

## Notes on Climate of Poverty Article:

To conserve printing ink, the following pages were not included in this PDF file from the original document because they had large photos and color background. They do not contain essential text. If you want a copy of the full document, send a request to [david@justfaith.org](mailto:david@justfaith.org).

PAGE 4 NOT INCLUDED – Section Title Page and photo “Climate Change: Destroying Development”

PAGE 13 NOT INCLUDED – Section Title Page and photo “Empowering the Poor”

PAGE 23 NOT INCLUDED – Full page photo

PAGE 28 NOT INCLUDED – Section Title Page and photo “Kenya: Drought and Conflict”

PAGE 32 NOT INCLUDED – Section Title Page and photo “Bangladesh: Erosion and Flood”

PAGE 37 NOT INCLUDED – Full page photo

PAGE 38 NOT INCLUDED – Section Title Page and photo “Recommendations”

Other: ON PAGE 22, the sentence ending the page continues on PAGE 25.  
PAGE 24-25 is a sidebar story “Ray of Hope”

## Introduction

If 2005 was the year of Make Poverty History, then 2006 is turning into the year of Climate Change. Scarcely a week goes by without a new set of statistics being released or leaked, showing the accelerating process of global warming – and prompting ever more dire predictions about the future of the planet.

It may seem, then, that the news agenda has moved on – away from issues of aid, debt and trade, and how they affect the world's poorest people. Christian Aid, however, believes that poverty and climate change are inextricably linked.

As this report graphically illustrates, it is the poor of the world who are already suffering disproportionately from the effects of global warming. The report also definitively shows that poor people in the world's most vulnerable communities will bear the brunt of the forecast 'future shock'.

The potential ravages of climate change are so severe that they could nullify efforts to secure meaningful and sustainable development in poor countries. At worst, they could send the real progress that has already been achieved spinning into reverse. No other single issue presents such a clear and present danger to the future welfare of the world's poor.

Climate change, then, is a pressing poverty issue.

The facts in this report are harsh. The well-founded fears of what, on present trends, lies in store for the poor people of the world are even starker. But Christian Aid is also here to offer a message of hope – there are things that can be done. It doesn't have to be all doom and gloom if urgent action is taken by those with the power to deliver a radical change of direction.

One particularly stark figure in the report emphasises this need for urgency. Our research, based on current scientific predictions, has revealed that 185 million people in sub-Saharan Africa alone could die of disease directly attributable to climate change by the end of the century.

That is three times the population of the UK condemned to die because of the spread and increasing intensity of disease, caused by rising temperatures over which they have little or no control. And that is only the start. What is true for people in sub-Saharan Africa in terms of disease is true for poor people across the developing world.

Elsewhere, an even greater threat will come from floods and ever more frequent natural disasters. Tens of millions of people are likely to be made homeless and left without the means of growing food or making a living to support their families.

Everywhere, the twin threats of drought and famine – caused by increasingly unpredictable rain patterns in tropical areas – are expected to bring even more misery. The unfolding disaster in east Africa, where 11 million people have been put at risk of hunger by years of unprecedented drought, is a foretaste of what is to come.

And where resources are scarce, particularly water, there are the seeds of continuing or accelerating conflict between increasingly desperate populations.

Pestilence, floods, famine and war. An apocalyptic collection, indeed.

Christian Aid is turning its development and campaigning energies towards these issues because action is needed urgently. From this point on, the effects of climate change on the world's poorest people will become a major focus of our work. We are also adding our voice to those demanding that governments across the globe take immediate steps to cut back on life-destroying carbon emissions.

We believe that, as a development agency, we bring a new perspective to the debate, viewing as we do environmental issues through the prism of poverty. The stark fact is that climate change has already begun to impact detrimentally on poor people.

According to the UK government's Department for

International Development, some 94 per cent of disasters and 97 per cent of natural-disaster-related deaths occur in developing countries. Scientific opinion is moving inexorably towards acknowledging that the increasing incidence and severity of 'extreme weather events' that provoke many disasters is connected to climate change.

The European Commission has also concluded that climate change is no longer just an environmental issue. 'It is also clearly a development problem since its adverse effects will disproportionately affect poorer countries.'

In June 2005, in the run up to the G8 meeting at Gleneagles, the academies of science of the world's 11 richest countries (the G8 countries plus India, China and Brazil) made a joint statement calling for urgent action to combat climate change. Never before have the academies issued such a statement.

If climate change remains unchecked, it is difficult to see how the UN's millennium development goals, which aim to halve world poverty by 2015, can be met. Again, real progress towards these goals could go into reverse in the longer term unless something is done to arrest the rate of environmental degradation.

In this sense, the environment is too important to be left to the environmentalists.

Politicians are now grasping the climate change argument and in the UK are vying to appear greener than one another. The Conservatives have made their 'Quality of life challenge', which includes a review of their policies on climate change and carbon emissions. Labour has Gordon Brown, the Chancellor of the Exchequer, proposing a new World Bank fund of US\$20 billion to help poorer countries pay for 'clean' technologies as they develop.

The World Bank has picked up the idea of a fund and recently published proposals for a 'clean energy investment framework', detailing how the US\$20 billion would be raised, allocated and spent.<sup>1</sup>

Mr Brown has also established a Treasury commission, under the leadership of former World Bank chief economist Sir Nicholas Stern, to consider the economic implications of climate change. Its report is due out later this year.

The Irish government has proposed the Irish Aid Environmental Policy for Sustainable Development, with an accompanying three-year action plan.

While these initiatives are laudable, as with all statesmen's grand statements, they will need to be closely monitored to make sure that they are delivered. Most importantly, they need to target the world's poorest people.

The other main message of this report is that there are concrete actions that can be taken to help people work their way out of poverty without risking further climate change and its associated threats. Christian Aid is offering a model for a different kind of development – one not fuelled by an ever-increasing use of carbon-based energy, such as oil or coal.

It shows how renewable energy could provide radical improvements to the lives of some of the world's poorest and most marginalised people – tangible benefits delivered on a timescale of months not decades.

Light for schools or small businesses, which can only currently operate during daylight hours, creating new opportunities – especially for women. Power for water pumps, doing away with the arduous daily slog to the nearest well. Energy for refrigeration units, meaning vital vaccines and other drugs can be kept safely.

These show how communities and countries can aspire to a better future, without repeating the destructive mistakes of the rich, industrialised world. There are real alternatives.

The report also engages in some genuine 'blue sky' thinking to illustrate how renewable energy could even make sub-Saharan Africa a net exporter of clean, sustainable power in the future. This could alleviate many of its economic problems, while providing a solution to the rich world's apparently insatiable desire for dirty power.

Much of our analysis concentrates on sub-Saharan Africa – which has the highest concentration of the world's poorest people. It is also the one place on earth where development is actually going backwards; economically, people are worse off here than they were a decade ago. In health terms, they are more frequently ill and die younger.

So, the first of our case studies is **Kenya**, where we examine how climate change is fuelling violence in drought-hit areas. Pastoralists in the north of the country have started killing each other over the right to water their cattle at a diminishing number of watering holes. Experts predict that the situation can only deteriorate as climate change bites deeper.

We also look at **Bangladesh**, where virtually the entire population is precariously perched just above sea level. Predicted rises in this level would leave millions displaced and dispossessed. There is, quite literally, nowhere for them to go. Already, families are having to move every couple of years, as increased melt water from the Himalayan glaciers sweeps their land and fragile livelihoods away. Without concerted efforts to alleviate these effects, say experts there, we can forget about making poverty history – climate change is set to make it permanent.

As ever, Christian Aid is speaking out on behalf of those who have most to lose from a continuation of climate chaos – poor people. Rich countries must take responsibility for having largely created this problem – and cut CO<sub>2</sub> emissions radically. Leaders must have the political courage to set clear targets to reduce their national emissions, and then have the ingenuity and vision to find the ways and means to hit those targets.

We are calling on Britain and Ireland to lead the way by setting an annual, constantly contracting 'carbon budget', which plots a course, year on year, towards a two-thirds reduction in emissions on 1990 levels, by 2050.

This does not mean that governments of developing countries can turn a blind eye to climate change. Those that have enjoyed economic growth, such as India, China and Brazil, should agree to reduce emissions and set targets for doing so – ideally as part of the deal that must be struck to succeed the Kyoto protocol.

We also believe that a ninth millennium development goal – calling on governments to reduce emissions as a critical contribution to the fight against poverty – should be added to the existing eight.

Christian Aid, for its part, will set its own targets to reduce emissions. As an agency that seeks to serve poor people, we must not contribute to their suffering. We will encourage our supporters to do the same.

The reality, though, is that climate change is already taking place and will inevitably continue. Poor people will take the brunt, so we are calling on rich countries to help them adapt as the seas rise, the deserts expand, and floods and hurricanes become more frequent and intense. Specific aid packages should compensate poor countries for their losses, as well as helping them plot a clean route to development.

These payments must not be taken from existing aid budgets, but instead represent additional aid in recognition of the historical and ongoing responsibility rich nations bear for the impact of their actions on the developing world.

It is time that we truly shared the welfare of the planet, for the good of us all.

To understand how the climate affects poor people, it is first important to understand how it is changing – and why. A decade ago, the subject was fraught with uncertainty, but today the science of climate change has solidified into a real consensus on what is altering the atmosphere and who is to blame.

The Intergovernmental Panel on Climate Change (IPCC), established by the United Nations Environmental Programme (UNEP) and the World Meteorological Office (WMO) in 1988, has become the ‘gold standard’ of the scientific community. It sifts through all the available evidence to see what is genuinely known about the topic across the world as well as assessing climate predictions. In 2001 it famously presented its Third Assessment Report (TAR) which concluded that there was overwhelming evidence to assert that human activities were causing the earth to warm.

During the 20th century the world’s average surface temperatures increased by approximately 0.6°C – two-thirds of that rise has taken place since 1975. Looking ahead, the IPCC forecasted that mean surface temperatures would increase by between 1.5°C and 6°C by 2100, with sea levels set to rise by between 15 and 95 centimetres (6 to 37 inches) by the end of the century.

Since its publication, a considerable number of further scientific studies have backed up the IPCC report’s basic assertion that the world is getting damagingly warmer. The BBC recently reported senior sources from within the IPCC as saying that scientists were forecasting a doubling of greenhouse-gas concentrations in the atmosphere by 2100 that would cause a temperature rise of 2-4.5°C, or maybe more.<sup>2</sup>

One of the IPCC report’s authors told Christian Aid, on the condition that he remain anonymous, that one of the most disturbing aspects of the current data was how fast temperatures were rising. ‘What is significant is that what we have measured in actual temperature rises is on the upper end of the scale of predictions prior to 2001. This means we were underestimating the rapidity with which the earth was warming,’ he said.<sup>3</sup>

The 2001 report’s pivotal assertion was that mankind was to blame for this warming effect. It ascribed the huge leap in the energy-trapping gases in the earth’s atmosphere, which amplify the otherwise natural greenhouse effect, to human activities.

The phrase ‘greenhouse gases’ mainly refers to carbon dioxide (CO<sub>2</sub>), which is produced by the burning of fossil fuels, such as oil, coal and gas. Other gases, such as methane and nitrous oxide, also play an important part in locking warmth into the earth’s atmosphere. The IPCC’s 2001 report found that

since the mid-18th century, the amount of CO<sub>2</sub> in the atmosphere had increased by some 31 per cent, from about 280 parts per million to approximately 367 parts per million.

The UK’s chief scientific advisor, Professor Sir David King, recently said that a level of 550 parts per million is the absolute maximum that the earth can ‘afford’ to maintain and that we were currently heading towards much higher levels that were ‘more like 900 to 1,200 parts per million’.

In 2004, the International Energy Agency (IEA) predicted that CO<sub>2</sub> emissions would increase by another 63 per cent by the year 2030.<sup>4</sup> The IEA said this would ensure that the earth warmed up by between a further 0.5°C and 2°C by 2050 – an increase that would certainly have devastating implications for poor countries.

In summary, the evidence shows that the earth is heating up and that mankind is largely responsible for the gases that cause the warming. What has not yet been proven is the effect that this warming has on local weather systems. Up until now this relationship has been inferred rather than proven despite the fairly common-sense connection.

This is about to change. The IPCC will present its Fourth Assessment Report in 2007, when it is expected to make explicit the fact that global warming is directly responsible for the changing climate.

It is hard to overstate the importance of this conclusion for poor people. For the first time, scientists will lay out in hard technical terms what ordinary people around the world have sensed for some time: namely that ‘something is going on’ with their local climate.

This chapter will outline just how these changes have already devastated the lives of poor people all over the world, whether through disasters, disease, drought, famine or flood. It also gathers together existing evidence and new research to predict how these apocalyptic forces will intensify over the coming decades if nothing is done to arrest the headlong carbon charge. The news is universally grim.

**‘Africa, of course, is also seen by experts as particularly vulnerable to climate change. The size of its land mass means that in the middle of the continent, overall rises in temperature will be up to double the global rise, with increased risk of extreme droughts, floods and outbreaks of disease.’<sup>5</sup>**

Tony Blair, January 2005

## Climate, poverty and disasters

Tracking climate change is not a straightforward matter of measuring how hot the planet is becoming. This is exemplified by sub-Saharan Africa where the scientific consensus is that the climate will become increasingly variable. The dry areas in both the north and south will get drier while the wet tropics will get even wetter. At the same time, sea levels are predicted to rise and affect large swathes of Africa’s coastline, while the frequency and intensity of severe weather events is likely to increase.

How will this affect poor countries and their people? The answer is both directly, through extreme weather events such as floods and storms, and indirectly, because of long-term weather changes that cause famine and droughts. ‘Climatic extremes such as drought and flooding take a direct toll on lives, health, livelihoods, assets and infrastructure,’ says the International Research Institute for Climate Prediction (IRI) at Columbia University, New York.<sup>6</sup>

Climate experts often stress that there is no way, given the huge number of meteorological factors involved, that global warming can be proven to have caused any one extreme weather event. There has been some debate, for instance, over whether the conditions leading up to Hurricane Katrina, which hit New Orleans in 2005, were caused by global warming or were part of a natural pattern. There is, however, growing agreement that climate change may account for the strength of a hurricane.

US scientists conclude that ‘there is no way to prove that Katrina either was or was not affected by global warming. For a single event, regardless of how extreme, such attribution is fundamentally impossible...’ But they also state that ‘the available scientific evidence indicates that it is likely that global warming will make – and possibly already is making – those hurricanes that form more destructive than they otherwise would have been.’<sup>7</sup>

Overall, what these trends do show is that extreme weather

### Haiti

Climate change is making storms in the Caribbean more intense. And when bad weather strikes, it hits poor people hardest.

Haiti is not only the poorest country in the western hemisphere, it comes below many African countries on the human development index. While conflict-ridden Sudan is rated 142 out of 177, Haiti is 153rd. The Dominican Republic is at 95 on the same league table even though it shares the same land mass as Haiti, occupying the eastern half of Hispaniola.

This extreme poverty makes the Haitian population more vulnerable to the effects of climate change. Hurricanes and tropical storms are common throughout the Caribbean, but in Haiti their toll is often much more severe.

When tropical storm Jeanne hit Haiti in September 2004, nearly 3,000 people lost their lives, even though the winds weren’t even fierce enough to be deemed hurricane force.<sup>10</sup> The same storm hit Jamaica, but caused very few casualties.

When rains come in this part of the world, they come hard and fast. The town of Fonds Verettes has been washed away three times in ten years. People continue to rebuild in the riverbed because they have nowhere else to go.

Elamene Valcin tends a small plot on the steep slopes of a hillside overlooking a dry riverbed in the Terre Froide region of south-eastern Haiti.

Before the floods, the Valcin family had a horse to transport their potatoes, corn, beans and poultry to market. But when the storm came, the

horse was killed. Now Elamene is forced to sell most of her produce in front of her house for less money, and she has lost the income she used to make from renting her horse.

