

Development Futures in the Context of Climate Change: Challenging the Present and Learning from the Past

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Climate change poses a challenge to the dominant development paradigm with its concepts of modernisation, economic growth and globalisation which treat the environment as an externality and largely ignore climate variability. This article explores the extent of the challenge, drawing on archaeological evidence showing that adaptation to severe climate change can involve much more radical changes in human societies than are currently envisaged. Furthermore, short-term adaptation can result in long-term maladaptation, increasing vulnerability to climate shocks. The article argues that development urgently needs to shift its focus away from prevailing growth and yield-maximisation models towards alternatives encouraging resilience and risk-spreading.

Key words: Development model, resilience, climate change, adaptation, development futures, transition

1 Introduction

Climate change is increasingly recognised as a threat to the achievement of the Millennium Development Goals (MDGs), and to human development and well-being globally. Greenhouse gas (GHG) concentrations are currently rising at a rate greater than projected by the Intergovernmental Panel on Climate Change (IPCC) (Meehl et al., 2007), leading to concerns that the IPCC projections are likely to be conservative and over-optimistic (Raupach et al., 2007), and that large, abrupt, non-linear changes in the global climate system may occur during the twenty-first century (Schneider and Lane, 2006; Pittock, 2008).

The implications of such changes for human well-being and for the poor in developing countries are profound, widespread and deadly. The 2007/8 *Human Development Report* warns that, in the next 50-80 years, as a result of climate change an extra 600 million people are likely to be affected by malnutrition; an additional 1.8 billion people are likely to be living in a water-stressed environment; 330 million people may be permanently displaced, because of rising sea levels; and an additional 220-400 million may be exposed to malaria worldwide (UNDP, 2007). Of course, these impacts will be – and are already being – felt most keenly by the poorest in developing countries

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around the world. Testimony to the severity of these problems, the *Human Development Report* calls climate change the ‘defining human development issue of our generation’ and furthermore claims that ‘Climate change ... calls into question the Enlightenment principle that human progress will make the future look better than the past’ (ibid.: 1). Against this background, linked climate change and development discourses emphasise the need for a combination of mitigation through reductions in GHG emissions and adaptation to address the potential impacts of unavoidable climate change (ibid.).

We observe that current development planning and practice relating to climate change focus pragmatically on actions within a fairly narrow range of mitigation and adaptation options and opportunities. Although development agencies – including government, multilateral agencies and many NGOs – now see climate change as critical and central to their policies, it has had a negligible effect on the reconceptualisation of development approaches and strategies. ‘Mainstreaming’ climate-change adaptation and even ‘low-carbon growth’ are incremental responses within what is essentially a business-as-usual approach to development. Proposed changes in investment patterns, increased finance and expanded markets (including global carbon markets) do not challenge fundamental ideas of growth and progress that define the way that ‘modern’ human societies interact with their environment.

This article explores the legacy of the dominant development paradigm, based on ideas of progress that are underpinned by processes of growth, modernisation and globalisation. The following section outlines this paradigm, whilst Section 3 discusses examples of this development paradigm in recent decades. Section 4 draws relevant lessons from evidence of adaptation in the distant past, and Sections 5 and 6 present discussion and conclusions on how development might address potentially large future changes in climate.

2 The development paradigm persists

The meaning of ‘development’ in both theory and practice has been discussed and critiqued for several decades. ‘Development’ is related to the broader idea of the progressive improvement of human societies (Rist, 2008). The post-World War II era has been one of organised development efforts, the goal of which is intimately linked with modernisation (Kingsbury, 2007). Over the last half-century, policies and programmes have shifted significantly as development approaches have been challenged and modified. Development paradigms established in the 1950s and predominant for the subsequent two decades shared three characteristics: (i) the treatment of the Third World and its inhabitants as an homogenous entity; (ii) the application of an unconditional belief in the concept of progress and the possibility of creating society through universally applicable processes; and (iii) a conviction that the nation-state is essential in order to realise progress (Schuurman, 2000).

But the roots of the developmentalist approach are far deeper than this, emerging from Western philosophical discourses, based on two main assumptions or philosophical positions that underpin the idea of modernity. The most important of these assumptions is that modern human societies are continuing a process of advancement, driven by endogenous factors such as technological, economic and political innovation. This process is thought to have started in the Palaeolithic period, ultimately resulting in

the development of agriculture, highly organised urban societies, the nation-state, and ultimately the modern world. This view of human development was popularised in the nineteenth and early twentieth centuries by anthropologists and archaeologists who argued that human societies had progressed through a number of evolutionary stages, characterised broadly by the terms 'savagery', 'barbarism' and 'civilisation' (Daniel, 1968). It was reflected to an extent in the 'new archaeology' of the 1950s (Trigger, 1989). While ideas of progressive social evolution have been largely discarded by anthropologists and archaeologists (Scarre, 2005), they form the foundation of many popular and political discourses, particularly those relating to development, globalisation and modernisation (Gray, 2007), and they have played an explicit role in views of development since the 1950s (Cooper, 1997).

The second assumption is that human advancement has been associated with a progressive distancing of human beings from the natural environment, characterised by a decline in the proportion of the world's population directly dependent on subsistence agriculture. This trend is associated with urbanisation and human management of the environment, which may be viewed in this context as a by-product of human advancement. The idea that progress is associated with a reduction in day-to-day dependence on, and contact with, the natural environment is related to philosophical positions that view human beings as existing 'outside of' or somehow separate from 'nature', often expressed via the doctrine of 'human exceptionalism' (Soper, 1995; Macnaghten and Urry, 2005; Heyd and Brooks, 2009).

