CHANGE OF WIND or WIND OF CHANGE?

Climate change, adaptation and pastoralism

Prepared for the World Initiative for Sustainable Pastoralism by:

Michele Nori[1] and Jonathan Davies[2]

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[1] mnori69@ominiverdi.com
[2] Jonathan.davies@iucn.org

E-conference on climate change, adaptation and pastoralism

Climate change with its overall rising temperatures and increasingly variable and unpredictable rainfall distribution, is likely to affect diverse regions, locations and population groups differently. The implications for pastoral livelihoods are yet to be fully understood, and indeed two quite different opinions seem to prevail. Some see pastoral groups as the 'canaries in the coalmine' of ongoing processes, as rangelands will tend to become drier, and existing water shortages will worsen, thus affecting the overall sustainability of their livelihoods. Others see pastoralists as the most capable to adapt to climate change, since pastoral livelihoods are shaped to deal with scarce and variable natural resources and to tackle difficult and uncertain agro-ecological conditions, and climate change could conceivably lead to the extension of territories where pastoralism could show comparative advantages.

To dig deeper into this debate, The World Initiative for Sustainable Pastoralism hosted an e-conference during January and February 2007 on the subject of Climate Change, Adaptation and Pastoralism. The conference included some 600 WISP-net members and other invitees and drew contributions from pastoralists, Civil Society, Government and researchers. The broad consensus that emerged was that, under current conditions pastoralists are more vulnerable to political and economic marginalisation than to climate change *per se*. However, with their current social marginalisation, pastoralists' adaptive capacities have been eroded and they may have become more susceptible to climate variability than some other communities. The result of marginalisation is that innovation and adaptive strategies are impeded, and constraints are placed on investment, which undermines sustainable development. The threat of Climate Change therefore augments the call for shaping a new societal contract, to enhance learning from the capacities of pastoralists to tackle the challenges of climate change, while enabling herders to innovate and pursue a sustainable process of development.

The World Initiative for Sustainable Pastoralism

Pastoralists are the best custodians of drylands environments, but their stewardship is undermined by inappropriate policies and strong competition for their natural resources. The World Initiative for Sustainable Pastoralism (WISP) is an advocacy and capacity building project that seeks a greater recognition of the importance of sustainable pastoral development for both poverty reduction and environmental management. WISP empowers pastoralists to sustainably manage drylands resources and to demonstrate that their land use and production system is an effective and efficient way of harnessing the natural resources of the world's drylands.

WISP is a three year GEF-funded project, implemented by UNDP and executed by IUCN (The World Conservation Union). Through consultative global, regional and national partnerships, WISP ensures that appropriate policies, legal mechanisms and support systems are established to enhance the economic, social and ecological sustainability of the pastoral livelihood system. WISP provides the social, economic and environmental arguments for pastoralism to improve perceptions of pastoralism as a viable and sustainable resource management system.

For more information visit the web site at www.iucn.org/wisp or contact the global coordinator at jonathan.davies@iucn.org

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Executive Summary

Climate change will be felt differently depending on where you are and what you do, and opinions over what the future holds for the world's pastoralists are polarised. Some experts believe that pastoralists will be the first to feel the effects of climate change, whilst others consider that, since pastoralism is an adaptation to climate change, pastoralists will be amongst the best equipped to deal with such a threat. Such polarised opinions present challenges for policy makers and planners in the drylands, and the intention of this e-conference was to bring the divergent opinions out into the open and see what sort of consensus could be found.

Extensive pastoral production occurs throughout the world, typically in areas where constraining soil, rainfall and temperature conditions limit the range of options for sustainable land use. Agro-ecological conditions and physical characteristics of range resources are critical in shaping the socio-economic livelihood patterns of pastoral communities, which hinge upon strategies that continuously adapt to a limited, highly variable and unpredictable resource endowment.

Pastoralism is a complex form of natural resource management, which requires maintaining an ecological balance between pastures, livestock and people, and it is an adaptive strategy to a stressful environment. Pastoral systems are globally important: for the populations that they support; for the food they provide; for their economic contributions to some of the world's poorest countries; and for the diverse ecological services that they provide.

Pastoral adaptation faces a myriad of challenges, of which climatic change is but one. Indeed, the challenge of climate change seems insignificant to many pastoralists who are faced with extreme political, social and economic marginalisation: relax these constraints and pastoral adaptive strategies might enable pastoralists to manage climate change better than many other rural inhabitants. The vulnerability that is associated with climate change in some pastoral environments has its roots in the restriction of tried and tested pastoral coping strategies, including the ability to move through different territories, to access critical livelihood resources, to trade across borders, to benefit from appropriate investments, and to participate in relevant policy decision-making. As is so often the case in developing regions, the main concern for pastoralists is the accessibility, rather than the availability or variability, of resources.

Growing population pressure, together with the shrinking of effective rangelands, poses an important challenge to the sustainability of pastoral livelihoods. Pastoralism is particularly sensitive to population growth because, unlike in cultivated areas, the technical possibilities for raising productivity in the rangelands are limited and tend to be more resource-degrading.

Current concern for climate change seems to start from the assumption that climate patterns normally do not change. In fact, climate change per-se is not a new phenomenon, and it is recognised that climate has always been changing. More than once pastoralism has provided a means through which fairly sedentary populations could increase their mobility in order to survive in the face of deteriorating climatic conditions. However, although the phenomenon is not a new one, three main factors justify the current growing concern over this critical challenge: the rate and the scale of its occurrence and the magnitude of its social impact.

Despite the violent conflict that is associated with a small minority of the worlds pastoral regions, collaborative and cooperative arrangements are the norm in pastoral areas, with neighbouring pastoralists and with farming and urban communities. Ties with the latter have become increasingly important in the effort to diversify the pastoral livelihood and to integrate it with the marketplace. The distinction between pastoralism and cultivation is becoming increasingly blurred as a growing number of pastoralists adopt cultivation and many rural communities increasingly engage in pastoralism in response to higher variability and uncertainty. This process of diversification is a major adaptive process, not exclusively to climate change but to economic pressures as well as policy influences.

The political will to acknowledge the effectiveness of pastoral traditional practices, both at institutional and at scientific levels, represents the starting step of any process aimed at enhancing societal adaptation to increasing climatic variability. It is therefore time to learn from pastoral resource management to tackle the challenge that climate change involves. Pastoralism is changing and must innovate accordingly: policy, science and market contributions are all needed to make this challenge sustainable. The leap forward requires overcoming the traditional/modern, sedentary/mobile, public/private, local/central dichotomies which have so far contributed to patterns of unsustainability.

Three major areas need to be addressed to enable the consequences of climate change to be adequately analysed:

1. Institutions and Power: in particular the functioning of pastoralist institutions within the wider institutional framework, and enabling pastoralists to claim their rights and participate in decision-making at policy level. However, enhancing pastoralists' adaptive capacities also requires alliances and synergies with other, more formal institutional levels.
2. Science and technology: including adoption and dissemination of new understandings in rangeland ecology and pastoral economics, and recognition of the capacity of pastoralism to sustainably produce valuable goods in marginal lands. Scientific knowledge should not be used as a distraction from the political problems underlying pastoral development, but should focus on Need-Oriented-Technology and addressing the specific concerns raised by pastoral producers themselves.
3. Economy and market: economic integration and diversification bring positive benefits of spreading risk, but also introduce pastoralists to new source of risk to which they are sometimes poorly adapted. Discussions around adaptation to climate change can overlook the fact that some pastoralists are failing to adapt to even more immediate changes, such as economic trends, of which they are far more aware. Three main forces are driving economic changes:
    - Positive caloric terms of trade (livestock products vs. grain) in the face of population growth, and demand for external goods by pastoralists;
    - Urbanisation and the growing demand for livestock products;
    - Diversification of livelihoods into alternative and complementary economic activities.

Paradoxically, although long seen as responsible for environmental degradation, pastoralists are amongst the most exposed to the impacts of climate change, for which they are recognizably the least responsible. Nevertheless, where climatic conditions become more variable without leading to the collapse of rangelands, pastoral livelihoods have the potential to sustain populations in the face of climate change. Pastoralism may in fact provide food resources and secure a viable livelihood where climate change and other pressures lead to lower reliability of marginal farming and the transformation of forest into savannah.