Her case exemplifies one aspect of the vicious circle that bedevils the Haitian economy and degrades the country’s environment. When livestock and crops are lost, one of the few reliable sources of income left in Haiti is cutting down trees, manufacturing charcoal and selling it. Like most of their neighbours, Elamene and her family are forced to chop trees between harvests.

This has accelerated a process of deforestation that has been going on in Haiti since colonial times. The situation is so extreme that only two per cent of the country’s entire forest cover is left.

The cycle of poverty-related environmental degradation is very difficult to break. The Haitian economy is already heavily dependent on charcoal as a source of energy, and as the poor get poorer, there is little chance of investing in alternatives. Nearly all industrial production, from bakeries to distilleries, relies on wood-based products for fuel. Altering that dependence would require significant assistance to help households and factories use alternative energy sources.

With the landscape deprived of trees and their roots, the recurring hurricanes wash away the country’s rich topsoil into the rivers and oceans – making farming even more difficult. It also makes the terrain more dangerous. The lack of trees and topsoil mean the hillsides

events have been increasing in both number and ferocity over recent years. The Red Cross's World Disasters Report is the most authoritative source on the issue and it states with clear confidence that weather-related disasters have soared over the past 40 years.

The number of reported natural disasters has almost trebled from 1,110 during the 1970s, to 2,935 between 1993 and 2002.<sup>8</sup> During the same period, the numbers of people affected by storms and floods rocketed from 740 million people to 2.5 billion. Similarly, the cost of the damage increased five-fold to US\$655 billion.

These statistics also show that the numbers of people who were killed by natural disasters fell during this period from 1.96 million during the 1970s to 531,000 between 1993 and 2002. But the figures do not include 2004 and 2005 when hundreds of thousands of people died during the Asian tsunami and several severe floods. The Red Cross also notes that the fall may have been largely the result of better disaster preparedness.

can easily become deadly mudslides.

Not only does poverty greatly magnify the effects of hurricanes, but there is growing conviction that the frequency and severity of storms hitting the region is increasing as a result of climate change.

'It is clear that hurricanes have been hitting the island more often and with much more force over the past decade,' says Moïse Jean Paul, the coordinator of the Haitian environment ministry's climate-change programme.

Another significant problem is the country's changing rainfall patterns. In Terre Froide, the barren, dusty landscape has seen hardly any rain in several months. The topography looks more like sub-Saharan Africa than the western Caribbean. But at

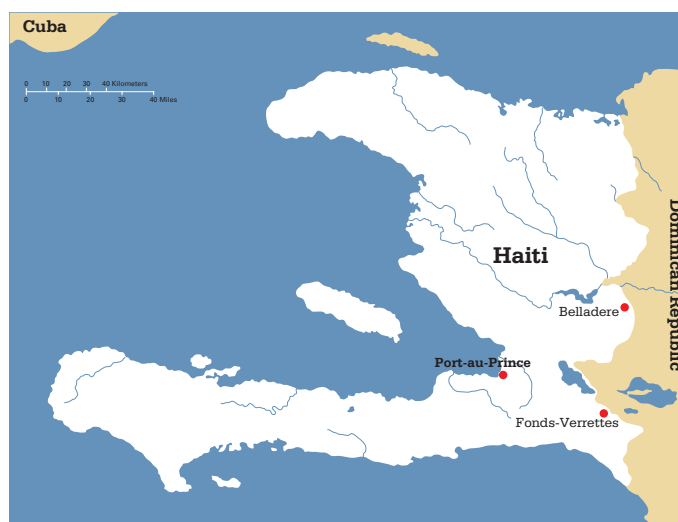
other times, the same landscape sees people's homes being washed away by floods.

In some areas of the country, annual rain levels have risen and in others they have fallen. In a place where 70 per cent of the population depends directly or indirectly on agriculture, such precipitation changes can be devastating.<sup>11</sup> Irrigation systems are almost non-existent, so nearly all agriculture is rain fed. Farmers are at the mercy of the elements. If they plant a little too early or too late, they can lose their whole crop.

It is clearly not the case that all extreme weather events have been caused by global warming, but it is reasonable to assume that a significant proportion of the increase has been connected to it. Again, the world's leading climate scientists are expected to make this link explicit in the forthcoming IPCC report.

The true message is that poor people are the ones who suffer most when extreme weather strikes. They may not have access to formal information networks that could alert them that a storm is coming; they tend to live on land that is more susceptible to storms or flooding because they cannot afford to live anywhere else; and they often depend on the land for their livelihoods, land vulnerable to severe weather.

As the Red Cross puts it: 'This growing vulnerability is intimately tied to development patterns: environmentally unsound practices, global environmental changes, population growth, urbanisation, social injustice, poverty and short-term economic vision are producing vulnerable societies.'<sup>9</sup>





**‘Climate change can affect human health directly (eg impacts of thermal stress, death/injury in floods and storms) and indirectly through changes in the ranges of disease vectors (eg mosquitoes), water borne pathogens, water quality, air quality, and food availability and quality.’<sup>12</sup>**

IPCC Third Assessment Report, 2001

## Disease

When the great heatwave of the summer of 2003 struck Paris, it left 12,000 people dead. Throughout the rest of Europe a further 27,000 died. These were not the young and strong that perished, but the elderly and weak.

It is a deadly axiom that it is poor people in the poorer countries of the world who will suffer and die most from the diseases that the changing climate will leave trailing in its wake. A 2003 World Health Organisation (WHO) report estimated that the annual death toll from such diseases was already 150,000.

Christian Aid estimates that by the end of this century, climate-change-associated diseases on their own will have killed around 182 million people in sub-Saharan Africa.

It is not just extremes of heat that can kill. According to the WHO’s report, climate change was responsible for 2.4 per cent of all cases of global diarrhoea and two per cent of world wide malarial cases.<sup>13</sup>

Jeffrey Sachs of the Earth Institute at Columbia University in New York, says that up to 3 million people die of malaria each year.<sup>14</sup> Some 90 per cent of these deaths – 2.7 million a year – are in Africa, most of them young children under five.<sup>15</sup>

Malaria has a close relationship with the temperature. If cooler regions become warmer, the malarial mosquito will be able to survive and spread. Scientists now predict that wetter, warmer weather will take the disease into new regions making it more lethal than ever. Already there are signs that the disease has extended into previously cool highland areas of Tanzania and Rwanda. And increased rainfall in the tropical zones of

Africa, as predicted by the IPCC, will encourage an increase in the numbers of malaria-carrying mosquitoes there.

Dengue fever, which is also carried by mosquitoes, is climate sensitive too. Increased rainfall in hot areas encourages the female to breed simply by creating more warm pools of water in far more places. Meanwhile, hot, fetid conditions encourage the spread of cholera, which is also associated with the poor sanitary conditions that typically follow floods.

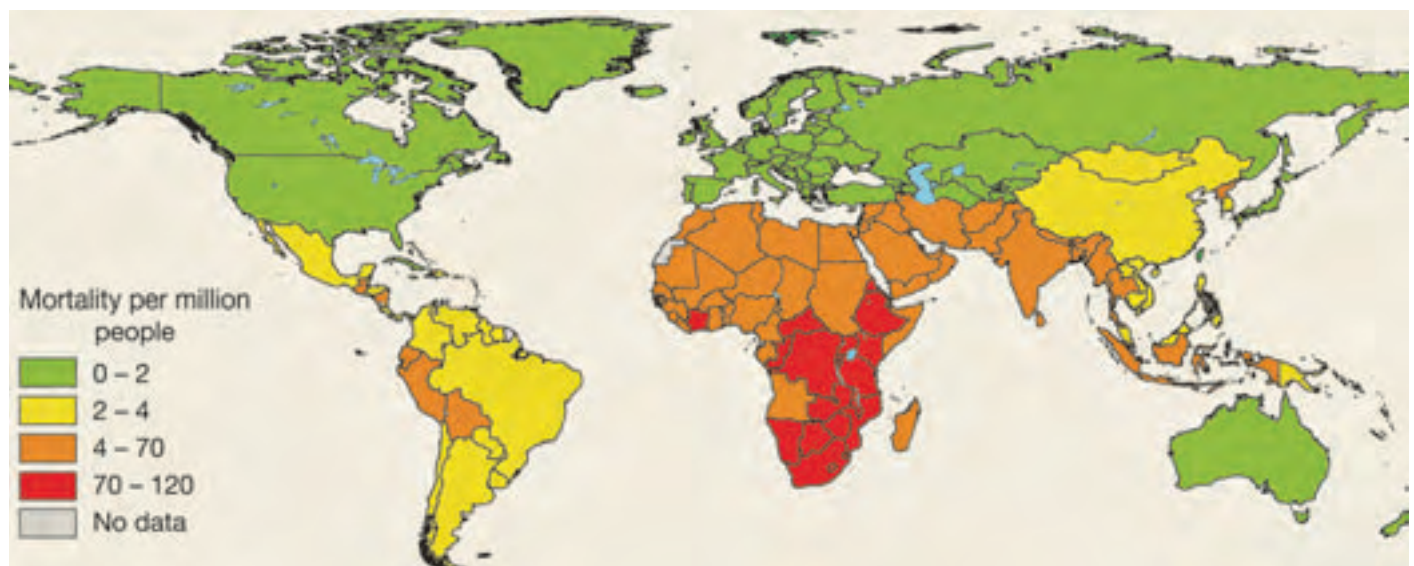
Rift Valley fever and the parasitic disease visceral leishmaniasis are associated with increased rainfall. Leishmaniasis, referred to historically as the ‘Aleppo boil’, is a deadly parasitic disease caused by the bite of the female sand fly. It is estimated to infect half a million poor people a year.<sup>16</sup>

Diarrhoea can vary with seasons – in the tropics peak diarrhoea rates are associated with the rainy season. Other diseases of the gut, such as infection, giardia and typhoid, follow suit so it is likely that the warmer and wetter conditions predicted for tropical regions will make them more prevalent – which, yet again, will primarily affect poor people.

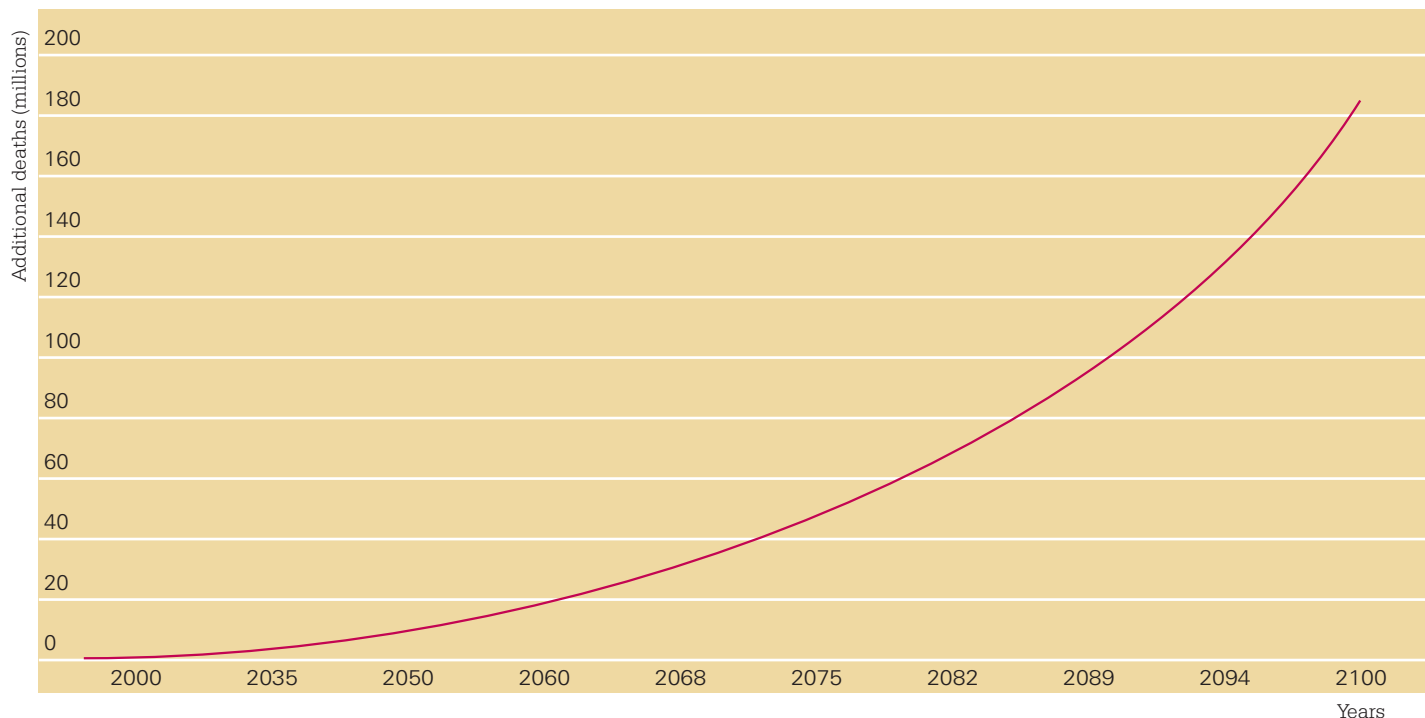
Meningitis, on the other hand, thrives in hot dusty regions, typified by the Sahel – that area of Africa immediately south of the Sahara desert. Meningitis is also likely to increase in the more arid conditions that climate change is predicted to bring there.

Below: Estimated deaths due to climate change in 2000, based on comparison with 1961-1991 climates

Source: World Health Organisation data quoted in Patz *et al* 2005<sup>17</sup>







Above: Predicted extra deaths from disease attributable to climate change in sub-Saharan Africa (based on IPCC worst-case scenario of a 6°C temperature rise by the end of the century)

The strong association between climate change and disease was outlined in a seminal paper in the magazine *Nature* in November 2005. American academic Professor Jonathan Patz and others showed how climate-change-associated diseases particularly hit poor people, with sub-Saharan Africa being the worst affected.

Looking at 47 out of the 53 African countries, Patz managed to isolate the figure of an extra 176 people in every million of the population who had died of disease associated with climate change. Christian Aid has taken this work further to project how many sub-Saharan Africans might die from climate-change-associated diseases by the end of the century (see table above).

If we use a 'middle' UN projection for population rise in sub-Saharan Africa and plot it against the IPCC's worst-case scenario of the earth's temperature rising by 6°C by the end of the century, we arrive at a horrifying total of more than 182 million deaths from climate-change-associated diseases in sub-Saharan Africa by the year 2100. While these figures are a projection and so cannot be absolutely precise, they do point to the vast scale of the problem.

But this disturbing glimpse into the lives of poor people in

a climate-changed future is by no means complete. Droughts, famines, floods, a rise in the sea level and scarcity-induced conflict are other, equally tangible, ways that climate change will kill.

## Droughts and food

Water is vital in the truest sense of the word. With none to drink we die of thirst. With none to water our crops, we starve. With too much of it, in the form of floods, we drown.

In rich countries water is taken for granted. Save for the odd hosepipe ban, it is always on tap for domestic, industrial and agricultural use. But in the developing world, where most people depend on agriculture to earn a living or just stay alive, it is a scarce and precious resource.

In Africa, 70 per cent of the working population rely on agriculture to make a living, and it contributes 40 per cent of the continent's collective GDP.<sup>18</sup> Some estimates suggest climate change will reduce Africa's crop yields by ten per cent and in some regions by even more: maize production is forecast to fall by 33 per cent in Tanzania; and millet by between 20 and 76 per cent and sorghum by between 13 and 82 per cent in Sudan.<sup>19</sup>

The IPCC's 2001 report concluded that temperatures in Africa had risen by 0.6°C during the last century. The effects of this are two-fold: in some wet, tropical regions rainfall is increasing, while in already arid areas there is even less rain.

