



## Drylands and Climate Change

paper commissioned by the World Bank Group for the "Social Dimensions of Climate Change" workshop

Simon Anderson, IIED  
and John Morton, NRI



People bringing their weakened animals to an Oxfam destocking programme in Kenya Photo: Jane Beesley, Oxfam.



## Drylands and Climate Change

### Key messages

#### Huge problems

- scale and depth of poverty
- dimensions & degradation of lands
- susceptibility to climate change

#### But also huge opportunities

- histories of adaptive strategies
- successful cases to scale up



*“Dryland societies are characterised by an orientation to adaptation - the readiness to adopt flexible strategies that reduce ex ante vulnerability to climate shock and other forms of environmental risk. ‘Adaptation’ as used in dryland development literature is therefore closely allied to the use of the term in climate change literature.”* Morton & Anderson, 2008



## Drylands and Climate Change Presentation contents

- Extent and population
- Livelihoods & ecosystem status
- Observed & future climate
- Non-climate stressors
- Pastoralists – a case in point
- Policy implications

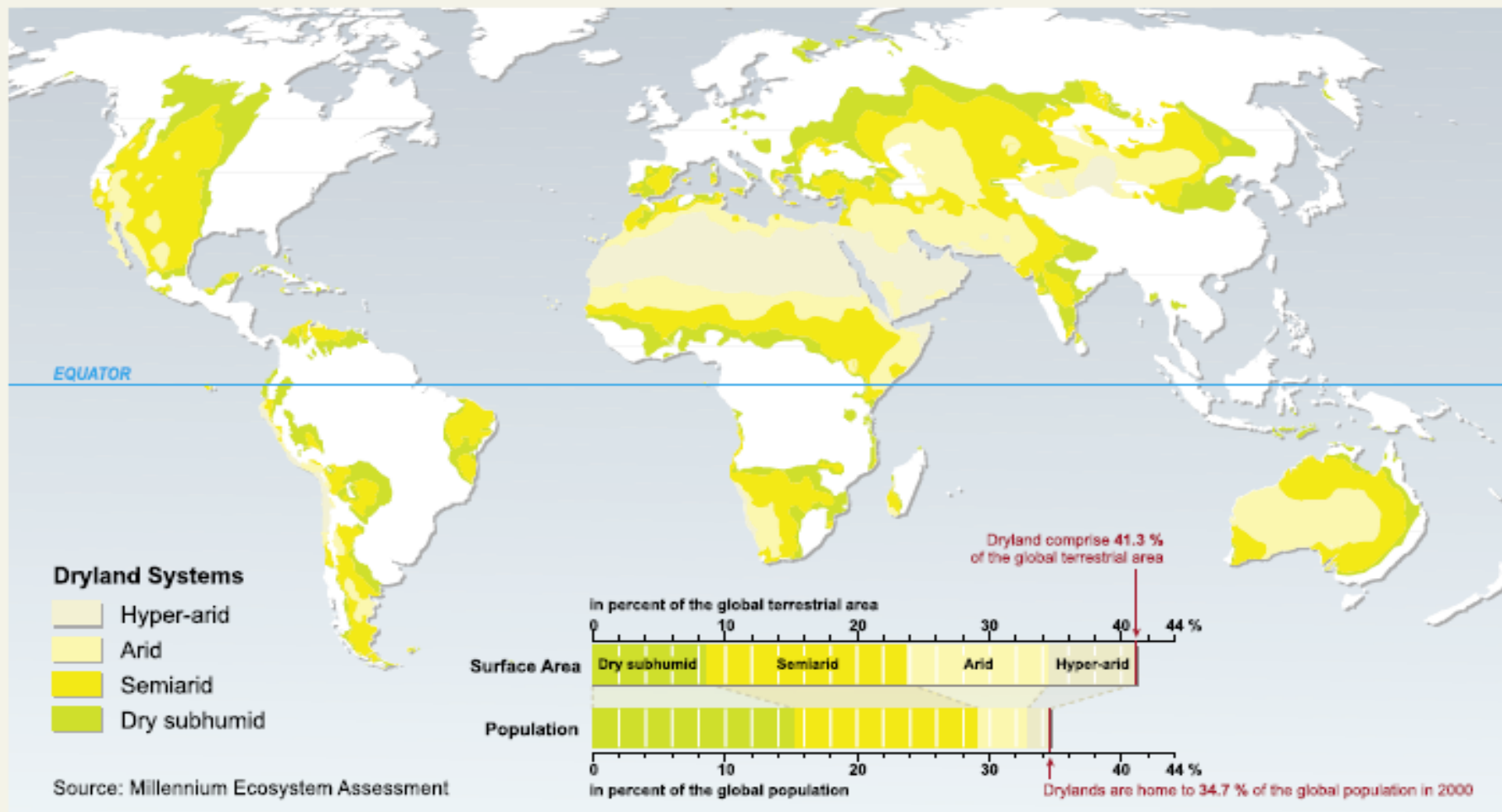


## Extent & population

- >40% of world land surface
- <8% world renewable water resources
- >2 bn people, 90% in developing countries and >70% in rural areas
- Lowest levels of human well-being, lowest per capita GDP and highest infant mortality rates
- Yet highest population growth rates in 90's



Drylands include all terrestrial regions where the production of crops, forage, wood and other ecosystem services are limited by water. Formally, the definition encompasses all lands where the climate is classified as dry subhumid, semiarid, arid or hyper-arid. This classification is based on Aridity Index values<sup>†</sup>.