In marginal environments characterised by resource variability mobile pastoralism can be the best way to mitigate against risk and it may be part of the solution to climate change, just as enhancing mobile pastoralism is part of the solution to overcoming poverty and reducing drylands degradation. In a dynamic climatic environment, the flexibility, mobility and low-intensity use of natural resources afforded by pastoralism may increasingly provide a sustainable means of providing security where other more sedentary models fail.

Enhancing pastoralists' entitlement to a wider range of resources, agro-ecological as well as socio-economic, and enabling them to use such resources as needed, is vital to reducing their vulnerability and to supporting their capacity to tackle the sustainable development challenge in marginal areas. In the debate over whether there is a difference between development and adaptation, it is worth recognising that the capacity to adapt is something intrinsically pastoral, and its loss has been associated with 'development'. Sustainable pastoral development must be founded on the understanding that adaptive capacity is what makes pastoralism work: restoring and enhancing adaptive capacities must therefore be central to development plans. The adaptive capacity of pastoralists needs to be seen not as something different to, but as a primary indicator of, pastoral development.

Introduction

With the recent Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Nairobi (November 2006), significant international attention has been drawn to the issue of climate change. It is widely recognised that developing countries stand to suffer disproportionately from the effects of climate change; they are in the weakest position to mitigate the adverse effects and stand to lose some of the current development gains that have been made as a result.

In the build up to the UNFCCC meeting, a number of NGOs began to voice their concerns about the impact of climate change on pastoral livelihoods, particularly in parts of the world where droughts lead to famine and poverty for pastoralists. The World Initiative for Sustainable Pastoralism therefore commissioned a paper from Dr. Nick Brooks[3] to learn more about the realities of climate change and adaptation in the drylands.

The paper "*Climate Change and Pastoral Adaptation*"[4] focused on the Sahelian region and raised a number of intriguing considerations and scenarios. The author provides an exhaustive analysis of the important rainfall variations that have characterised the Sahelian region in recent decades, with related land use implications. Scientific predictions and computer simulations suggest that in the short term the Sahel might actually benefit from climate change, through a greening of the Sahel and southern Sahara. However, given our knowledge of long-term global and regional climate change and the driving factors behind such change we can say with confidence that any greening of the Sahel and Sahara in the near future will eventually be reversed, if not this century then at some time in the (possibly distant) future.

While this may be the case for the Sahelian region, trends, implications and effects of climate change vary in other regions, such as northern and southern Africa. For example, climate analyses suggest that some parts of East Africa will become drier, with considerable reduction in the length of the growing season, whilst other areas, including southern Kenya and northern Tanzania, may become wetter, with increases in the length of the growing season[5]. In Southern Africa, there are predictions of a collapse of vegetation in the Kalahari region, which will have dire consequences for Botswana's significant pastoral population (Thomas et al., 2005). Overall, these processes will be accompanied by increased variability of weather, especially of precipitation, which seems to characterise climate change on a global scale.

According to Brooks, pastoralism in Africa arose over 6000 years ago precisely as an adaptation to climate change at that time, and in the future pastoralism might provide important answers to the question of 'adaptability'. Changing environments may provide suitable conditions for an expansion of pastoralism, as the flexibility and mobility afforded by pastoralism may increasingly provide a means of providing security where other more sedentary models fail.

Climate change will be felt differently depending on where you are and what you do, and opinions over what the future holds for the world's pastoralists are polarised. Some experts believe that pastoralists will be the first to feel the effects of climate change, whilst others consider pastoralism to be an adaptation to climate change and that pastoralists will therefore be amongst the best equipped to deal with it.

This paper reports the outcomes of the e-conference on Climate change, adaptation and Pastoralism that WISP coordinated during February 2007. The discussion included 600 people, of which 70 people, from different parts of the world, contributed (refer to Annex 1 for details of contributors).

Of clouds and hoofs

Extensive pastoral production occurs in some 25 percent of the global land area, from the drylands of Africa (66% of the total continent land area) and the Arabian Peninsula, to the highlands of Asia and Latin America. Pastoral groups inhabit areas where constraining soil, rainfall and temperature conditions provide limited effective options for sustainable land use, other than mobile livestock rearing. Agro-ecological conditions and physical characteristics of range resources are critical in shaping the socio-economic livelihood patterns of pastoral communities, which critically hinge upon strategies that continuously adapt to a limited, highly variable and unpredictable resource endowment.

[3] Visiting Research Fellow at the Tyndall Centre for Climate Change Research, University of East Anglia.

[4] Available on the WISP website: www.iucn.org/wisp/wisp-publications

[5] Thornton et al., 2002; quoted in Galvin et al., 2003.

The range of strategies pastoralists apply to maintain that balance in turn result from and are affected by the larger geo-political system[6].

Pastoralism is the finely-honed symbiotic relationship between local ecology, domesticated livestock and people in resource-scarce, climatically marginal and highly variable conditions. It represents a complex form of natural resource management, involving a continuous ecological balance between pastures, livestock and people:

There are strong commonalities in livelihood strategies of pastoral groups inhabiting and exploiting distant and diverse drylands or highlands of the world (from Sub-Saharan African dry lowlands to cold Asian plateaux, from the tropical savannah to the cold northern steppe) – a feature that is much less evident among other population groups across the globe[7].

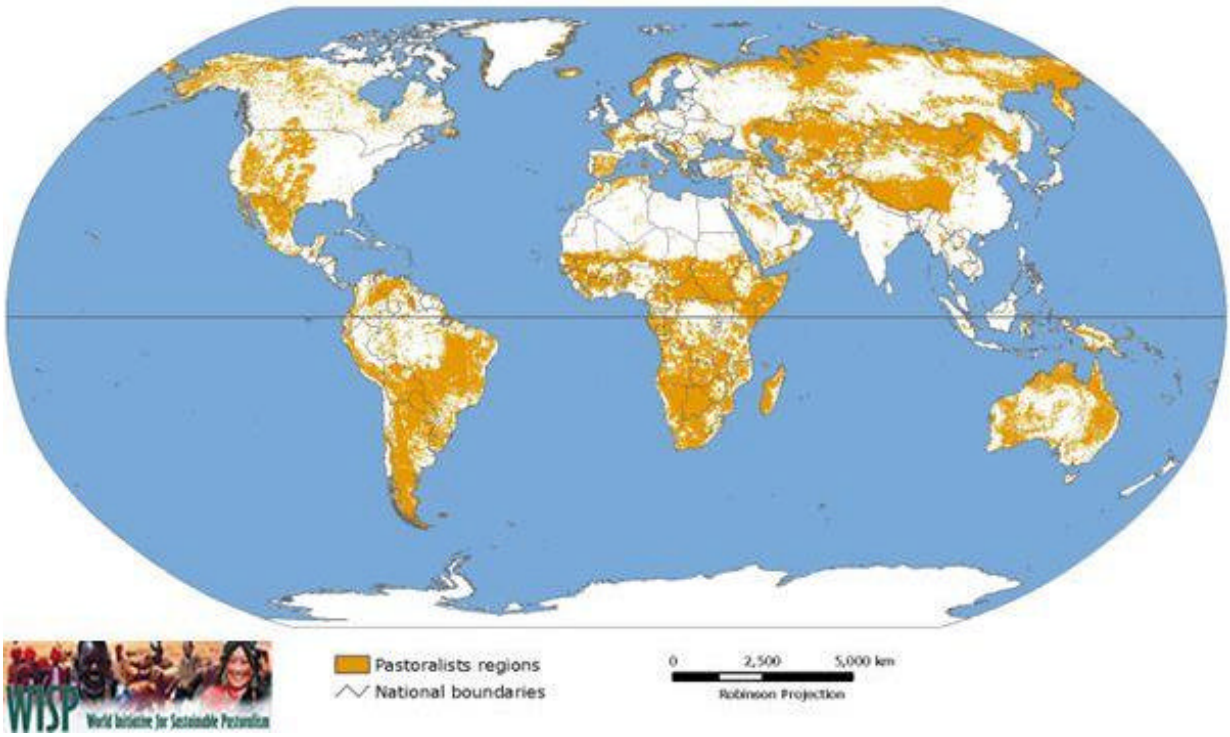

Figure 1: Global distribution of pastoralists (www.iucn.org/wisp)

Overall pastoral systems are important to global society as they support herders' subsistence, provide large quantities of food and non-food products which play a major role in ensuring local food security, and contribute significantly to the national economies of poor countries[8]. These contributions accrue from marginal lands where mobile livestock rearing has a natural comparative advantage and other land uses have been shown ineffective.