This type of climate change has meant that it is the water supply that is affected first. And as agriculture is dependent on rainfall, this change in weather patterns puts huge numbers of predominately poor people's livelihoods at risk.

A lack of rain brings drought and that means that people who cannot afford to move or buy water start to die. The drought that gripped the Horn of Africa in 2005 and 2006 bears this out. Nobody knows the full extent of a tragedy that is still unfolding, but the UN estimates that 11 million lives are at risk.

The long-term picture is no less bleak. There is still some disagreement over whether the Horn will get more or less rain as a result of future warming. But recent IPCC research suggests that even if there is slightly more precipitation in the Sahel, as some predict, this will do little to ameliorate the region's increased aridity. This is because the rise in temperatures there will mean that the extra heat of the day will evaporate what little additional rainfall there is, before it has the chance to do any good.

Serigne Kandji, a tropical-ecology scientist at the World Agroforestry Centre in Nairobi, Kenya, suggests that the major concern in the Sahel is the possible increase in the frequency and intensity of droughts. This would make it extremely difficult for Sahelian countries to achieve their millennium development goals, the targets set by the UN to halve poverty by 2015.

Furthermore, as Kandji says: 'If action to tackle this is not taken immediately, food deficits will become more pronounced, aggravating an already worrying food and nutritional situation. Indeed, climate change is likely to become the greatest obstacle to achieving food security [and] poverty reduction.'<sup>20</sup>

Last year Wulf Killman, chairman of the UN Food and Agriculture Organisation's (FAO) Climate Change Group, warned world leaders meeting at Gleneagles for the G8 summit that the droughts that had devastated Central America and parts of Asia and Africa would not only continue but get worse – and Africa would bear the brunt. 'Africa is our greatest worry... we would expect areas which are already prone to drought to become drier with climate change,' he said.<sup>21</sup>

The FAO identified the Horn, Zimbabwe, Malawi and Zambia as those parts of Africa most at risk of drought and its concomitant – famine. In Malawi, for example, after the 'hidden' famines of 2003, which killed untold thousands of poor people living in remote rural areas, it was estimated that one person in three needed assistance because of lack of rain.

As populations have increased, people have been pushed out onto less productive areas of land which are even more susceptible to drought. Jennifer Olson, regional coordinator for

land use at the International Livestock Research Institute in Kenya, says these small-scale, subsistence farmers are often the most vulnerable to the weather hazards associated with climate change.

'Rainfall is the biggest variable for crop and animal production here,' she says. 'Everything goes up and down depending on how the rainy seasons are going, so climate change is going to have a huge impact with the expansion of people cropping into more marginal areas. These tend to be the people on the edge of doing well anyway because there's not enough rainfall for them to be productive.'<sup>22</sup>

Droughts and famines tend to happen quickly and the consequences for people and economies are dramatic. But even gradual climate change can have a direct and damaging effect on economies, and particularly food-related industries.

The UK government's Department for International Development (DFID), identifies one example of this 'slow-burn' effect: 'Gradual changes may also be a concern: studies show that an increase in temperature by an average of 2°C would drastically reduce the area suitable for growing Robusta coffee in Uganda, where it is a major export crop, limiting it to the highlands only.'<sup>23</sup>

The EU is seriously concerned that climate change will cause a more widespread and permanent shift in food production along these lines. It identifies food-deficient small African countries as particularly vulnerable, adding that '... where fish constitute a significant source of protein for the poor, declining and shift of resources (of fish stocks) due to additional climate change stress may impact on their food security.'<sup>24</sup>

Impact on fish stocks has already been seen in the great African lakes that have provided east Africans with food for thousands of years. These are already feeling the strain because of unsustainable practices, such as introducing foreign species like Nile perch. Now, local people talk of a huge fall in the number of fish in the Rift Valley lake system. And in 2003, *Nature* reported that Lake Tanganyika (which borders Tanzania, the Democratic Republic of Congo, Zambia and Burundi) had seen fish stocks decline by 30 per cent over the past 80 years.<sup>25</sup>

Climate change reduces crop yields, forcing people to look for alternative sources of food, and putting even more pressure on fish stocks. Conversely, when people who rely on fish find stocks diminishing, they will turn to farming in marginal areas, with all the problems that entails.

## 'When the apocalyptic horsemen of famine and pestilence appear, war can't be far behind.'<sup>26</sup>

Scott Fields, environmentalist, 2005



Christian Ald/Anjali Kwatra

The government tries to protect the shore from erosion by building embankments along the beach in Kutubdia, an island off the southern coast of Bangladesh that has shrunk by almost half in the past 50 years due to coastal erosion

### Ice, floods and sea rises

Paradoxically, too much water is as much a consequence of global warming as its opposite, drought.

In Africa, major glaciers and ice caps on Mount Kenya, Ruwenzori and Kilimanjaro are melting fast (Kilimanjaro has lost some 82 per cent of its mass since 1912). But this tends to contribute more to drought than flood as it depletes natural reservoirs. Warmer temperatures are making more water than usual cascade down from the Himalayas. These increased water flows are posing real dangers to the millions of poor people who inhabit the fertile but flood-prone riverbanks of Bangladesh (see the case study on page 32).<sup>27</sup>

A fifth of the country endures some kind of flooding every year. But it is clear that flood damage has become more extreme in the past 20 years. In 1988, and again ten years later, two-thirds of Bangladesh was covered in water. During the floods of 2004, 80 per cent of crops were damaged or destroyed and more than 30 million people left homeless.

Bangladesh also faces acute danger from another effect of climate change – rising sea levels. Most of the country lies less than ten metres above sea level and around 17 million people live on land less than a metre higher than the sea. It is not surprising, therefore, that climate experts see Bangladesh, one of the most densely populated countries in the world, as among the most vulnerable to even small changes in sea levels.

The top end of the IPCC's sea-level forecasts – rises of between 15 and 95 centimetres – would leave a fifth of the country permanently under water and force some 35 million

people to abandon their homes and seek shelter inland. While there are no predictions about how many would die as a result, this scenario is a grim one.

There is no doubt that rising sea levels will be one of the costliest effects of climate change, both in terms of lives and economic damage. Aside from Bangladesh, several other low-lying nations are also predicted to suffer badly. According to an IPCC assessment in 1998, a one-metre rise would displace 10 million people in Vietnam, 8-10 million in Egypt and several hundred thousand on islands in the Indian and Pacific oceans.

A recently leaked DFID paper on the implications of climate change for the developing world also paints a bleak picture for Africa if sea levels rise. A quarter of all Africans live within 100km of the continent's coast, and the DFID paper reports that the number of people at risk from coastal flooding is set to rise from 1 million in 1990 to 70 million in 2080.<sup>28</sup>

In Tanzania, for example, the IPCC suggests that a 50-centimetre rise in sea levels (which is in the middle of its forecasts) would flood more than 2,000 square kilometres and cost around US\$51 million.<sup>29</sup>

Flash floods kill tens of thousands of poor people every year. Sustained periods of unseasonably heavy rain can also have a damaging impact on agriculture, causing the loss of topsoil and serious nutrient leaching.

The widespread floods that ravaged Mozambique in 2000 and 2001, killing hundreds, provide a telling example of what such a disaster can do to a country where infrastructure is poor and the people poorer. Heavy rains in January 2000 were followed by tropical cyclone Connie, which dumped record amounts of rain on the capital Maputo and the nation's southern watersheds. A few weeks later another cyclone dropped more rain across the region, submerging an area nearly the size of Belgium and the Netherlands combined.<sup>30</sup>

A third of the country's crops were ruined, roads and railway lines were destroyed, entire villages disappeared, and hundreds of thousands of people were made homeless. According to the International Federation of Red Cross and Red Crescent Societies, 350,000 lost their jobs, which undermined the livelihoods of 1.5 million people.

### Conflict

Climate change fuels conflict. If temperatures are increasing in areas that are already hot, it will have a direct effect on the scarce resources required to sustain life: water, food, crops and livestock. When it becomes warm enough, wells will dry, livestock will die, crops will wither and there will not be enough food.

## ‘Let those who emit no carbon, cast the first refugee out.’<sup>31</sup>

Simon Slater and Matthew Turner

In east Africa, a combination of drought and famine brought on by increasingly varied – and generally warmer – temperatures has led to flare-ups among nomadic pastoralists.

Pastoralists have a history of disputes with each other. One of the prime causes of these conflicts, alongside increased weaponry and traditional economic disputes, is the drying out of wells, making livestock routes unsustainable. Nomads wander further afield with their animals and inevitably intrude into other areas, perhaps with settled populations. The ensuing competition for resources frequently ignites into fighting (see the case study on Kenya on page 28). For example, in certain areas of Uganda more prone to the vicissitudes of the climate, conflict between tribes and cattle rustlers has increased.<sup>32</sup>

Often conflict, drought and famine interact with each other in a terrible, destructive cycle. Sometimes it is difficult to discern which is the trigger, but it is never hard to tell who suffers most.

During the Sudanese drought of 1997, some 100,000 poor people died.<sup>33</sup> It is clear that conflict exacerbated the drought and famine because it interrupted lines of supply and hindered emergency provision.

Siri Eriksen of Oslo University, is a former senior research fellow at the Center for International Climate and Environmental Research. She says: ‘Although many conflicts are politically instigated and driven by underlying political inequities in resource access rather than climate change as such, increasing drought stress can exacerbate conflict and violence.’<sup>34</sup>

### Refugees

The number of refugees created by climate change could be set to dwarf the numbers caused by conflict or political and economic necessity.

When land becomes uninhabitable because of drought, flood or sea-level rise, people will naturally seek to move to a safer location. This in itself can cause conflict, and if some of the predictions about climate change and the associated weather extremes do come about, the numbers forced to move will be massive.

The Red Cross has already identified that 25 million refugees (58 per cent of the global total)<sup>35</sup> owe their displacement to climate change and some believe that figure is about to get much higher.

The IPCC has estimated that by 2050, a combination of rising sea levels, erosion and agricultural damage due to climate change could make 150 million people environmental refugees.

Clearly, a movement of people on this scale will be unprecedented and will cause major social and economic upheaval and conflict. The impact on the countries to which these refugees flee is likely to be severe, creating huge new swathes of poverty.

### Spiral of despair

Poverty and climate change go hand in hand. A review of floods, disease, drought and conflict shows that climate change affects poor people more than any anyone else – and exacerbates their poverty.

Many of the burdens that poor people in Africa have to endure have always been around. Disease, for example, is not new to the continent. But climate change not only increases the incidence of disease per se but also makes the impact of that disease profoundly worse.

Dealing with HIV, for example, will be made far harder. If there is a famine caused by unusual warming, or a drought, or a spread of another disease, the effect on HIV treatment could be devastating.

As DFID puts it: ‘The poor have mechanisms to cope with climate variability but many of these will be overwhelmed by the extent of changes or by other pressures on their livelihoods... Pastoralists in Kenya were unable to draw on traditional migration strategies during the 2000 drought because land had been sold off to meet income needs and more affluent farmers had erected barriers across grazing lands.’<sup>36</sup>

So, climate change both poses its own dangers as well as insinuating itself around existing problems and amplifying them. That is what makes it such an enemy of the struggle against poverty.

If it is poor countries and poor people who are in gravest danger from the fall out of climate change, what can be done?

The same scientists who are arriving at consensus on the damage greenhouse gases cause are also in agreement that the first major step towards tacking the problem is to cut down on these emissions.

This obvious step is clearly one that Christian Aid would endorse. Unless we dramatically reduce the emissions that are damaging the atmosphere and changing the climate, we are probably doomed as a species; poor people first and then the rest.

A crucial point to bear in mind, however, is that poor people are not significant users of fossil fuel. Africa's total emissions of CO<sub>2</sub> are about nine times higher than in 1950. But in 2002 they had only reached 235 million metric tonnes is significantly less than the output from many individual developed countries.<sup>1</sup>

Even this tells a slightly skewed story, as the handful of more developed countries within Africa account for most of its carbon dioxide emissions. South Africa accounts for 40 per cent of the total and Algeria, Egypt, Libya, Morocco and Nigeria a further 44 per cent. At the same time, no less than 28 African countries produce so little CO<sub>2</sub> that they register only 0.1 metric tonnes per person per year<sup>2</sup> compared, for example, to one American who emits 24 tonnes a year.<sup>3</sup>

What these figures point to is a vast discrepancy between rich and poor. The richer and more developed the country, the larger the damaging fog of greenhouse gas that surrounds it; the poorer the country, the fewer emissions. Industrialised nations account for some 80 per cent of all the carbon dioxide in our atmosphere.

It is for this reason that the Kyoto protocol has provided a 'sliding scale' of cuts to emissions, with most of the richer

## India and China

Rapid economic growth in India and China has dramatically inflated demand for energy – and, since the vast majority of the power generated in each country is from coal, oil and gas, carbon emissions have followed suit.

China's GDP doubled from a little more than US\$500 billion in 1995 to around US\$1.1 trillion in 2005, and is expected to double again in the next ten years. While the country's consumption of energy per dollar of GDP has fallen, indicating increased efficiency, the doubling of its GDP has seen carbon emissions rise from around 800 million metric tonnes in 1995 to more than 1.2 billion metric tonnes in 2005. Against the projected further doubling of GDP by 2015 is a predicted 50 per cent rise in emissions.<sup>5</sup>

China is now the world's

second-largest consumer of energy and, concomitantly, the second-highest emitter of greenhouse gases, behind the US.<sup>6</sup> Nevertheless, because of its large population (1.3 billion in 2003), its annual per capita emissions of 2.7 metric tonnes<sup>7</sup> are still well below the global average, and just one-ninth that of the US. China, on the other hand, has a lot of growing still to do – 150 million of its people are still poor.<sup>8</sup>

India's GDP has also doubled, from more than US\$320 billion in 1994 to almost US\$690 billion in 2004.<sup>9</sup> Similarly, its carbon emissions have increased from 190 million metric tonnes in 1994 to 251 million metric tonnes in 2001.<sup>10</sup> It too has per-capita carbon emissions below the international average, at 1.2 metric tonnes a year.<sup>11</sup>

And India also has huge

scope for growth – 28.6 per cent of its population, some 300 million people, live below the poverty line.

Neither India nor China are Kyoto protocol 'annex 1' countries, which means they are not obliged to make cuts in greenhouse-gas emissions. In each case, their per-capita annual emissions are still low, but clearly if every person in India or China were to pollute to the same extent as a US or even European citizen, any chance of taming climate change would be lost.

Current patterns of energy consumption give little cause for hope. Both countries are heavily dependent on fossil fuels. China, according to popular climate change folklore, is building coal-fired power-stations at a rate of one per week.

There are, however, some positive signs. In the past two decades, by employing

measures to increase energy efficiency, China has reduced its expected energy use by a carbon equivalent of 250 million tonnes.<sup>12</sup> Beijing has recently begun to deploy 'energy police' in an attempt to cut excessive lighting and heating in commercial premises.<sup>13</sup> The Chinese government has passed laws allowing energy from renewable sources to be sold into the grid at a higher tariff and encouraging property developers to build more energy-efficient housing and offices. It has also famously introduced a tax on disposable items, such as wooden chopsticks.

China will soon be home to the world's largest 'ecocity'. Dongtan, situated on a coastal plain close to Shanghai, will house 50,000 people by 2010 and half a million by 2050. Its buildings will be energy efficient and designed to have



## The richer and more developed the country, the larger the damaging fog of greenhouse gas that surrounds it.

countries committed to greater reductions than the poorer ones. The spectacular exceptions to this are the US and Australia who have refused to ratify Kyoto, despite the fact that the US is biggest CO<sub>2</sub> emitter in the world and Australia is the second largest in per capita terms.

Christian Aid fully supports this principle of the 'polluter pays', because if climate change is the threat we believe it to be, the best way rich countries can help poor ones is to cut back strenuously on pumping greenhouse gases into the atmosphere we all share.

