Labour shortages may cause shrinking food production and collapsing social services that could increase risks of food crises as a result of even minor climate impacts (de Waal and Whiteside, 2003).

## 3. Development

Development defies simple definitions due to its long post-war history of ideology, theory and practice rooted in ‘the Enlightenment’ and the ideas of the early nineteenth century. Methodologically, development implies both goals and means (Cowen and Shenton, 1996). If goals are expressed in long-term aims and means in short-term policies, then the aim of expanding people’s choices could be achieved through policies of increased participation. However, context-bound conditions and conflicting interests are overlooked in such general definitions (Rist, 1999). Modernization and industrialization are other goals and means of development, but experiences of pollution and resource depletion (Angel and Rock, 2005) imply that ‘modernity no longer seems so attractive in view of ecological problems’ (Pieterse, 2001). In light of these and other contested views of development, the relevance of the discourse may be questioned (Cornwall, 2007).

Development is highly institutionalized at universities; in international conventions; via the influential Bretton Woods system, and through official development assistance (ODA). Although development continuously mainstreams new issues into its domain, the common denominator, in idea and practice, is poverty alleviation – aiming at poverty eradication (Burnell, 2002). But instead of describing poverty theoretically as ‘getting by’, the daily practice to make ends meet, and ‘getting out’, the long-term strategy of social mobility (Lister, 2004), development visions are framed in simplified images or quantitative terms, such as *reducing the number of people living under the poverty line* (Millennium Development Goals); *lifting people out of poverty* (Fan and Hazell, 2001); or encouraging people to *make it to the first step of the development ladder* (Sachs, 2005). We argue that an ambition to build sustainable livelihoods (Ellis, 2000), thereby addressing vulnerability and adaptation needs, serves the poorest in a more constructive way.

Development theory neglects the dynamics of the physical environment in which (socio-economic) development is supposed to take place (Cowen and Shenton, 1996; Pieterse, 2001). Even when development theory highlights the fact that poverty and environment are intertwined, it often stops there, or resorts to sweeping statements on the need for an efficient use of resources. It may even state that the topic of development and environment is highly controversial (Meier, 1995). With the assumption, thrown up by global climate change, of profound global, regional and local repercussions on the natural resources and assets on which livelihoods of the poor are based (IPCC, 2007b), it becomes a problem when the development discourse externalizes negative impacts of resource exploitation and pollution. While the scientific community agrees that climate change will alter the conditions for production and consumption substantially, the development discourse lacks a systemic analysis of the Earth system and its social implications.

Development visions may lack an explicit focus on risks posed by increasing climate change impacts, but construction projects often include them. In the planning and construction of long-lasting infrastructure, such as bridges, dams and roads, investors must consider climate variability and potential climate change relevant for the expected life span of the investment; a good example is the guidelines developed by the World Bank for screening their investments in climate-sensitive sectors (van Aalst, 2006). Many development ambitions and efforts, such as national and regional development strategies, could (in our view) learn from such thinking.

Mainstreaming, as a process, may not solve burning social, political and environmental issues. The continued loss of biodiversity (Mace et al., 2005) and the lingering absence of gender equality (Moser, 2005) are conspicuous examples. Mainstreaming may create conflicting goals, loss of political edge, and methodological problems resulting from an overloading of the discourse. As examples, sustainable development is more complex than the 'greening' of development projects, while gender inequalities are more complex than the often simplified 'gendering' of development projects (Kabeer, 2005).

In contrast, sustainable development (SD), as a paradigm and transition process, strives to deal with both temporal and nature–society complexities. As we see it, SD offers at least three advantages over the development discourse. First, SD theorizes the Earth system *per se* as well as short- and long-term dynamics and relations to society; secondly, as a consequence of severe and partly unavoidable future impacts of climate change, SD involves future generations and societies; and, thirdly, SD appeals to all countries to embark on a sustainability transition, whereas development appeals only to developing countries. These core aspects of SD are under-theorized by development theory, absent from development practice, but compatible with transition theory.