Pastoralism is a complex form of natural resource management, which requires maintaining an ecological balance between pastures, livestock and people, and it is an adaptive strategy to a stressful environment. This adaptation faces a myriad of challenges, of which climatic change is but one. Indeed, the challenge of climate change seems insignificant to many pastoralists who are faced with extreme political, social and economic marginalisation: relax these constraints and pastoral adaptive strategies might enable pastoralists to manage climate change better than many other rural inhabitants.

Furthermore pastoralists have historically helped maintaining the rich range of biodiversity in pastoral lands which are home to an impressive variety of animals and plants. This ecological wealth has translated into a wide variety of protected areas and national parks being located within pastoral areas, such as the Serengeti-Mara region of East Africa, the Three Riverheads area of China and the National Parks of Abruzzi and of the Picos de Europa in Europe. The relevance of sustainable range management to carbon-sequestration strategies in grassland soils further supports the need to enhance pastoral natural resource management.

[6] Pratt et al, 1997
[7] Nori, 2007
[8] For details of contributions to national economies, see "The Global review of the Economics of Pastoralism", www.iucn.org/wisp/wisp-publications

The capacity pastoralists display in protecting natural resources in mountain territories has contributed to the conservation and regeneration of freshwater resources for neighbouring lowland populations, as in the mountainous areas of Kyrgyzstan which supply fresh water to regions of the Central Asian and the Tibetan plateaux which provides the water base for the main rivers flowing in South East Asia, the most populous region of the world. The recognition that pastoral areas are particularly critical for the environment is not without cause for concern, however, since initiatives aimed at the protection and conservation of nature often result in local pastoral communities being deprived of access to the very resources they have conserved[9].

One of the most important assets of most pastoralists is their rich knowledge of complex ecosystem dynamics, which makes them often the best detectors of environmental change. Within this context it is clear that any minor or major changes to climatic patterns will have significant consequences for many pastoralists, as it increases resource variability, while also reshaping its overall availability. If pastoralism is *going after the clouds*, variations in the ways the clouds move will no doubt carry important implications.

In fact pastoral livelihood strategies have evolved precisely to developed to tackle these bio-physical constraints and are shaped by the capability to respond to these problems and to adapt accordingly, in what Véronique Ancey[10] (quoting Bonfiglioli, 1988) defines as 'survival ideology'. Roe et al. (2003) have recently brought a further and deeper vision of pastoralists as active, knowledgeable and capable managers of risk[11].

Pastoralism is a multifaceted livelihood system, which deals simultaneously with a range of different factors and events on which herders have limited control. As highlighted by Mohamed Aly Ag Hamana[12] pastoral adaptive strategies must be operational on different fronts. Climatic change and related risks are but one of the challenging factors to their livelihoods, together with the political and social marginalisation that constrains their access to resources and services. The critical links between vulnerability, adaptive capacity and entitlements will be explored through this paper.

A main conclusion from this e-conference is that, according to most participants, climate change and its immediate consequences do not represent a pressing concern for many pastoralists; they would probably be the best equipped to tackle the challenging implications of changes in the climatic pattern, at least in the short term. However, another conclusion is that pastoralists are often not in a position to change and adapt to these processes, as the institutional environment neither supports nor enables their coping capacities.

In the opinion of most participants, increased herders' vulnerability vis-à-vis climatic variability does not necessarily relate to shifting rainfall patterns, but rather to changes in pastoral capacities to move through different territories, to access critical livelihood resources, to trade across borders, to benefit from appropriate investments, to participate in relevant policy decision-making.

As highlighted by some contributors to the e-conference, the degree of vulnerability to climatic variations have become a matter of critical concern long before climate change started to be debated, with pastoral systems already suffering tremendous crises, and herding households and communities increasingly insecure in their livelihoods[13]. Despite the fact that more intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics[14], in the opinion of most participants increased herders' vulnerability vis-à-vis climatic variability does not necessarily relate to shifting rainfall patterns, but rather to changes in pastoral capacities to move through different territories, to access critical livelihood resources, to trade across borders, to benefit from appropriate investments, to participate in relevant policy decision-making. The recently held Alive-LEAD[15] conference recognized the increasing impact that meteorological drought has had on

[9] ibidem

[10] Contribution to this e-conference

[11] From this perspective, high reliability pastoralism is the search and attainment of reliable peak performance through utilizing and managing highly complex technologies.

[12] Contribution from the Network of Pasteurs et Eleveurs du Sahel "Billital Maroobé", based in Burkina Faso

[13] Contribution from Harnet Bokrezion, Penha, London

[14] IPCC, 2007: 8

[15] http://www.virtualcentre.org/en/ele/econf_03_alive/

pastoral people, because their capacity to anticipate, cope with, resist and recover from the impact of drought has diminished[16].

A Range of constraints

While endogenous population growth no doubt represents an important driving force of this change[17], exogenous and induced factors also play an important role[18] in shaping recent pastoral vulnerability to climate variability. A poisonous mix of scientific misunderstanding and political interests has paved the way towards pastoral destitution, thus rendering herding communities increasingly vulnerable to climatic shocks[19]. A combination over time of '*colonial governance, scientific homogenisation, and simplistic economic theories about the use of the commons*'[20] explain the long history of misguided and failed pastoral development interventions by governments. Pastoralism was perceived as intrinsically self-destructive[21] and therefore 'modern' systems of governance and natural resource management have historically aimed to erode and weaken the basis of traditional pastoral livelihood systems, leading to profound changes in power and control structures and undermining the material foundations of the pastoralist economy. Faced with growing external interference and a rising pressure on rich-but-fragile environments, pastoral societies have become increasingly unable to retain control over resources[22].

The establishment of nation states often implied sharp parting of pastoral territories and populations, which invariably ended up composing the margins of evolving nations and the remotest regions from the newly-created central power. Scientific misunderstandings, wrong policies, power plays and resource grabbing in pastoral environments have further fuelled the conflict between centralised policy and power structures and marginal, scattered and mobile pastoral citizens.

Marginalisation is therefore the key word that explains pastoralists' current inability to deal with changes and to adapt. As emphasized in a number of interventions from the different world regions[23], under current conditions pastoralists are more vulnerable to the political and economic environment than to climate change *per se* as it is pastoralists' political marginalisation that constrains them from employing their adaptive strategies and denies them adequate investments for their sustainable development. Major processes currently reshaping the global society present important consequences for pastoral livelihoods and for their overall adaptive capacities:

- Expansion of trade, integration of markets and increasing regional interconnectedness, together with high and increasing demand for animal proteins all over the world;
- A political setting defined by former Structural Adjustment Programs, state retrenching and economic liberalization, implying shifts towards decentralization, devolution and local participation;
- Technological developments enhancing mobility and telecommunications, but also improvements in genetics, which enable 'new' animal and plant organisms;
- Regional stability, security and geopolitical interests, which play an important role in determining pastoral livelihoods, as in the case of the 'war on terror' affecting pastoral lands in Afghanistan, Somalia, the Middle East and Saharan zones.

Within this context, growing population pressure, together with the shrinking of effective rangelands, pose an important challenge to the sustainability of future pastoral livelihoods. *If we use the 2.8% annual natural growth rate often quoted for pastoral population growth in the Horn of Africa and also for West African Sahelian countries as a reference figure, the pastoral population doubles in 25 years and trebles in 40 years (*even higher rates are recorded from some West African Sahelian countries). *Pastoralism is particularly sensitive to population growth because, unlike the situation in cultivated areas, the technical possibilities of changing the productivity of rangeland (changing the output-to-*

[16] Alive LEAD keynote Session 1 ALIVE-LEAD "Pastoral livelihoods between aid dependence and self-reliant drought management"
[17] Contribution from S. Sandford, UK
[18] Refer to Nori and Taylor, 2006 for an exhaustive discussion on this
[19] Contribution from Solomon Wakgari, SCF US, Ethiopia
[20] Warren, 1995
[21] Anderson 1999
[22] Swift, 1994; Lane & Moorehead, 1994; Lane, 1998
[23] Habaye Ag Mohamed (Mauritania), Tanveer Arif (Pakistan), Walter Lusigi (USA), A. Akbari (Iran) and Gabriel Palmili (Argentina) amongst others

land ratio) are limited, especially when compared to yield increases obtainable by technical advances in crop production, and tend (particularly with fuel wood) to be more resource-degrading[24].