'What is required is a social mobilisation that insists on cuts in greenhouse gas emissions by industrialised countries in the order of 60-80% (relative to 1990 levels) by the middle of this century – far beyond the targets of the Kyoto protocol,' says Global Health Watch.<sup>4</sup>

Governments urgently need to play a role and take climate

change far more seriously than they have done so far. The UK government, for example, admitted in April 2006 that it is actually falling *behind* its stated target of a 20 per cent cut in the UK's emissions by 2012.

### Energising development

If rich countries should be obliged to make substantial cuts in their emissions, what about poorer countries? How can they climb out of poverty without using the very same fossil fuels that we know to be so destructive to the climate and to their own long-term development?

In the short term, the use of fossil fuels, in the absence of immediate alternatives, is essential for developing countries. It is because they currently produce so little CO<sub>2</sub>, compared to industrialised nations, that they should not, for the time being, be asked to make any cuts in their emissions.

a low environmental impact. All its transport and residential and commercial properties will be powered by wind, sunlight, or other renewable energy sources.<sup>14</sup>

More modest schemes are also in evidence in India. On the island of Sagar in the Ganges delta, for instance, the West Bengal Renewable Energy Development Agency has built a network of solar power plants connected to a localised grid system that provides energy to communities between 6pm and midnight. Bringing power to the predominantly poor communities on Sagar has revolutionised life there, enabling small businesses to operate in the evenings and adults to study – boosting literacy rates.<sup>15</sup>

But these are rays of hope in an otherwise gloomy picture. Despite the high levels of economic growth in

India and China, they are still home to almost half of the world's poor people. As the New Economics Foundation recently revealed, for every US\$100 increase in GDP, only US\$0.60 goes to poor people, making growth a hugely inefficient means of tackling poverty.<sup>16</sup>

Furthermore, when it is powered by coal, oil and gas – which seems inevitable given that both countries are suffering a power deficit – growth also leads to increased carbon emissions. Both countries are likely to experience climatic changes. Projections for India show increased rainfall of between 10 and 30 per cent in the centre of the country and a rise in average peak temperatures of 3-4°C by the end of the century. Among other things, these factors will increase the number of months malaria can be

transmitted by mosquitoes, especially in the north of the country.<sup>17</sup>

Once again, it is poor rural communities – still sizeable in both countries – that will be at the sharp end. Unchecked increases in emissions are not in their interests. And, as is the case for the rural poor in Africa, large-scale power generation – including India's much-heralded, US-endorsed nuclear programme – may not be the answer to their energy needs. It is likely to be hugely costly and will rely on a grid system to reach remote communities.

As the example of Sagar illustrates, poor communities without power can be transformed with modest and, most critically, renewable sources of energy. This is a win-win scenario. It means communities are able to leap forward because they have power, but do not shoot

themselves in the foot because that power causes further emissions that ultimately undermine their development through climate change.

The situation in India and China further underlines the importance of leadership in rich, industrialised countries that are still big emitters and bear the historical responsibility for the unsustainable level of greenhouse gases in the atmosphere. There is a clear role for the UK, Europe and individual states within the US – in lieu of the US government signing up to Kyoto – to lead by example and illustrate willingness to cut emissions and invest in renewable energy so that China, India and other larger developing countries have the confidence to do the same.



## 'Americans have been on a two-decade oil pig-out, gorging like oversized vacationers at a Vegas buffet.'<sup>18</sup>

*Fortune magazine, 2004*

That said, developing countries must now begin a fundamental switch away from fossil fuels to renewable energies like solar, wind, geothermal, biomass and hydropower, for these three powerful reasons:

- **Economic.** It already clear that fossil fuels, particularly oil, will become increasingly expensive for developing countries.
- **Environmental.** If poor countries do follow the fossil-fuel development models of richer countries in the North or the new developing nations like China and India, it would, in all likelihood, result in an enormous increase in global warming. If emissions from poor countries simply replaced those from rich ones, the damage to developing nations would merely continue.
- **Pro-poor.** On a more optimistic note, renewable energy could not only fuel cleaner growth in poorer countries but also present some startling and positive opportunities for a different kind of development. The potential to use renewables to enhance the lives of nearly a third of the world's population who currently live without electricity – or 'off-grid' – is immense and at the heart of Christian Aid's pro-poor analysis of how to respond to the challenge of climate change.

### **Economic cost**

Oil is still the world's major source of energy and carbon emissions, providing 40 per cent of the planet's power. The two other big hydrocarbon fuels – and therefore CO<sub>2</sub> emitters – are gas and coal, which provide a further 23 per cent each.

It's not just Americans in gas-guzzling Humvees who are to blame. Europe, Australia, China and India have all seen oil consumption increase in the past decade so that globally around 84 billion barrels of the black stuff is now pumped out of the ground every day.<sup>19</sup> In 2004, demand increased by 2.6 million barrels a day.<sup>20</sup>

A report by the Exxon-Mobil Corporation projected that the world will need 40 per cent more energy in 2020 than it does today. It also predicted that consumption levels would reach the equivalent of 300 million barrels a day, with most of the new demand coming from increased energy use in poor countries.<sup>21</sup>

But oil is a finite substance and one day will run out. As it becomes scarcer, it will also become harder to extract, as it will be deeper underground or in fields that are more difficult to get at. So even before the last drop of oil is squeezed out of the earth it will become prohibitively expensive.

The point at which there is less oil in the ground than has already been extracted is known as the 'Hubbert Peak', in honour of the American geologist who correctly predicted the peak supply of US oilfields.

After it has reached the Hubbert Peak, oil becomes more expensive. Today there is fierce debate between scientists about when we'll reach this global peak. Some say we have already passed it while others predict it won't come for another 20 years or so.

Most, however, believe that this peak is imminent. Within most of our lifetimes, then, oil will probably become significantly more expensive as demand increases for a diminishing supply.

Some argue that prices might level out for a period as technology becomes more efficient at extracting the deposits. But there will inevitably come a moment when even the most efficient technology will not be able to hold back the price of a dwindling oil pool.

In December 2005, analysts at investment bank Goldman Sachs predicted that high oil prices had entered a 'super spike' phase that could last for four more years, in contrast with other predictions that said that crude oil prices had reached their peak earlier in 2005. The analysts said oil demand remained resilient while supply was lacklustre, prompting them to keep their average US crude price forecast for the whole of 2006 at US\$68 a barrel – a massive leap from an average of US\$24.9 per barrel just four years ago. They also predicted that oil prices could soon see 1970s-style price surges to as high as US\$105 a barrel.<sup>22</sup>

The world's volatile political situation has also helped to raise oil prices. Some of the major oil-producing regions are the most vulnerable to the kind of pressure that halts oil production and sends prices soaring.

This year, for example, geopolitical reasons have helped increase the oil price to more than US\$60 per barrel and in April 2006 crude oil prices reached an all-time high of US\$72 a barrel. The prospect of conflict between the West and Iran over its nuclear ambitions and local unrest in Nigeria, which reduced its oil-producing capacity, sent a cold shiver through the market. The situation in Iraq is still highly unstable and Saudi oil installations have been attacked.

Add to this Hurricane Katrina, which temporarily halted oil production in the Gulf of Mexico, and even the oil-loving US President George W Bush was forced to admit at the beginning of 2006 that his country had to be weaned off its addiction to oil.

If, as is likely, oil prices increase even further, the effect on developing countries can be expected to be severe. To measure the likely impact, we have calculated how much rising oil prices could cost sub-Saharan Africa as it looks to fund its development.

If the region continues using oil as its primary energy

source, it will need substantial amounts to power its growth. Christian Aid has postulated two scenarios using the New Economics Foundation's figures, shown in the table below.

Assuming that the cost of oil rises moderately until 2015, sub-Saharan Africa will end up spending US\$45.9 billion per year on oil – 5.8 per cent of its GDP.

The second is the more realistic 'high' oil-price scenario. This would see sub-Saharan Africa spending US\$83.6 billion on oil, representing 10.6 per cent of its total GDP in 2015 (compared with 3.3 per cent in 2004). This means that rising oil price rises between 2004 and 2015 would force sub-Saharan Africa to spend an extra US\$57.4 billion on buying oil.

Either scenario involves billions of dollars going to oil companies instead of being spent on things that really matter to poor people. Indeed, if the high oil-price scenario becomes a reality, the US\$57.4 billion extra sub-Saharan Africa will have to pour into oil companies' coffers could instead vaccinate the world's children (US\$450 million);<sup>23</sup> send them to primary school (US\$5.6 billion);<sup>24</sup> provide antiretroviral therapy and HIV education

Below: Projected total expenditure on oil per year in sub-Saharan Africa<sup>25</sup>

to everyone who needs it in low- and middle-income countries (US\$15 billion);<sup>26</sup> buy an insecticide-treated mosquito net (costing US\$3) for everyone in the world (US\$18 billion) and still leave more than US\$18 billion to spare.

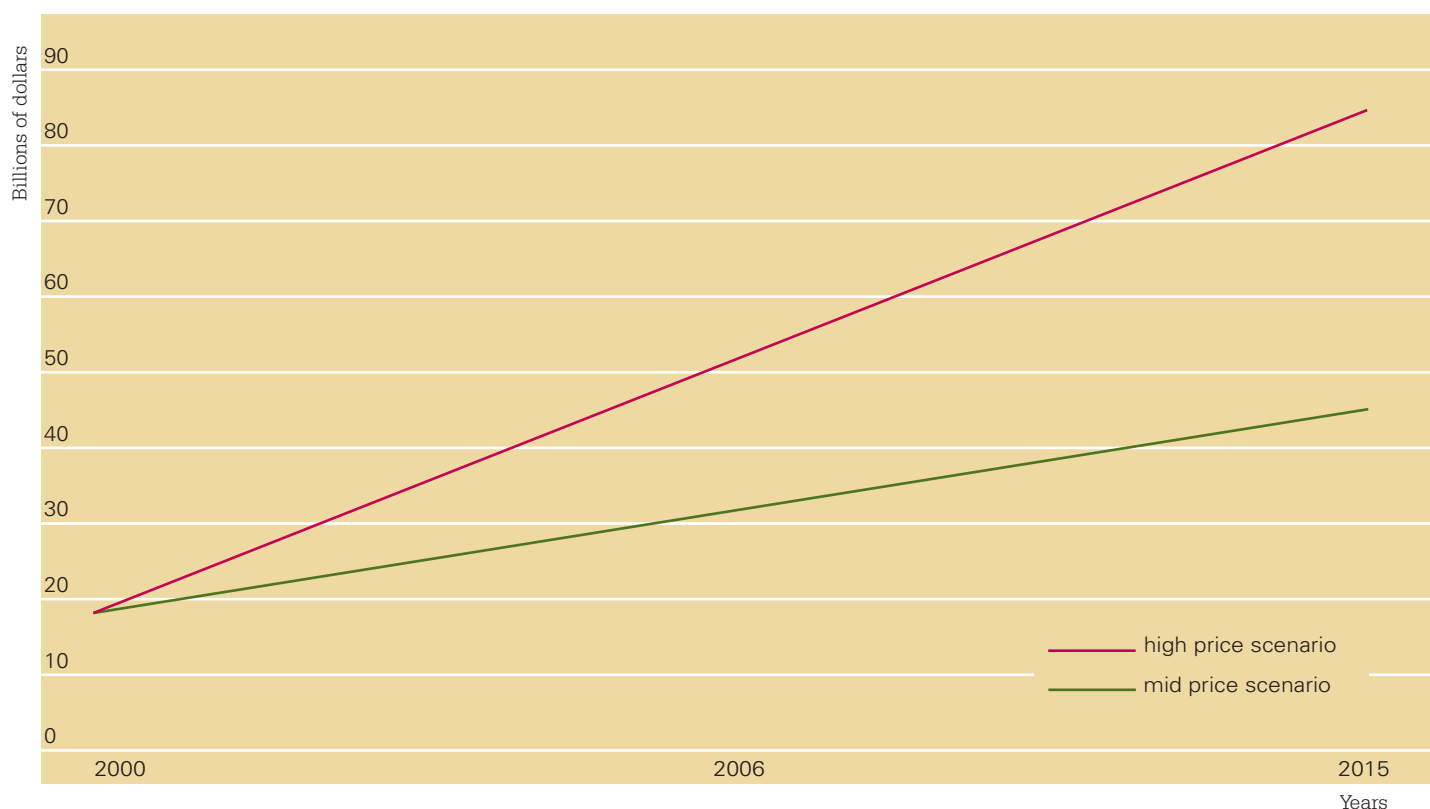
Without this money to spend on these poverty-related areas, the chances of reaching the millennium development goals (MDGs) by 2015 grow ever more unrealistic.

Instead of wasting this money on oil, sub-Saharan Africa would be better served if it switched to renewable energy. According to some forecasts, it would cost Africa considerably less than US\$50 billion to adopt a mix of renewable energy technologies to supply its energy needs.<sup>27</sup>

## Carbon cost

There is, of course, another cost associated with oil use, which may be far more significant than money alone – carbon emissions.

Christian Aid estimates that if sub-Saharan Africa grows by 7.1 per cent a year – the amount the UN says will be required for it to achieve its MDGs by 2015 – and continues to use oil as one of its primary fossil fuels, it will be pumping an extra 76 million tonnes of carbon a year into the atmosphere by 2015.



**Growth fallacy**

More economic growth means more energy use. If this growth is powered by fossil fuels, the increases in carbon emissions will inevitably hurt poor people. The question is whether the benefits of growth outweigh the costs of climate change.

The benefits of growth are not as clear as many might think. DFID and the UK government are strident advocates of the 'growth will reduce poverty' school of development. But there is actually very little evidence underpinning this article of economic faith. Between 1990 and 2001, for every US\$100

worth of growth in global per capita income, only US\$0.60 found its way into the pockets of poor people.<sup>28</sup> They are bearing the costs of US\$100 worth of growth, but only seeing US\$0.60 worth of benefits. This does not look like a good deal.

And if growth is powered by fossil-fuel-based energy and increases in carbon emissions, it also – according to the central thesis of this report and an increasing number of decision-makers including Tony Blair – actually *damages* the interests of poor people.

Rather than relying on growth per se to deliver benefits to poor people, the

aim should be to encourage growth in those parts of the economy where poor people are likely to benefit – such as small-scale agriculture and labour-intensive industries – and on making sure that they benefit directly from the wealth created. Pro-poor growth ought also to be that which emits the least amount of greenhouse gas and leads to the least climate change.

This means a pro-poor economy is one organised to create jobs and public infrastructure, in which wealth is more equally distributed and which powers its growth with efficient and, wherever possible, renewable energy.

This would make sub-Saharan Africa a significant emitter of greenhouse gases with all the harmful consequences to the climate and poor people that would follow. So while the region should be encouraged to achieve its MDGs, there are concerns over the environmental costs involved.

Should poor countries have the right to develop with fossil fuels given that they did not cause the disequilibrium that now so disadvantages them? In the short term, the hard answer has to be a guarded 'yes'. To say otherwise would be to condemn developing countries to poverty, while allowing the rich and wasteful nations to sit back and enjoy the benefits of a growth that is destroying the atmosphere.

If the Kyoto protocol is adhered to and the US comes on board, the resulting CO<sub>2</sub> cuts may give developing countries 'space' to increase their carbon fuel consumption.

However, this is only a short-term solution. The longer-term answer requires the developed world to continue making significant CO<sub>2</sub> cuts, while poor nations switch over to a mode of development that does not require increasingly expensive and damaging fossil fuels.

When the Kyoto protocol expires in 2012, there will be an urgent need for an international agreement to replace it, that sets new and more stringent emission targets. Any such agreement should also include the larger developing nations, such as India, China, Brazil and South Africa.

