



Dried up, drowned out



Voices from the developing world
on a changing climate

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(see APPENDIX 1 for full acknowledgements):

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Tearfund is an evangelical Christian relief and development charity working with local partners to bring help and hope to communities in need around the world.

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Communities around the world are extremely vulnerable to changes in climate, particularly in agriculture-based societies.

Photo: Jim Loring

Executive summary

This report reveals that poor communities around the world are extremely vulnerable to climate changes at the local level. These changes are the result of a number of different factors, but local environmental management is very significant in many cases. Whatever the cause now, human-induced global climate change is happening and is only going to make things worse. Serious international action on climate change is needed with regard to mitigation, adaptation, and wider issues of justice for the poor. These findings emerged as a result of asking Tearfund partner organisations, working with poor communities around the world, to share experiences of their own climate.

VOICES FROM AFRICA Tearfund partners in Africa report that they are experiencing increasingly long and frequent periods of drought, as well as there being more flash floods. Rainfall is decreasing, becoming more unpredictable, and the seasons are less distinct. Drinking water is becoming less readily available, and agricultural cycles are disrupted, causing declining crop yields. Partners report that there is migration towards cities, in search of work and better living conditions. Certain health problems are increasing, such as malaria and malnutrition. Traditional medicines are being lost, with a decline in biodiversity. Desertification is a big problem in the Sahel. Key issues identified as contributing to these experiences are deforestation, water management, local industrial activities and greenhouse gas emissions.

VOICES FROM ASIA In Asia partners report that both floods and droughts are more and more unpredictable, which is affecting the monsoon in certain areas. The timing of the rains is changing and thus the seasons are altered. The effect of both floods and drought periods is that crops fail and livelihoods are threatened. Water-borne diseases are reported to be increasing, as well as skin, eye and chest problems. Biodiversity is decreasing and sea-level rise is already forcing some communities to relocate. The causes of the problems being faced include deforestation, water management, urbanisation and greenhouse gas emissions.

VOICES FROM LATIN AMERICA In Latin America floods, droughts and storms are all becoming more prevalent; temperatures are rising and dry spells are getting longer. Declining water availability is a big problem, and as the seasons become more unpredictable this is having a huge impact on agricultural communities, with productivity declining. In some situations people are abandoning agricultural livelihoods and migrating to urban areas in search of alternative sources of income. There are reports of deforestation across the region contributing to local-level climate change, and there is concern over the lack of national policies and over the impact of rising greenhouse gas emissions.

RECOMMENDATIONS TO THE INTERNATIONAL COMMUNITY Voices from Africa, Asia and Latin America call upon the international community to take action in three areas:

- The international community is urged to tackle the increase in greenhouse gas emissions. Recommendations include complying with the Kyoto Protocol, developing alternative energy sources, and providing education on the effects of individual behaviour.
- In relation to helping developing countries and poor communities adapt to the effects of climate change, suggested activities include supporting environmental protection and

recovery programmes, capacity building, providing resources for specific adaptation initiatives and supporting local responses.

- At a more structural level, rich countries are urged to tackle injustice by addressing corruption, the unfair distribution of resources, and the international debt burden.

TEARFUND'S ASSESSMENT In this final section we summarise the current experiences of poor communities relating to climate change. We consider the issues that lie behind the changes in climate and impacts that have been described. There are clear local activities contributing to climate change at a local level in many cases. We acknowledge that global human-induced climate change is definitely happening and that the changes being experienced are consistent with scientific predictions. We point out that whilst the exact contribution of global climate change in these cases will not always be clear, increasing climate change is certain. It will exacerbate the problems already being faced and be a major impediment to achieving the Millennium Development Goals. National and international development strategies must take climate change risks into account, and local management of natural resources must be a fundamental component of climate change adaptation programmes in developing countries.

The report concludes that communities are vulnerable and already struggling to cope with the impact of changing climates. Things are set to get worse. We must listen to the voices of those living out their lives in the midst of climates that are changing and take more serious action at all levels immediately.

Introduction

Discussions about the impact of climate change usually focus on the effect it will have on the richest countries. But Tearfund is very concerned about the fact that the biggest impact of climate change will be on the world's poorest people. We therefore decided to ask some of our partner organisations (working with poor communities around the world) about their experiences of the climate, whether it is changing and, if so, how this is affecting their lives.

The response was unexpected. We were surprised not only by how many of our partner organisations were keen to talk about the issue and present their experiences, but also by how similar their experiences are, as the quotes on the following pages reveal. They show that climates are changing across the world, affecting the lives of poor people in many ways. Changes in climate at a local level are clearly having a devastating effect on lives and on development. The causes of the changes and impacts outlined here vary, but the experiences particularly highlight that in many cases local environmental management has a huge part to play. They also reveal that communities are hugely vulnerable to changes in climate – and that accelerating global climate change is only going to make matters very much worse.

