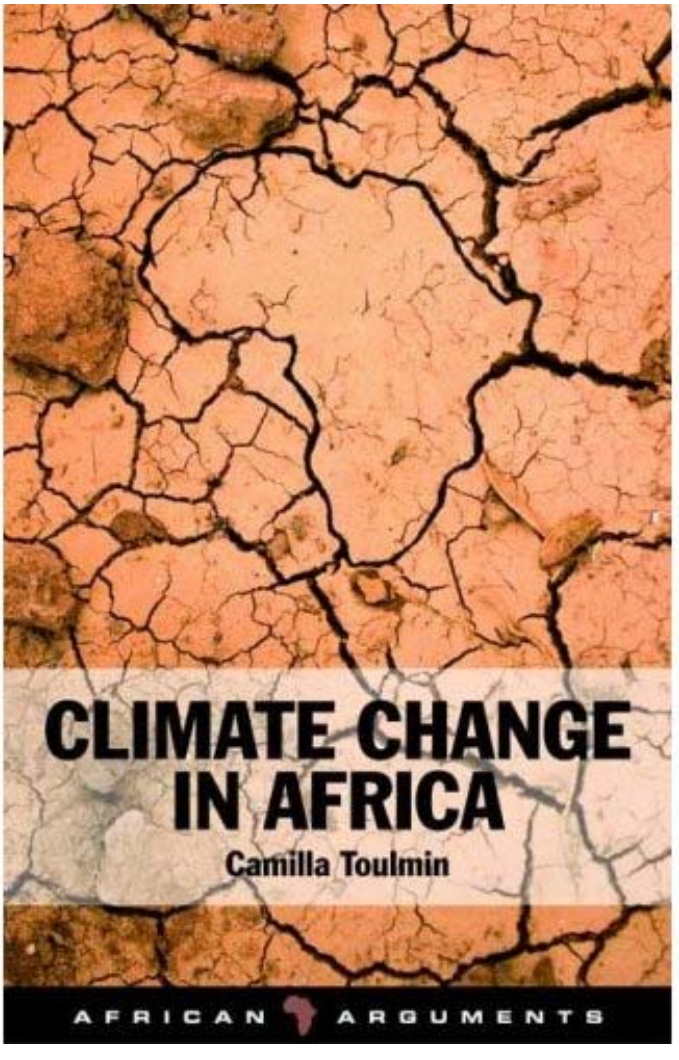

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1 | Introduction

> The world's wealthiest countries have emitted more than their fair share of greenhouse gases. Resultant floods, droughts and other climate change impacts continue to fall disproportionately on the world's poorest people and countries, many of which are in Africa. (Archbishop Desmond Tutu)

> Africa is the continent that will be hit hardest by climate change. Unpredictable rains and floods, prolonged droughts, subsequent crop failures and rapid desertification, among other signs of global warming, have in fact already begun to change the face of Africa. (Dr Wangari Muta Maathai, 2004 Nobel Peace Prize winner)

> So finally today, there is an understanding that climate change is very real, it is happening and it is happening now. We can no longer consider it a threat that is yet to hit us; all over the world we see its impact. (Kofi Annan, opening address at the Global Humanitarian Forum, 2007)

Since 2006, climate change has become a major public issue. Everyone is talking about global warming, how to measure their carbon footprint, and whether it is still ethical to fly around the world. But what will climate change mean for different parts of the world – will some be winners and others losers? How will it affect the continent of Africa, and its many people who depend on farming or who have moved into its rapidly growing cities to find work, or whose incomes stem from the tourist economy? Will it hit rich and poor alike? And what kind of investment would help people and nations 'adapt' to climate change? Amid a rather sombre assessment of adverse impacts from global warming in many parts of the world, are there any opportunities that could

bring better prospects for some peoples, such as the growth in financial markets for carbon? And if so, how might African people gain access to such markets?

We live in a world in which our global interconnectedness has become ever more evident, as shown by the extraordinary and unexpected hike in food and commodity prices from late 2006 to mid-2008. Biofuel targets set by the European Union (EU), the USA and China, among others, are part of the reason for the doubling or tripling of prices. Some observers have portrayed this as the rich world choosing to channel limited food supplies into generating fuel for gas-guzzling cars, rather than nourishing the world's poor. While there may be some truth in this, there are many other forces at work, such as the drought in Australia, growing demand for food from nations such as China and India, speculation in commodities, and the imposition of food export bans by a large number of countries, leading to further hoarding and price increases.