Of course, ideas about development have evolved and changed, and are widely and powerfully contested. Nonetheless, we argue that a dominant paradigm – strongly informed by the assumptions outlined above – does exist and defines popular conceptions of development as practised since the 1950s. This paradigm also shapes key international investments, programmes and projects and institutions which 'do' development. The model of development as human advancement was promoted in post-World War II approaches to rebuilding the world economy through Keynesian policies, which prioritised the role of government in fostering capitalist-led growth in the 1950s and 1960s. Rostow's (1960) theorisation of stages of economic growth and the elevation of traditional societies in 'underdeveloped' countries to the level of more 'advanced' nations and an age of high mass consumption in the 1960s was also influential. These ideas and practices were modified by the Washington Consensus ideals of the 1980s, which reframed progress for developing countries to incorporate privatisation, liberalisation and deregulation, giving priority to the goals of economic growth and macroeconomic stability. Globalisation and increasing trade within a market-oriented world were encouraged. Economic growth, technological advancement and cultural change were perceived to be central components of the move towards enhanced material well-being.

These original conceptualisations, theories and practices of development have been challenged and modified. Elements of what became known as the post-Washington Consensus were proposed in the 1990s. These approaches retained the aim of economic growth, but incorporated multidimensional poverty reduction, sustainability, equity and democracy as key aims. They have achieved a high degree of uptake in most development circles, at least on paper. Development now incorporates a series of aims including positive social and economic change, economic growth, socio-

cultural empowerment, political development, human development and sustainable development (Clark, 2002). Within academia, however, a backlash occurred against prescriptive, overarching development meta-narratives amongst development theorists, policy-makers and practitioners, which has been characterised as post-development theory (Escobar, 1995; Schuurman, 2000). Whilst these ideas have proved difficult to incorporate into development policy (and so have been largely ignored), some related changes include a strengthening of the ‘small is beautiful’ approaches focusing on local-level and community-based solutions to development problems. For example, Scott (1998) showed how authoritarian state planning in many developing countries ignores the subjects of development in efforts to attain ‘modernity’, and instead proposed locally-relevant development efforts. So international development policy-makers have turned attention to other areas: firstly, to the target-based Millennium Development Goals (MDGs), which do not explicitly incorporate meta-narratives, focusing on ends rather than means; secondly, to regionally appropriate and specific development issues such as governance, risk management and sustainable livelihoods; and, thirdly, to nationally defined Poverty Reduction Strategy Papers (PRSPs) and related policy goals.

Thus, at one level it seems that development processes have fragmented as efforts focus more on practices and ‘mini-narratives’. But McKay (2004) argues that the essence of the theories of modernisation in the 1950s and 1960s was reflected in the neoliberalism of the Washington Consensus of the 1980s, and still influences the dominant international financial institutions of the IMF and World Bank. Others argue that the MDGs and their attendant objectives themselves constitute a new meta-narrative (Maxwell, 2005). Practices and theories of development have clearly multiplied. However, the overarching paradigm based on the concept of progress and the belief that societies tend to become more ‘advanced’ through endogenous processes of social change leading to an increasing separation of humans from nature, still retains a high level of influence. This developmentalist paradigm remains dominant in much contemporary development activity (Blaikie, 2000; Gray, 2007; Heyd and Brooks, 2009). The following section addresses how this paradigm has been played out in practice.

3 What effect do development models have on vulnerability to climatic and environmental change?

There is evidence at the global scale that the developmentalist paradigm, played out through global economic growth and development, has lifted many people across the world out of poverty, measured in terms of rising GDP per capita. However, this has had severe costs, and both costs and benefits have been unequally and inequitably distributed. The costs to the environment have been high, including the degradation and loss of ecosystem services (Millennium Ecosystem Assessment, 2005). The economic analysis of key changes, including climate change, overfishing and mangrove loss, shows that poor countries bear a disproportionate burden of the total damage costs compared with their share of damaging activity, highlighting the so-called ‘ecological debt of nations’ (Srinivasan et al., 2008; Turner and Fisher, 2008).

Table 1 presents three examples which demonstrate how the developmentalist paradigm has affected development policy and practice for the worse in specific contexts during the past 50 years. These examples illustrate how development policies have exacerbated social and/or environmental vulnerability to previous or potential future changes in climate. The most dramatic comes from the Sahel. Here development policies in the 1950s and 1960s sought to achieve a shift from subsistence to commercial agriculture as part of a process of modernisation, driven by a desire to ensure that countries which were soon to be independent were capable of maintaining stable, functional national economies that were integrated into the world economy (Cooper, 1997). The result was the intensification of agriculture, agricultural expansion into areas viewed as under-utilised, the undermining of traditional risk-management measures and the marginalisation of pastoralists (Thébaud and Batterby, 2001). This all occurred during an unusually wet period (Brooks, 2004). When rainfall declined in the late 1960s, culminating in severe drought in the early 1970s, agriculture and pastoralism collapsed, resulting in a famine that killed hundreds of thousands of people and millions of animals, precipitating severe social disruption (Swift, 1977). The Sahel provides us with a clear example of how development policies focused on achieving a transition from tradition to modernity, which ignore the crucial role of longer-term (in this case decadal-scale) climatic and environmental variability, can massively increase vulnerability and result in disaster when this vulnerability interacts with a large change in climate (Heyd and Brooks, 2009).