The profile of human-induced global climate change has been increasing in recent years. Scientists frequently publish new evidence, rich countries hold ongoing debates about how to deal with the problem, there are international conferences on the subject, and more and more coverage in the press. But the focus is often on the science, or on the cost to developed countries of doing something about the problem. If there is a flood or a heatwave in Europe then our attention may be drawn away from the predictions and politics for a while and onto the people who are affected, but we rarely look much further afield. What about those people whom the predictions say will be most affected by climate change? What impact is it having on their lives? The voice of the poorest



Photo: Jim Loring

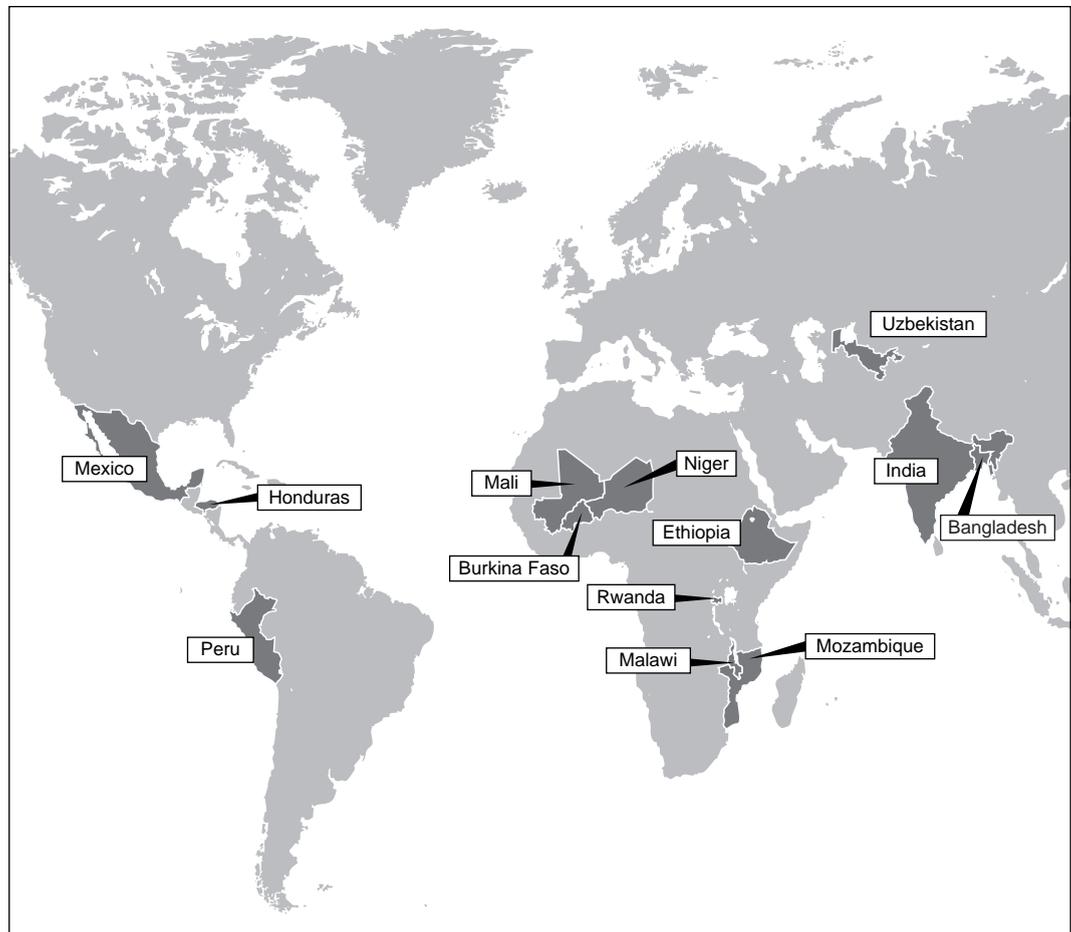
communities is not being heard and so we wanted to provide an opportunity for them to express their views.

To do this we gathered views from people in 13 countries across Africa, Asia and Latin America (see map below). This was achieved principally through a questionnaire circulated to 16 organisations with whom Tearfund works, and there was often input from people in the communities where they are working. The outcome is not a comprehensive or scientific study, but it provides grassroots evidence of climatic changes and the effect of these on people's lives. Most of what is included here are direct quotes from those who were involved, as we wanted to represent their experience in its entirety and let their voices be heard.