**Carbon fix**

The key for poor countries wanting to grow out of poverty without harming the environment, is what development agencies have been discussing for decades, namely 'sustainable development'. The best definition of this in a climate change context is perhaps: 'that development which meets the long-term needs of poor people, while safeguarding finite natural resources for future generations.'

This means producing food and other goods and services without overusing scarce resources, such as water or wood. It means not damaging the land or watercourses or atmosphere with toxic substances. It means not wasting precious commodities.

Christian Aid supports many organisations across the world that practise precisely this type of approach. Farmers who conserve seed, herders who practise good husbandry, fishermen who use traditional methods that don't deplete stocks are all examples of the kind of work that happens already, and indeed, in some cases, has happened for millennia.

Improving all of these activities requires increased levels of energy. So too does improved transport, education, healthcare and just about any primary service that one can think of – all of which need to be enhanced if the MDGs stand a chance of being reached.

In sub-Saharan Africa, oil fuels most of these activities.

## It is not noble or interesting to live without power... Yet nearly one-third of the world's population are 'off-grid'.

Crude oil still dominates energy production in Africa, though its share has declined: in 1970 it constituted 86 per cent of energy production, with coal, gas and hydro constituting 11, 2 and 0.5 per cent respectively. But in 1997, oil had declined to 63 per cent, while coal had increased to 19 per cent and natural gas to 15 per cent. Hydro remained static.<sup>29</sup>

Oil accounts for roughly 60 per cent of commercial energy consumption in Africa, with 53 per cent of oil used by transport, 13 per cent by industry and 13 per cent by residential sectors.<sup>30</sup>

Given the terrible costs involved, sub-Saharan Africa, along with the rest of the world, needs to wean itself away from this dependence on fossil fuels. Long the poor relation in any discussion about energy use and development, the time has now come for renewable energy to claim its rightful place at the top of the agenda.

Christian Aid believes that tapping non-carbon sources of power like solar, wind, hydro, biofuels and geothermal, as well as using existing energy more efficiently, is essential if developing countries are to escape the twin dangers of climate change and poverty.

It is no coincidence that the vast majority of the world's 1.6 billion people who do not have access to the electricity grid are poor. If you are wealthy you do not often choose to live without power. Power enables people to do the basic things in life: cook, keep warm, light their homes, feel secure.

It has a host of secondary functions that we, who have power, take for granted. Phones, fridges, machinery, showers, computers, medicines, radios, TVs, fans, torches; a thousand devices need power. Any industry, from farming to hairdressing, benefits from energy. Muscle may be fine for fetching water from a well, but a pump is easier; a kerosene lamp sputtering smoke may allow you to see for a few hours at night, but a light bulb is better.

It is not noble or interesting to live without power. It is difficult and confining and marks you as being down at the bottom of the developmental pile. Yet nearly one-third of the world's population are 'off grid'.

The proportion is far higher in sub-Saharan Africa, where only eight per cent of the rural population has access to electricity, compared with 51 per cent of the urban population.<sup>31</sup>

Here is a breakdown of the average household access to electricity in different African regions:

- Central Africa: 9 per cent
- East Africa: 10 per cent
- West Africa: 17.9 per cent
- Southern Africa: 20.8 per cent
- Northern Africa: 85.8 per cent<sup>32</sup>

Despite the relatively high figures for northern Africa, the 'average' African is still using less energy than the 'average' person used in England in 1875.<sup>33</sup>

One of the consequences of this in Africa and in other poor regions of the world is that people use what they can for fuel, and that is almost always wood. Indeed, Africa's use of firewood and charcoal as energy sources – about 67 per cent of primary energy use – is the highest in the world.<sup>34</sup>

This damages the environment. Trees hold fragile soil together, help prevent desertification, provide an ecosystem for wildlife, suck up CO<sub>2</sub>, and provide medicines and building materials.

Another cost of using wood or dung that is rarely taken into account is the physical harm that comes from the smoke they produce. Disturbingly, cooking with biomass inside a house or hut contributes to the biggest single killer of small children in developing countries.

According to a definitive World Health Organisation (WHO) scientific study, around 50 per cent of people – almost all of which live in developing countries – rely on coal and biomass in the form of wood, dung and crops for domestic energy. This exposes mainly women and children to indoor air pollution from stoves every day of their lives.

'There is consistent evidence that indoor air pollution increases the risk of chronic obstructive pulmonary disease and of acute respiratory infections in childhood, the most important cause of death among children under five years of age in developing countries. Evidence also exists of associations with low birth weight, increased infant and perinatal mortality, pulmonary tuberculosis, nasopharyngeal and laryngeal cancer.'<sup>35</sup>

There are, then, compelling reasons why developing countries should switch away from wood, avoid other fossil fuels and switch to renewables.

Later, we will examine the types of renewable energy available, their benefits and some of the difficulties inherent in getting them off the ground.

But first, a tale from Africa.

## Solar future – now

Jigawa state is in the far north of Nigeria, on the edge of the Sahel region. It is hot, dusty and remote. Its people are poor and poorly served by their government. Nigeria is rich in oil. It is the fifth richest member of the Organisation of Petroleum Exporting Countries (OPEC), yet this wealth has brought few benefits to Jigawa.

A recurrent feature of life in Nigeria is blackouts – electricity supply is sporadic at best in towns, in villages it is non-existent. There is little expectation that the national grid will reach these villages in the near future, so the government of Jigawa state decided to try something radically different.

In 2001, an American organisation, the Solar Electric Light Fund, joined up with the Jigawa Alternative Energy Fund to use solar power to provide essential services in three villages. Solar energy would be used to provide electricity to 20 households in each village; there would be street lighting and electricity for schools, clinics, a water pump and a business centre. Two technicians are responsible for basic maintenance, such as checking and watering batteries and cleaning the lamps. Senior technicians who visit the villages each month handle more complex jobs.

'We first discussed other possibilities such as coal or biogas,' says Mohammad

Sani Muhammad, the executive secretary of the Jigawa fund. 'Solar was the obvious solution. Not only would we be helping economic development, but we would also cut down on deforestation which is such a big problem here.'

Ahoto is one of the chosen three; a remote village more than 100km from Jigawa's forlorn capital of Dutse. Ahoto has about 400 families; they live in large compounds of thatched huts for the extended family. Pigs, goats and chickens also live in the compounds, scrabbling for food around the communal cooking areas. The more fortunate families – 20 in all – now have a three- or five-light solar system.

The head of the village, Garba Bello, is delighted. He has a five-light system in his compound and pays about 600 naira (US\$4) a month.

'The difference is great,' says Garba. 'People now go out at night and chat. Before, you could not even see your neighbour's house in the night. It is also good for the women because there are classes for them at night in the school.'

But the real difference is in the bustling shopping area – along the dusty path that leads from the school to the mosque is a newly constructed block with six rooms. Each houses a different business and when darkness falls, this is the social and economic hub of Ahoto.

'Before, we had to work at

night with a lantern. It was terrible, so much heat and smoke,' says tailor Omar Aliyu. 'Now we have a lot of business, especially before religious festivals.' Omar has done so well he now owns five farms and employs farm hands.

Omar's fellow tailor is Garbe Tela. A football fanatic, he has even made his own football boots complete with a homemade Nike logo. 'Now I even have a fan next to me to keep me cool. Before, I worked in front of my house with a kerosene lantern right up close to the machine. The smoke was horrible.'

Moussa Muhammad, the solar field manager for Ahoto, says the system is so successful that many more households would like to be connected, but the expense is prohibitive. Even this small foray into solar energy costs about ten million naira (US\$8,000) per village.

The solar panels are also very vulnerable, which is why local communities need to take ownership of their systems. There are panels on the roof of the concrete business block, but they cannot be installed on the thatched roofs of homes, so they are attached to poles. The panels for the water pump are set out in an enclosed area protected by a 24-hour watchman. Petty vandalism or a severe storm can easily damage a panel.

The water pump is vital for the health of the villagers. For the first time they have access

to clean, fresh water. Fifteen household compounds have taps and there are ten communal taps. The pump provides water during daylight hours; the rest of the time it comes from an overhead tank holding 1,000 gallons.

The shops stay open until well past midnight. If it were possible to build another block of shops, there would be no problem filling them with businesses. Auwalal Muhammad decided not to wait; he ran a cable under the sand to his radio repair shop. His shop is piled up with radios waiting to be repaired. 'It was very difficult before,' he says. 'I used a kerosene stove and had to work with live flame and heat. Now I have ten times more business and I am doing so well I even got myself another wife.'

Solar energy has changed the lives of women. Sharia law is strictly enforced in this part of Nigeria and women are not allowed to leave their compounds during daylight hours. Street lighting actually makes life more complicated for them, as they should not be seen at night either, but they manage to skirt around the lit areas. Those lucky enough to have light in their compounds say it is easier for them to care for their children.

'Before, you had to buy kerosene and sometimes you did not have the money,' says Fatima Bello, the wizened mother of the head of the village. 'Now you can work at night, you have no difficulty,



you thank God. You can wash and skin peanuts at night and then they are ready for grinding in the morning.'

But the grinding machine still runs on a generator. The amount of energy required to operate it means using solar power is not cost effective.

The mosque is vital in this deeply religious village. Set in the centre it holds 200 worshippers inside and for Friday prayers attracts 500 more outside. It has four inside lights and the solar-powered public address system facilitates the call to prayer.

As in all developing countries, Nigeria's young people need to travel to the cities in search of jobs. A guaranteed supply of electricity can change all that. Salisu Ibrahim worked for one year as a barber before setting up a shop in Ahoto's business centre. 'Before, when I used hand clippers, I used to travel all over – to Abuja, Kano and around Plateau state just looking for business,' he says while trimming the hair of a terrified-looking nine-year-old. 'Now I am staying put. I earn enough to look after my

wife and child and my parents. Business is very good; people are attracted by modern equipment.'

Solar energy has dramatically changed the lives of these villagers. Economically they are better off, they have access to clean water and education is not limited to daylight hours. The benefits have led the Jigawa state government to approve funds to supply 30 more villages with solar energy. None of these villages are likely to have access to the national grid in the next ten years.

However, without serious

research and development, it is unlikely that solar energy can make the leap from isolated villages to towns and cities. Solar energy for a three-bedroom bungalow in the city of Kano costs one million naira (US\$800); a generator comes to just half that amount.

Omar Aliya in his tailor's shop in Ahoto, Nigeria. Solar powered electric light allows him to work at night, making all the difference to his business. Before, he had to use a kerosene lantern; the fumes and heat made work very difficult



Christian Aid/Sam Faulkner/NB Pictures



## What power?

In Nigeria the renewable of choice is solar power. But for Africa – as elsewhere – the type of energy chosen depends very much on local circumstances.

In hot, dry areas, solar will clearly have a role. While in windy regions – such as South Africa and parts of the Red Sea coast – wind turbines will make more sense. However, winds in sub-Saharan Africa tend to be so light that most of wind energy's potential there lies in powering water pumps rather than generating electricity.<sup>36</sup>

African river systems may yield more power than wind. There are environmental problems with large dams that displace populations and disrupt ecosystems. But systems that draw power from rushing water without disturbing the wider environment are highly efficient sources of power generation. To date, however, less than seven per cent of Africa's massive hydropower potential has been harnessed.<sup>37</sup>

If used sustainably, biomass has enormous potential, whatever the region. Biomass power is derived from vegetation – trees, bushes, grass or crops.

It has great potential to create fuel for cooking, heating and transport. Bio-ethanol (alcohol spirit derived from plants) is already used widely across the world as a substitute for petrol and a means of powering industry. Biofuels give off some CO<sub>2</sub>, but far less than oil.

More than 20 per cent of all of Mauritius' electricity comes from a derivative of sugar. It is estimated that up to 16 countries in sub-Saharan Africa could meet a significant proportion of their current electricity consumption in the same way.<sup>38</sup>

On a smaller but still important scale, an energy-efficient charcoal kiln and a cleaner stove for rural and urban households in sub-Saharan Africa has been developed in the past 20 years.<sup>39</sup>

Another renewable power source is geothermal, which involves converting heat from the ground into energy. It has huge potential but is often overlooked. Although only four of Africa's 53 countries have started exploring underground heat sources,<sup>40</sup> the continent has an estimated potential of 9,000 megawatts of geothermal power. (One megawatt could power 1,000 homes in rich countries.) To date, only 123 megawatts of that energy has been tapped.<sup>41</sup>

In reality, it is impossible to say that one type of renewable is the answer to a particular region's energy needs. A combination of all or some of these options is likely to work out best.

## Power to the people

Renewables enable people to cook, drill for and pump water; run fridges; store vaccines; light homes, schools, clinics and businesses; power computers and phones; make stills to get drinking water from salt water; and power drying machinery to keep food pristine until it's needed to eat or sell. Indeed, renewable energy can help people perform any number of life-enhancing tasks.

Women are especially likely to benefit. Millions of women in Asia, Africa and South America spend countless hours involved in the drudgery of collecting firewood, hauling water and hand-grinding grain. With power, this could all change.

Renewables do not contribute to greenhouse gas emissions; they are cheaper than oil will become; and they literally empower poor people to climb out of poverty and reach the MDGs. For these reasons renewables are simply the only option that makes sense for poor people.

Given the tremendous advantages of renewable energy, it is legitimate to wonder why developing countries have not already started down this path. But one crucial question remains: can Africa, or anywhere else, get to a position where it can actually profit from renewables?

In some ways, we have been here before. After the last major oil price hike in the 1970s there was considerable talk about renewables but little came of it. The technology was awkward and, in today's terms, not very efficient. And as the price of oil came down, the comparative cost of solar rose.

The focus is now back on alternatives to fossil fuel because of massive oil price hikes and increased concern about climate change. But renewables still present some serious problems.

The first and biggest obstacle has always been price. While the cost of a diesel generator, as in the example from Nigeria on page 20, is substantially less than a single solar panel that delivers less power, it is hardly surprising that most people choose the cheaper, more powerful option.

Today there are many who argue that the true costs of oil are not taken into account. The economic cost of dealing with the environmental fallout of oil is never factored in. But with solar, as with other renewables, you pay for a lifetime's supply up front. If you stretch out the cost of solar power over the length of its use, it begins to stack up economically with fossil fuels.

And solar power seems even less expensive when you consider that, according to some estimates, if the World Bank redirected only one year's worth of its spending on fossil-fuel projects to small-scale solar installations in sub-Saharan Africa, it could provide ten million people with electricity. And all of non-

### Ray of hope

The stinking Kibera slum in Nairobi has a reputation for spawning criminals, inter-ethnic violence and misery – not for breeding entrepreneurs and philanthropists.

Almost all of Kenya's 42 tribes are represented here among the one million illegal squatters who live hunched up in densely-packed one-room shacks.

They have no bathrooms. The lucky ones share communal toilets – holes in the ground that empty straight into open ditches where the human waste sits

and festers until it rains.

Few residents have electricity. Those that do have often created their own supply. Many sometimes unofficially connect their wires into a neighbours' house to use their electricity. With the plethora of wires snaking in and out of makeshift connections, it can be a dangerous business. Too often, fires sweep through the closely-packed dwellings, killing and maiming.

It's not a place where you would expect to find a thriving small business. But the young men and women of the Kibera Community

Youth Programme (KCYP) have spotted a gap in the market; they are producing solar power for radios, lights and mobile phones.

The small team work in a ramshackle building on the edge of the slum, making small power packs from fragments of solar panels. The panels are wired up so they can be attached to portable radios – precluding the need to rely on expensive disposable batteries – or to mobile phones for recharging, or even portable lights and torches.

The completed panels are cheap to buy, free to run and

need no maintenance. This literally empowers poor slum dwellers. They can use their phones to keep in contact with family, friends and prospective employers and use their radios to keep up with the news or listen to health-education broadcasts.

The solar project makes enough money to pay for itself, fund other projects run by KCYP and give the project members a living wage. The young men and women who came up with the idea – the eldest is only 24 – are all products of the Kibera slum.