#### **4. Resilience**

The idea of resilience of social-ecological systems (SES) is a strong and, in some circles, predominant way of addressing adaptation. But there is considerable confusion about the meaning of resilience, both theoretically (Gallopín, 2006) and in practice (Klein et al., 2003; Armitage and Johnson, 2006). To trace its origins, the concept of resilience was successfully introduced in ecology in the early 1970s as a response to the, then predominant, idea of ecosystems striving towards equilibrium:

Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb change of state variable, driving variables, and parameters, and still persist (Holling, 1973).

More recently the concept of resilience has found its way into social sciences:

The ability of human communities to withstand external shocks or perturbations to their infrastructure, such as environmental variability or social, economic or political upheaval, and to recover from such perturbations (Adger, 2000).

In the context of climate change, resilience has become a common concept related to vulnerability and adaptation. Vulnerability is sometimes described as the flipside of resilience, implying that the loss of resilience results in vulnerability to changes that previously could be absorbed (Folke et al., 2002). This is illustrated by the three dimensions of resilience adopted by the Resilience Alliance (Carpenter et al., 2001):

- The amount of disturbance a system can absorb and still remain within the same state or domain of attraction
- The degree to which the system is capable of self-organization
- The degree to which the system can build and increase the capacity for learning and adaptation.

A fundamental problem with resilience, as we see it, is the implicit normative assumption of preservation of the system and thus resistance to change (Gallopín, 2006). In many cases where ecological systems are closely linked with social systems, such as agriculture and aquaculture, there is a strong desire to prevent major changes to the ecological system (such as degradation of the soil or coastal vegetation). But for the ecological system to remain within its domain of attraction, the social system needs to change radically or even sever its links with the ecological system. Hence, there is a built-in contradiction in the concept of resilience when it is applied to complex systems where subsystems with conflicting goals are linked.

From a resilience perspective, a logical policy response to adaptation needs is that insurance can provide a means of strengthening the adaptive capacity, i.e. society's resilience (Linnerooth-Bayer et al., 2005; Gurenko, 2006a, 2006b). But, from the point of view of the poorest of the poor, there are two crucial limitations to insurance. First, it implies that you *have* assets to insure and, second, that you *have the financial means to buy* the insurance. We have identified three types of livelihoods where insurance might even be counterproductive because insurance would delay a long-term solution to the problem by encouraging people to continue with a livelihood for which there is no sustainable basis.

- Livelihoods where the resource base is at risk of being permanently and severely damaged owing to anticipated climate change. Examples include dryland agriculture in areas where increased frequency and intensity of droughts are anticipated; coastal regions in danger of flooding due to sea-level rise; and irrigated agriculture in areas in danger of profound change of hydrological regimes.
- Livelihoods where the resource base is gradually eroded by other processes, such as fishing livelihoods in areas of over-fishing and/or severe pollution; and livelihoods based on water extracted from diminishing water reserves.
- Livelihoods where social and/or economic conditions gradually erode the long-term basis through replacement of technology, shifts in world market preferences, etc.

Many regions where vulnerability to climate change is high, such as southern Africa, the Sahel and the Greater Horn of Africa, suffer from more or less chronic food insecurity. Conventional insurance schemes for crops have been tested in many countries but have failed (Hess and Syroka, 2005). Weather-based insurance, where the claims are based on meteorological data rather than reported losses, is another kind of insurance that is currently being tested in several countries, such as Bangladesh, India, Nepal, Pakistan and Malawi (Linnerooth-Bayer and Mechler, 2006; Mechler et al., 2006). Some of the problems of conventional crop insurance can be avoided, but success in this requires well-functioning markets and timely meteorological information – two factors notoriously lacking in areas dominated by smallholders and subsistence farmers. Another potential hurdle for insurance to reach the poorest of the poor is the many localized climatic impacts that may not be extreme in a climatic sense but which may cause a collapse of households on the margin (Hutchinson, 1998). We argue that if such events become more frequent they may cause much damage that goes unrecorded because it is too localized or the magnitude is below the threshold for reporting.