About the quotes

Throughout the document, passages of text in boxes like this are quotes taken directly from those involved in the survey. These have largely been left intact, but some have been slightly edited to improve ease of reading without changing tone or content.

Where the survey was conducted



Voices from Africa

Contributions for the African perspective came from Burkina Faso, Ethiopia, Malawi, Mali, Mozambique, Niger and Rwanda.

The weather has been changing for many years. It is just that we have not been taking note of it. I am 51 years old and I remember when I was young experiencing a nice cool weather and receiving good rains in our village. Big streams would be flowing with water throughout the year. I would be walking to school with a good forest cover on the way. It was beautiful. It is not now. (River of Life, Malawi)

Changing frequency and severity of extreme weather events

Flooding and droughts are now common across Africa. Droughts have mainly affected the Sahel, the Horn of Africa and Southern Africa, particularly since the end of the 1960s, and estimates suggest that one third of African people live in drought-prone areas. Floods are also recurrent in some countries; even communities located in dry areas have not been safe from floods.¹ It is also not uncommon for some countries to experience both droughts and floods in the same year.

As the following quotes convey, increasing length and frequency of drought periods are a major problem, having an impact on both food and water security.

Mali

Drought is becoming more and more frequent, leading to drying out of soil and the disappearance of vegetation. The life of an entire population is on hold, waiting for clouds which promise less and less rain and which finally destroy the hope that cattle breeders and their herds will enjoy healthy pastures. They also destroy people's hope for a better tomorrow which would usher in an abundant harvest so passionately awaited by farmers and their creditors. (TNT)



Cotton farmers
hoeing their fields in
Burkina Faso

Photo: Marcus Perkins

¹ Nyong, 2005. *Impacts of climate change in the tropics: the African Experience*.

Mozambique

Mozambique had the worst floods in the year 2000, in the whole of the Southern and Central regions of the country. But in all the years since then up until now Mozambique is experiencing an acute drought, principally in the provinces of Gaza and Inhamabane in the south and some floods in the centre and north of the country, on the main rivers Buzi and Zambezi... (In Gaza and Inhamabane) we are living in a time of great drought. The greater part of the communities did not harvest anything in the agricultural fields from 2003 to 2005; they are now living by consuming wild roots and selling firewood in the towns. (MCL)

Ethiopia

Due to drought in many parts of the country, the crop production is reducing yearly, especially in southern Ethiopia. This is mainly observed in the Boricha area of southern Ethiopia, where 20,000, 30,000, 38,000 and 60,000 people were affected by food shortage in 2001, 2002, 2003, and 2004 respectively. (MKC)

Rwanda

The temperatures are becoming higher and higher. The maximum used to be 25°C but these days it goes up to 29°C. The longest drought period used to be up to four months and now it can be six to seven months. River and lake levels have also fallen and some swamps have dried up. (MOUCECORE)

Flash floods are also an issue. In Malawi, when it rains a lot in the upper shire (plateau), this causes flooding in the lower shire. This has become frequent in recent years as the problem of changing rainfalls is exacerbated by deforestation (as a result of population pressures), causing flash floods. This also results in siltation in rivers and subsequently less energy output at hydroelectric plants.

IPCC²

The main challenges likely to face African populations will emanate from extreme climate events such as floods, strong winds, droughts and tidal waves.³

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- 2 The Intergovernmental Panel on Climate Change (IPCC) has been established by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) to assess scientific, technical and socio-economic information relevant to understanding the risk of human-induced climate change, its potential impacts and options for adaptation (addressing the effects) and mitigation (addressing the impacts). See www.ipcc.ch
 - 3 IPCC, 1997. IPCC Special Report, *The Regional Impacts of Climate Change: An Assessment of Vulnerability – Summary for Policymakers*, online at www.ipcc.ch

Changing rains and water resources

In 2000 UNEP estimated that around two thirds of the rural population and a quarter of the urban population in Africa lacked access to safe drinking water. It also estimated that these figures were set to increase as a result of urbanisation, increased economic development and population growth.⁴ In addition, observational records show that since the mid-1970s precipitation has declined across Africa.⁵

Partners report below that climate is one factor contributing to declining water security, with rainfall decreasing as the seasons change (see food security section). The result is a decline in water availability for people and livestock, and for sustaining the wider environment.