One of the organisers, Robert Kheyi, said: 'We



Christian Aid/Maxwell Awanda

left school with nothing – no qualifications and no future apart from irregular manual work. ‘We wanted to do something for ourselves and our community and came up with the youth programme.

‘We got the idea for the solar project from a man from Wales who visited us. He told us how to get cheap, small solar panels and how to wire them up. We took it on and we do the marketing.

‘Our only problem is that now we can’t make them fast enough.’

Robert and his colleagues have a certainty about the

value of what they do and the success they know they will eventually share.

They are looking for suppliers who can sell them parts in bulk at cheaper prices. And they plan to take their products beyond Kibera to rural communities across Kenya – and even into Sudan, Senegal, Ghana, Uganda and elsewhere.

‘Solar power is safe, it’s affordable and it’s environmentally friendly,’ says Robert. ‘We are working on a panel that will charge up a 12-volt battery so that people can run computers and TVs. It takes a day to

charge up a car battery. If we can perfect this, we will change people’s lives.’

Bottom left: Project organiser Robert Kheyi Ckheyi charges a mobile phone with a mini-solar panel produced by the Kibera Community Programme

electrified sub-Saharan Africa could be provided with energy from small-scale solar facilities for less than 70 per cent of what OECD countries spend on subsidising dirty energy every year.<sup>42</sup>

A massive shift is required, away from subsidising fossil fuels and into renewable energies. Once renewable systems are price competitive with carbon ones, they become an attractive option. They will only become cheaper, however, if these systems are mass-produced and the technology improves.

Fortunately, there are real signs of progress on this front. There has been a substantial drop in the production costs of solar technology in Africa over the past 20 years, reflecting a worldwide increase in solar-cell production. During the 1990s, for example, the photovoltaic (PV) market grew by around 25 per cent<sup>43</sup> – PV being the type of solar system that most people are familiar with, usually a solar panel that converts the sun’s light, as opposed to heat, into electricity. In 2004, the solar power business was worth US\$7.5 billion and is currently growing by more than 30 per cent per annum.<sup>44</sup>

Solar technology has improved enormously. Second- and third-generation PV panels and roof tiles now charge up faster, are cheaper and last longer. PV solar power is also best-suited to smaller, off-grid houses and settlements, precisely where most agrarian poor people live.

Off-grid systems tend to be far more efficient than the large power stations that provide energy for grids. These power

stations use coal, gas, oil or atomic energy to heat water that drives turbines to produce energy that is then distributed across the grid – but this system is riddled with inefficiencies. In the UK, for instance, 65 per cent of the energy produced in power stations is lost before it reaches businesses and homes because the heat generated during the process is lost and energy leaches away during its transmission across the national grid.<sup>45</sup>

Generating power close to where it is used, to reduce losses during transmission and so that the heat as well as the electricity generated can be harnessed, is a far more efficient way of producing energy. A good example of this already exists in the UK.

Woking Borough Council in Surrey, south-east England, has adopted a climate change strategy and has reduced carbon emissions in council buildings and its stock of properties across the borough by 77.4 per cent against 1990 levels. It has achieved this by generating power close to where it will be used, harnessing the heat as well as the electricity generated and using solar and fuel-cell technologies where possible. Woking funded its energy investments by recycling the money saved through increased energy efficiency.<sup>46</sup>

But if renewables are ever to genuinely replace fossil fuels, there will also have to be large-scale power for industry. Until recently this was not technologically possible, but advances in another type of solar power seem to indicate that this too could be achievable.



## 'And now we face a crisis with unprecedented danger that also presents an opportunity like no other.'

Al Gore, former US vice-president

Concentrated solar thermal power derives energy from the sun's heat (as opposed to light, as in the PV model). These are large systems that require serious amounts of land and sunshine to work. But once they do, they become comparable with oil- and coal-fired power stations.

Concentrated power is still a young technology, but power stations have already been built in California and many more are about to begin production in India, Algeria, Egypt, Morocco, Spain, Mexico, Italy, Greece and elsewhere.<sup>47</sup>

According to Greenpeace, solar thermal power is capable of supplying electricity to 100 million people across the world within just two decades.

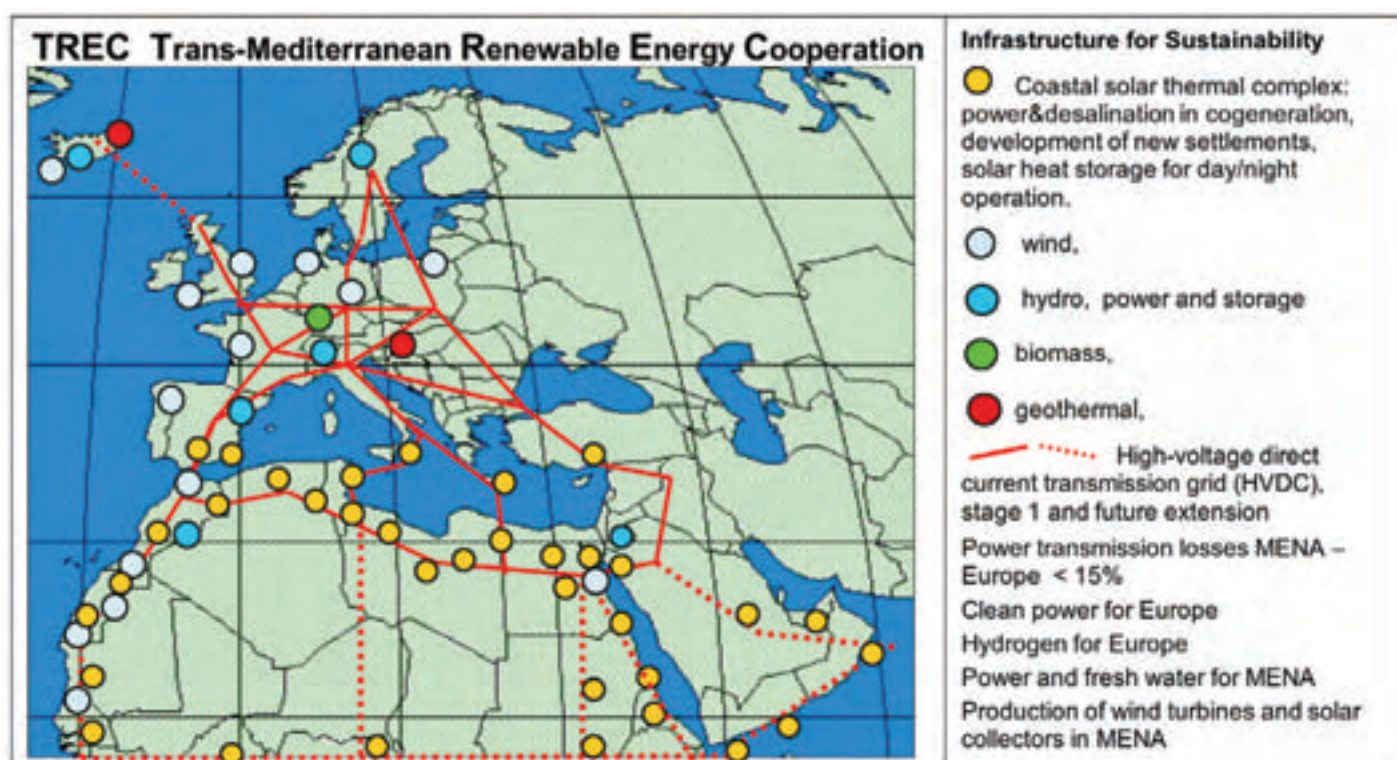
Greenpeace has calculated that: 'In many regions of the world, one square kilometre of land is enough to generate as much as 100-120 gigawatt hours of electricity per year using solar thermal technology. This is equivalent to the annual production of a conventional 50 megawatt coal- or gas-fired mid-load power plant. Over the total life cycle of a solar thermal power system, its output would be equivalent to the energy contained in more than five million barrels of oil.'<sup>48</sup>

### World power – from Africa

Some forecasters have envisaged giant concentrated solar-power and hydro-thermal stations across the Middle East, parts of Europe and North Africa powering the whole of Europe (see map, below). But if Europe could be powered from Africa there is no reason why Africa could not power itself.

The environmentalist Club of Rome was one of the first organisations to argue that finding alternative energy sources was a necessity given the finite nature of fossil fuels. One of its offshoots, the Trans Mediterranean Renewable Energy Cooperation (TREC), has produced a blueprint for renewable power.

It says both technically feasible and affordable forms of renewable energy already exist and far surpass humanity's needs: 'By far the largest potential is the direct solar energy radiation onto deserts. If deployment of concentrating solar power plants – a technology in operation since 20 years – were to grow by 25 per cent per year, which is technically, economically and logistically feasible, then within 40 years we could achieve much of what needs to be done to provide affordable, reliable and secure power for the world-wide needs, and to stabilise the world's climate.'<sup>49</sup>



Source: Trans Mediterranean Renewable Energy Cooperation

There are other exciting developments waiting to happen. Scientists in the US are developing a flexible, photovoltaic, paint-like substance that can be applied to large and small surfaces alike.

Others are examining nanotechnology, the use of microscopic engineering to emulate the natural world. Plants do two things that human beings are struggling to copy: they use sunlight to convert carbon dioxide and water into sugar and oxygen; they also store the sun's energy overnight. They both eliminate a greenhouse gas and overcome one of the biggest drawbacks of any man-made solar system, namely that it stops working when there is no light. But so far man's attempts at storage are cumbersome beside the power of plants.

There is still some way to go, but it does not seem entirely fanciful to imagine that solar power could take off as fast as other new technologies. Mobile phones were virtually unknown in Africa 15 years ago and now have almost replaced existing, terrestrial phone systems.

Even as things stand, the cost of solar power may not be beyond Africa and the international community. For example, one estimate calculates that providing solar electricity to a village of 50 households would cost an average of US\$25,000.<sup>50</sup> Assuming conservatively that the average household size in sub-Saharan Africa is five people, this works out at a cost of about US\$100 per person.<sup>51</sup>

If one multiplies this by the number of people in sub-Saharan Africa without electricity – about 500 million – it works out at about US\$50 billion.<sup>52</sup> This figure compares favourably with the amount the region is likely to have to spend on oil over the next decade.

In the industrialised world, the market is the main driver for expansion. But while it has an important role to play, it would be irresponsible to leave the ushering in of a new age of renewable energy solely to the market.

We all have a stake in moving beyond fossil fuels as swiftly as possible and it is imperative to use any and every mechanism to hand in both the state and private sector.

Governments of rich countries must intervene to fund research and development on renewables. At the same time, the World Bank and International Monetary Fund must swiftly increase their funding of the renewable sector in poor countries.

Meanwhile, rich-country governments must phase out the massive public subsidies they give to fossil-fuel industries. In the last decade, industrialised countries on average gave the oil industry a massive US\$73 billion in subsidies per year during the late 1990s<sup>53</sup> – roughly equivalent to the global aid budget.

Only with the state and market working in tandem will the economies of scale needed to bring cost down happen sufficiently quickly. Only with the whole of society operating in concert will we ever get the type of power system that poor people need and, ultimately, we all so urgently require.

Former US vice president Al Gore has written extensively about the environmental crisis. Like Christian Aid, he too sees that as well as terrible risks there are real prospects for a better world that arise out of global warming.

As he puts it: 'And now we face a crisis with unprecedented danger that also presents an opportunity like no other. As we rise to meet this historic challenge, it promises prosperity, common purpose and the renewal of our moral authority. We should not wait. We cannot wait. We must not wait.'<sup>54</sup>

Once Sambarwawa had water, now it has bodies. Following prolonged drought, animal carcasses litter the valley and the stench of decay pervades the remote village of Sambarwawa in the heart of the northern Kenyan district of Isiolo.

But Sambarwawa is not only a graveyard for the animals of local livestock farmers. Some of these nomadic herders – known as pastoralists – have also died because of the drought; not from starvation or thirst, but as a result of escalating conflict in the area. They were murdered for their water.

Sambarwawa is a place where groups of pastoralists congregate in times of drought. Each group is allocated a space on the dry river bed to drill a borehole for water. They are allowed to bring their animals to drink here once every four days. 'It's a sort of cafeteria system to ensure everybody has a chance to get water for their animals,' says local leader Wako Liba.

But the system has been under extraordinary strain for years because of almost a decade of drought.<sup>1</sup> By December last year, some 10,000 herders with 200,000 animals had descended on tiny Sambarwawa, many trekking 400km from the epicentre of the drought in the east. Although the village had not seen rain for a year, they knew they could still find water under the riverbed. But then the boreholes began to dry up.

'As the water level dropped, I foresaw conflict,' says Liba. 'Some herders started encroaching on boreholes owned by different communities. As one group pushed to water its livestock, another moved to restrict access to the few boreholes that had enough water.'

In December, as the drought intensified, the pressure finally led to killings.

'Gunshots reverberated the whole night,' Liba recalls. 'By the time I came down, seven people had died. There were dozens of injuries. Animal carcasses littered almost a kilometre stretch of the valley.'

David Kheyle, 37, was queuing for water when fighting broke out. 'There was grumbling that evening. A good number of boreholes didn't have water so the queues were relentless,' he says.

'People were becoming impatient. Suddenly there was a scramble at the northern end of the valley... it was a free-for-all. But it later took on an ethnic dimension when people aligned with their kind to defend themselves.'

Over the next 40 days, there were another four violent incidents that left at least two more people dead, according to government officials. More than 3,000 animals – pastoral communities' only assets – were stolen.

Arkan Athan Hussein, a lanky 18-year-old herder, was injured

in one of the incidents while tending his family's livestock. His friend, Abdi Maalim, was killed.

'Six armed people emerged from nowhere. They wanted us to help them drive their livestock to the watering point. We couldn't do that. The use of boreholes is restricted so we couldn't push through someone else's herds.

'As we resisted, one of them raised his AK-47 and shot Abdi in the chest and shoulder. As I fled, they shot at me.'

Arkan's father, 70-year-old Ibrahim Hussein, says that in the 40 years he has been coming to Sambarwawa, this is the first time there has been such violence. In response, the authorities have set up a police post manned by 12 specially-trained officers. But the area remains tense. The link between drought and conflict is widely recognised in Kenya.

Edwin Rutto of the Africa Peace Forum monitors violent incidents in the country. He says that there is an 'established correlation between drought and violent conflict... During times of drought, conflict between communities over water and pastures increases.'

It is a view echoed by Professor Richard Odingo, vice-chairman of the UK's Intergovernmental Panel on Climate Change (IPCC), who has published work on drought-related conflict in north-eastern Kenya.

'During a period of drought, the strongest survive,' he says. 'It's survival of the fittest. You have a lot of conflict because of that. It is related to the struggle for resources, especially water and grazing.' As the climate changes, say experts that Christian Aid interviewed, this is certain to get worse.

Recent drought has also triggered violence between communities in Naivasha's Mai Mahiu area, 90km north-west of Kenya's capital, Nairobi. In January and February 2005, 22 people were killed and more than a dozen hospitalised in fighting over a water point on Ewaso Kedong river. When farmers diverted water to irrigate their farms, Maasai pastoralists living downstream illegally occupied their land, stole livestock and destroyed waterpipes in protest.

The Maasai were desperate for water because Kajiado district, where they live, had received less than 20 per cent of its usual rainfall during 2004 and 2005.<sup>2</sup> The violence took on an ethnic dimension, as gangs from different tribes staged revenge attacks, pulling Maasai passengers out of buses and killing them with machetes, spears and arrows.

Conflict over access to water, grazing and land has resulted in extreme violence between Borana and Gabra pastoralists in Kenya's Marsabit district, near the Ethiopian border. On 12 July 2005, 56 people, including 22 primary school children, were



killed in Turbi village. Another 20 people died in revenge attacks as Borana passengers were pulled from buses and murdered.