Broadly similar policies to those implemented in the Sahel in the 1950s and 1960s are operating today across the globe. In Tlaxcala, Mexico, a shift in support from subsistence to commercial agriculture has undermined smallholder resources and resilience at a time of increasing climatic uncertainty (Eakin, 2000, 2005). In Brazilian Amazonia, military-initiated resettlement and large investments in infrastructure from the late 1960s to the 1980s led to unsustainable and inequitable patterns of development that are still continuing today under a different governmental regime (Clusender-Godt and Sachs, 1995; Browder and Godfrey, 1997; Barton, 1999; Cox et al., 2004; Malhi et al., 2008). These examples are elaborated in Table 1. A further example is the Kenya Vision 2030, which aims to generate an annual 10% growth in GDP for the next 25 years, through a programme of modernisation which includes the construction of two new coastal cities and one new city in a semi-arid region, and the expansion of commercialised agriculture into 'newly opened' lands and semi-arid areas (Republic of Kenya, 2007). The only mention of climate change in the principal documentation relating to Kenya Vision 2030 is a statement to the effect that Kenya will also 'enhance disaster preparedness in all disaster-prone areas and improve the capacity for adaptation to global climatic change' (ibid.: 19).

In all of the examples, development strategies and actions can be seen to reflect the conventional developmentalist paradigm in a number of important ways. Despite different geographical, social, economic and cultural specifics, the lack of consideration – indeed of any awareness – of the implications of environmental variability and related vulnerabilities is strikingly similar. In all three cases described in Table 1, development policies and practices have failed to consider or plan for variations in climatic and environmental conditions on timescales longer than those associated with seasonal or interannual variability. This has resulted in increases in the vulnerability of

Table 1: The developmentalist paradigm expressed in different development models

Context and timing	Tlaxcala, Mexico 1990s onwards	Brazilian Amazonia 1960s-2000	Sahel 1950s onwards
<i>Expression of developmentalist paradigm</i>	Modernisation within context of globalisation & NAFTA	Neoliberalism with prioritisation of growth & commerce, trade & investment in context of globalisation	Transition from tradition to modernity to achieve socio-economic 'progress'
<i>Development model</i>	Support for commercialisation at expense of subsistence production	Support of agri-business & foreign direct investment	Expansion of agriculture & shift from subsistence to commercialisation
<i>Aims</i>	To increase yields & overall productivity	National integration, security, economic growth	To enable soon-to-be independent countries to be economically viable & participate in global economy
<i>Technology instruments & activities</i>	Policies divert support from subsistence to areas with high commercial potential. Subsidies removed	Large-scale cattle ranching, mining, hydroelectric & transport infrastructure. Export of natural resource wealth	Fertiliser subsidies removed. Traditional risk-spreading strategies (e.g. pastoralism) viewed as backward & replaced with 'modern' agricultural models & methods
<i>Environment</i>	Subsistence employs risk-spreading in face of high climate variability – variable rainfall, ENSO, drought. Resilience traded for productivity with shift to commercialisation	Treated as an externality causing 'predatory development' to date & 25,000km ² forest loss per year in the 1990s	Long-term variability ignored. Increased aridity wrongly blamed on land degradation due to 'inappropriate' indigenous land-use practices

<i>Climate trends & future projections</i>	Recent increase in mid-summer drought, uncertainty in future trends & ENSO behaviour, higher temperatures & evaporation will increase water stress, exacerbated by any decrease in rainfall or increase in drought	Variable & inconclusive; increased drying expected in parts, possible large-scale collapse of Amazon forest systems for global warming of > 2°-3°C	Wet conditions in 1950s & 1960s. Long-term desiccation from late 1960s into 1990s, extreme drought in early 1970s & mid-1980s. Recent amelioration & possible 'greening' under warming scenarios, but high uncertainty
<i>Climate vulnerability & resilience impacts</i>	Resilience & capacity to innovate & adapt among majority of farmers (i.e. those practising subsistence) undermined by removal of state support. Increased resource dependence due to shift to high-yield but less drought-tolerant commercial crops	Possibly higher climatic resilience than models suggest. However, high vulnerability to human impacts, especially fire, & deforestation & fragmentation may reduce resilience in face of large changes in climate in future	Expansion of agriculture into historically marginal areas in wet 1950s & 1960s. Subsequent collapse of these agricultural systems in dry 1970s: famine, social collapse. Followed by recovery, adaptation & increased resilience in some areas, coupled with increased social inequality & economic dependence
<i>Future outlook</i>	Under current trends, marginalisation of subsistence farmers & decline of subsistence; increase in resource-intensive commercial agriculture as climate becomes more variable & unpredictable	Amazon Fund launched August 2008 to preserve forest, using international funds – a 'new economic paradigm'	Uncertain – danger of repeat of 1950s/60s agriculture expansion into marginal areas, further marginalisation of pastoralists if region becomes wetter, increasing vulnerability to future dry episodes.

human and natural systems to actual or potential large changes in climate. In addition, it has caused a decrease in the capacity of people to adapt to climate variability and change, due to reduced access to resources (for example, farm inputs, available land), and the undermining of traditional livelihoods and associated risk-spreading practices. The exclusion of considerations of the wider environmental context from the decision-making process has been closely bound up with a dominant economic paradigm that emphasises economic efficiency and the maximisation of production, at the expense of less efficient/productive modes of production that may nonetheless encompass a variety of risk-spreading strategies based on built-in redundancy and diversity in production systems. This emphasis on productivity at the expense of resilience is linked to a concept of ‘modernisation’ as a transition from ‘inefficient’ subsistence to ‘efficient’ commercial production (Cooper, 1997).

4 Learning from the past: lessons from the last global climatic reorganisation

The examples outlined in Table 1 illustrate how development policies can increase vulnerability and decrease adaptive capacity, and how such policies can result in widespread societal disruption when vulnerable systems and populations are exposed to large, sustained changes in climate. Further lessons are available from the more distant past, which furnishes us with additional examples of large climatic changes and associated human responses. For example, Costanza et al. (2007) address human-environment interactions from a systems perspective, assessing how they have shaped historical forces in certain situations since ancient times. In this section, we elaborate on some key themes and relate this specifically to development.