## 5. Transition

A different view on adaptation emerges from transition theory rooted in social theory and technology systems studies (Rotmans et al., 2001; Foxon, 2007). Transitions are transformation processes in

which societies, or subsystems thereof, change profoundly in terms of structures, institutions and relations between actors. After a transition, the society, or a subsystem, operates according to new assumptions and rules (Rotmans et al., 2001), thus indicating a range of new practices.

The Green Revolution (GR) can serve to illustrate transition theory. The GR is often described as a technological change involving new crop varieties and agrochemicals. But the GR was in fact part of a much more fundamental change in national and international politics, markets and institutions (Djurfeldt and Jirström, 2005); thus it was a transition in which new technologies based on scientific research were introduced and supported by a new and comprehensive institutional package, which in turn gave rise to several other adaptation processes (Burton et al., 1993).

Technology and its relationship with institutions is a central theme in transition theory. Viewed through the lens of transition theory, adaptation problems with livelihoods at risk from climate change will be understood as part of a complex system with multiple chains of causality. It may also be characterized by institutional as well as technological lock-ins (Foxon, 2007). And, importantly, the allocation of power plays an important role in an analysis spanning multiple levels, such as niches, regimes and landscapes (Rip and Kemp, 1998).

These three levels represent a useful heuristic for understanding technological and social change (Geels, 2002) rather than an ontological description. The *niche level* refers to individual actors (or groups of actors), technologies or practices. On this level, the symptoms of the problem are identified – in this case the risk of damage from climate change impacts on the livelihood. The *regime level* refers to the web of institutions governing the predominant practices at the niche level – in this case it could represent regional markets, local credit systems and government services. The *landscape level* refers to slowly changing social, physical and natural structures, such as physical infrastructure, international political institutions, macro-economic conditions, and the natural environment – in this case transportation constraints, agricultural trade policies and subsidies, structural adjustment programmes, and global climate change.

The regime level is removed from the visible symptoms of the problem and often characterized by resistance to changes, due to internal interactions, alliances and linkages (Foxon, 2007). The landscape level may promote incremental change. In this case it could be price adjustments or insurance schemes, while the niche level may need radical changes for the sake of sustainable livelihoods, such as a complete shift from crop production to livestock production or from rural to urban location. Using credits rather than insurance represents a logical policy implication of analysing adaptation as a transition. While insurance may conserve the current livelihood, credits may instead promote change.

Adaptation can occur at any level, from plant, field or farm, to national or international policy; adaptation is therefore a multifaceted decision-making process (Smit and Skinner, 2002). In the context of transitions, this would mean interdependent multiple levels, from niche to regime and landscape. A good example would be a change from crop production to livestock, involving a change in agricultural practices at the niche level, but also regime-level changes in markets and infrastructure, as well as changes in international trade at the landscape level.

The political and social responses after the Dust Bowl events in the 1930s in the Midwest of the USA represent a concrete example of a major transition relevant for adaptation to climate change. The late 1920s saw good crop yields and high prices for wheat, leading to a rapid expansion of the cropped area. Everybody was badly hurt, though, when drought hit the Great Plains in 1930, resulting in mass migration. By 1940, 2.5 million people had left. The multiplicity of responses to this crisis was a successful transition in which niches, regimes and the landscape level interacted to promote and maintain the transition to a sustainable agricultural region through soil conservation. As shown in Table 1, interventions occurred at different levels and in all domains: economic, social, political, legal, infrastructure and scientific (see Hansen and Libecap, 2004).