The problem has even begun to cross international borders, raising the fearsome spectre of war. In recent weeks, drought has caused conflict between Ugandan and Kenyan pastoralists. And Ethiopian troops have moved into parts of northern Somalia to stop Somalis crossing the border in search of pasture and water for their livestock.

## Climate change

As part of his work for the IPCC, Richard Odingo has been monitoring climate change in Africa. 'We have rather frightening evidence. If you go back 50 years, climate is changing and is changing fairly rapidly for the worse,' he says.

The melting of the glaciers on Mount Kenya provides the clearest evidence of climate change. 'The glaciers on Mount Kenya have always been there,' he says. 'They have fluctuated during periods of drought. They have come back during periods of heavy rain. But for the first time we are seeing almost the disappearance of the glaciers.'

Professor Eric Odada, the regional director for climate change research in Africa at the Paris-based International Council for Science, argues that the melting of the glaciers on Mount Kilimanjaro, just across Kenya's southern border with Tanzania, will have further devastating implications for some of Kenya's most fertile lands. They provide the source for many local rivers, but they are disappearing. Professor Odada warns that rain-fed lakes will dry up, hitting some of the most populated parts of east Africa.

'Cities like Mombasa [Kenya's second largest city] will be put in a difficult situation because [it] is getting water from Mzima Springs which is fed by the glaciers on Mount Kilimanjaro,' he says.

The rapidity with which glaciers are melting shows that Kenya is getting warmer. This is confirmed by measurements on the ground. For example, the maximum temperature in Kericho, a highland area in the Rift Valley province where most of Kenya's tea exports are grown, has increased by 3.5°C during the past 20 years.<sup>3</sup> In Lamu, on Kenya's north-eastern coast near Somalia, the maximum temperature has increased by more than 3°C since the 1940s.<sup>4</sup>

Peter Ambenje, head of forecasting at Kenya Meteorological Department, says: 'There seems to be increased frequency and intensity of severe weather and extreme climate events. Just by looking at rainfall patterns for the last 25 years... severe drought... seem[s] to be becoming more prevalent. We can

[also] see very high variability in rainfall.'

Dr Jesse Njoka of the University of Nairobi is an expert on the ecology of Kenya's arid and semi-arid lands. His analysis backs up Ambenje's observations. 'The beginning and end of the rains are no longer that predictable,' he explains. 'Even drought within the rainy season is an issue. For example, we always expect rains to start at the end of March. Now they are predicted for April. We expected grass rains [rains which allow grass to grow] in the middle of February and now it appears the rains we had in March are grass rains.'

The implications are serious. Crops die during these prolonged dry spells and animals have no grass to feed on and perish.

## Poverty and climate

In Kenya, where 56 per cent of the population live on less than US\$2 a day, it is the poor who will be hardest hit by climate change.

Pastoralists are among the poorest and least educated people in Kenya. They spend their lives traversing the arid and semi-arid lands that make up 80 per cent of the country, looking for water and pasture. Most of the herders in Sambarwawa have never stepped inside a classroom and cannot speak either of Kenya's national languages, English or Swahili.

With the recurring droughts brought by climate change, poor pastoralists are stuck in an ever-tightening poverty-trap. 'After people go through a period of relative recovery, then another drought hits. People are living in a state of perpetual suffering,' says Edwin Rutto of the Africa Peace Forum.

If the climate cannot sustain you, then you tend to spend a lifetime careering from crisis to crisis, periodically relying on emergency aid. This is undermining the government's development efforts. 'It is extremely expensive to feed people. The government has diverted all its development money to emergency money,' says Fatuma Abdikadir, national coordinator of the government's Arid Lands Resource Management Project.

People are left with very few choices when drought strikes – women and children fewest of all. As Dominic Kariuki of the peace-negotiating organisation Chemchemi Ya Ukweli puts it, 'You can't sell your animals – you don't have [any]. You can't sell your labour – you don't have skills. So you are left with your body.'

Prostitution has fast become not just the last but the only resort for many women and children – some as young as seven, according to Kariuki. He says: 'They have lost their relatives. They are on their own. There is nobody to protect

## 'After people go through a period of relative recovery, then another drought hits. People are living in a state of perpetual suffering.'

Edwin Rutto of the Africa Peace Forum

them. They come to work almost as slaves in urban centres where they work for food and nothing else. When those jobs are not available and they are getting used to urban life, they broaden their survival skills.'

### War

Prospects for the future are grim. Experts agree that conflict is likely to become more widespread, particularly as water shortages worsen. Cross-border conflict in the Horn of Africa, already existing on a small-scale, is likely to escalate.

Traditionally, young men in pastoralist groups attack their neighbours to steal their cattle. This is part of the culture of communities like the Turkana and Pokot from Kenya, the Karamajong from Uganda, Toposa from Sudan, Oromo and Merille from Ethiopia and numerous Somali clans. But these raids have become increasingly deadly in recent years with the influx of cheap guns from nearby war zones. Communities are becoming caught up in an endless cycle of revenge attacks.

Nomads are used to crossing borders in search of scarce water and pasture. As drought tightens its grip on the region, the pressure to search for water is intensifying, leading to armed violence and deaths. In March, for example, Kenyan Pokots raided a Ugandan settlement, killing 16 people. In retaliation, the Ugandan army sent in a helicopter to pursue the Pokot raiders. Increasingly, soldiers are being used to protect communities, for example, around Soroti in eastern Uganda. A military response is one small step closer to state-backed conflict – or war.

Water shortages could also lead to conflict between Kenya and Ethiopia. Kenya's arid Turkana district, which borders Ethiopia, has only two sources of freshwater – the Turkwell and Omo rivers. The Turkwell, in Kenya, has been dammed to generate electricity, reducing its flow downstream. The Omo originates in the Ethiopian highlands.

Professor Eric Odada of the International Council for Science, says: 'On the Ethiopian side, they're now diverting this water for irrigation and very little is coming into Lake Turkana. Turkana people are now very worried because [the river] is turning saline. The lake level has dropped by 60 metres over the last ten years.'

Another likely water war is over the River Nile which flows through Sudan to Egypt and the Mediterranean Sea. Lake Victoria, in western Kenya, is one of its sources. Yet, under the rules of a treaty drawn up by British colonialists, Kenyans are not allowed to use the water for irrigation. Only Egypt, further downstream has this right.



Peace negotiator Dominic Kariuki says: 'Due to that treaty, which was written without our consent, some people are dying of drought in Kenya. Conflict will explode as the water lessens. If it's not worked out that we share the little that is there, then people will start fighting. It's just a matter of time.'

Experts are increasingly concerned about the widening impacts of climate change. Professor Eric Odada foresees a 'doomsday' when 'there will be mass migrations by people from Africa in search of food'.

'Europe should be prepared,' he says. 'We are either going to prosper together or perish together when climate change comes. They should not think that the barrier between Morocco and Spain will stop people from the south moving into Europe.'

Mazeda Begum's eyes well with tears as she describes how desperate poverty forced her to send her nine-year-old daughter to work as a servant in a strange city hundreds of miles away. That was five years ago and Mazeda has only been able to see Shada Rani once a year since.

'I think she is being well looked after and she is getting enough to eat, which is more than I could provide for her,' she says as she sits on the ground in the shade of a banyan tree.

Mazeda, 35, had spent her whole life in Balashighat, a village in the Gaibandha district of northern Bangladesh, until the river Tista began to erode the land she lived on. For three years in a row, she and her husband and three children were forced to abandon their house and build a new shelter further back from the crumbling riverbank.

Then, in 2000, the river finally swallowed all that remained of their small plot of farmland. Saving only what they could carry, the family had to flee by boat to a raised embankment a kilometre away, built by the government to protect a nearby town from floods.

Ever since, they have lived on the seven-metre high, five-metre wide embankment which winds through waterlogged paddy fields, camping alongside 200 other families who also lost their homes to river erosion.

For the first few days after they arrived they sheltered under a tree, using plastic sheets to keep off the heavy rain. A few weeks later Mazeda's husband built a house with palm leaves and straw. But without their land, where they used to grow wheat, rice and jute, they had no way of earning an income. So Mazeda decided to send Shada Rani to Dhaka. 'I had no choice but to send her as we could not afford to feed the whole family,' she says. 'I did the right thing for her.'

## Coping with erosion

River erosion and flooding are part of everyday life in many areas of Bangladesh. Most of the 200 families on the embankment have moved two or three times because of erosion and some say they have had to move as many as ten or 11 times during their lives.

They also say these events have become more common in the past few years. 'Before, my father could predict how the river would change course over the years. But now it happens too fast for us to be able to predict,' Mazeda says.

Surveys conducted in villages and rural areas show that people in Bangladesh are aware that their weather patterns are changing, even though they may not understand why, and many are worried.

They are right to be. Bangladesh will be one of the countries hit hardest by climate change. More frequent floods, erosion and rising sea levels could reduce its landmass by more than a fifth, forcing millions of people to leave their homes and migrate in search of food, water and shelter.<sup>1</sup> Climate change could also cause droughts in some parts of the country and lead to more and stronger cyclones.

The Tista is one of 230 rivers that criss-cross the country. Further downstream it becomes the Brahmaputra, one of three great rivers – the others are the Ganges and the Meghna – which together drain 175 million hectares of land.<sup>2</sup>

The outflow of water from Bangladesh is the third highest in the world after the Amazon and Congo systems. Although it is only the size of Greece, as much water flows through the country as through the whole of Europe. And with more than 140 million people, Bangladesh is among the most densely populated agricultural nations in the world. People must use every available piece of fertile land, including riverbanks – where they are at greater risk from flooding.

Each year during the monsoon season, which runs from July to September, roughly a fifth of the country is flooded. People have become used to coping with the inundation. In fact they welcome this regular flooding as it deposits essential nutrients on the soil, allowing them to grow crops year after year.

River erosion is also a natural process caused by the scouring action of the water as it flows downstream. Also, as floodwaters recede, the riverbank often breaks up and tens of metres of land can be washed downstream. At the same time deposits of silt can create new land, which is particularly vulnerable to erosion.

Although flooding and erosion are nothing new to the people of Bangladesh, the past 20 years have seen the incidences of both intensify. In 1987, 1988, 1995, 1998 and 2004, severe floods left vast swathes (more than two-thirds in 1988 and 1998) of the country under water. The 2004 floods destroyed 80 per cent of the country's crops, killed 747 people and left 30 million homeless or stranded.<sup>3</sup>

A good number of scientists and non-governmental organisations working with flood and river-erosion victims are certain that climate change is increasing the frequency of floods and the speed of erosion. Others agree that weather patterns are changing but are more circumspect about drawing a direct link between climate change and more erosion or floods.

'We simply do not know if climate change is definitely increasing the erosion by our rivers. There are many complex factors involved,' says Dr Atiq Rahman, executive director of

## 'Forget about making poverty history. Climate change will make poverty permanent.'

Nazmul Chowdhury from Practical Action

the Bangladesh Centre for Advanced Studies (BCAS), a Christian Aid partner organisation and the country's leading environmental research group.

But, he adds, 'what we can say is that patterns of rainfall and flooding have changed in the past few years. Severe floods used to come once every 20 years, but now seem to occur around every five to seven years. This could very well be linked with climate change.'

But while the debate continues over whether Bangladesh is already feeling the effects of climate change, the forecast of what is to come for the country is indisputably dire.

### Predictions

Climate models developed by the Intergovernmental Panel on Climate Change (IPCC) indicate that Bangladesh could experience ten to 15 per cent more rainfall by 2030.<sup>4</sup>

This heavier rainfall will flood between 20 and 40 per cent more land than today, according to Monirul Qader Mirza, a Bangladeshi water-resources expert within the University of Toronto's Adaptation and Impacts Research Group.<sup>5</sup>

This flooding will be exacerbated as increasing global temperatures melt more snow in the Himalayan mountains in Nepal and India each summer. Already studies have shown that the Himalayan glaciers are retreating at a rate of about ten to 15 metres per year.<sup>6</sup> The huge amount of water created runs into rivers, many of which eventually flow through Bangladesh on their way to the sea.

At the same time higher sea levels and higher tidal surges caused by more intense cyclones – which are also predicted to become worse with climate change – will decrease the rate at which water is discharged into the sea. This 'back-water effect' means floodwater will continue to accumulate, inundating more parts of the country and increasing the depth and area of flooding in those places already affected.

'Anything which increases the flow of water through the rivers – such as more rain, more glacial melt or higher sea levels – will cause more river erosion and more flooding,' says Dr Rahman from BCAS. 'The amount of water coming from the Himalayas is huge and flows through the three main rivers which end in the Bay of Bengal.'

'When the sea level is higher, the flow of that water will be restricted and it will only be able to spread sideways which means more severe and prolonged floods. Bangladesh is already a flood-prone country but it will become much worse in future.'

However, eventually if the glaciers melt completely, runoff

will decrease rather than increase, leading to water shortages rather than floods.<sup>7</sup>

Nazmul Chowdhury, from UK-based development agency Practical Action, runs a project that helps Mazeda and those like her who have lost their land find permanent homes and new ways of earning a living. He is in no doubt that floods and river erosion are getting worse and that this is linked to climate change.

'The intensity of the floods is increasing year by year and the river erosion is happening much more in recent years,' he says. 'Of course the people who are facing the brunt of this process are the villagers who are poor to start with. Now they are in an even more vulnerable situation. Forget about making poverty history. Climate change will make poverty permanent.'

Flood victims get some support from the government. But those affected by river erosion get very little financial compensation, even if they permanently lose their home or land, according to Charles Sarkar of Christian Aid partner the Christian Commission for Development in Bangladesh (CCDB). 'They have nowhere to go and end up living on relatives' land or by the roadside or on embankments,' he says.

CCDB estimates that each year a million people are displaced by river erosion, many permanently. But this would be nothing compared to the numbers who may have to migrate in the future. Experts have forecast that climate change could result in 150 million environmental refugees by 2050, including around 15 million from Bangladesh.<sup>8</sup>

### Encroaching seas

Most of Bangladesh is less than ten metres above sea level.<sup>9</sup> A rise in sea levels of between nine and 95 centimetres by the year 2100 – which is towards the top end of the IPCC's predictions – would leave about 18 per cent (or 25,000 square kilometres) of Bangladesh under water.<sup>10</sup>

About 35 million people live in the country's coastal areas<sup>11</sup> and many could be forced to migrate inland as sea levels rise. This will put pressure on non-coastal areas, where land is scarce and the population density already high – and where climate change could already be causing more flooding and erosion.

Scientists also predict that global warming will increase the frequency and intensity of tropical storms. If the surface temperature of the sea rises, cyclones – which already hit Bangladesh regularly, with devastating consequences – are more likely to form.

The island of Kutubdia, just off the coast of the southern



district of Cox's Bazar, has shrunk by half in less than 50 years because of coastal erosion, according to the Coastal Association for Social Transformation (Coast) Trust. In 1959 it covered an area of 36 square kilometres, but in 2005 was just 18 square kilometres, according to Coast, which has analysed maps from the Bangladesh Water Development Board.

Much of the erosion happened as a result of a devastating cyclone in 1991, which killed 140,000 people across Bangladesh, including 22,000 in Kutubdia. But erosion also occurs every year during the high monsoon tides. A government-built embankment has held off the erosion in recent years. But where the embankment does not exist or is broken, the sea continues to swallow up land.

In June 2005, Pancha Bala saw her home broken apart by the waves. Sand covers the place where the house stood and where she used to sleep is now part of the beach.

Pancha, 45, whose husband died of cancer a year ago, says that when she moved into the bamboo house about quarter of a century ago, the sea was nearly 1km away. 'I had lived in the house for many years. It was destroyed in the cyclone in 1991, but we rebuilt it on the same spot,' she recalls.