The main direct link between pastoralists and climate change is therefore not so much the livelihood risk of changing agro-ecological conditions, but rather the diminishing capacity of pastoralists to put their adaptive capacities properly to work. There is a general agreement that climate change is a process that most pastoralists should be able to cope with, provided political and economic factors define an **enabling framework** that reverses current trends where pastoralists seemingly have a decreasing access to increasingly limited resources. While indeed many problems reported in pastoral areas are related to the availability of natural resources on which livelihoods depend[25], the main pastoral concern is on the accessibility rather than the availability or variability of these resources.

Pastoralism represents by definition an adaptive strategy to a stressful environment, so when that stress leads to livelihood failure, something has gone wrong, and it is often at a policy level[26]. As a result, issues such as reduced mobility, resource tenure, conflict management, access to services and market integration seem to represent priorities for most pastoralists[27].

In the North African and Sahelian regions this marginalisation trend is being inverted in recent times, with pastoralists increasingly involved in the political decision-making, with visible benefits also for national and regional institutions[28]. Concerns have been voiced about the lack of consultations during the formulation of pastoral codes in West Africa, yet local and regional pastoral associations have begun to make efforts to shape those codes. However, weakness in pastoral Civil Society in other regions is a major constraint to raising pastoralists' voice, getting their skills acknowledged and their rights recognized.

Although perhaps less organised than its West African counterpart, East Africa Civil Society, increasingly supported by international Civil Society, is now helping to develop pastoral voice, with a number of initiatives aimed at tacking environmental degradation, food insecurity and social vulnerability (including conflict) through innovative and participatory approaches. Compared to the Sahelian zone, this region suffers from a much wider fragmentation of the pastoral population base, which is divided in a myriad of groups, making it more difficult to raise a common voice.

Specifically in northern Kenya, where a number of research and development activities are in place, degradation of rangelands represents a serious element of concern for local livelihoods, which seem increasingly incapable of dealing with the increasing severity of drought events[29]. In that region the vicious circle of political pressures, environmental degradation, severity of droughts and social vulnerability seems particularly critical. Reduced rainfall and its variability and the recurrent drought from the 1960`s have negatively affected the vegetation resulting to the depletion of fodder in the rangelands.

From the other side of the border, Adrian Cullis and Solomon Wakgari have contributed to the conference the experience from the 'Pastoralist Livelihoods Initiative' in the Borana region of Ethiopia, where the revitalization and the strengthening of traditional institutions together with adequate investments have been chosen as the strategy to tackle these trends. The two main ingredients of such strategy have been the recognition and the appreciation of local institutions and practices, and the direct involvement of local communities since the programme inception.

The weather forecast

The Intergovernmental Panel on Climate change (IPCC 2007) reports that if trends in greenhouse gas emissions are not fundamentally altered, global temperatures will rise by between 1.4 and 5.8º C by 2100. Temperature change implies a number of outcomes, whose overall consequences are not (yet) clearly estimable. Long term impacts are difficult to predict and are bound to vary from one region to another in the world, and will carry different consequences on the different population groups, such as predicted increased aridity in the Kalahari and increased rainfall in the Sahel[30]. In some areas and for some groups climate change might therefore be beneficial to an extent.

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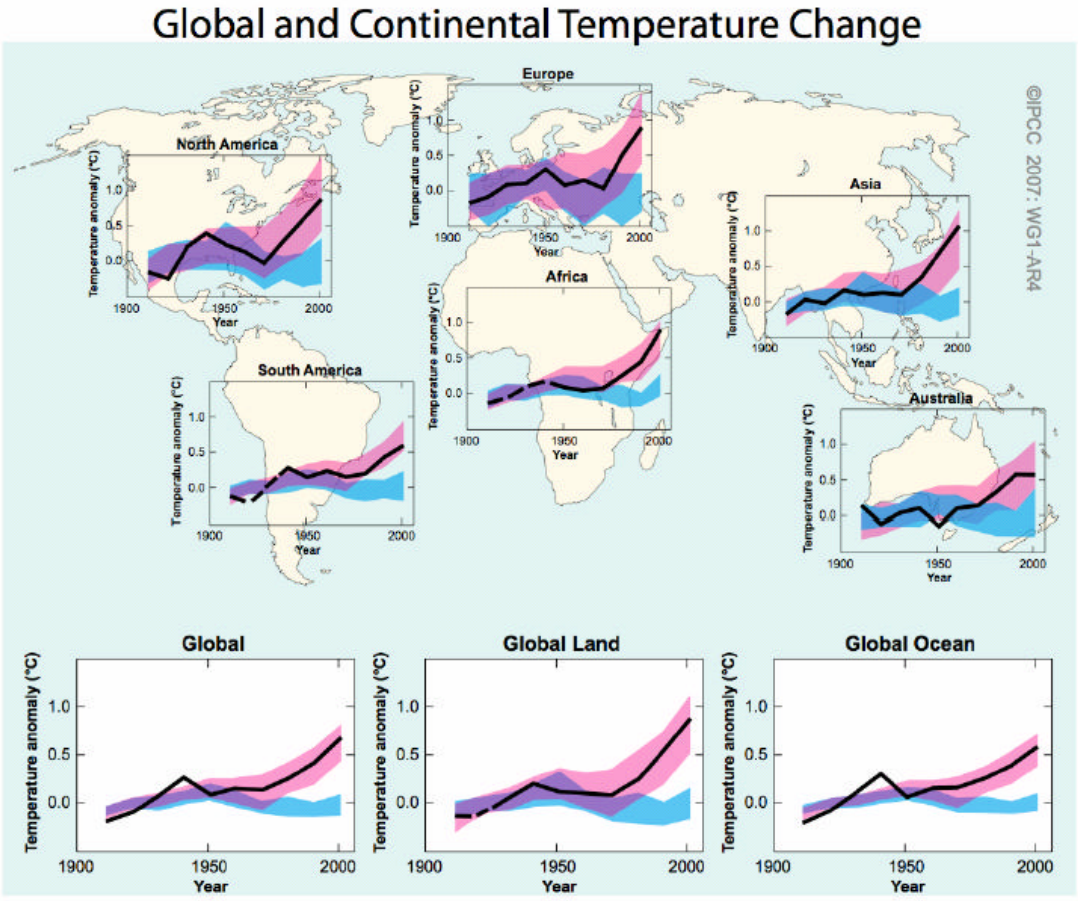
[24] Contribution from S. Sandford to the International Land Coalition e-conference on pastoral lands
[25] Claire et al., 2003.
[26] Contribution from J. Davies, IUCN, Kenya
[27] Also refer to the LEAD-Alive e-conference http://www.virtualcentre.org/en/ele/default.htm
[28] Contribution from Mohamed Ag Ewanghaye, Prodecap, Niger
[29] Contribution from Chris Field and Brian O. Otiende, Kenya; article from David Kimenye, Christian Aid, reported in The Observer on 12/11/2006.
[30] Contribution from Daniel McGahey, Oxford University Centre for the Environment, UK

In general most climate change models predict rising temperatures and decreasing rainfall in many dryland areas. As a result, these areas will tend to become drier, and existing water shortages will worsen. In addition, climate change is likely to bring about even more erratic and less predictable rainfall and more extreme weather conditions such as longer and more frequent droughts and/or floods and intense wind events. Where this happens, the delicate balance on which pastoral systems depend is undermined.

Overall major effects could be classified as:

- Changing rainfall patterns, with an overall increased variability expected and declining water balances;
- Biodiversity shifts in both time and space;
- Changes in wind patterns;
- More frequent extreme climatic events (e.g. floods and droughts);
- Changes in oscillations of recurrent events such as El Niño, heat waves and tropical cyclones.