Historical examples of human adaptation to the kinds of large climatic and environmental changes that are expected in the twenty-first century are extremely rare. There are no precise palaeo-environmental analogues for an increase in global mean surface temperature of more than about 3°C, which is increasingly likely in the second half of the twenty-first century (Jansen et al., 2007; Meehl et al., 2007; Anderson and Bows, 2008). Nonetheless, some insight into how human societies respond to large climatic and environmental changes manifest over large geographical areas may be gleaned from an examination of the last period of sustained, global-scale climatic reorganisation, which occurred between about 6000 and 4000 years before present (BP). During this period, monsoon systems weakened and collapsed across the northern hemisphere sub-tropical zone, a regular El Niño Southern Oscillation (ENSO) periodicity was established after a long period of quiescence, and middle and high-latitude regions cooled (Mayewski et al., 2004; Brooks, 2006a; Sandweiss et al., 2007). The 6th millennium BP was bracketed by episodes of abrupt climate change associated with cold, arid ‘crises’ around 6000-5800 and 5200 BP (Brooks, 2006a). This episode of global climatic reorganisation was situated in the middle of the post-glacial Holocene period, which spans the last 10,000 years, and brought to an end the so-called ‘Holocene Climatic Optimum’, a period during which the northern hemisphere sub-tropics and adjacent regions were much more humid than today, and temperatures in middle and high-latitude regions were somewhat warmer than at present. The term ‘Middle

Holocene' is used as a shorthand for the period from about 6000 to 4000 BP. Archaeological evidence identifies some extreme responses to major climate change during this period, including migration, social stratification and increased territoriality.

During the Middle Holocene, human populations in many areas experienced a collapse of the resource base as large swathes of the northern hemisphere sub-tropics experienced a shift from well-watered savannah and scrub environments to desert (Brooks, 2006a). Throughout today's Afro-Asiatic desert belt there is evidence of abandonment of large areas coupled with in-migration to environmental refugia within the affected regions, or out-migration to more humid climatic zones. The number of occupation sites in the southern Sahara and Sahel increased as the central Saharan monsoon weakened in more northerly regions throughout the 6th millennium BP, and the number of occupation sites in the central Sahara declined dramatically when the Saharan monsoon collapsed around or just before 5000 BP (Vernet and Faure, 2000).

These indications of a southward shift in population are complemented by strong evidence of contemporaneous in-migration to certain areas in the central Sahara where surface water remained available (Hoelzmann et al., 2001; Brooks, 2006a). During the same period in Egypt, human settlements gradually shifted from the deserts towards the Nile Valley (Midant-Reynes, 1992; Wilkinson, 2003). Pastoralists, previously mobile, became permanently settled at the site of Hierakonopolis as the final significant rains fell around 5200 BP (Midant-Reynes, 1992; Wengrow, 2001). In other parts of the current Afro-Asiatic desert belt human populations intensified their exploitation of riverine zones, with settlement in river valleys intensifying as surrounding areas became more arid and less productive (Brooks, 2006a). Similar trends are also apparent in northern coastal Peru, where changes in ocean circulation resulted in increased coastal upwelling associated with coastal aridity (Sandweiss et al., 2007; Brooks, 2006a).

Aridification and increased resource scarcity in the northern hemisphere sub-tropics and adjacent regions during the Middle Holocene coincided with an increase in social stratification and inequality. In the Sahara, increased territoriality and social stratification are suggested by the rapid spread of monumental funerary architecture, and a shift from ritual animal to human interments as conditions became drier (Sivili, 2002; di Lernia, 2006). Key figures in pastoral groups were afforded elaborate monumental burials, which advertised the association between certain groups and specific territories (di Lernia, 2006; Brooks, 2006a). In Egypt the development of elaborate and richly decorated tombs in the 6th millennium BP was linked with increasing social inequality and the emergence of elites as populations concentrated in the Nile Valley (Midant-Reynes, 1992; Brewer, 2005). In Mesopotamia, monumental public and religious buildings accompanied the rise of political power, with some of the earliest representations of violence and authority during a period of region-wide aridification (Pollock, 1999; Brooks, 2006a). The unification of Egypt soon after 5200 BP was depicted as a violent act, and probably represented the end result of a process of competition between smaller polities (Midant-Reynes, 1992; Brewer, 2005).

Around the same time, settlement fortification appears to have become more prevalent in Mesopotamia, with the period around 5200 BP being one of collapse and transition followed by the emergence of competing city states (Brooks, 2006a). It might be noted that social disruption, abandonment and migration, increases in social inequality and conflict have all been linked with twentieth-century Sahelian desiccation,

suggesting that these apparent responses to extreme, climatically-driven resource scarcity (mediated by underlying social vulnerability) are, while not necessarily universal, at least robust in space and time (Keita, 1998; Thébaud and Batterby, 2001).

Trends towards hierarchical, unequal societies accelerated after the full establishment of arid conditions across today's northern-hemisphere desert belt around or soon after 5200 BP, as did the growth of settlements and the concentration of human populations in restricted geographical areas in environments where rainfall and productivity had otherwise collapsed (di Lernia, 2002; Brooks, 2006a). At the transition from the 6th to the 5th millennium BP, large urban centres with monumental architecture and high degrees of social differentiation and stratification emerged in river valleys in Egypt, Western and South Asia, and northern coastal Peru (Possehl, 2002; Shady Solis et al., 2001), and hierarchical chiefdom-level societies developed in northern China (Liu, 1996; Lee, 2004).