'Over the years the sea was coming closer and closer, but in the end the waves took it in one night. The waves and rain started at ten in the morning. That first day, the kitchen was washed away. We thought we might drown, so we left.' She took her six children to her sister-in-law's house further inland, but the final memories of her home still haunt her.

'I didn't sleep at all that night. The wind was howling and I could hear the roar of the sea. I was only thinking about the future and how we would live. When it became light I went outside and could not even see my house. It was covered by the water. I just sat and cried. Still I am angry with the sea for destroying my house.'

There is anecdotal evidence that the rate of erosion has increased in Kutubdia in the past few years. The Coast trust estimates that if the erosion continues at the same rate, Kutubdia will vanish from the map completely in 70 years, forcing the remaining population of around 150,000 to find shelter and work elsewhere.

Again, the factors involved in coastal erosion are complex. But if sea levels rise, tidal surges are likely to be stronger which increases the rate of erosion.

'Over the last 20 years erosion has increased in coastal areas,' says Dr M Rafique Islam, leader of Intergovernmental Coastal Zone Management (ICZM), a body which advises the government on coastal issues. 'Why exactly this is happening we are not sure, but certainly climate change is something that we believe is one of the factors.'

'As climate change gets worse, coastal erosion will get worse. Of course I am worried about the future for those who live and work on our coastlines. There is a disaster coming and all that we can do is try to make people better able to cope.'

Work is already underway to mitigate the effects of climate change and help those at risk adapt. Many of Christian Aid's partners in Bangladesh help the victims of river and coastal erosion and flooding, training communities to prepare for future disasters.

CCDB and Gonoshasthaya Kendra (another Christian Aid partner) have built numerous multipurpose cyclone shelters in the country's coastal areas and islands. They and other partners, including Gono Unnayan Procheta, the Church of Bangladesh and UBINIG also build raised platforms to provide shelter for

people and livestock during emergencies, and help communities diversify their crops and find alternative employment.

During the 2004 floods, Christian Aid and seven partners successfully worked together to respond to the emergency, helping more than 100,000 families. The same group is a leading member of a new five-year Christian Aid project called Building Disaster Resilient Communities, which aims to reduce vulnerability to future crises in six different countries.

### Far from home

Although Pancha has only left Kutubdia twice in her life, she says she will soon have to move away from the island. 'We cannot stay with my sister-in-law forever. We have no house, no land and no money,' she says.

This year, Pancha's 24-year-old son decided to move to Kutubdia Para, a slum area of Cox's Bazar on the mainland. It is home to around 20,000 people from the island who lost their homes after the cyclone or because of erosion.

Nur Hussain is among them. He left the island where his family had lived for generations, after losing his house. During the monsoon of July 2005, heavy rains and two-metre-high waves lashed the island. Within the space of 24 hours, Nur's house and the land it stood on had gone.

'I did not know how my family would survive or where we would live. I was filled with despair. The sea had swallowed my home,' he says.

The family stayed with relatives for six months until they made the hard decision to move to the mainland. 'Kutubdia is my home, my motherland,' says Nur, 'but I had to leave. Sometimes I cry for what I have lost.'

Others are facing different problems that seem to point to climate change.

A rise in sea levels will enable saline water to intrude further inland during high tides and salt in the groundwater will increase, leaving fields near the coast useless for farming, according to Dr Rahman from BCAS. On Kutubdia and the mainland, there are signs that this is already happening.

Saiful Islam used to grow rice on his farm near Moghnama village in Cox's Bazar district. Gradually his rice production decreased until, eventually, the rice seedlings failed to grow at all because of the increased salinity of the land.

'Now I cultivate salt because nothing else will grow,' he says as he scrapes his fresh 'crop' across the plastic sheeting laid out over his fields, which are around 1.5km from the sea.

'Salinity is increasing in land near the coast,' says ICZM's Dr Islam. 'Some people blame contamination for this – that as one person cultivates salt on their land, saline water will move into neighbouring fields. Contamination can be a localised issue, but that could not cause the big shifts that we are seeing now.'

Mazeda, Pancha, Nur and Saiful have never heard of the terms climate change, global warming or carbon dioxide emissions. They have never even been in a car. But it is people like these – who are already the most vulnerable – that will be hardest hit by climate change.

As Rezaul Karim Chowdhury, executive director of Coast, says, 'It is the rich that cause climate change and it is the poor here in Bangladesh who will pay the price.'



Tackling poverty and dealing with climate change are now inextricably bound together. Neither poor people nor the climate can wait long for change. Nothing short of a revolution in the way development takes place will suit the needs of either.

In May 2000, Christian Aid warned of the impending disaster of climate change and its impact on poor people.<sup>1</sup> At the time, we found ourselves dealing with increasingly frequent and ferocious climate-related disasters. Since then, along with our partner organisations in poor countries and the people with whom they work, we have also begun to experience the chronic impact of changing weather patterns – unpredictable and volatile rains and ever longer intervening dry periods.<sup>2</sup>

Most poor people depend on their natural environment for their survival and livelihood. Because many also live fragile and marginal existences, any change in the nature of their environment will affect them profoundly. Climate change, as this report definitively establishes, affects poor people first and worst.

Now urgent action is required to halt the rate of climate change and, ultimately, reverse it. This action must come primarily from the industrialised world, from the governments of rich countries and from international organisations. But it must also come from the governments of poor countries.

We do not pretend to have all the answers – this is a vast and complex subject.

What we do know is that unless the first steps outlined in this report are undertaken now, then vast sections of the world's poor people will be condemned to a future even more terrible than they face today. And while it may be poor people who suffer first, the rest of us will assuredly follow.

This is a global problem that requires a global solution. None of us can shelter in bunkers of ignorance or self-interest any more.

It would be easy to give up in the face of such an overwhelming problem, and some forecasts say that it is already too late to reverse the situation. Christian Aid emphatically rejects this position. Ours is not a counsel of despair.

The problems are vast, it is true. But if we accept our responsibility to act now, there is a massive opportunity, not only to halt climate change, but to explore new methods of development that bypass discredited, fossil-fuelled models of growth.

Naturally, poor people need more secure ways of making a living, which implies that new jobs must be created in the countries in which they live. While this may mean more carbon emissions in the short term, it can no longer be argued that

growth can only be achieved at the expense of the climate. For growth to favour poor people it must, among other things, use clean technologies wherever possible – growth and development must be sustainable.

With renewable energies there is real hope that this can be achieved. It is clear there are rapid innovations taking place in these clean technologies – in wind, solar and water power – reminiscent of the early days of information technology or mobile phones. And like the Information Age, the Renewable Age could also herald real new opportunities.

If the relentless quest for polluting growth can be stemmed; if carbon emissions can be cut; if new approaches to development can be found for billions of the world's poor people – then the climate change crisis might actually be the genesis of something truly positive instead of being part of a terminal global decline.

The question is whether this revolution is happening fast enough and whether the powers that be are listening. It is up to all of us to ensure that they do.

## **Cutting carbon emissions**

The first and best way to alleviate the effects of climate change on poor people is for the rich world to make immediate and dramatic cuts to damaging greenhouse gas emissions. Where climate change is concerned, our charitable feelings towards the world's poorest people must truly begin with action at home.

So far, the UK and Ireland's contribution has been less than adequate.

Rhetorically, the UK government is taking a leading role. Its focus on both climate change and Africa during its presidency of the G8 last year was most welcome. Its advocacy at the UN climate summit in Montreal in December 2005 in favour of the Kyoto protocol and measures for cutting carbon emissions beyond 2012 are also to be commended.

In reality, however, the government has recently backed away from its previous target of reducing UK emissions by 20 per cent by 2010.<sup>3</sup> Ministers now 'aspire' to hitting the target, saying that 15-18 per cent cuts are more likely. This is extremely disappointing.

Beyond the emissions that the UK pumps directly into the atmosphere – two per cent of the global share – the top 100 stocks and shares traded on the London Stock Exchange are in companies that, between them, are responsible for more than 12 per cent of the world's total emissions.<sup>4</sup> UK plc is a major polluter.

Ireland, meanwhile, has one of the most fossil-fuel intensive economies in the world, with little energy coming from renewable sources.<sup>5</sup> The country is expected to overshoot its Kyoto target by more than 7 million tonnes a year from 2008 – a further 1.75 tonnes per person per year.<sup>6</sup>

The UK and Ireland must now:

- Set an annual 'carbon budget' to limit the amount of greenhouse gas they can produce each year. This budget should then contract by three per cent year-on-year in order to reduce emissions by more than 60 per cent by 2050.
- Offer incentives and penalties in sectors where the most emissions can be cut. The transport and energy industries are the two most significant and demand the governments' most urgent attention. Steps should also be taken by both countries to curb the rapidly rising emissions resulting from the growth in aviation.
- Report annually on whether or not emissions are kept within the limits of the carbon budget, and to set the budget for the following year.
- Establish independent-audit commissions to check that emissions are being reduced in line with the carbon budget and recommend how to ensure they stay within this limit.
- Provide significant tax incentives to drive UK and Irish innovation in renewable energy and other clean technology and use public subsidy to support research and development.

### **Championing sustainable development**

The UK and Irish governments must champion a development revolution – in particular through their development white papers – setting sustainability at its heart.

- The UK government must produce a much clearer working definition of sustainable development that has at its core the stewardship of natural resources, including the atmosphere, for future generations.
- The proposed Irish Aid Environment Policy for Sustainable Development and accompanying three-year action plan, expected in autumn 2006, must also produce a clearer working definition of sustainable development.
- The notion of sustainable development should replace macroeconomic growth as the mantra of development. Growth in itself is neither an efficient tool for poverty eradication nor a policy that can be successfully pursued at the expense of the environment.

- As the aid budgets of the UK and Ireland increase over the next few years, a greater emphasis must be placed on environmental issues and the way in which they relate to poverty. A more finely tuned understanding of sustainable development should be put into practice through a climate-proofing of programmes. This would involve:
  - a thorough review of donor support (through the World Bank and other IFIs) for coal, oil and gas extraction, with a view to phasing it out
  - major new research examining the power needs of poor communities
  - giving additional funds as effective compensation to help vulnerable poor people withstand the inevitable increase in climate-related disasters
  - contribute significantly to international funds to help poor countries take these necessary steps.

### **International**

Climate experts suggest that greenhouse gas emissions must peak by 2015 and then decline rapidly thereafter if the worst of climate change is to be avoided. The significance of this date will not be lost on anyone taking part in the development debate; it is the year by which world leaders have pledged that poverty must be halved and many infectious diseases eradicated.

Action to tackle climate change must be international and equitable. That people in sub-Saharan Africa emit less than one tonne of carbon per year and people in the US more than 24 tonnes is a factual illustration of the current inequity. This must change.

Christian Aid believes, above all else, that poor people have a right to develop and live long, dignified, productive lives. They have a right, in the pursuit of development, to emit carbon just as those countries that are now wealthy have and continue to do. First and foremost, it is rich countries' obligation to create the atmospheric 'space' for this to happen by making real cuts in their emissions.

It is also rich countries' responsibility – having already increased the atmospheric concentration of greenhouse gases to dangerous levels – to help poor countries escape poverty through clean technology. This is not a pipe dream. Renewable energy technology and energy-saving measures (for households, communities, cities and countries) are already available. The overwhelming challenge – witnessed by Christian Aid in Nigeria's solar villages – is the high upfront cost of renewable energy.

## While it may be poor people who suffer first, the rest of us will assuredly follow.

- As a starting point, all OECD governments must sign and ratify the Kyoto protocol. Kyoto is not perfect, but it is the only forum for international negotiations on climate change.
- Each OECD government should then adopt its own carbon budget, similar to that Christian Aid recommends for the UK and Ireland. In future, carbon budgets should be apportioned globally, and then be divided by country, industry and even individually.
- As a matter of urgency, the UN's development programme must add a discreet carbon-emissions goal to its 2015 millennium development goals that translates the science of climate change into measurable emissions targets.
- Public funding must be phased out for projects with high production or consumption carbon emissions (oil, gas and coal extraction and fossil fuel-based power generation in particular). This includes funding from the World Bank, other multilateral development banks, export credit agencies and development agencies.
- A global aviation tax, following the model suggested by the French government, should be levied on airline ticket prices as a means of both raising revenue for development and curbing the runaway growth in air travel. In future, this tax should be transferred to aviation fuel itself.
- Rich countries must fund community-led adaptation programmes in poor countries to help those areas of the world already affected to adapt to climate change. In effect, this is compensation for the damage done and must be funded from additional sources, not out of current aid budgets or from any existing promises to increase aid to 0.7 per cent of national wealth.
- While people in poor countries should not be held responsible for climate change, their governments have an obligation to prevent a rapid growth in emissions as their economies grow. After 2012, when the first period of the Kyoto protocol ends, a new agreement that includes binding commitments must be made by rich countries and by those with large and rapidly growing economies – such as China, India, Brazil and South Africa – to control and reduce their emissions. It should also give other, poorer countries the option to sign.

### Climate change: A call to action

**Individuals** Climate change unites us all – each and every one of us will suffer if we allow runaway increases in our emissions to further damage an already ailing atmosphere.

More than one-third of the UK's carbon emissions and a little less than one-third of Ireland's come from people's homes or road transport.<sup>7</sup> This is an issue of personal choice as well as government policy. Christian Aid believes the government must set the framework for change and we will campaign for this, both unilaterally and in coalition with others. But to save 182 million lives in poor countries, individuals must reduce their energy use, lower their carbon emissions and consider contributing financially to offset schemes to support development overseas.

Christian Aid plans to work with its UK and Irish supporters and sponsoring churches to communicate a message of change in the climate's favour – change in government policies, change in organisations, change in individuals' lifestyles.

**Christian Aid** The central tenet of this report is that carbon emissions hurt poor people. It therefore follows that Christian Aid's emissions hurt poor people and that they must be reduced wherever possible.

Christian Aid is and shall remain a development organisation. The vast majority of our income must be spent helping poor people escape poverty through sustainable development programmes. We must balance our efforts to reduce our emissions against this core purpose.

That said, there are simple steps that we can and will aim to take to bring about a reduction in our carbon emissions. These include:

- seeking to buy energy from a supplier that both sources from and funds the building of renewable energy installations
- reducing staff travel, especially involving flying
- taking all feasible energy-efficiency measures, which will both help reduce emissions and may also save Christian Aid money.

Our aim is to reduce our emissions by at least three per cent per year. We aim to achieve this by saving energy, switching sources and purchasing voluntary 'Gold Standard' offsets to account for those carbon emissions we cannot eliminate.

We will also work with our field offices and partner organisations in poor countries with the eventual aim of monitoring the environmental sustainability of projects across all our programmes.

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**25** Based on calculations by David Woodward, Head of Global New Economies, New Economics Foundation, London, and Christian Aid. (Using the base year of 2004 we know from DEFRA sources that



sub-Saharan Africa consumed 1,323 million barrels of oil per day. In this year we know from World Bank figures that the region's GDP was approximately US\$544 billion. We therefore know that it takes 1,323 million barrels of oil per day to achieve this level of GDP. We know that in 2004 sub-Saharan Africa spent 3.3 per cent of its GDP on oil. We also know that the average growth rate in sub-Saharan Africa over the past five years has been 3.4 per cent a year. We know, too, that the price of a barrel of oil bought in sub-Saharan Africa during 2004 was US\$37.70. NEF has also forecast how much oil will cost in sub-Saharan Africa each year up to and including 2015 using two different price structures, a mid cost and a high cost. The mid-price scenario is based on NYMEX oil futures prices (as of 22 March 2006) until 2012. Thereafter, prices are assumed to remain constant in real terms. This represents an average reduction in the real price of 1.8 per cent per annum between 2005 and 2025. The high-price scenario predicts that the oil price reaches US\$100 per barrel in nominal terms in 2012, and continues to rise at a similar (arithmetic) rate thereafter. This represents an average increase in the real price of 4.4 per cent per annum between 2005 and 2025.)

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