Figure 2[31]: Comparison of observed continental and global-scale changes in surface temperature with results simulated by climate models using natural and anthropogenic forcings[32]



[31] IPCC, 2007: 11

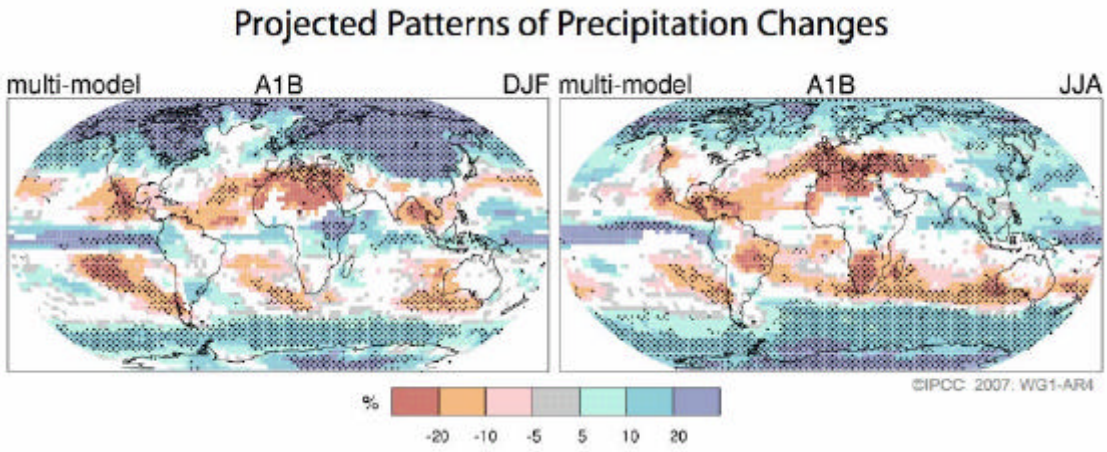
[32] Decadal averages of observations are shown for the period 1906–2005 (black line) plotted against the centre of the decade and relative to the corresponding average for 1901–1950. Lines are dashed where spatial coverage is less than 50%. Blue shaded bands show the 5–95% range for 19 simulations from 5 climate models using only the natural forcings due to solar activity and volcanoes. Red shaded bands show the 5–95% range for 58 simulations from 14 climate models using both natural and anthropogenic forcings.

Current concern for climate change seems to start from the assumption that climate patterns normally do not change. In fact, climate change per-se is not a new phenomenon, and it is recognised that **climate has always been changing**. History teaches that climate change phenomena in the past have led to important changes in society, and possibly contributed to an extent to undermining a number of ancient civilizations. According to some theories the decline of the Maya-Quiché Civilization, around XVI Century, was triggered by a change in climatic patterns[33]. The same applied to other centralised great empires.

More than once in history, pastoralism has provided a means through which populations adapted to deteriorating climatic conditions. Archaeological suggests that pastoralism in Africa developed in direct response to long-term climate change and variability, and spread throughout northern Africa as a means of coping with an increasingly unpredictable and arid climate.

On a more environmental basis, huge lakes in the Sahara have come and gone as the climate changed over the last 10,000 years (Gasse, 2000), southern Africa has experienced extended periods of both warm wet and cold dry weather over the last 1000 years (Holmgren et al., 2003) and eastern Africa has suffered severe droughts within the last few hundred years (Gillson, 2006).

Figure 3[34]: Relative changes in precipitation (in percent) for the period 2090–2099, relative to 1980–1999[35]



History also teaches that more than once pastoralism provided a means through which fairly sedentary populations could increase their mobility in order to survive in the face of deteriorating climatic conditions. Archaeological evidence indicates that pastoralism in Africa developed in direct response to long-term climate change and variability, and spread throughout northern Africa as a means of coping with an increasingly unpredictable and arid climate[36]. The phenomenon therefore is not a new one, although three main factors justify the current growing concern over this critical challenge: the rate and the scale of its occurrence and the magnitude of its social impact.

1. The **fast pace of the process** compromises adaptation strategies:

As has always been the case, when the pace of change is too fast, some organisms face extinction, as they won't have the necessary time to adapt, leading to important ecosystem changes and biodiversity loss[37]. The UN Framework Convention on Climate Change (article 2) specifically recognizes the critical link between climate change and the natural capacity of ecosystems to adapt. A critical concern is on slowing down current man-induced change to a pace that allows ecosystems to adapt naturally to climate change[38].

2. Major changes in **resource availability at the global scale**:

[33] Contribution from J.L. Merega, Fundacion del Sur, Argentina
[34] IPCC, 2007: 11
[35] Values are multi-model averages based on the SRES A1B scenario for December to February (left) and June to August (right). White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change.
[36] Climate Change, Adaptation and Pastoralism, available on the WISP website: www.iucn.org/wisp/wisp-publications
[37] Contributions from Abdulrahman Ahmad, Nigeria, and Sora Adi, Ethiopia. Recent estimations indicate a 20 to 30% biodivesity loss in the coming years at this pace of change.
[38] Hannah et al., 2002

A second main element that contributes to shaping the debate is represented by the growing recognition that critical resources are becoming scarcer for the mounting population of the world. While this applies to a number of different resources, freshwater is particularly at stake as the immediate effects of climate change have important consequences on its availability (less, and more variable precipitation in some areas; lower glacial reserves; higher sea levels). Important freshwater reserves that are diminishing include lake Turkana in East Africa and the Chad Tog lake in West Africa[39].

3. It is generally accepted that **poorer countries**, which historically bear lower responsibility for this process, would be those **bearing the biggest burden**:

Climatic variability increases with the degree of aridity[40], and many of the world's poorer countries contain a significant share of the drylands. In these countries livelihoods are more reliant on the natural resource base and on environmental goods[41] and services, but their capacity to invest in adaptive technologies, such as improved varieties or water system, is lower.

Indirect contributors, active recipients

According to the IPCC[42], *most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentration*. While overall human influences over ongoing climate change processes are increasingly acknowledged, the **situation seems quite peculiar for pastoralists**, whose direct contribution to the problem seems debatable. On one side the growing *livestock sector accounts for 9 percent of CO^2 deriving from human-related activities, but produces a much larger share of even more harmful greenhouse gases. It generates 65 percent of human-related nitrous oxide, which has 296 times the Global Warming Potential (GWP) of CO^2. Most of this comes from manure. It accounts for respectively 37 percent of all human-induced methane (23 times as warming as CO^2), which is largely produced by the digestive system of ruminants, and 64 percent of ammonia, which contributes significantly to acid rain. Furthermore livestock now use 30 percent of the earth's entire land surface, mostly permanent pasture but also including 33 percent of the global arable land used to producing feed for livestock. As forests are cleared to create new pastures, it is a major driver of deforestation, especially in Latin America where, for example, some 70 percent of former forests in the Amazon have been turned over to grazing*[43].

Although these trends relate mainly to intensive production systems, or to extensive systems created through the clearance of extensive tracts of forest, extensive herding also contributes to an extent. When it specifically comes to pastoralists, the report states that *herds cause wide-scale land degradation, with about 20 percent of pastures considered as degraded through overgrazing, compaction and erosion. This figure is even higher in the drylands where inappropriate policies and inadequate livestock management contribute to advancing desertification.* Nevertheless, suggested solutions, such as restoring mobility on common property pastures, or improving resource access and management mechanisms, seem to further recognise the effectiveness of customary pastoral practices vis-à-vis environmental changes.

Conversely, pastoral lands, rather than their people, play a major role in the climate change process. Many areas inhabited and exploited by pastoralists are endowed with rich underground resources, such as fossil fuels, whose utilisation is a major trigger to the global increase in carbon dioxide concentration: a major determinant of climate change. Land use changes associated with the shift of forests and ranges into agriculture areas represents another major drive of climate change, due to less sustainable resource use patterns with overall consequences on concentrations of greenhouse gases.

Therefore not only do pastoralists bear the brunt of decreasing land access and increasing land-related conflicts, but pastoral capacities to protect biodiversity and to preserve soils, water and wildlife, together with their direct contribution to enhanced carbon sequestration through rangeland management, go unnoticed. Meanwhile, pastoralists themselves end up being amongst those most exposed to the immediate effects of changing climatic patterns.