The evidence suggests that, contrary to popular belief (for example, Gross, 2005), the earliest cities and states (constituting the world's first 'civilisations') did not emerge during a time of benign climatic conditions after the inhibiting conditions of the last Ice Age. Rather, they emerged at a time of widespread and severe climatic deterioration, and in locations facing extreme resource scarcity associated with the collapse of rainfall and vegetation systems. The archaeological and palaeo-environmental records strongly indicate that the development of the earliest civilisations was not driven solely by endogenous factors, bringing incremental benefits as a result purely of technological, economic and political innovation. The growth of complex, highly differentiated societies, governed by new, formal political institutions (often highly authoritarian in nature), more likely represented a means of managing large human populations in restricted geographical areas where resources were limited and where production and distribution of key resources needed to be carefully managed. These societies appear to have emerged largely as a result of unplanned, ad hoc adaptation, following transitional periods during which societies underwent considerable upheaval (Brooks, 2006a). The transition to 'civilised' life was associated with costs as well as benefits, principal among which was a loss of individual autonomy (Kennet and Kennet, 2007). Far from the products of progress, we might even characterise the earliest civilisations as measures of last resort.

The emergence of these early, complex, state-level societies also appears to have driven maladaptation, in some cases leading to their eventual demise or disruption. The 5200 BP arid episode that heralded the end of the Holocene Climatic Optimum, and the beginning of the historical period, was followed a millennium later by a similar arid crisis around 4200 BP. This latter event has been linked with the demise of the Egyptian Old Kingdom and the Akkadian Empire (Hassan, 1997; Cullen et al., 2000; Tigger et al., 1983). Given the growth in population and the intensification of resource use in the intervening millennium, a plausible explanation is that the newly 'civilised' populations in Egypt and Mesopotamia maximised their use of available resources to an extent that they became dependent on continued climatic stability (most probably associated with regular river flows and flooding). As a result, their societies could not absorb subsequent climatic shocks: the result was a collapse of central political authority, cultural fragmentation, famine, violence and social upheaval (Hassan, 1997).

In summary, the archaeological record indicates that people in widely separated parts of the world often responded to climatically-driven resource scarcity in ways that were broadly similar (for example, migration, increased social complexity and stratification), where they faced similar environmental and geographical constraints and opportunities. Such a conclusion is not a plea for a return to simple environmental determinism. The societies that emerged from the Middle Holocene climatic reorganisation exhibited considerable diversity in their character, and significant variation in the trajectories of adaptation visible in the archaeological record of this period (Brooks, 2006a). In some regions trends towards sedentarism in environmental refugia were also complemented by increased mobility among some groups, indicating a variety of responses to climatic deterioration (for example, di Lernia, 2002).

Examples from later periods emphasise the interactive role of environmental change with other factors. For example, Scarborough's (2007) analysis of the rise and fall of the Maya concludes that, while environmental factors played a key role in both limiting and encouraging certain aspects of development in Mayan societies, the ultimate cause of their decline was related to the political systems that developed within these environments, their isolation, centralisation and elite 'hubris'. Thus Scarborough concludes that 'economic, political and ideological variables internal to the underpinnings of society may weigh more heavily' than environmental variables in their decline (2007: 58). A survey of history and prehistory indicates that many factors drive changes in human societies. The physical or 'natural' environment is one such factor, and is often less important than factors such as social, economic and technological innovation or conflict. Nonetheless, we have to recognise that any single factor has the potential to dominate over others in certain circumstances. The Middle Holocene appears to have provided the circumstances for environmental change to become – at least temporarily – a key driver of social change in many parts of the world, and the twenty-first century is likely to generate analogous circumstances, at least in certain regions.

5 Challenges for existing development models and adaptation approaches

We have argued that existing development models are based on flawed ideas about progress and human advancement, which derive from a misreading of human history and the origins of human civilisation, based on models which have been generally discredited within relevant academic fields. Importantly, the application of these models has increased societal vulnerability and reduced people's capacity to adapt to climatic and environmental variability and change. These models can be 'maladaptive', in that they enhance vulnerability in the context of both normal climate variability and longer-term climate change. They are therefore particularly poorly suited to the twenty-first century, which is likely to be characterised by large changes in climate and environment, including the possible collapse of vegetation systems in southern Africa (Thomas et al., 2005), extreme desiccation in the Maghreb (Christensen et al., 2007), the partial or total loss of the Amazon rainforest (Cox et al., 2005), extreme water stress

in the Andean and Himalayan regions (Bradley et al., 2006; Cruz et al., 2007), and the loss of land in low-lying coastal areas.

Not only do existing development models fail to address long-term climatic and environmental variability and change, but they also frame current approaches to adaptation. Development agencies are focusing their adaptation efforts principally on what might be termed the more 'manageable' manifestations of climate change, namely, changes in seasonal and inter-annual variability (for example, in rainfall), and in the frequency and severity of extremes such as droughts, storms and floods (UNFCCC, 2007). Adaptation is presented essentially as a means of 'neutralising', or at least minimising, the impacts of climate change, in pursuit of predetermined development goals and desirable developmental outcomes, via processes that are manageable and, by implication, predictable (for example, UNDP, 2005). The emphasis on 'climate-proofing' (for example, Asian Development Bank, 2005; UNFCCC, 2007) is associated with an approach which implicitly assumes that adaptation is a question of identifying and implementing the appropriate measures (often technological in nature) to protect existing developmental policies, plans, programmes and practices against the adverse impacts of climate change.