Burkina Faso

There is a change because the weather is becoming hotter year after year. The amount of rain we have is also reducing. The rainy season has become very short. (Pastor Elie Kabore)

Malawi

Rainfall is becoming more erratic and there is less each year. The streams and rivers are drying up – which are the source of drinking water. Many rural areas do not have adequate water. The water table is now deeper than before. (RoL)

Late rains are now a very predictable phenomenon. Less rainfall than was previously the case is a very common experience for farming communities. (Eagles)

A lady collecting water for her family in Ethiopia – partners report that streams and springs are drying up

Photo: Jim Loring



4 UNEP, 1999. *Global Environmental Outlook 2000*. Earthscan publications Ltd.

5 Nyong, 2005. *Impacts of climate change in the tropics: the African Experience*.

- Mali** Climate changes affect water security in the following way: if rain is scarce, there is very little rise in water levels and this, of course, implies a reduction in the water table. Consequently, there is a lack of water in many water holes and wells in our area (Timbuktu). This is the situation at present, and many in the camps have serious problems finding drinking water because their water source has dried up and they cannot afford deeper wells. This makes daily life very difficult. People have to walk for kilometres to look for water, which often turns out to be contaminated. Lack of drinking water drives some communities to abandon their original areas; forests have now dried up; game has disappeared; cattle breeding and cultural activities are reduced. (TNT)
- Mozambique** There are some wells and rivers that in the past have never dried up, but now it is strange to say that they have dried up. Communities live in great difficulty, fetching water from a distance of 10–30km for drinking and for animals and sometimes do not wash every day as a way of saving the little water that they find. (MCL)
- Niger** In the past, the rains came for three months at a time and the temperature was quite cold; there were very few diseases. Now it only rains for two months or less. After 1984, the really bad years started: we had severe drought, many animals died and we saw all the changes that have led to the current situation. (Ibrahim)
- Ethiopia** Changes in climate are affecting water security by drying up of streams and springs; decreased flow in rivers; shrinking of lakes, affecting habitat for birds and fish; poor replenishment of ground water aquifers. These changes result in a decrease in quantity of water available for human and livestock consumption and an increased burden on women and children as they travel further and further in search of water. (Tadesse Dadi)

In Ethiopia reports are that ground water levels are getting lower and there is a reduction in the volume of water at hydroelectricity plants. In some places specific industrial activities are clearly affecting water availability. One example given is in the Rift Valley of Ethiopia where use of water for soda ash extraction from Lake Abiyatta has caused the lake water to recede by as much as 3–4km compared to what it was 30 years ago.⁶ But the amount of rainfall is decreasing and measurements show that there has been a downward trend in rainfall since 1984.⁷

6 Extraction of soda ash from the lake involves the evaporation of 900,000 m³ of water a year from the lake. (IUCN 2003: *Wetlands of Ethiopia*. Online at <http://www.iucn.org/themes/wetlands/pdf/Ethiopiawetlands.PDF>)

7 FEWSnet, 2003. FEWSnet special report: *Rainfall in Ethiopia is becoming Increasingly Erratic*. <http://www.fews.net/Special/index.aspx?f=al&pageID=specialDoc&g=1000293>

IPCC

Climate change is expected to intensify Africa's increasingly critical water situation, with southern Africa being one of many water-stressed regions in which climate change could further decrease stream flow and groundwater recharge.⁸

Changing seasons and food security

Food production in most of sub-Saharan Africa has not kept pace with population increase over the last 30 years and food aid constitutes a major proportion of net food trade in Africa. The World Resources Institute estimates that roughly 70 per cent of the population live by farming, and 40 per cent of all exports are agricultural products. The poorest members of society are those who are most dependent on rain-fed agriculture for jobs and income, so the continent is highly vulnerable to climatic phenomena that disrupt agricultural cycles.

In addition to the specific periods of drought outlined above, partners across the continent report that seasons are changing, and that this is having a dramatic effect on agricultural cycles.



A lady carrying water for her crops, collected from a dam in Burkina Faso

Photo: Marcus Perkins

8 Unless otherwise stated, all of the IPCC predictions are taken from IPCC, 2001. *Summary for Policymakers Climate Change 2001: Impacts, Adaptation, and Vulnerability*, online at www.ipcc.ch

Mozambique

In our region, it used to be normal with two seasons – hot and cool – where more rain was registered in the hot season, and the cool season that lasted from April to August was characterised by intense cold and fog in the mornings. We continue with the two seasons in the year, only that it sometimes rains more in the cool season. In recent years the temperatures have risen from 30°C up to 49°C in the hot season and are less cold in the cool season, which is not normal. There is a significant change in the growing season. Communities would hope to make seed beds at the normal time but up until now there has been no rain – it could rain at any time. The majority of communities are afraid to plant, thinking that it is not the right time, thus affecting the food security of the region. (MCL)