The **effect of climate variations** in pastoral areas are even more uncertain, as enhanced climatic variability and unpredictability might provide pastoralists with **huge new habitats**[44] whilst rendering agriculture increasingly less feasible and reliable in marginal lands, which could be (re)devoted to

[39] And other reported West African lakes such as the Daouna, Faguibine, Tanda et Kabara.
[40] Niamir-Fuller, 1999a
[41] Contribution from Omondi, Reconcile, Kenya
[42] IPCC Climate Change 2007 "The Physical Science Basis" Summary for policy makers, 2007. www.ipcc.ch
[43] FAO-LEAD, 2006.
[44] Contribution from Jeremy J. Swift, UK

grazing and herding. At the same time, livestock capacity to tolerate climatic variations are yet to be understood. Higher variations in temperature and humidity levels could affect the conditions of typical drylands animals, such as camels. Important **animal health** disease vectors go with humidity (e.g. trypanosomiasis, which is one of the most serious vector-borne diseases affecting livelihoods in sub-Saharan Africa). Higher temperatures might decrease ice and snow levels in mountainous areas and Central Asian highlands, thus changing seasonal access to grazing and water resources.

The mix of growing population, shrinking lands and shifting rain patterns is likely to provoke and aggravate **conflict over resource access, control and utilization**. The issue of conflict becomes particularly critical when assuming that diminished freshwater availability will be a main outcome of ongoing climatic change dynamics. In many areas an adaptive strategy applied by pastoralists involves moving into greener areas, at least for part of the year, such as the Fulani pastoralists in Nigeria who move into southern forest areas in search of grazing lands[45]. While these areas might have once been under control of herding groups, they host today a variety of other land users. Negotiations to access land at different times might be one result of this process, but conflict might easily be another outcome. No doubt the new balance between land, water and pasture that climate change will reshape carries implications for the adaptive capacities of pastoralists, vis-à-vis other groups. Clearly defined rules and increased negotiating power concerning the access, control and management of such resources is therefore critical to mitigate possible conflict as well as to enhance development and adaptation.

While the extension and the impact of such events will change from one location to another, it is also important to highlight that different social groups will be affected differently. The ongoing **socio-economic stratification** that characterises many pastoral societies also influences vulnerability and adaptability within the pastoral population. Better off (at times absentee) livestock owners have better access to, and invest in, modern devices and services (four-wheel-drive cars, satellite phones, banks) to capture the best grazing as well as the best socio-economic opportunities.

A crucial adaptive response, whether to climate change, to global economic forces or to some other challenge, is to diversify livelihoods and embrace new opportunities. This adaptation is increasingly apparent in the blurring of the distinction between pastoralists and cultivators: a growing number of pastoralists now cultivate the land and increasing numbers of crop farmers now have stock vested in pastoral systems. Despite the violent conflict that is associated with a small minority of the worlds pastoral regions, such collaborative and cooperative arrangements are the norm in pastoral areas.

Aside from more traditional mechanisms aimed at tackling environmental variability (such as mobility, herd and household splitting, changing herd composition), pastoralists also **increasingly diversify their livelihood base**, by seeking access to a variety of different ecological and socio-economic resources, which critically extend their capacity to access food, income and support at times of need. This represents an adaptive strategy to the "land squeeze" and the decreased mobility that is characterizing pastoral groups, as a rising human population depends on a declining livestock and rangeland resource. Different strategies imply diverse forms of risks and exposure to changes in climatic patterns.

Aside from the conflict that characterizes some areas and the relationships among some pastoral groups, collaborative and cooperative arrangements are also the norm in pastoral areas, with neighbouring pastoralists and with farming and urban communities. The ties with these latter have become increasingly important in the effort to diversify the pastoral livelihood base and to integrate into market dynamics. While the main concern of this report is pastoralism, implications for other land use systems are also accounted for since they are increasingly interdependent with pastoral systems.

Climate change has important implications for the processes interlinking pastoral livelihoods to non-pastoral communities. An immediate implication is that cultivation will be carried out in increasingly marginal lands, which could increase competition, but also could increase complementarities with herding. There are also implications for the sustainability of urban environments under changing rainfall conditions. As experience attests, urban environments represent important complementary environments to pastoral areas, with high economic and social relationships established[46]. Too little or too much rainfall will affect infrastructure that is designed for specific agro-ecological conditions. Moreover in some areas (e.g. Somalia) close ties with coastal communities represent an important strategy to buffer and complement the pastoral economy: as coastal area are threatened by rising sea levels and changes in freshwater availability, so the impact may be felt by pastoralists.

[45] From the conference 'the future of transhumance in West Africa', Abuja, November 2006.

[46] The Livestock Revolution paradigm represents an interesting case with this respect. Refer to Delgado et al., 1999

Experiences in pastoral areas ranging from the dry Kalahari[47] to the cold Himalayan region[48] indicate that it is not so much the challenges brought by the climate that affect pastoral livelihoods, but the physical and institutional barriers that constrain their mobility and flexibility, thus rendering them more vulnerable to climatic variability, while also affecting overall environmental conditions. Scientific works are in fact nowadays quite clear that pastoralists are not at the heart of land degradation and desertification phenomena in marginal ecosystems, but rather the primary victims of such environmental changes, which are caused in part by long-term climate variability driven by variations in global surface temperature. Most contributors[49] agree that efforts and investments are to be made in strengthening and improving pastoralists' capacity to claim their rights and to cope with growing climatic variability rather than in developing adequate technical advices and devices, such as early warning schemes, which seem of limited effectiveness.

Climatic models, early warning mechanisms, scenario analysis and other tools provide limited, sometimes contradictory, scientific understanding over the diverse implications of climate change. Greater efforts and investments should be made to strengthen and improve pastoralists' capacity to claim their rights and to cope with growing climatic variability rather than in developing technical advices and devices that seem of limited effectiveness. Nevertheless, lack of full scientific certainty should not be used as a reason for postponing measures to mitigate impacts of climate change.

In fact, growing climatic variability seems to clash with scientific capacities to determine unilinear evolution patterns. The effect of limited and sometimes contradictory scientific understanding over the diverse implications of climate change translates into a variety of recommendations, which, altogether, give little indication about what to do. Climatic models, early warning mechanisms, scenario analysis and other tools are utilised from time to time to pay lip service to a growing concern about future uncertain dynamics, often in a not-so-convincing way, either for international agencies, or for local communities[50]. At the same time the UN Framework Convention on Climate Change warns explicitly that *'lack of full scientific certainty should not be used as a reason for postponing measures to mitigate impacts of climate change'.*

Shaping a new contract

So what is to be done, when we do not fully know what will happen? The answer is not so much a technical one as a political one. Pastoralists hold in fact many of the appropriate skills and capacities to respond to changing climate patterns and related ecological consequences and to adapt accordingly. Pastoralist resource management could in this respect provide important lessons for society: as climate change involves higher degrees of uncertainty, rather than struggling to achieve certainty in an uncertain world, the best response may be to embrace the consequences of uncertainty and rethink responses accordingly[51].

Adequate emphasis should be put on the fact that not only pastoralists need to innovate, but the overall society is in critical need of new resource management paradigms to tackle the challenge of climate change. Within this context, **renegotiating knowledge and power** represents a most critical factor. The political will to acknowledge the effectiveness of pastoral traditional practices, both at institutional and at scientific levels, represents the starting step of any process aimed at enhancing societal adaptation to increasing climatic variability. In this respect, it is worth fostering dialogue to enable development of innovative and complementary skills and forms of knowledge[52].

While climate change dynamics push society into new directions, a new social contract has to be established with pastoralists. New contractual forms between pastoral communities and the rest of society have to be struck, for the sake of all parties. This contract should enable them to apply innovative and sustainable adaptive livelihood strategies, while also teaching the rest of society how to sustainably manage increasingly scarce and variable natural resources. This new contract needs efforts at all institutional levels, so that an enabling framework of policies, laws and incentives is put in place[53].

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[47] Contribution from Susannah M. Sallu, Oxford University Centre for the Environment, Kalahari
[48] Contribution from Minoti Chakravarty-Kaul from India and Krishna Kaphle from Nepal Veterinary association
[49] Contributions from Aman Singh du Krapavis (India), Maryam Niamir Fuller UNDP (USA), Boshra Salem, University of Alexandria (Egypt), amongst others
[50] Contribution from Ian Scoones, IDS, Uk
[51] ibidem
[52] Contribution from Mahalmoudou Hamadoun, CILLS, Burkina Faso
[53] Contribution from Jeremy J. Swift, Uk

Pastoralism is changing and must innovate accordingly; policy, science and market contributions are all needed to make achieve this sustainably. The wider society is facing an unprecedented challenge, as shifts in climate patterns are likely to represent the main force driving social change in coming times[54]. The skills and the capacities different human systems have developed show degrees of complementarity which is vital to synergize and exploit. The leap forward should enable overcoming the traditional-modern, sedentary-mobile, public-private, local-central dichotomies which have so far contributed to patterns of unsustainability.