<sup>†</sup> The long-term mean of the ratio of an area's mean annual precipitation to its mean annual potential evapotranspiration is the Aridity Index (AI).

Notes: The map is based on data from UNEP Geo Data Portal (<http://geodata.grid.unep.ch/>). Global area based on Digital Chart of the World data (147,573,196.6 square km); Data presented in the graph are from the MA core database for the year 2000.



## Livelihoods & ecosystem status

- High reliance on rainfed agriculture and other environment dependent activities
- Desertification and loss of biological potential constrain productive ecosystems
- Development depends on addressing ecosystem degradation, mainstreaming sustainable NRM and building upon the adaptive capacities of people and institutions



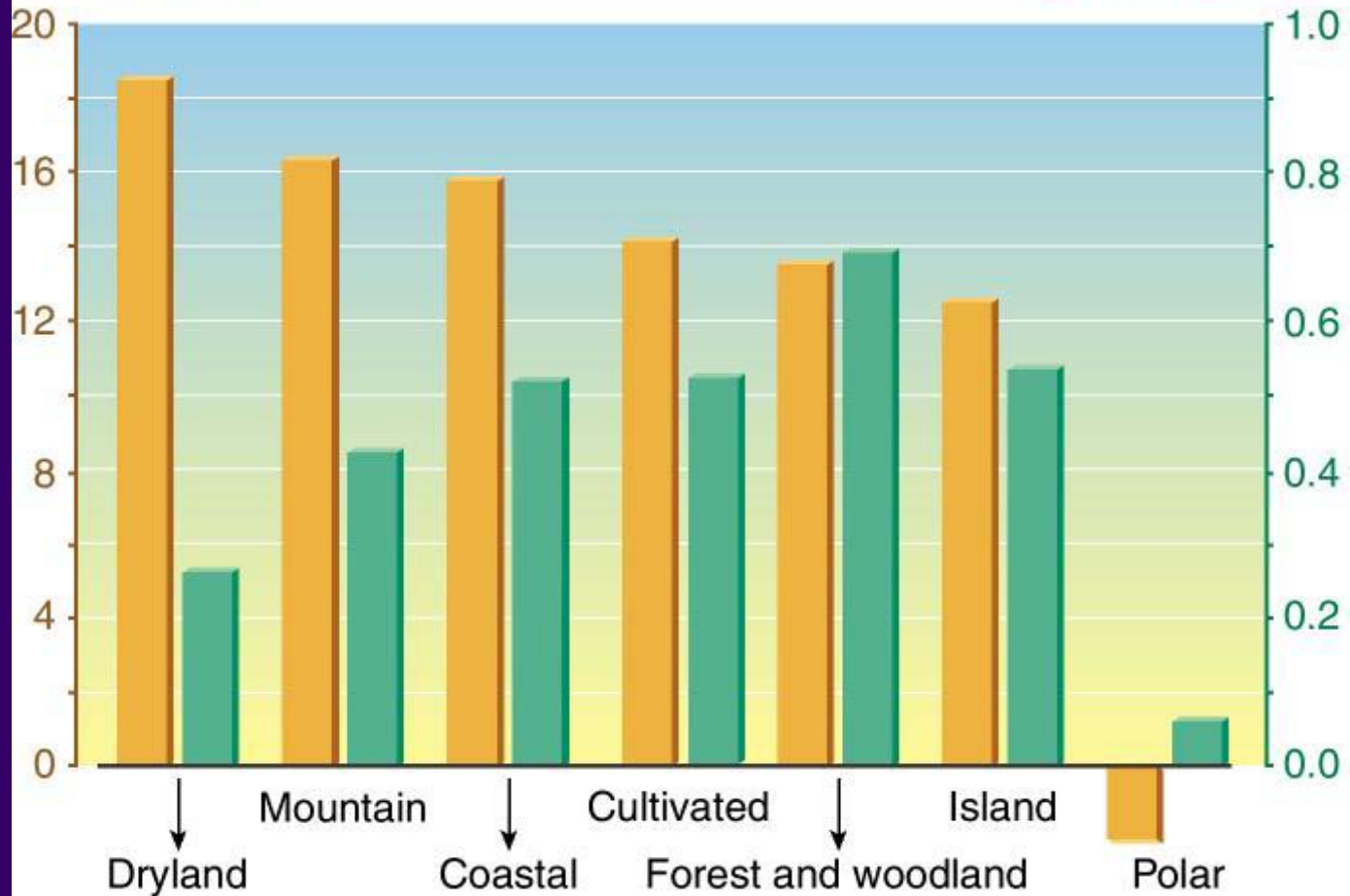
- Existing water shortages projected to increase over time due to population increase, land cover change, and global climate change