This is exemplified by 'climate-change screening', an approach emerging to integrate climate change into development planning, where existing development plans are assessed for their exposure to climate-change risks, and measures to reduce these risks are identified (Klein et al., 2007). Current adaptation research emphasises the need to mainstream adaptation into current development strategies (for example, Poverty Reduction Strategy Papers), and to consider the implications of adaptation for current aid flows and development portfolios (Klein et al., 2007; Huq and Ayers, 2008; Prowse et al., 2009). Current adaptation discourses thus emphasise the necessity to control and minimise change, and have as their ultimate objective maintenance of the status quo or business as usual. The managerial approach to adaptation emphasises more effective deployment of existing institutional, technological and market-based risk-reduction measures such as disaster preparedness, irrigation, and insurance (for example, UNFCCC, 2007). This approach fails to address the risks associated with large, severe and abrupt climatic and environmental changes. While issues such as migration are increasingly on the political agenda, these less tractable climate-change problems are not being addressed by development agencies. Therefore adaptation as currently conceived is firmly embedded within the dominant development paradigm, and effectively treats climate change as an externality.

The (often implicit) assumptions in current adaptation discourses outlined above are not justifiable on the basis of the empirical evidence. The examination of past responses to climatic variability and change demonstrates that past adaptation has involved radical changes in the way societies organise production, economic, social and cultural activities. Past adaptation has often involved major movements of populations and major shifts in subsistence activities, and has been associated with conflict and changes in political organisation. Adaptation has not necessarily allowed societies to keep pace with changes in climate, particularly when those changes are of large magnitude, as expected during the course of the twenty-first century. Past adaptation has been reactive and has lagged behind the climatic and environmental changes that have driven it, with new patterns of human-environment interaction often emerging

after periods of disruption and transition. While adaptation will be guided and informed by specific adaptation policies, strategies and measures over the coming decades, autonomous, reactive adaptation will undoubtedly still occur. The lesson we learn from history and prehistory is that adaptation itself may have profound consequences for society, and may involve fundamental changes in the way people exploit, manage and conserve their environment. This necessitates a radical shift in how we relate to our environment and to each other, and a rethinking of patterns of production and consumption, and of who and where we are. These changes are not compatible with business as usual.

Current development models and adaptation approaches are clearly inadequate for addressing climate change. Through their focus on growth and consumption and their treatment of the environment as an externality, existing development models drive climate change and can exacerbate vulnerability to it. Climate change is viewed by most development practitioners as something that *affects* development, and from which development needs to be protected. While existing approaches to adaptation may go some way towards reducing the risks climate change poses to development investments, these approaches run the risk of locking societies into unsustainable and maladaptive patterns of development, by assuming that development along business-as-usual lines can simply be secured through the identification and implementation of appropriate adaptation measures. Some current adaptation actions have been shown to undermine system resilience, or even constitute maladaptation (Nelson et al., 2007). A new approach to development, and a new vision of adaptation, are urgently needed.

6 Learning from the past; securing the future

This article has drawn lessons from the recent historical past, and from the last period during which the global climate underwent a systematic reorganisation, when *ad hoc*, reactive and autonomous adaptation appears to have fundamentally reshaped human societies. A key question today is to what extent the consequences of climate change in the twenty-first century and beyond will resemble those of the distant past, as we enter a period during which the global climate is likely to undergo a system-wide reorganisation for the first time in five millennia, driven by an increase in global mean surface temperature unprecedented in millions of years.

The world today is not the same as it was at the end of the Holocene climatic optimum some 5000 years ago, when the first civilisations emerged against the backdrop of widespread and severe climate change; we are now faced with a quite different set of opportunities and constraints. We have some foresight, as well as some hindsight. We have identified a process of global climate change, and although the nature, timing and severity of its associated impacts cannot be predicted with precision, there are clear indications and sound evidence indicating which groups and regions are likely to be most affected. As a result, society can – at least in principle – act in advance and take precautionary measures to protect the most vulnerable. Such action must be taken in the face of uncertainty; however, the dominant development paradigm and current development models do not favour action under uncertainty, being based on assumptions of constancy and stability, with adaptation seen as a means of preserving this stability rather than enabling people to live in an increasingly dynamic

environment. Globalisation works both against and in favour of actions to address the uncertainty associated with a global climate in a state of transition, and institutions which, theoretically at least, should make these actions easier *do* exist. Investments, production and consumption patterns, people and labour, technology and knowledge can be and have moved and been deployed rapidly around the globe. However, the combined forces of globalisation and global environmental change have made the poor more vulnerable and acted to increase inequality in many instances (Nissanke and Thorbecke, 2005). Within this context it is instructive to note that evidence from the recent and distant past demonstrates that climate change has the potential to generate conflict, more authoritarian rule, greater inequality and more hierarchical societies. Robust institutions are needed to navigate these changes and to counter these possibilities; we shall have to deal not only with the direct impacts of climate change, but also with the consequences of adaptation itself.

These lessons – the need for precautionary action, to act in anticipation of change and in the face of uncertainty; to work at multiple scales; to develop institutions which will adapt; and to incorporate learning – all indicate that a radical rethinking of how development is conceived and implemented is required. There is a need to move beyond current global climate-change discourses that emphasise managerial and technocratic solutions, and to seek radical departures from the dominant developmentalist paradigm and current conceptions of sustainable development (Grist, 2008). The latest scientific findings indicate the potential need for adaptation to a rise in global mean surface temperature of 4°C or more (Anderson and Bows, 2008) that may trigger ‘abrupt’, non-linear changes in the climate system (Lenton et al., 2008). As a result, development will need to be based on systems and approaches that can accommodate large changes in mean climatic and environmental conditions, enhanced climatic variability over a range of timescales, and (in many parts of the world) a high degree of uncertainty regarding how climate will evolve in the near, medium and long term. In addition, development will have to grapple with certain very specific consequences of climate change, including the loss of productive land, the inundation of coastal settlements, and systemic changes in landscapes, ecosystems and resource availability, as well as changes in the nature, distribution, frequency and severity of climate-related hazards. These changes will make development along ‘business-as-usual’ lines impossible in many parts of the world.