Like global warming, the global 'food crisis' demonstrates yet again that we live on a single planet where our decisions impact, whether we like it or not, on people often in distant parts of the world. In 1972, Barbara Ward, philosopher and writer, who founded IIED, the organization for which I work, wrote a prophetic book, *Only One Earth*, which laid out only too clearly the choices open to us then. These choices are even more pressing now. Thirty-seven years ago, she argued that we faced the real possibility, for the first time, of making the planet unfit for human life, and she took, as an example, the oceans, into which people tip a cocktail of wastes, as though they had boundless capacity to absorb whatever we empty into them. Second, she pointed to the impossibility of everyone on the planet living with the consumption levels of the rich world. But this then poses a difficult question: 'What is to be reduced, the luxuries of the rich or the necessities of the poor?' Third, she noted that there are many issues of huge planetary importance which cannot be solved by nations acting alone. 'The relentless pursuit of separate national interests by rich and poor alike can, in a totally interdependent biosphere, produce global disasters of irreversible environmental damage.'

Only One Earth was published half a lifetime ago, but the message is only too pertinent to our position today. The way we structure ourselves into families, neighbourhoods and nations may help us to mobilize energy and action to defend ourselves or pursue some great ambition, such as space travel. But in the face of global warming, regardless of which part of the world we inhabit, these tribal affiliations make no difference to our ability to protect ourselves and those we love. All will be affected in differing ways. This fundamental mismatch between the global span of the climate system and the social and political constructions within which we plan, make decisions and allocate resources presents a great challenge for our political leaders and the people they are meant to represent. The shortness of the electoral cycle, fear of telling the electorate that we have been living beyond our means, and the need to weigh our wants against the needs of both poor nations today and the rights of future generations tomorrow, together make for a complex manifesto for any political party. It is much easier to focus on tax cuts today and increased spending on health next week. Currently, our politicians are only tinkering at the margins, with a yawning gap between their proud claims to be addressing climate change on the one hand and the timid budgetary allocations that are dwarfed by more immediate political priorities. As Tom Burke reminds us, 'The problem is neither the economics nor the technology: it's the politics.' The credit crunch and the economic downturn offer a much-needed breathing space in which to rethink patterns of growth, ways of measuring progress and the means to build more resilient systems at global and local levels.

The Stern report, *Review of the Economics of Climate Change* (2006), commissioned by the UK government, showed that early action to cut emissions of greenhouse gases (GHG) makes much more sense than waiting for another decade or two and then trying to adapt to the consequences. This is partly because there are time lags in the global climate system, which mean that, even were we to be successful in cutting emissions to zero today, another twenty to thirty years of warming are inevitable. The rising concentration of GHG in the atmosphere will bring ever rising global temperatures,

as described in more detail in Chapter 2. The longer we leave the cutbacks in GHG, the bigger the rise in temperature, the larger the adverse impacts and the more costly it will be to bring down emissions. Stern argues we should start now to make the necessary investments over a period of time which will lead us to a low-carbon economy at a manageable pace. We cannot afford to wait and risk the uncertain and potentially catastrophic impacts of climate change (Stern 2009).

Scientists can only give us a range of predictions on how different GHG concentrations will feed into higher temperatures, because of the difficulty of modelling the complex systems that make up the different levels of the atmosphere and its interlinkages with land and sea. There are also some concerns that global warming may feed back into further accelerating the rise in GHG and temperatures. These include the possibility of the methane currently trapped in the frozen Siberian tundra being released as northern Russia starts to warm up. This tundra is estimated to contain 70 billion tons of methane. If even a small fraction of this escapes, it will eclipse the estimated 600 million metric tons of methane that are emitted each year, from natural and human sources, and cause a dramatic acceleration in global warming. Equally, as the world warms, there will be limits to how much CO_2 can be absorbed by the soils and oceans. Normally, land and water act as a 'sink' by absorbing CO_2 from the atmosphere but, with rising temperature, these sinks may start to act as 'sources', releasing rather than absorbing GHG.