Adaptive capacity is the potential of a social system to adapt to external stressors; it is the ability to cope with impacts of climate variability and change[55]. It would be meaningless to analyse the consequences of climate change without considering the range of adaptive responses a specific society is capable of putting into practice[56]. Three main domains are here explored which specifically relate to pastoralists and their capacity to change and adapt to climatic variations:

1. **Institutions and Power:** provide an enabling policy, legal and social framework for pastoralists to respond adequately to the challenges posed by changing and variable climatic conditions;
2. **Science and technology:** provide accessible and more need-based information that complements existing, traditional knowledge;
3. **Economy and market:** provide an economic environment that enables pastoralists to buffer risks related to agro-ecological dynamics.

Institutions and power

The literature on natural disasters emphasises the importance of social institutions for shaping the way that environmental stress affects communities and individuals[57]. The functioning of pastoralist institutions and their role within the wider institutional framework represents therefore a critical factor[58], which directly relates to the capacity of pastoralists to raise their voice, improve their capacity to claim rights carry and participate in decision-making at policy level.

In the past, formal statutory institutions have often contributed to undermining the customary institutional setting and fuelling conflict, while failing to deal with the complexity of range ecosystems and pastoral resource management, representing an important element in ongoing unsustainable trends upon rangelands. Nowadays the effectiveness of pastoral institutional set up is being increasingly recognised to tackle the agro-ecologic dynamics of such environments. However, it is also increasingly acknowledged that in order to enhance pastoralists' adaptive capacities it does not suffice to rely on the traditional institutional setting, but alliances and synergies with other, more formal levels must be developed[59].

In this respect, the different global, regional, national and community institutional levels should be considered, due to the scale of the problem. International agreements between governments are needed to recognize and respect pastoral resource management and to harmonise the institutional framework that regulates access to pastoral resources at regional level[60]. Experiences from West Africa and Central Asia indicate the role that Civil Society can play in bridging existing institutional gaps, by investing in capacity building of pastoral leaders and enhancing networking that could help mobilise communities and enable them to articulate themselves within the wider society[61].

Science and knowledge

A main call for scientists is to adopt, enhance and disseminate new understanding in rangeland ecology and pastoral economics, and to recognise pastoralism's capacity to sustainably produce valuable goods in marginal lands[62]. The challenge that was raised during the 1990's by the "New Rangeland Ecology"[63] has not permeated far enough to actively influence the way pastoralism

[54] Contribution from Nick Brooks, University of East Anglia, Uk
[55] Smit & Pilifosova, 2001
[56] Neil and Mick, 1999.
[57] Pelling & High, 2003.
[58] Michael Ochieng Odhiambo, Reconcile, Kenya.
[59] Veronique Ancey, CIRAD, Senegal; Mohyel Deen El Tohami Taha, UNDP, Sudan.
[60] Samba Harouna Thiam, UNDP Mauritania; Fatima Jibrell, Somalia.
[61] Contributions from the state servants Aminu Ibrahim from Katsina, Nigeria and Gabriel Palmili from Patagonia, Argentina
[62] Contributions from Ag Ewanghaye from Prodecap SADAD in Niger and Ben Ole Koissaba from the Maa Civil Society Forum in Kenya, amongst others.
[63] Behnke 1994, Behnke & Scoones 1992, Behnke et al. 1993, Scoones, 1994.

research and development is carried out and more coordination is required between the natural and the social sciences.

Most contributors have reported on the limits of current scientifically-generated information and the fact that a holistic understanding of pastoral resource management is still lacking. In many areas indigenous pastoral systems have proved through time more socially and ecologically effective and efficient than scientifically designed schemes, but nevertheless development interventions and investments are still utilizing old-fashioned blueprint range management and livestock production strategies that don't account for pastoralists skills.

Within the scientific domain the now familiar 'adaptation' argument often does not go beyond providing mechanisms for early warning. While not originally seen as a direct response to global climate changes, it is now firmly part of the adaptation/response menu, whilst the plethora of early warning systems that have been set up across Africa in particular seem to be of little effectiveness. Using the most sophisticated of satellite technology, Geographic Information Systems and predictive models, early warning systems attempt to predict droughts (or other climate events) and offset the likelihood of - or at least warn people about - imminent food crises and potential famines[64]. Such technologies do not have the results they hoped for and there seems to be a 'missing link' between the information provided (often increasingly accurate) and responses on the ground[65]. Farmers or pastoralists just don't trust such results, and fail to respond accordingly.

Until now scientific knowledge has often been used to turn a political problem into a technical one, and technological solutions have been a distraction used as a cover for inaction by those who want to abdicate responsibility and delay action[66]. Instead, integrated and action oriented research approaches, and Need-Oriented-Technology, could yield a basket of options for adaptation to climate changes in pastoral environment[67]. Traditional and modern capacities to understand and monitor climate changes should be utilised in complementary and synergic ways, with formal, external response mechanisms linked to that, rather than imposing an externally driven, science-based culture of prediction and control[68]. For this to happen, pastoralists' capacities to critically interlink development and adaptation strategies need to be recognised and reinforced, and must be made clearer to policy makers at different levels[69].

In the debate over whether there is a difference between development and adaptation, it is worth recognising that the capacity to adapt is something intrinsically pastoral, and its loss has been associated with 'development'. Sustainable pastoral development must be founded on the understanding that adaptive capacity is what makes pastoralism work and restoring, and enhancing, such capacities must be central to development plans. Adaptive capacity of pastoralists needs to be seen not as something different to, but as a primary indicator of, pastoral development.

This is not to denigrate the role of science and technology, and such developments should be critically utilised to help understanding the implications related to climate change[70], to make environmental information consistent and accessible to beneficiary communities[71], and to enhance adaptive capacities. Good sources of information in this regard are the Sahara and Sahel Observatory[72], and the Système d'Information sur le Pastoralisme et l'Environnement[73].

Economy and market

Enhanced integration into market dynamics seems to be an unavoidable process for pastoral societies. This process has important implications for pastoral adaptive capacities, as it slowly but inexorably shifts their resource access and utilization patterns, while broadening the overall economic base of their livelihood. Economic integration and diversification bring positive benefits of spreading risk, but also introduce pastoralists to new source of risk to which they are sometimes poorly adapted. Discussions around adaptation to climate change can overlook the fact that some pastoralists are

[64] contribution from Ian Scoones, IDS, Uk
[65] Buchanan-Smith and Davies, (1995)
[66] contribution from N. Brooks, University of East Anglia, UK
[67] contribution from S. Wakgari, SCF US, Ethiopia
[68] contribution from Ian Scoones, IDS, Uk
[69] contribution from Veronica Muthui, UNDP Kenya
[70] contribution from Nick Brooks, University of East Anglia Uk
[71] contribution from Wafa Essahli, OSSS, Tunisia
[72] www.unesco.org/oss/
[73] http://www.cirad.fr/senegal/recherche_et_developpement/pastoralisme_en_zone_seche/systeme_information_pastoralisme_sahel

failing to adapt to even more immediate changes, such as economic adaptation, of which they are far more aware.

Three main forces are driving economic changes, with implications for food security and socio-economic development in pastoral areas that increasingly integrate livelihoods with markets:

1. As the self-sufficiency of pastoral economies decreases with growing population pressure, pastoralists all over the world are driven towards market exchanges to satisfy the needs of a growing rangelands population. Animal products often have greater nutritive value when exchanged for other staples at markets (i.e. a positive 'caloric terms of trade').
2. Rapid population increase all over the world increasingly leads to huge urbanisation processes, which involves a demand for animal products rising faster than that for other food products[74], providing pastoral areas with interesting options for socio-economic development, while also contributing to the overall integration into overall national, regional and global society.
3. The increasing relevance of alternative income generation for enhancing and diversifying pastoral livelihoods is important for risk management and it may be critical for defining sustainability patterns and capacities to adapt to shifting trends.

Market integration and the increasing dependency on the economic environment generate new areas of uncertainty and vulnerability for pastoralists, as for other rural communities, by bringing new variables into the livelihood, such as market forces and globalisation, consumer demand, financial services and institutions, purchased inputs, labour markets etc. It is clear that pastoral areas have a high demand, and offer great opportunities for, appropriate investments, incentives and the involvement of public as well as private sectors[75].