For example, analysing the past and assessing options for the future in Syria, Hole (2007) demonstrates the necessity of, but also the constraints on, system-wide change. Syria’s 10,000-year history shows the fragility of intensive land use and precipitation variability, and how current development has intensified agriculture, depleted groundwater and degraded steppe vegetation. Hole concludes that large-scale emigration to more favourable zones, in the case of severe events in these marginal environments ‘may be unsupportable and lead to eventual system failure’ (2007: 84). He describes how conditions and stresses are constantly evolving, as a consequence of development and natural processes (such as fossil fuel use and climate change). His solution is to advocate closer monitoring, but he notes that planners in this region do not plan for future change.

New models of development are required that build development *around* environmental constraints and opportunities, rather than tacking environmental

considerations onto development policies, programmes and practices that are based on today's flawed ideologies of progress and modernity. These new models will need to address enhanced climatic variability and uncertainty by striking a balance between productivity, on the one hand (to feed a growing population), and resilience, on the other (to absorb the impacts of potentially large variations in rainfall, for example). This may require people to choose not to maximise production in the short term, which might reduce the potential for economic growth, but which may prevent societies becoming dependent on levels of production that require 'optimum' climatic conditions and which are not sustainable in the medium to long term. These new development models will prize resilience in the face of climatic uncertainty and change over the short-term maximisation of productivity and growth, and might seek to minimise the exploitation of certain resources and build redundancy into production systems in order to spread risk.

Table 2 compares existing approaches to development with suggested approaches that build development around dynamic climatic and environmental conditions. The policy implications outlined in the table are drawn up with consideration of four key principles: i) act to save the most vulnerable; ii) reduce environmental pressures from globalisation; iii) act at multiple scales; and iv) strengthen institutions.

We elaborate on the final principle using current policy examples. In relation to strengthening institutions, multi-scalar institutions need to be integrated horizontally (across nations and internationally) and vertically (drilling down to different levels within nations). These forms of integration need to go beyond the nation-state as currently incorporated in the UNFCCC and international negotiation processes. Useful international initiatives, such as START and SouthSouthNorth, have fostered collaborations between developing countries. Key actions which these collaborations can undertake include sharing lessons for adaptation and providing support for the most vulnerable. Funding and governance are key related issues. Funding has been made available for the Least Developed Countries to produce NAPAs and PRSPs. But wealthier countries also need to have their own mitigation and adaptation plans integrated into this system (the developed countries lag notably behind in their production of national adaptation strategies). They may benefit from developing-country expertise generated in producing some of these documents.

At the national level, climate change and resilience ideas need to be taken beyond the environment ministries and into finance, energy and agriculture ministries, supported by the translation of resilience ideas into actionable, realistic, ambitious policies based on these ideas. The UK has made some limited progress towards this, including the establishment of a climate division within the finance department (Her Majesty's Treasury), which produced the Stern Review arguing strongly for precautionary action on climate change justified on the basis of financial savings. The UK (and the world) has used this information to promote action on climate change. The UK has now created its own Department of Energy and Climate Change (DECC) which, critically, is a central department with close links to government leadership, and substantial interactions with several other departments working on climate change (Transport; International Development; Environment, Food and Rural Affairs; Foreign and Commonwealth Office). A further example of current policy approaches for

Table 2: Comparison of current and new paradigm and policy implications

	Current paradigm	New approach	Policy implications
Agriculture	Maximise agricultural yields; pro GM crops	Minimise risk; promote resilience; address variability. Lower yields mean equity & redistribution are essential	Pro-poor agricultural sustainable growth; consider radical restructuring of land tenure & other equity issues; co-operative approaches to water sharing
Economy & development	Maximise economic growth; economic determinism	Minimise environmental & social impacts	Sustainable or 'resilient' development to become principal models of growth – myriad of regional, national & local variations. Tailor development to the situation
Institutional approach	Managerialism; technocratic approach to resolving climate problems pump-priming the solution (e.g. African Green Revolution, Green New Deal)	Multiple approaches embracing social, political & capacity elements of development & resilience first, before bringing in technocratic solutions Horizontal & vertical integration of governance	Embrace diversity within overarching international targets Strong global environmental governance essential to ensure well-being of the poorest through UNFCCC Research & funding on climate change to be focused on the development reality experienced first, building up Innovative pilots to be refined & scaled up where useful

Sustainability	<p>Environment treated as an externality</p> <p>Certain systems & modes of production viewed as optimal, regardless of environmental contexts, resulting in tendency for development to marginalise diversity & adopt universalist approaches</p>	<p>Environment prioritised in calculations</p> <p>Development built around environmental constraints & opportunities</p>	<p>Take on concepts of non-substitutable environmental capital – major implications for land use & management worldwide as non-renewables & renewables become valued</p> <p>Promote systems designed specifically to function under extant (& anticipate) environmental conditions, appropriate to local & regional circumstances</p>
Environment	Assumption of static environment	Dynamic environment	Build in leeway in the use of the environment; science focus on tipping points & limits; precautionary approach
Social development & well-being	Subsidiary to economic growth	Social indicators & non-economic quality of life are foremost	<p>New approaches to promoting well-being</p> <p>Development focuses on delivering food security, health, clean water & risk management rather than economic growth</p>
Urbanisation	Seek to provide services for growing population	Promote sustaining agricultural lifestyles more strongly; promote multiple, resilient livelihood approaches based in rural & urban places	<p>New approaches to urban planning, considering evolution of exposure to climate-related hazards over long (i.e. multi-decadal) timescales</p> <p>Increased urban food production</p> <p>Reduction of 'urban footprint' locally & globally, based on considerations of pollution, resource extraction & impacts on rural areas & ecosystems</p>

strengthening institutions is the EU Emissions Trading Scheme, which illustrates the potential for incorporating permits for carbon emissions into the economy. It also reminds us that all ideas need refinement and will not work flawlessly on initial implementation (Euractiv, 2009).