This book outlines what research tells us about the likely impacts of global warming on the African continent. Written for a mainstream audience, it tries to avoid technical language and argument, while recognizing the uncertainties inherent in modelling global climate systems and predicting how they play out on the ground. It starts from a recognition that, while no body of science can provide all the answers, the college of scientists in the Intergovernmental Panel on Climate Change constitutes the best foundation for understanding what is happening to the world's climate. Set up in 1988, the IPCC prepares an assessment

of knowledge about climate change every four to five years, drawing on existing peer-reviewed literature. The fourth and latest IPCC assessment report dates from 2007 and concludes for the first time that the evidence of man-made global warming, linked to emissions of GHG, is now incontrovertible. Because the IPCC works on the published literature, it is inevitably working with material that is two to three years old. Scientific evidence emerging over the last two years indicates that the process of global warming is happening faster than the IPCC report suggests, and global emissions of GHG are even higher than the most pessimistic of the scenarios outlined in the report. While one or two climate sceptics describe the IPCC as alarmist, much well-informed opinion worries that – in their attempt to be cautious in their interpretation of the evidence – the IPCC's fourth and latest assessment report underestimates the risks of runaway global climate change we now face.

The year 2009 is a critical period for making progress in addressing climate change, with the hope that agreement will be reached on a new global treaty at the Copenhagen climate conference in December. As a successor to the current Kyoto protocol, which runs out in 2012, this treaty will need to establish new and more binding targets for cutbacks to GHG among rich countries. It will need to offer a variety of options for helping other countries, such as India, China and Brazil, move to a pattern of economic growth that minimizes their GHG emissions in future. Science tells us that global emissions of GHG need to fall by at least 50 per cent by 2050, in comparison with 1990 levels, if we are to limit the risk of dangerous climate change. Developed countries will need to commit to cutting emissions by 80–90 per cent by 2050 in comparison with the 1990 baseline. Developing countries with major emissions, such as China, India, South Africa and Brazil, will need to set targets in advance of 2020, if global emissions are to peak and then fall in time. Such long-term targets and credible interim goals will help firm up the price to be paid for carbon reductions, which will act as a strong, positive incentive for a wide range of new technologies. Stern (2009) outlines a number of other elements that would need to form part of the deal, which include developed

countries demonstrating that they can achieve low-carbon growth and provide resources and technologies to developing countries to help them follow suit, offering a cost-effective means of reducing deforestation, and supporting vulnerable countries in adapting to the impacts of climate change.

It is hoped that the Copenhagen summit will produce a text along these lines, but most observers recognize that we are currently a long way from reaching an agreement of this sort. The election of Barack Obama as US president offers much greater hope of progress in reaching a climate agreement, given his statements and the appointment of serious scientific advisers in his administration. The high price for oil and gas up to mid-2008 brought about a significant cutback in demand for big cars and made renewable energy sources much more competitive. These trends have now been reversed, however, given the collapse in oil prices and financial difficulties facing investors. The growth in carbon markets has established a mechanism for seeking out carbon emission reductions in different sectors, and different regions of the world. This has generated a new constituency of interests in obtaining a successful post-Kyoto treaty, which can start to provide a counterweight to the very powerful set of vested interests linked to the fossil fuel economy.

On the other side of the coin is the lack of ambition from politicians and governments. European governments, which see themselves as at the progressive end of the climate change negotiations, are still far behind what many businesses and citizen groups would like to see achieved in terms of emission cuts. The global credit crunch and economic slowdown in North America and Europe have increased budget deficits, and have made people feel poorer and more vulnerable, while the breakdown of the WTO negotiations has sent out a signal that many governments are more interested in narrow domestic interests than gaining an equitable global agreement. Climate sceptics have been sowing the seeds of doubt, pandering to the self-interest of those who want no change in current arrangements. Globally, our economies remain firmly wedded to oil and gas as the fuels that keep our economies working

and growing, with all the associated infrastructure of refineries, pipelines and road systems. The big oil and gas giants, eight of which are among the top twenty publicly quoted companies, are powerful actors able to lobby for their interests at national and global levels. Oil-producing countries and companies have a very strong interest in maintaining the status quo of the fossil fuel economy, and ensuring a return on their continuing investment in the steel and concrete needed to service the extraction, processing and distribution of oil.