Malawi

Farmers tend to be at a loss as to when to plant. An example I can give is this year. We had early rains in October and the Meteorological Department warned people not to plant and made a forecast that good rains will come around December–January. However, in other areas, people went ahead and planted. Well, many years ago, October was the month when rains would come. Now, it has changed to December and it is never consistent. When the agriculture cycle is negatively affected, it brings food insecurity. (RoL)

Burkina Faso

I am too young to know when it started, but since 1984 there is no longer a definite time that the rainy season starts and finishes. Rains are very irregular. Before 1984 people started planting by June, but now we can expect to start in June but then we are still planting in late July. (Hamado Sebgo)

Farmers hoeing their crops in Rwanda where partners describe how changing seasons are affecting food security

Photo: Geoff Crawford



Rwanda

Seasons have been irregular in certain regions and there are no precise times for planting as there used to be. Crop yield has reduced drastically, sometimes resulting in total crop failure, and high yielding variety crops are no longer grown. There is no longer food security, which results in high food prices, malnutrition, and poverty. (MOUCECORE)

Mali

The first rains that used to come in May now only arrive during the last two weeks of June. The rainy season keeps shrinking: it used to last for five months but now we only get three months of rain. (BADs)

The climate changes affect the growing season (the vegetation cycle). Planting times are affected because we can no longer follow the agricultural calendar. Changes in climate also prevent us from harvesting at the normal time. (TNT)

Yields are being adversely affected by seasonal changes and prolonged droughts. Increases in disease and pests are also factors. Farmers are finding they cannot grow what they once did and some are forced to use other varieties. This has a knock-on effect on livestock productivity.

Mali

The climate has changed and the rainy season has become unpredictable. The water levels fall year by year and some kinds of animals and vegetation have disappeared. The future is bleak for farmers and cattle breeders alike. Everything has become complex and the survival of the poor uncertain, especially when they think about their children and descendants.

Ethiopia

Changes in climate are affecting harvests because a delay in onset of rains forces farmers to miss the optimum planting time and farmers fail to plant long-season crops. The growing season is shorter, with delayed onset and early cessation of rainfall. There is a decline in crop yields and poor performance of root crops that require relatively even distribution of rainfall. The effect on food security is decreased food production, increase in grain prices and decreased income for farmers. Also a decrease in livestock productivity as a result of a decline in the availability of forage and crop residues. (Tadesse Dadi)

Yield reduction is observed every year. For example, due to Belg rain (March to May) shortage, yield losses of 80 per cent at Boricha and 25 per cent at Meta Robi lowland area happened on maize crop in year 2004. Due to moisture stress, the grass cover in the livestock grazing areas is very low, and this further affects the livestock production/yield, especially in the areas of nomads. Temperature and rain control the speed and development of many disease and pests. However, untimely rainfall and change in temperature create favourable conditions for breeding of pests and disease. (MKC)

Burkina Faso

The change in weather has affected agriculture to the extent that some vegetables don't now grow and we yield less vegetables per hectare. Also, there are more plant attacks by insects than before. (Pastor Elie Kabore)

There are changes in the weather and this causes changes in agriculture. Last year we did not have enough rain and so we didn't get enough harvest of our crops. It is very obvious the weather is changing and this has a negative impact on agriculture and the people. (Moustrapha Congo)

Malawi

Reduction in yields has been one inescapable consequence of the delays in rainfall and unpreparedness on the part of governments and communities. (Eagles)

IPCC

There is wide consensus that climate change will worsen food security in Africa, mainly through increased extremes and temporal/spatial shifts; increased droughts could seriously impact the availability of food in Africa.⁹

Human health

It has become clear that climate change will have direct and indirect impacts on diseases that are endemic in Africa. Malaria, Rift Valley fever and cholera outbreaks were recorded in many countries in East Africa following the 1997–1998 El Niño event, and the meningitis belt in the drier parts of West and Central Africa is expanding into the eastern region of the continent.¹⁰

Tearfund's partners raise a number of concerns relating to changes in climate and health problems:

Mozambique

There are various factors, so we do not know for certain whether the diseases, deaths and life expectation fixed at 38 years are a result of environmental factors or not ... the malnutrition provoked by the drought is a grave problem in our communities. (MCL)

Ethiopia

One of the health impacts as a result of changing weather patterns is that malaria vector mosquitoes are spreading into highland areas that were historically free from malaria. There is also an increase in water-borne diseases. (Tadesse Dadi)

9 IPCC, 1997. IPCC Special Report *The Regional Impacts of Climate Change: An Assessment of Vulnerability – Summary for Policymakers*, online at www.ipcc.ch

10 IPCC, 2001. *Summary for Policymakers Climate Change 2001: Impacts, Adaptation, and Vulnerability*, online at www.ipcc.ch

Mali Traditional medicine has declined because many medicinal plants have been wiped out by constant drought. (TNT)

IPCC Changes in temperature and rainfall will have many negative impacts on human health in Africa.