## Main conclusions of MA on drylands

- Transformation of rangelands etc to cultivated croplands is leading to significant, persistent decrease in overall dryland plant productivity
- 10–20% suffer from one or more forms of land degradation
- Traditional and other current management practices contribute to the sustainable use of ecosystem services
- Biodiversity is relatively rich & secure, critical for the provision of dryland services

**Population growth  
between 1990 and 2000**  
in percentage

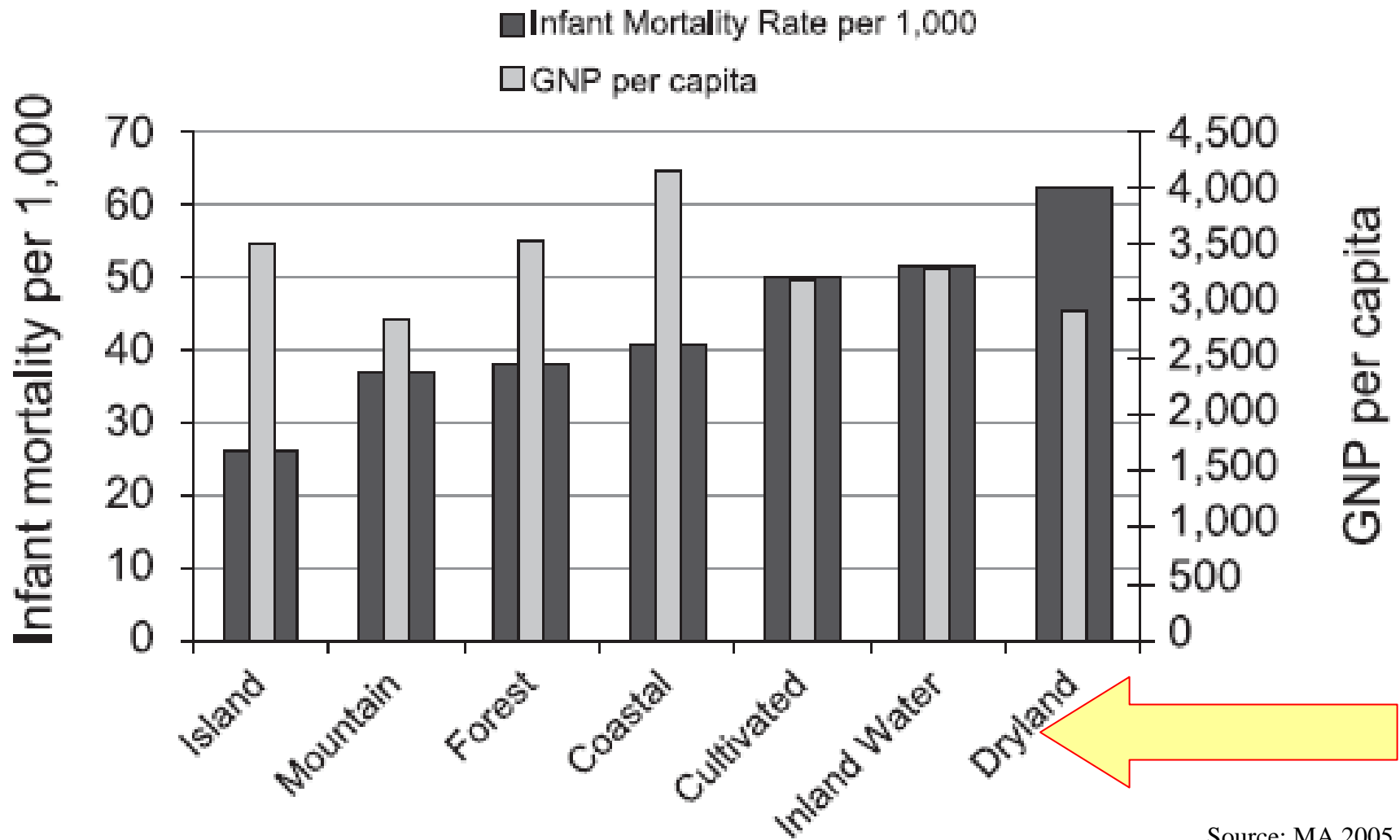
**Net primary  
productivity**  
kg/sq. meter/ year