Where does the African continent sit in relation to these global trends and debates? In some ways, the diversity to be found within Africa's landmass and its enormous size make generalizations impossible. With a surface area of 30 million square kilometres, Africa is seven times larger than the current EU and three times the size of China. But despite this evident diversity in people and place, there are some important common features, including continued heavy reliance on natural resources and agriculture, low levels of income per head, and consequent marginalization in global political affairs. With high levels of inequality, and limited government capacity to deliver services to the majority of people, many states serve the interests of an elite, especially where mineral or oil wealth generates significant riches. Apart from the North African region and South Africa, there has been limited industrialization, and even this is threatened by the huge strength of the Chinese manufacturing sector, with its capacity to produce enormous volumes of low-price goods. Hence, in terms of the world economy, African countries remain largely a source of raw materials and agricultural commodities.

As regards climate change, Africa also stands out as the continent that has contributed the least amount of greenhouse gases to the atmosphere in terms of current flows and existing stocks. For example, for 2007, which is the most recent year for which full data are available, per-head emissions of CO_2 for all of Africa stood at 1 tCO_2 (tonnes of CO_2), in comparison with a world average of 4.3 tCO_2, a US figure of 19.9 tCO_2, the EU15 (the fifteen countries in the EU at the start of 2004) with 6.9 tCO_2 and China

with 3.2 tCO_2. South Africa is the one exception, with an average of 7.9 tCO_2/person in 2004 (UNDP 2007/08), a level very similar to that of high-income countries. This is due to the very high reliance on coal for electricity generation.

In terms of the historic responsibility for GHG in the atmosphere, Africa is even more starkly at odds with the rest of the world, having contributed 2.3 per cent of CO_2 emissions by 2004 in comparison with 11 per cent for the EU15, 20.9 per cent for the USA and 17.3 per cent for China. In a fair world, in which all people have equal rights to the atmosphere, this should mean that Africa has considerable rights to emit, which have not yet been exercised. But one of the perversities of the climate change negotiations is that it is the big emitters who exercise power – the USA, the EU, China, India and Brazil. It is they who can hold the rest of the world to ransom, by quibbling over 5 or 10 per cent targets, or by trying to shift the calculation of target reductions from a 1990 baseline to one more accommodating of their interests, such as 2008.

Those people who are most likely to be hardest hit by global warming have little or no voice, since they have nothing to trade. In the past, African countries have been forced to 'take' whatever agreements and rules are established by world leaders, rather than having a seat at the table at which the rules are made. The Copenhagen talks are likely to be no different. Africa's weak economic position is one reason, and its diversity is another. With a rising number of oil- and gas-producing nations, as well as some of the poorest countries, their interests are too divergent for them to speak with a common voice. And within many countries, inequalities in political power and economic interests between the rich elite and the poor majority mean that the needs and perspectives of millions of small-scale producers are not well represented by governments when it comes to negotiations. In more extreme cases, the rich have bank accounts offshore and family members elsewhere in the global diaspora, allowing them an alternative future when things get bad at home. The poor have few if any options, except risking the sea crossing in a leaky fishing boat from Senegal, Libya or Morocco, in the hope of a landfall in Europe. While the

Kyoto protocol, agreed in 1997, has established a range of new financial opportunities to sell carbon emission reductions, through the EU's Emission Trading System and the Clean Development Mechanism, African nations have had only a very small slice of the pie. Those seeking to buy such carbon reductions find it much easier going to major polluters, such as India, China and Brazil, where they can do deals with a few large industrial enterprises, rather than many small-scale producers, given the costs of pooling a large number of small transactions. Equally, buyers of carbon feel more secure in their purchases where there is greater certainty about contracts, and land and property rights.