Migration

Estimates suggest that globally there are at least 25 million 'environmental refugees'. These are individuals who have migrated because they can no longer secure a livelihood from the land due to environmental problems – eg: desertification and soil erosion. More than half of these are in Africa.¹¹

Migration as a result of the changing climate is certainly a growing phenomenon in a number of different countries, as these partners explain:

Mozambique The lack of rain has provoked a movement of communities in recent years in search of fertile areas for agriculture, principally around low-lying areas or gathering in the cities in search of better living conditions. (MCL)

Ethiopia Our farmers are totally dependent on rain-fed agriculture, thus any slight change in climate will result in food shortage and migration. Communities are migrating from non-suitable areas to areas of suitable weather for cropping seasonally, and they move for labour for income generating. [Coping mechanisms can be hindered because] sometimes clashes happen between different ethnic groups and races. (MKC)

Mali Arable lands and pastures are diminished and potential workers are unemployed and hungry. Huge numbers of people move to the towns where other difficult problems also await them. They are malnourished and subjected to under-development with its consequent diseases, illiteracy and misery. (TNT)

11 <http://www.unfpa.org/sustainable/urbanization.htm>

Desertification is a huge problem for Tearfund partners in the Sahel

Photo: Jim Loring



IPCC

The IPCC states for Africa: 'Increasing aridity and prolonged spells of severe drought could accelerate abandonment of the rural economy and migration to urban centres.'¹²

Desertification

Desertification is defined by the UN as 'land degradation in arid, semi-arid, and dry sub humid areas resulting from various factors, including climatic variations and human activities'.¹³ UNEP estimates that desertification in Africa has reduced by 25 per cent the potential vegetative productivity of more than one quarter of the continent's land area.¹⁴

As discussed later, the exact causes of desertification are often hard to determine (though deforestation is identified here as being a contributing factor), but the issue is clearly a reality for many, as the quotes below illustrate.

Burkina Faso

Desertification is strongly coming in because 20 years ago you couldn't see between here and the dam because there was a big forest. The trees have gone and even the grass has gone in some places. Some trees are dying because there isn't enough water in the ground for them to survive. (Moustrapha Congo)

¹² IPCC, 1997. IPCC Special Report *The Regional Impacts of Climate Change: An Assessment of Vulnerability – Summary for Policymakers*, online at www.ipcc.ch

¹³ UN, 1997. The United Nations Convention to Combat Desertification (UNCCD).

¹⁴ See Tearfund's Church Pack *Sahel* for experiences of the Tuareg nomadic community in the Sahel.

Mali People have felled enormous areas of forest, including both green and dry timber, leaving behind them lands that are totally stripped of vegetation and vulnerable to rapid desertification; deforestation has affected whole areas because the water table has dropped dramatically. (TNT)

Niger Some plants are disappearing as the desert closes in, and some of the animals which we have had here for a long time are no longer here, for example giraffes and ostrich. In addition, there is just one kind of plant that grows here (a type of grass) and it always attracts large numbers of animals... they come and graze all our land and then move on. So that is the problem; the desert is eating up the green pastures, and the few that are left are crowded with animals. Even last year, we suffered from lack of pastures for grazing, and it is the same this year. Then we had the severe drought. All this has led to the problem of the acute lack of animals (cattle). (Ahmed)

IPCC

For Africa, alteration of spatial and temporal patterns in temperature, rainfall, solar radiation, and winds from a changing climate will exacerbate desertification.

What are the causes of the perceived changes in climate?

Tearfund asked organisations to give possible causes for the changes in climate they are experiencing, including specific activities at local, national and international level. Some gave direct causes of climatic changes, whilst others mentioned factors that may not be causes of climate change in themselves but can certainly exacerbate the effects (for example, water management).

LOCAL Resource use is one of the main causes given for climatic changes at a local level. Deforestation – often the result of population pressure – is important, as well as little reforestation. Organisations also mention poor water management, bush fires and overgrazing – which could be contributing factors to deforestation in themselves, and exacerbate the impacts of climatic changes. (These factors are discussed in more detail in later sections.)

NATIONAL Partners cite deforestation again here, and specifically the lack of national policies on this issue (Ethiopia), and a lack of political will in addressing it (Malawi). Another area where they think national policies are lacking is in relation to emissions. Sources of emissions mentioned include industry (poor waste management of factories) and vehicles. There are also wider environmental practices of local industries (see example of soda ash extraction in Ethiopia on page 4), and a feeling that the government has turned a blind eye to such practices. Partners also sense that environmental rehabilitation or restoration projects do not receive sufficient attention.