**TABLE 1** Categorization of various responses to the Dust Bowl problem in the US Midwest organized chronologically and according to the levels proposed by Geels (2002) (information compiled from Worster, 1979)

	Niche (micro)	Regime (meso)	Landscape (macro)
1933		Farm Credit Act: set up a system for local banks to provide credits to farmers. Federal Surplus Relief Corporation (FSRC): set up to distribute emergency relief.	Emergency Banking Act: restore faith in the banking system. Emergency Farm Mortgage Act: prevent farm closure by helping farmers who cannot pay their mortgages. Stabilization policy: stabilize prices of agricultural products.
1934	Soil Conservation Service (SCS): establish 79 demonstration areas to encourage farmers to adopt soil conservation measures.	Farm Bankruptcy Act: restrict banks' ability to dispossess farmers. Grazing Act: make federal land available for grazing.	Soil Conservation Services: develop and implement new soil conservation programmes.
1935		Drought Relief Service: buy livestock at reasonable prices to be distributed by FSRC.	Works Progress Administration (part of New Deal): offer employment for 8.5 million people. Resettlement Administration: buy land to be set aside from agriculture.
1936			
1937	Tree planting programmes.	Formation of Soil Conservation Districts: fund and force farmers to practice soil conservation measures.	

The example shows that this transition was enabled through a set of substantial multilevel political changes (local, regional, national) in several domains (science, economy, law). This profound social transformation can be seen as a successful process of adaptation to climate variability, and thus a transition to sustainability.

## 6. Addressing adaptation at the international regime level

In the interests of the poorest of the poor, a range of international regimes addressing environment, human rights, development and trade can be linked. Concerning the environment, adaptation to climate change needs to be related to other international environmental regimes such as the United Nations Convention on Biodiversity (UNCBD) and the United Nations Convention to Combat Desertification (UNCCD). Accordingly, the three Conventions, UNFCCC, UNCBD and UNCCD, are mutually encouraged to coordinate their activities (Arts 7.2 and 8.2 in UNFCCC, Arts 5 and 24 in UNCBD, and Arts 8.1 and 23 in UNCCD). But in order to identify synergies and potential conflicts it is necessary to go beyond vague formulations on coordination.

Climate change is expected to affect the geographical distribution of biodiversity substantially (IPCC, 2007b). Moreover, biodiversity is a crucial source of income and security for poor people (Millennium Ecosystem Assessment, 2005). It is therefore urgent to strengthen the protection of



biodiversity resources and to provide opportunities for local communities to harness such resources sustainably. However, the current situation is characterized by misunderstanding, mistrust and regulatory confusion for both providers and users of genetic materials (Wynberg and Laird, 2007). The inclusion of Reductions of Emissions from Deforestation and Degradation (REDD) as a mechanism in the climate regime is a concrete proposal with implications for UNFCCC and UNCBD (Zahabu et al., 2007). But, while theoretically attractive, there are methodological and ethical considerations that need to be further developed.

Climate change can potentially be linked to desertification through the important synergy of biological sequestration of carbon. Several studies demonstrate a substantial potential to reduce atmospheric CO<sub>2</sub> through improved land management in drylands. Such activities would provide an important synergy between mitigation and adaptation (Sanchez, 2000; Olsson and Ardö, 2002; FAO, 2004). Even if the aim of carbon sequestration through land management is to achieve win-win situations, there is an asymmetry in the relationship between the two wins. While the KP requires meticulous verification of the amount of carbon stored, there is no such verification to guarantee that the benefits are transferred to the right beneficiaries. This is an area where policy should be strengthened to serve the adaptation needs better.

### **6.1. Rectificatory justice**

The international legal basis for adaptation needs to be strengthened, especially in relation to the regimes of development and human rights. Such amendments can be based on the ethical principles of rectificatory and redistributive justice. Rectificatory, or corrective, justice deals with injustice from the past (Bell, 2004). Accordingly, it can be argued that countries with high historical GHG emissions should decrease their contemporary and future emissions substantially. The logic is that countries which were low emitters historically should be compensated today, for example through adaptation.

### **6.2. Redistributive justice**

Even though the rich in poor countries contribute substantially to GHG emissions, climate change as we know it today is primarily a problem caused by rich countries with high GHG emissions. Ironically, poor countries are more vulnerable to the impacts of climate change and should therefore be compensated through adaptation.