While the strengthening of institutions is of vital importance in stimulating and supporting action on both mitigation and adaptation, it does not guarantee that these actions will be appropriate or successful. Institutions will only deliver meaningful action if the models, assumptions and approaches framing this action are sound. We have argued that the models, assumptions and approaches currently framing development are deeply flawed. The reality of climate change does not seem compatible with the type of visions being promoted in some developing countries, as illustrated by elements of the Kenya Vision 2030 and other national development 'blueprints' which fail to take account of the environmental realities and futures that they face.

The purpose of this article is not to propose a single alternative approach to development; to do so would be to fall into the developmentalist trap of universalism. Rather, we propose that the flawed dogmas of progress, modernity and economic growth that frame and drive current development approaches be challenged – and indeed discarded – in order to permit a diversity of approaches to development that are appropriate to regional, national and local circumstances, and which adequately address evolving environmental opportunities and constraints (particularly as associated with climate change) by building development around the environment rather than vice versa. On an abstract level this will require a change in the culture of development institutions and practitioners to one in which development, and human societies at large, are viewed as embedded in a dynamic physical or 'natural' environment with which they have something akin to 'social' relations (Heyd and Brooks, 2009).

On a more practical level, we can envisage some possible alternative approaches to development that might be appropriate in certain contexts. A key feature of any alternative is that development must be far more tailored to individual systems, particularly their ecological and environmental characteristics and dynamics, if it is to be sustainable in the long term. For example, in agricultural communities in developing countries, trends from subsistence to commercialisation might be reversed in some instances if this enhances resilience by providing food crops for farmers and reducing risk by increasing the diversity of cultivars, growing locations, and risk-spreading measures. Less dramatically, producers might retreat from low-diversity production for global markets to high-diversity production focusing on local and regional markets. Where markets or large-scale commercial production fail, this tends to occur anyway, with no policy incentives required (see, for example, Mortimore and Adams, 2001). In semi-arid environments or areas where rainfall is expected to become more variable, mobile pastoralism might be rehabilitated. If it is supported by appropriate policies such as the recognition of grazing rights, mobile pastoralism provides an effective means of ensuring food security in marginal and variable environments (Brooks, 2006b). Such a strategy would be counter to the 'modern' aspirations of many governments, which often view pastoralists as backward and in need of 'civilising', and would require a move beyond the philosophy and ideology that underpin current development models. Development activities can be adapted around mobility, for example through programmes that deliver health care and education to pastoralists *in situ*, taking

'development to pastoralists' rather than vice versa. In developed countries, proposals are being galvanised around ideas such as a Green New Deal (New Deal Group, 2008), focusing on promoting energy efficiency, investment in a new grid, and renewables, thus stimulating green investment and job creation. However, this approach still sees economic growth as desirable, and is therefore basically aligned with the dominant developmentalist paradigm. There is a broader debate about prosperity and well-being emerging in developed countries (partly in response to the current recession) and re-ignition of discussions of zero-growth and recognition of ecological limits (for example, Jackson, 2009).

This article has shown the potential for climate change and adaptation to drive radical social change. Contrary to current development discourses, adaptation often emerges after a period of crisis and transition, with unforeseen, and not necessarily wholly benign, outcomes. Implicit assumptions (evident in the language of climate proofing and mainstreaming) that adaptation is manageable, predictable, and represents a means of 'neutralising' the impacts of climate change while securing or enhancing human well-being, need to be critically evaluated. Furthermore, some current adaptation actions have been shown to undermine system resilience, or even constitute maladaptation (Nelson et al., 2007). Despite the current framing of adaptation as something that is driven by policy, we must recognise that much adaptation is autonomous and ad hoc in nature. Thus facilitating people's own efforts at adaptation may be quite different from the proposals to 'mainstream adaptation' in development policy. The idea that adaptation *in situ* is always possible also needs to be challenged, and more attention paid to the existence of limits to adaptation. While climate change is perceived as but one of many factors in development, it should also be recognised that there are instances where climate change may overwhelm other drivers.

The bold question posed in the *Human Development Report*, that perhaps the Enlightenment belief in human progress is misplaced, deserves much greater scrutiny than it has received to date. It is supported by evidence in this article, which indicates that the philosophical and ideological foundations of modernity itself are fatally flawed. At the least, development practitioners would do well to examine more closely the apparent tendency for climatically-driven resource scarcity to increase social inequality, suggesting that climate change may pose a considerable challenge to attempts to create a more equitable world characterised by greater individual autonomy and the empowerment of marginalised groups.

The likely scale of climate change and its potential regional impacts, and the experience of how societies have coped with comparable changes in the past, point to the disruption and re-organisation of social, political and economic systems, systems of production, and land use, on a massive scale in the near to medium term. A shift to risk-minimising strategies and livelihood- and resource-management strategies which maximise resilience and security is necessary to ensure that climate change does not further widen the profound inequalities and vulnerabilities created in the name of progress.

first submitted February 2009
final revision accepted June 2009

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