Population growth
  Net primary productivity

Sources: Millennium Ecosystem Assessment

# Per capita GNP and infant mortality across different ecosystems





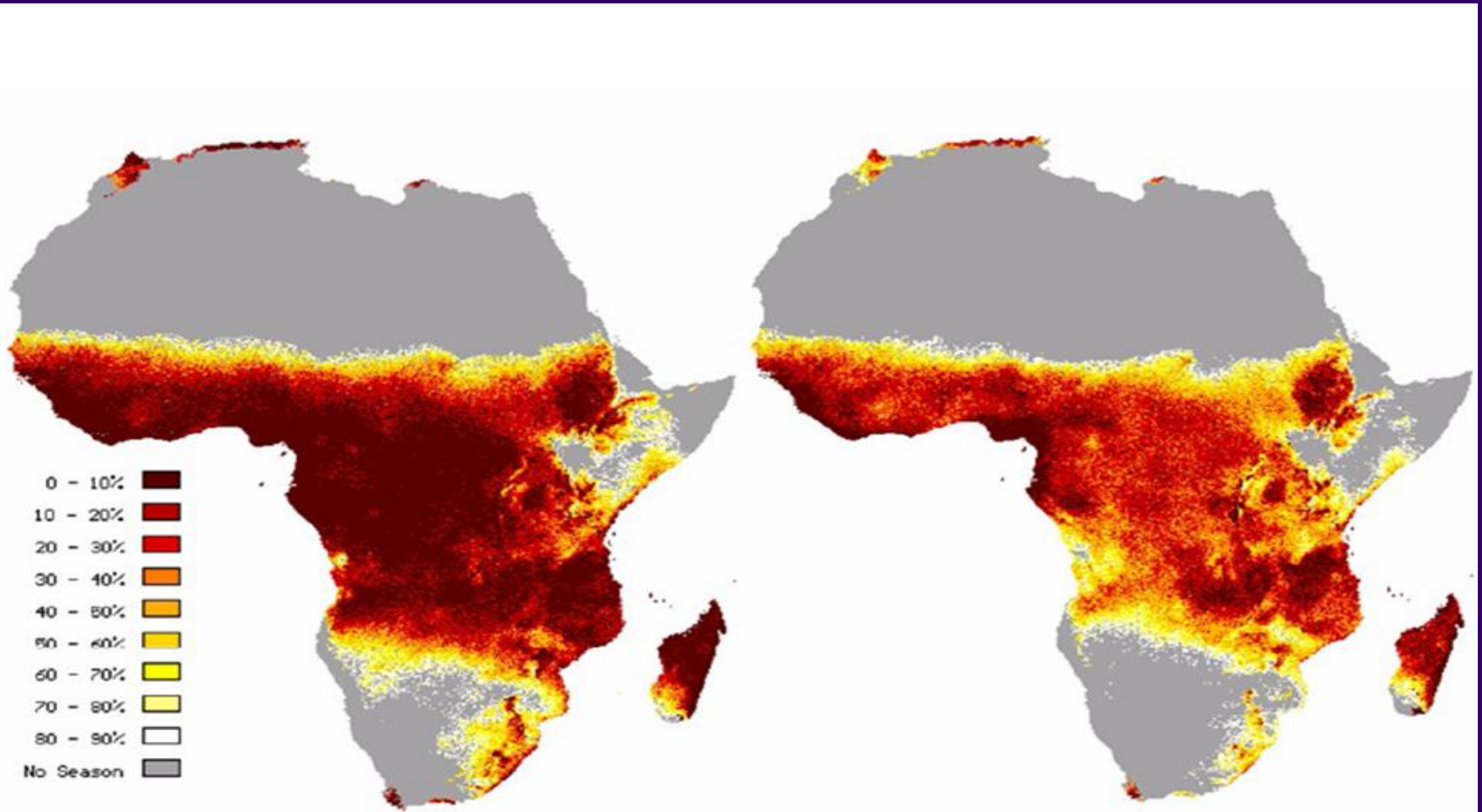
## Observed & future climate

- Drying observed in the Sahel, the Mediterranean, southern Africa and parts of southern Asia
- More intense & longer droughts observed over wider areas since the 1970s - particularly in the tropics and subtropics
- Great uncertainties in prediction of arid ecosystem responses to elevated CO<sub>2</sub> and global warming
- Generalised warming expected of >3 degrees and a 100% increase in frequency of extremely warm years
- Rainfall likely to reduce in Southern Africa, Sahara & Central Asia and may increase in West Africa, East Africa and South Asia

# IPCC reported climate change projections in drylands regions comparing current climate with projection for 2080-2099

Region	Median projected temperature increase (° C)	Median projected precipitation increase (%)	Agreement on precipitation among models	Projected frequency of extreme warm years (%)	Projected frequency of extreme wet years (%)	Projected frequency of extreme dry years (%)
West Africa	3.3	+2	Not strong	100	22	
East Africa	3.2	+7	Strong for increase in DJF, MAM, SON	100	30	1
Southern Africa	3.4	-4	Strong for decrease in JJA, SON	100	4	13
Sahara	3.6	-6	Strong for decrease in DJF, MAM	100		
Southern Europe and Mediterranean	3.5	-12	Strong for decrease in all seasons	100		46
Central Asia	3.7	-3	Strong for decrease in MAM and JJA	100		12
Southern Asia	3.3	+11	Strong for increase in JJA, SON	100	39	3

# Increased incidence of rainy season failure across Africa



**Percentage of failed seasons: left-hand panel current conditions, right-hand panel in 2050 lighter colours depict greater likelihood of failed seasons** (using the HadCM3 model, scenario A1)