INTERNATIONAL Partners blame emissions of gases and toxic products that contribute to global warming and damage the ozone layer. Partners particularly single out large industrial companies and the industrialisation of the developed world. They also point to the poor transfer of environmental-friendly technologies to developing countries.

Changes in climate inevitably mean change in established societal life patterns such as farming patterns, animal husbandry and seasonal calendar activities. The issue of climate change can only be left out of the agenda of organisations, communities, nations and churches at our own peril. Climatic changes have a terrible and a telling impact on the livelihoods of communities. (Eagles)

Voices from Asia

Contributions for the Asian perspective came from Bangladesh, India and Uzbekistan.

We are experiencing a major change in both weather and climate over the last 10–15 years. These changes, like almost all changes, affect and impact the lives of the poor. (HEED, Bangladesh)

Changing frequency of extreme weather events

About 75 per cent of the world's major natural catastrophes between 1970 and 1997 occurred in the Asia and the Pacific region (mostly in developing countries). There has also been a general upward trend in the number of natural disasters due to hydro-meteorological events (such as cyclones and flooding) in the region.¹⁵

In this study, partners report that higher rainfall in the Himalayas results in flooding in Bangladesh because deforestation has denuded the hillsides. But droughts, storms and sea-level rise are other growing problems with less obvious causes, and extreme events are increasingly unpredictable.

A rickshaw driver making his way through flooded roads in Bangladesh where the frequency of both floods and droughts are increasing

Photo: Jim Loring



15 UNEP, 2000. *Global Environment Outlook*. <http://www.unep.org/geo/geo3/english/457.htm>

Bangladesh

Frequency of flooding is increasing due to heavy rainfall or water coming from surrounding countries and creating waterlogging. Before 1988 we did not see flood in the Jessore area because Jessore is comparatively high land. But in 1988, 1998 and 2004 Jessore area flooded. Excessive flooding is caused by flood waters from upper riparian areas of the Himalayas in India, Bhutan, China and Nepal, where mountains have been denuded of forests, and not by rainfall in Bangladesh. This brings heavy siltation to the country's rivers, and river bank erosion not experienced ten years ago. (SA)

Frequency of droughts is increasing. Canals, ponds and rivers are drying due to low rainfall... as a result, water level is going down and people are not getting water from shallow tube wells. Winters tended to have some rain storms during the period from November to February. In recent years winter drought has been extended from the end of the monsoon in October to April. (SA)

The summer has become hotter and shorter – with an increase in the number of tornadoes and north-westerns (winds). The north-westerns cause havoc with the accompanied hail storms – destroying the standing crops, and the tornadoes crumble everything in their paths. The monsoon has become unpredictable, sometimes too much (like this year) and some too little (last year), causing either drought or floods. A new phenomenon over the last ten years is the cold waves during winter. (HEED)

There have been remarkable changes in the weather locally as well as nationally, such as occurrences of repeated flooding, jolting different parts of the country from time to time; sometimes frequent advance of monsoon and heavy rainfall for long periods; drought; cyclone; tornado; increasing of temperature and sea level, causing the life risk of the dwellers of these areas; and port facilities losing their utility in the face of more frequent storm surges. (Koinonia)

India

Periods of heavy rainfall over a very short period of time have been increasing over the last ten years. This is not usual. The frequency of cloud-bursts is increasing, when there can be 60mm of rain in five minutes. There have been two of these in the last three years and these weren't happening 30 years ago (in the northern mountainous areas). We are seeing many incidences of flash floods even in desert areas where we experience droughts. (EFICOR)

For the last five years we had no good rains and then last year we had flooding. It was devastating for us. Eight people lost their lives and more than 1,000 houses collapsed in the district (Balangir). It was a shock to the people because almost all the rivers were swollen, many trees were uprooted, houses collapsed and animals died. Crops were ruined and even now, many people have been unable to rebuild their homes – they lost everything. (TK Joy)

We have experienced sea-level changes on certain islands that are unrelated to the tsunami. Coastal sea-levels are changing in some places. In Pondicherry the government started building sea-walls because in the last five to six years the sea has started encroaching into the city. (EFICOR)

In Uzbekistan partners report that highly fluctuating seasonal weather has been occurring in recent years. It is the drying of the Aral Sea that is thought to be transforming the climate,

resulting in hotter summers and colder winters. The sea has been drying up since the 1960s as a result of increasing irrigation demands for cotton production. By 1990 more than 95 per cent of the marshes and wetlands had given way to sand deserts, and more than 50 delta lakes had dried up. The surface area of the Aral Sea shrank by 50 per cent and its volume by three quarters. The salinity of the remaining fragmented lakes is extremely high. The fishing industry collapsed and, with the reduction of the sea, its climate modifying function has been lost, affecting the seasons.^{16 17} This is a clear example of where locally induced climate change (caused by the overexploitation of water resources) is having severe effects on people's lives.