Conclusions

The idea of **sustainable development** has evolved due to the inherent tensions between economic development and the desire to protect the environment. The most commonly used definition comes from the Brundtland Report, which defines sustainable development as: 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987: 43). During the 1992 Earth Summit in Rio this approach was somehow institutionalized, in that the only sustainable socio-economic development is the one that aims at protecting the environment.

Sustainable environmental management and the eradication of poverty are also central to the thinking behind goals 1 and 7 of the United Nations **Millennium Development Goals**, which aim, respectively, to eradicate extreme poverty and ensure environmental sustainability, and the forthcoming 2007 *Human Development Report* also explores the critical linkages between climate change and human development.

While the tension between economic activities and environmental protection has traditionally characterized development patterns all over the world, the climate change debate is opening two new pathways of discussions, which in a way reframe the whole discussion:

Pastoralism may provide food resources and secure a viable livelihood where climate change and other pressures on ecosystems result in greater unreliability of marginal farming and the transformation of forest into savannah.

- The global scale of the process, which implies that actions taken somewhere have direct implications on other sides of the world;
- The clear evidence that short-sighted economic development might eventually lead to highly costly environmental situations, thus eating back previous socio-economic developments.

The outcomes and the implications of the phenomena associated with climate change vary consistently from one region to another of the world, and carry different consequences on different population groups, as those with the least capacity to adapt are generally the most vulnerable to climate variability and change impacts[76]. As stated, in some areas and for some groups climate change might also be beneficial to an extent. In general, as the variability of rainfall increases with decreasing annual rainfall totals, countries with important portions of pastoral territories are likely to

[74] Contribution from Jeremy J. Swift; refer also to Delgado et Al. (1999) ''Livestock Revolution'

[75] Contributions from Nancy Abdirahmane, Tiviski, Mauritania; Amit Poonj Sharma, Land Mawe limited, Kenya

[76] Galvin et al., 2003

suffer more from climate change. Most of these countries already rank very low in terms of human development.

A paradoxical element in the discussion about climate change, adaptation and pastoralism is therefore that pastoralists, long conceived as inappropriate land users triggering environmental degradation, are nowadays those most exposed to climate change phenomena, for which they are recognizably the least responsible.

Nevertheless, where climatic conditions become more variable without leading to the collapse of rangelands, pastoral livelihoods have the potential to sustain populations in the face of climate change. Pastoralism may in fact provide food resources and secure a viable livelihood alternative where the climate change and other pressures on ecosystems result in enhanced unreliability of marginal farming and the transformation of forest into savannah.

In marginal environments characterised by resource variability mobile pastoralism can be the best way to mitigate against risk, so it may be part of the solution to climate change, just as enhancing mobile pastoralism is part of the solution to overcoming poverty and reducing drylands degradation[77]. Indeed mobile livestock rearing already represents a growing activity in many marginal areas of the world. Many rural communities are increasingly rearing livestock in an extensive way as a strategy for diversifying their assets, as a response to the increase in variability and uncertainty that is associated both with the socio-economic environment as well as the climate[78]. Conversely, some pastoralists are themselves seeking ways to diversify their livelihood base by incorporating other production systems, as evidenced by the increase in farming amongst West African Fulani.

Overall, the ICCD[79] multidisciplinary research program in West Africa, has found that at the regional level there are specific complexes and combinations of cropping and animal husbandry systems often operated by different ethnic and occupational groups in response to climate conditions. In a more dynamic climatic environment, the flexibility, mobility and low-intensity use of natural resources afforded by pastoralism may increasingly provide a sustainable means of providing security where other more sedentary models fail.

Just as photos develop from dark negatives into colourful pictures, pastoralists are increasingly recognized as active agents with specific knowledge, skills, institutions, strategies and practices that would normally be well adapted to such climatic vagaries and uncertainties, provided overall societal conditions are enabling. Nowadays marginal lands are becoming even more marginal, due to climate change implications[80]. Pastoralists are used to being challenged by the climate, and should be more able to cope than other rural groups. Recognizing this represents the first and unavoidable step to enable pastoralists to respond to the phenomenon of climate change. The implications of this relate to the political, the scientific as well as the economic spheres, and involve the redefinition of a societal contract, where pastoralists can be considered as integral global citizens.

Vulnerability is defined as the characteristics of individuals or groups in terms of their capacity to anticipate, cope with, resist and recover from the impacts of a shock or a change. This capacity is determined by the availability of resources and, crucially, by the entitlement of individuals and groups to call on these resources. Influences and pressures from environmental, political and institutional environments are therefore critical[81]. Efforts aimed to reduce vulnerability should enhance pastoralists to innovate and to put into practice their livelihoods strategies, which traditionally address adaptation and development at the same time. Enhancing **pastoralists'**

In the debate over whether there is a difference between development and adaptation, it is worth recognising that the capacity to adapt is something intrinsically pastoral, and its loss has been associated with 'development'. Sustainable pastoral development must be founded on the understanding that adaptive capacity is what makes pastoralism work and restoring, or enhancing, such capacities must be central to development plans. Adaptive capacity of pastoralists needs to be seen not as something different to, but as a primary indicator of, pastoral development.

[77] Contribution from Jonathan Davies, WISP, Kenya

[78] Vulnerability assessment and enhancing adaptive capacity to climate change in Semi Arid regions of India. Second International Workshop on Community Based Adaptation (CBA) to Climate. 2007 - http://www.bcas.net/2nd-cba/Documents/tc-1a/Nambi.pdf

[79] Impact of Climate Change on Drylands (ICCD) implemented since 199 by African Studies Centre (ASC) in collaboration with Wageningen University and Research Centre and the University of Amsterdam

[80] Nori et al., 2005

[81] Adger & Kelly, 1999; Galvin et al., 2003

entitlement to a wider range of resources, agro-ecological as well as socio-economic, and enabling them to use such resources as needed, is vital to reducing their vulnerability and to supporting their capacity to tackle the sustainable development challenge in marginal areas[82].

Current subsidy schemes encourage livestock production in ways that are contributing to climate change, as recognised by the FAO-LEAD recent study. Efforts are needed to better recognise the comparative advantage of pastoral livestock production in a sustainable development perspective, leading to economic and environmental externalities built up into prices by selective taxing of and/or fees for resource use, inputs and wastes. Incentives that value and remunerate the precious environmental services pastoralists provide to society might represent a way to strengthen pastoral resource management.

These policy options would represent an important framework for the sustainability of extensive grazing systems in a context characterized by changing climate and 'livestock revolution'. Possible efforts in this direction must be supported by richer countries, which bear the main responsibility for climate change[83], although caution should be raised over the ways these resources would be allocated and utilized.

The challenge brought by climate change forces our society to rethink overall resource management. Pastoralism holds important skills, knowledge and capacities to deal with scarce and variable resource endowment, from which lessons could be learnt. This implies critical shifts in power and knowledge paradigms and the definition of a new social contract. Pastoralism might indeed provide a perfect setting where participatory processes and indigenous, traditional knowledge could really be used to find appropriate solutions, leading to ourselves learning from herders how to deal with scarce/limited and unpredictable resource endowment.

Pastoralists are amongst those that are exposed to the contradictions of ongoing development patterns, which have deeply undermined their adaptive capacities. This is not to say that traditional pastoralism is necessarily the way forward, but pastoral skills are certainly relevant for tackling future environmental challenges. While efforts are to be made to integrate these skills into our development patterns, pastoralists must also be enabled to articulate themselves, and non-pastoralists must be enabled to listen, so as to enhance their capacity to adapt to changes over which they have no control.

[82] Neil and Mick, (1999) - contributions from Richard Grahn (Kenya) and Minoti Chakravarty-Kaul (India)

[83] Hesse and Cotula, 2006

Annex

Classification of the 70 participants to the e-conference.
Note that some people contributed more than once.

East Africa	West Africa	North Africa	Western Asia	South Asia	Latin America	North America	Europe	
6	5		1	2	1			local NGO/CBO
7	3						1	Intl. NGO
2	4	1	1			2	1	Intl. Org. (UN or other)
	1				1			Gov. body
2	1			1				Local Association
2	1	1		1			6	Research / University
1	1							Private enterprise

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