## Interactions of climate & non-climate stressors

- Migration as climate adaptation will increase population pressure and the balance of poor/non-poor, and will destabilize property rights systems
- Distribution and spread of climate sensitive diseases alters with rainfall and temperature changes leading to new disease burdens in high HIV/AIDS regions
- Climate change effects of both fast and slow onset represent increased hazards that fragile states are ill-equipped to deal with and are likely to fuel conflicts
- Climate change will exacerbate the effects loss of adaptive management practices based on common resources management by pastoralists

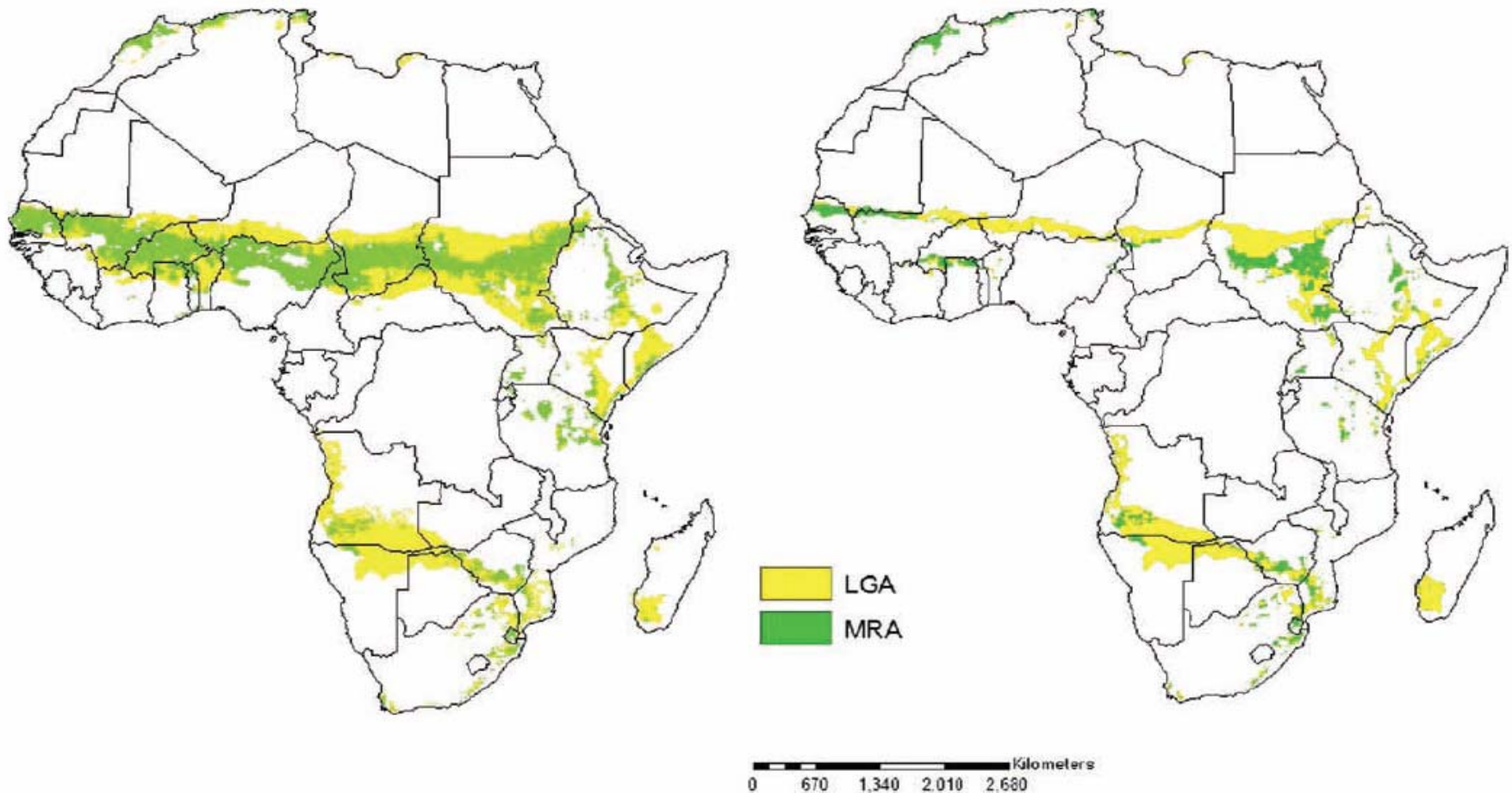




## Pastoralists

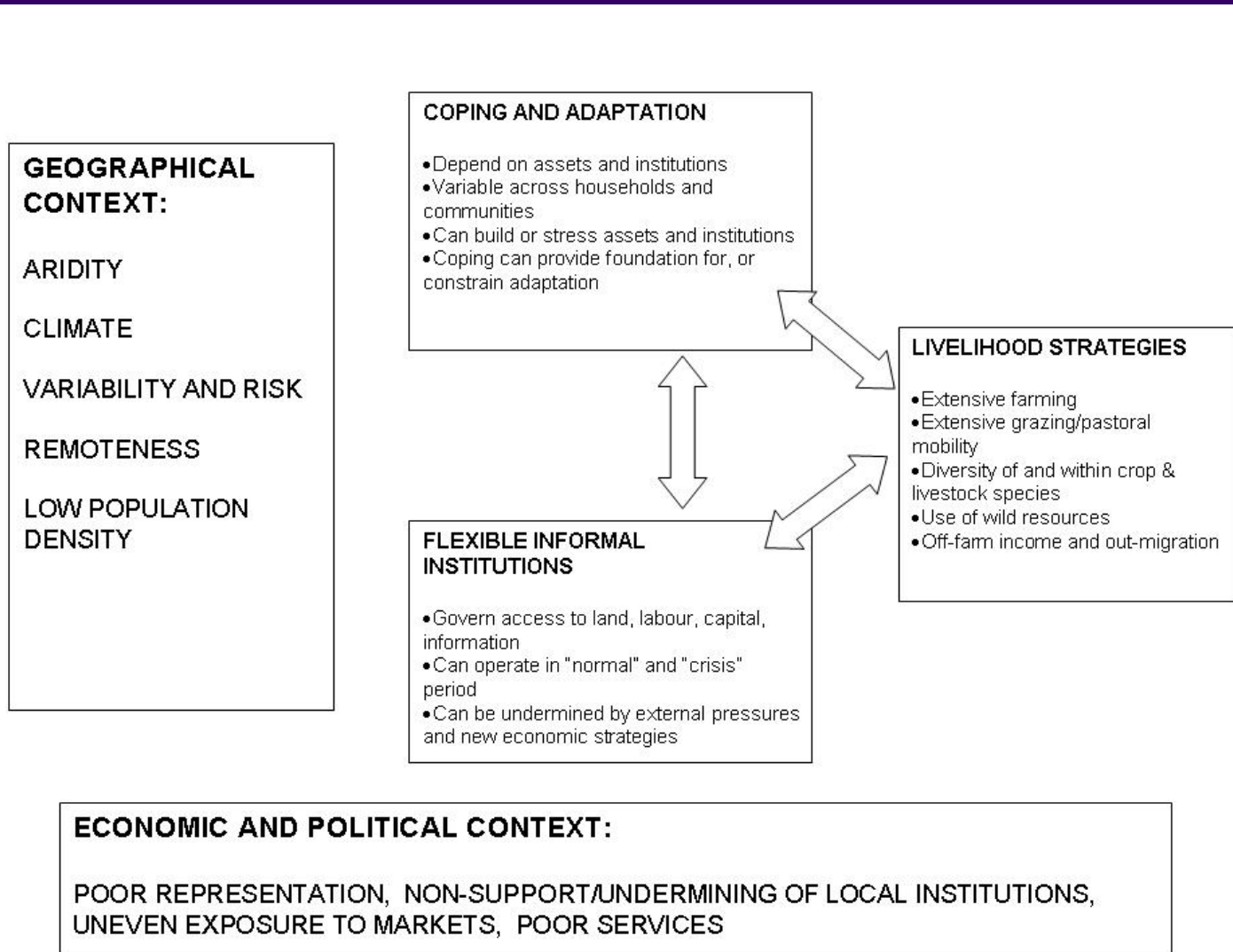
- Climate change is already affecting the delicate balance on which pastoral systems depend
- Scarcer pasture & water resources, coupled with current levels of demographic growth, likely to lead to stronger competition between pastoral communities and between these and other groups
- Loss of livestock due to several years of low rainfall have resulted in a major food crisis among the Turkana pastoralists in Kenya
- Pastoralists will have to further diversify their livelihoods - within the pastoral system (i.e. more drought-resistant species such as camels) and out of livestock production

Livestock only production areas that will experience >20% decrease in length of growing period to 2050 (left SRES A1, right B1)



**Figure 9.4.** Agricultural areas within the livestock-only systems (LGA) in arid and semi-arid areas, and rain-fed mixed crop/livestock systems (MRA) in semi-arid areas, are projected by the HadCM3 GCM to undergo >20% reduction in length of growing period to 2050, SRES A1 (left) and B1 (right) emissions scenarios, after Thornton et al. (2006).

# Conceptual framework for understanding how dryland agrarian societies cope and adapt to environmental change





Climate change impacts on the poor and marginalised can be assessed by looking at:

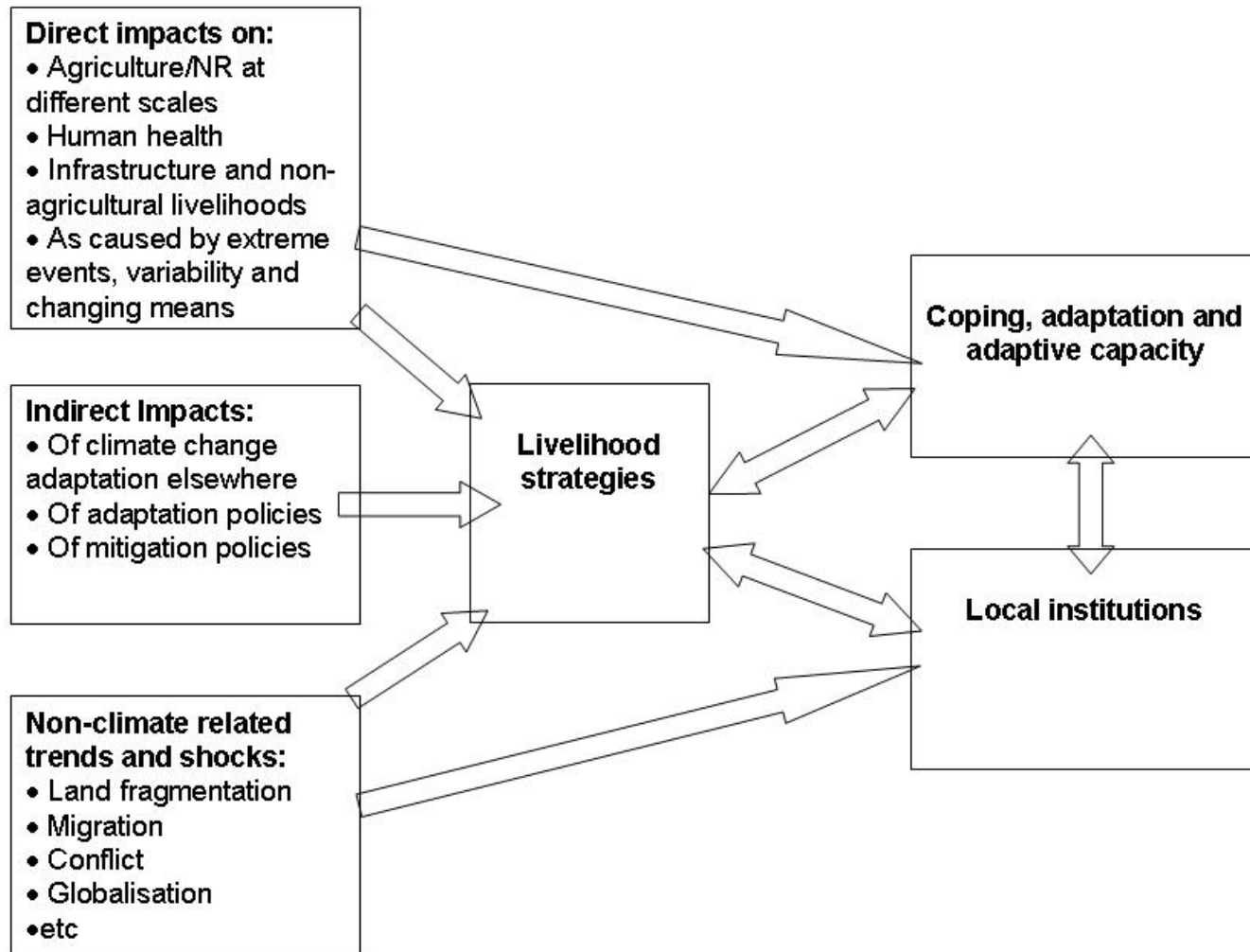
- Added risks due to climate change to current ways of securing well-being
- The particular strategies or adaptive capacity of poor people in the face of climate stresses
- The causes of vulnerability, or specific factors and conditions that make poor people vulnerable to climate stress

# The influence of climate variability and change on the way that people secure or fail to secure four types of basic needs: some examples [from Eriksen et al., 2007]