Migration is an important and long-standing response to disasters, whether human-induced or natural (Hugo, 1996). International migration is highly regulated by international Conventions. The Geneva Convention defines the criteria for being accepted as a refugee and achieving asylum in another country. Among the eligible reasons for acquiring refugee status, the current definition covers 'external aggression, occupation, foreign domination or events seriously disturbing public order in either part or the whole of his country of origin or nationality' (Keely, 1981). We argue that, in the case of extreme climate change impacts, where localities or whole regions become completely uninhabitable, as a result of, for example, sea-level rise or desiccation, the above definition could be amended to incorporate people affected by climate change. For policy makers it would be advantageous to create such a legal framework before severe climate change impacts generate large flows of refugees. Apart from providing a last resort for affected people, legal improvements would be a powerful signal to the international community to take climate change seriously.

In the development debate there is a long-standing discussion of whether to advocate 'trade over aid' or 'aid over trade'. And, since the emergence of the Bretton Woods system in the 1940s,

there is also a debate on free trade. Despite there being agreement that agricultural production will be severely hit by climate change and that agriculture is the most conflicted area of international trade negotiations, it is often argued by influential international organizations such as the World Bank that developing countries, especially in Africa, should focus more on, and increase, exports of agricultural goods (World Bank, 2007). This is, of course, a real dilemma experienced at all levels, from local farms via national to international settings and with implications for all global regimes. We see that the contemporary debate on free, fair and ethical trade is relevant here (Potter et al., 2004). However, it must be expanded to include the need to adapt to climate change according to some principle of fair burden-sharing.

The recent surge in the use of agricultural products as biofuels in the USA and EU has driven food prices to record highs (Runge and Senauer, 2007). In this context it must be noted that a majority of the poorest of the poor are food-insecure subsistence farmers or slum dwellers who cannot afford these rising prices. It is an irony that the most vulnerable to climate change impacts may suffer from such an act of mitigation. This example shows how important it is to include not only adaptation to climate change in international negotiations, but also to include adaptation needs that result from responses to climate change.

## 7. Concluding remarks

Our key message is that there is an urgent need to strengthen adaptation in the international climate change regime, particularly in the context of poor people subject to increasing vulnerability. We argue that adaptation needs to be facilitated, promoted and achieved in the local context where vulnerability to climate change is perceived and experienced, especially among the poorest populations. But the international community also needs to realize that adaptation must be addressed at all levels from the local to the global. The question remains how best to achieve this.

Since the very outset, development has been a normative international project aiming at the eradication of poverty mainly through modernization and industrialization. In that sense it is truly social and takes various scales into consideration, ranging from the international to the regional, national and local. However, the development discourse suffers from two crucial conditions that constitute an obstacle to tackling the challenge of adaptation to climate change:

- The development discourse does not examine the problems inherent in the dynamics between society and nature and is therefore blind to the way in which this crucial relationship changes profoundly in the wake of climate change.
- Development focuses primarily on obstacles to change in developing countries rather than on the relationship between rich and poor and the role of rich countries.

Development as a paradigm is rooted in the dichotomy between developed and underdeveloped countries, and is thus in essence a polarized paradigm with developed countries seen as the model for modernization and social change. This type of perspective has less relevance in times of global change when the problems rooted in the type of production, consumption and distribution in industrialized countries must also be examined explicitly in relation to developing countries.

Resilience is a very useful concept when describing the need for adaptation in systems in which there is no inherent conflict between linked social and ecological subsystems. Incremental changes to the management of such systems may be effective, such as insurance schemes. However, in cases characterized by conflicts between subsystems, incremental changes will not work and indeed may even exacerbate the problems. Moreover, the ideas of resilience underline recovery more than

fundamental change. Another problem with the conceptual framework of resilience is that it refers to systems where levels and domains are not addressed, owing either to invisibility or to exclusion from the system. In the context of adaptation, this invisibility becomes a real obstacle in those situations where there is need for fundamental change. In situations of conflicting goals, resilience will not be helpful because profound change rather than incremental changes may be required if adaptation is to be effective.

Transition theory offers a radically different view on adaptation which is particularly appealing when considering linked social and ecological systems characterized by goal and power conflicts.

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1. Both authors contributed equally to this paper.

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