Global justice, ethics and human rights

As Barbara Ward made clear in *Only One Earth*, our continued existence on this planet depends on us understanding what our global interconnectedness means, and shifting our behaviour towards a more sustainable use of the earth's finite resources. This will have to involve a fairer way of dividing up those things that are most scarce. Between 1972 and today, we have seen a big shift in understanding of where the greatest scarcity lies. When the Club of Rome produced its report *Limits to Growth* (Meadows et al. 1972), they highlighted the risks of running out of natural resources, such as metals, fossil fuels and water, but paid little attention to global warming. Today, many new oil and gas reserves are being discovered, such as off the coast of Brazil in seas thousands of metres deep. With each year's melting of the Arctic ice cap, further quantities become accessible to be exploited by the rush of neighbouring countries laying claim to mining rights.

In contrast to the Club of Rome's report, it is now clear that the scarcest resource is the capacity of our atmosphere to continue to absorb the growing volume of CO_2 and other GHG that we generate. How should we allocate this scarce resource? Should it be on the basis of where we are now, which confirms the status quo and the associated power of the big polluters? Or should we opt for a fairer, more radical approach, in which all people around the world are deemed to have an equal stake in the atmosphere, and hence

rights in and responsibilities for the future of our planet? This is the key principle underlying 'Contraction and Convergence' and a number of other proposals for managing global warming. In the current global setting, is it better to pitch high for an equity-based solution, or go for the second best, which is more in tune with the current power balance?

The political philosopher John Rawls outlined a theory of distributive justice, which sought to promote 'justice as fairness'. He argued that people are likely to develop the ideal set of rules and institutions if they start from a point where no rules currently exist – a situation Rawls calls the 'original position' – and with the goal that any new rules are based on equal basic liberties for all. The rules will also be fairest if they are drafted by people acting as though they are behind a 'veil of ignorance' and do not yet know where they will be in the future economic and political hierarchy. Rawls's hypothesis is that by applying these principles, people are likely to construct a society based on rules that deliver the best possible outcome for everyone.

Let us take an analogy familiar to many parents. Suppose we are at a child's birthday tea party and, having blown out the candles, the birthday girl or boy is given the job of cutting the cake and handing out slices to the eager faces around the table. Her first inclination might be to cut and take a large piece first and then let the other children scramble for slices of their own. But if a wise mother or father suggests the birthday child take their piece last, out comes a protractor to ensure that a completely fair division of the cake is achieved, so that whether any child is first or last makes no difference to how much they get.

At present the rules for addressing climate change are being written by the powerful and polluting nations. And it is inevitable that the deal they reach among themselves will pay particular attention to their current and future interests. It is as if the birthday cake is being devoured by a few special friends, while the rest of the party must sit and watch, hoping for a few crumbs left on the plate. It would be fairer for the post-Kyoto treaty to be written by those at the bottom of the global hierarchy with nothing to trade

but most to lose from the current way of doing business. A grouping of the poorest 100 nations, or some combination of the Association of Small Island States (AOSIS), or the fifty-three Least Developed Countries (LDCs) – many of which are in Africa – would craft a very different kind of text and associated rules. These groupings need to gain a much louder, stronger voice in the ongoing negotiations for the Copenhagen agreement, and to become better able to represent the interests of those who are politically marginal within their own countries, by listening to the perspectives of slum dwellers, herders, farmers and forest peoples – women, men, poor and better off – across their respective nations.

This book outlines the likely consequences of climate change for different parts of Africa and different sectors. It recognizes that climate change is only one of many powerful forces affecting African development prospects, both internal and external. It starts, in Chapter 2, with a review of what the science predicts as regards the impacts of global warming, what this means for different regions of the African continent, and the evidence of change in temperature and rainfall to date. It describes the international institutions charged with addressing climate change, and the timetable for negotiations, before examining the scales at which adaptation to climate change needs to take place. Chapter 3 covers how global warming affects water availability, with some areas becoming much drier and others considerably wetter. Overall, there is the prospect of more frequent extreme weather events, such as drought, floods and storms, as heating of the global atmosphere drives a more active and moisture-laden weather system. The exceptional floods that hit many parts of Africa in September 2007 are a reminder that too much water can be a problem, as well as too little. This chapter also looks at the very limited investment made to date in managing water supply for people's domestic needs, whether in villages or big cities, as well as the untapped potential for both small and larger dams to capture water for energy generation and agricultural production. Such investments, however, need to keep in mind future projections of water availability, and what this means for river flows.