Dimencions of poverty	Climate risk to ways of securing needs	Coping and adaptation strategies to climate stress	Factors and processes causing vulnerability among poor
Income and material needs	<ul style="list-style-type: none"> <li>• Increased variability, heat stress, flooding and drought inhibiting livestock and cultivation</li> <li>• Damage to productive assets and infrastructure</li> <li>• Urban disasters</li> <li>• Enhanced agricultural potential in some areas</li> <li>• Terms of trade deteriorate during crisis</li> <li>• Cut off from markets by floods</li> </ul>	<ul style="list-style-type: none"> <li>• Increased multiactivity, multilocality and migration</li> <li>• Shifts in cultivation and herding practices</li> <li>• Destitution and inability to adjust long term and inability to access adaptation initiatives</li> <li>• Reinforced need for access to common pool resources</li> <li>• Increased dependence and need for local/informal economic opportunities/remittances</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing marginality of off-farm livelihoods as well as natural resource based activities</li> <li>• Increasing inequality</li> <li>• Environmental degradation undermining livelihoods</li> <li>• Economic liberalization related changes</li> <li>• Interaction with stressors such as HIV/AIDS and conflict</li> <li>• Barriers to formal markets and employment opportunities</li> <li>• Dependence on conventional energy</li> <li>• Economic specialisation increases vulnerability</li> </ul>
Health and basic education	<ul style="list-style-type: none"> <li>• Droughts and floods cut people off/increases remoteness from facilities</li> <li>• Poor water supply and sanitation, heat stress and pollution</li> <li>• Dropping out of school due to non-payment of fees, hunger or coping strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Increased dependence on school feeding programmes</li> <li>• Increased cash need for hospital bills and demand for indigenous medicinal plants</li> <li>• Increased reliance on social networks to cover costs</li> <li>• Loss of breadwinner to disease and labour time spent caring for ill</li> </ul>	<ul style="list-style-type: none"> <li>• Poor education and generation of knowledge inhibits responses and access to climate information</li> <li>• Poor nutrition and health services compound disease outbreak and loss of productive labour during droughts and floods</li> </ul>
Rights and empowerment	<ul style="list-style-type: none"> <li>• Loss of democratic rights through dependence on aid</li> <li>• Redirecting of attention from poverty to climatic change and 'external' factors</li> <li>• Shifts in power relations</li> <li>• Social mobilization</li> <li>• Informal adjustments to tenure and access rights</li> <li>• Monetisation of critical drought resources</li> </ul>	<ul style="list-style-type: none"> <li>• Dependence on kinship ties and social networks</li> <li>• Gazettement and privatisation of land undermine resource rights and coping strategies of the poor</li> </ul>	<ul style="list-style-type: none"> <li>• Local democratization strengthens access to developments such as water</li> <li>• Powerless/excluded groups vulnerable</li> <li>• Informal rights precarious</li> <li>• Loss of international formal migration rights increases vulnerability</li> </ul>
Social and cultural affiliation and security	<ul style="list-style-type: none"> <li>• Crises justifying social exclusion</li> <li>• Climatic events increase isolation</li> <li>• Relocation and remoteness from social and cultural ties</li> <li>• Breaking up of families and networks</li> </ul>	<ul style="list-style-type: none"> <li>• Increased reliance on social networks</li> <li>• Increased reliance on local knowledge to cope and adapt to climatic changes</li> </ul>	<ul style="list-style-type: none"> <li>• Inability to access networks of non-poor reinforced</li> <li>• Existing social networks and customary institutions exhausted?</li> <li>• Loss or irrelevance of local knowledge to new geographic areas, livelihood options and networks</li> </ul>



# Causation web of direct, indirect and non climate effects on livelihoods





Policy responses more specific to dryland areas include:

- Land tenure initiatives
- Strengthening of local resource management
- Drought management
- “safety-net” provision
- donor-funded “community-driven development”



## Decentralisation of governance in drylands

In principle encourages local decision making, and potentially local adaptation and the building of local adaptive capacity, but dangers of:

- Elite capture of benefits
- Favouring sedentarised populations clearly associated with territories at the expense of pastoralists and other mobile people
- Under performance due to high transport & transaction costs in large areas with low populations





## Drought management

### Food insecurity & famine

- Early warning systems
- Contingency planning
- Mitigation measures to support livelihoods

### For pastoralists

- Indexed insurance schemes
- Commercial off-take of livestock
- Destocking, emergency slaughter and meat distribution
- Supplementary feeding for livestock
- Water provision for livestock
- Veterinary care
- Shelter for livestock



## Representation of the climate vulnerable

- Pastoralist representatives in parliaments of Kenya, Uganda, Ethiopia
- Support for civil society & dryland-dwellers organisations must build links to government and policy-making
- Producer associations effective on matters of marketing policy
- ‘New traditional’ bodies e.g Council of Amakari in Somali Region Ethiopia
- State-level welfare boards e.g. castes, tribal peoples & nomads India
- Media and communication technology
- Action-research





## Policy implications

- Support dryland LDC governments to engage with climate change negotiations ensure they shape the post-2012 agreement in ways responsive to their priorities
- Mainstream climate adaptation into plans and strategies at national and local/district level and at sectoral levels i.e. IWRM, conservation agriculture, disease control, livestock development, etc
- Focus on water management at regional, national and local levels to reduce risks from flooding, and capture rainfall for agricultural, livestock and eco-system use through micro- and larger scale investments
- Decentralised development in the drylands building on local institutions – overlaps with facilitating climate adaptation



## Policy implications

- Safeguard dryland dwellers against unintended effects of climate change mitigation e.g. encroachment on rangelands by biofuels or adaptive institutions exacerbating vulnerability traps
- Scale up pilot community-based adaptation projects with poor and vulnerable communities to ensure documentation and rapid replication of these activities
- Advance regional cooperation to help scale up successful initiatives in drylands
- Ensure effective public information campaigns to help people understand and respond to the climate change challenges faced in different regions and districts



## Policy implications - pastoralists

- Policies to enable herd mobility, while securing rights to critical resources
- Support livelihood diversification (tourism and conservation)
- Build robust conflict management institutions and effective drought mitigation systems, including early warning, insurance and safety nets
- Strengthen the capacity of pastoral groups to engage with debates on policy issues directly affecting their lives



## Research agenda

- Differentiation in climate effects adaptive capacity of dryland dwellers
- Governance and representation of dryland dwellers in adaptation
- Climate information needs of dryland dwellers and others
- Institutional responses – different bases to build on
- Adaptation/ mitigation linkages – carbon finance options
- Social policy alternatives where adaptation fails
- Conflict management e.g. pastoralists & croppers
- Migration management - analysis of success and failures of sedentarisation
- Livestock and famine/ food security early warning systems, insurance approaches, etc