Food systems are the subject of Chapter 4, which outlines the great reliance of most countries on agriculture and natural resources. Given the likely rise in temperatures and shifts in rainfall, many farmers will face yet more challenging growing conditions. Livestock production may do somewhat better than crops, especially if a shift is made away from cattle, which are less heat tolerant, and towards goats, sheep and camels, which are better able to cope in drier, hotter conditions. Changes in climate will also affect inland and coastal fisheries, and the myriad wild foods that give a harvest of great value to many rural people. The chapter finishes with a look at how greater resilience can be incorporated into farming systems, building on experience from the West African Sahel.

Chapter 5 deals with forests, and their enormously important role as a local source of income and provider of services, as a national economic asset and as a global resource essential to the maintenance of our global climate system. We know little as yet about how forests may themselves be affected by changes in temperature and rainfall, but we do know they are key to the global carbon cycle, with the Congo Basin second only to the Amazon in size and importance. It is not only tropical wet forests which provide incomes and ecological services. In the extensive drylands of Africa, trees play a vital role as a source of fruit, fodder and fuel, as well as giving shade and helping stem erosion, by cutting wind speeds. With the growth in carbon markets, questions arise about who actually owns the rights to trees in different parts of Africa and, hence, who can claim the payments from a global fund to provide cash in compensation for avoided deforestation.

Cities are the subject of Chapter 6. The development business has largely neglected cities in Africa, despite their accommodating 30–50 per cent of the population in many parts of the continent. The growth of towns and cities has been seen as a problem, rather than a sign of economic growth and diversification. This chapter examines how many of Africa's big cities and smaller towns may be affected by climate change, and how they might adapt to such changes. It highlights the need for city governments and urban

councils to work more closely with residents' associations, neighbourhood leaders and community groups to design together ways of handling shifts in water supply, risks of flooding and increased vulnerability to hazards. It also looks at the potential for cities to be part of the solution to climate change, through their redesign to deliver low-carbon growth in ways that benefit, rather than exclude, the poor majority.

Some of the more apocalyptic writers on climate change emphasize the likelihood of conflict over increasingly scarce resources, such as water, food and land. Chapter 7 assesses the evidence for these views to date, whether we are already seeing the first 'climate change wars' and what might be done to reduce the risks of shifts in resource availability generating devastating conflict. It concludes that the reasons for war are usually independent of an environmental challenge, such as climate change, and one should be cautious in inferring a simple relationship between increased scarcity and fighting. It is clear, however, that the more catastrophic predictions of temperature rises and rainfall failures could unleash major shortfalls in food and water and political upheaval in many regions.

Chapter 8 opens up discussion of what different African countries might gain or lose from a 'low-carbon economy' in which the sale of carbon services forms an ever larger source of income. Examples include payments for avoided deforestation, and the growth in biofuel production. As noted earlier, African countries have found it difficult to get their voices heard at the global decision-making tables, which design the markets and rules for access. African countries' ability to gain from the emerging carbon economy depends very much on making sure their perspectives and interests are built in from the start. This means getting centrally involved in negotiations over the next two to three years, during which new mechanisms and institutions will be designed to deliver a global economic system which can continue to grow in delivery of goods and services in ways that dramatically bring down the levels of GHG associated in their production, distribution and consumption. The final chapter looks forward to the challenges

climate change poses for the world as a whole, the scale of response required, and the practical and political hurdles faced.

At the Copenhagen summit and beyond, there is much work to be done in the rich world to alert people to the very real risks we run of global warming creating a planet 'unfit for life', and to our particular responsibility for the stock of GHG in the atmosphere, which is forcing a different pattern of economic growth on us all, if we are to avert disaster. African countries have had very little part in generating the problem we now face, and have had no voice in designing solutions, which should meet the needs not only of the big GHG polluters, but also the many parts of the world that will feel major impacts. It will be vital to get the perspectives of African citizens into the current negotiation process, so that their experience, knowledge and worries can weave as threads through the fabric of the texts to be agreed. As Barbara Ward reminds us, we face a clear and simple choice – will we design a world that preserves the way of life of the rich, or addresses the urgent needs of the poor? The choice is ours.