Uzbekistan

In recent years (about 20) the change of climatic condition in all seasons of the year is sharply felt. For example, in the winter in recent years strong freezing with snow was felt. In 1998 the temperatures reached -30°C . In subsequent years it was very warm and almost without precipitation. Then again in the current winter (2004–2005) the chill was -27 to -30°C with quite a bit of snow. (JDA)

IPCC

- Climate change and variability would exacerbate vulnerabilities to extreme climate events – eg: typhoons/cyclones, droughts, floods.
- Increased precipitation intensity, particularly during the summer monsoon, could increase flood-prone areas in temperate and tropical Asia, and there is potential for drier conditions in arid and semi-arid Asia during the summer, which could lead to more severe droughts.
- Low-lying areas of Asia would be inundated by sea-level rise.

Changing rains and water resources

The Asia and Pacific region accounts for about 36 per cent of global run-off, yet the region has the lowest per capita availability of freshwater.¹⁸ In 2000 UNEP reported that several countries (including India and Bangladesh) already suffered from water scarcity or water stress, and that more were set to join them as populations and consumption increase.

As mentioned above, the frequency of both floods and droughts is increasing for those involved in this study. Both of these have a big impact on safe water availability, as partners describe below.

16 UNEP, 2000. *Global Environment Outlook*. <http://www.unep.org/geo/geo3/english/457.htm>

17 People and Planet.net. *Requiem for a dying sea*. <http://www.peopleandplanet.net/doc.php?id=384>

18 UNEP, 2000. *Global Environment Outlook*. <http://www.unep.org/geo/geo3/english/457.htm>

Bangladesh

There [used to be] heavy rainfall in the rainy season (May–July) and as a result, lots of water was available in the ponds, canals and rivers. Nowadays we do not see heavy rainfall between May and July. We see rainfall between August and October. Due to reduced summer rainfall, underground water levels are depleting and people are not getting safe and adequate water, especially in the winter season (the dry season) when water levels are reducing, rendering shallow tube wells inoperable. This affects the marginal farmer who relies on shallow tube well supply which dries up in winter (the dry season). Underground water levels are depleting rapidly and not being replenished sufficiently during the monsoon months. (SA)

A decline in water availability affects irrigation systems for crops, and causes tubal drinking water to drop below the level at which it can be reached, making it very difficult to pump. (HEED)

India

During floods all the boreholes get damaged by mud. People have to go far away to a river for water – even to drink. People get sick with diarrhoea. (TK Joy)

In Uzbekistan the drying of the Aral Sea has clearly had, and continues to have, a major impact on water resources. Drinking water in Karakalpakstan is saline and polluted, with a high content of metals that cause a variety of diseases.

Uzbekistan

... the problem of water facilities, especially drinking water and water for irrigating agriculture, recently has become one of the largest problems. (JDA)

IPCC

Freshwater availability is expected to be highly vulnerable to anticipated climate change in Asia.

Changing seasons and food security

In 1998–2000 it was estimated that almost 800 million people in the developing world were undernourished, with almost two thirds of these living in Asia (nearly 30 per cent in India alone). It is estimated that only seven countries in the Asia Pacific region are on course to meet the Millennium Development Goal on hunger, whilst in eight countries hunger is increasing.¹⁹

19 ODI 2003. *Food Security and the Millennium Development Goal on Hunger in Asia*. http://www.odi.org.uk/publications/working_papers/wp231/wp231_web.pdf



Livelihoods are being threatened in India by floods and droughts

Photo: Jim Loring

Partners report below that food security in their countries is being affected by a number of factors. Decreased rainfall and changes in the timing of the seasons is affecting agricultural productivity. With yields reducing, farmers are using more chemical fertilisers and pesticides.

Bangladesh

This climate and weather change, like almost all changes, affects and impacts the lives of the poor. The droughts lead to crop failure, because the poor farmers are fully dependent on nature for watering their fields and meeting irrigational needs. If there is a variation in the timing of rains, the crop fails – no water causing drought or too much causing floods. (HEED)

Due to changes in rainfall, planting times come earlier or sometimes are delayed. The farmers are meeting their planting needs through collecting deep tube well water. Even in the rainy season the farmers face the same problem. Due to a shortage of rainfall the paddy or other crops are not growing properly. As a result, crop production is reducing. Due to heavy rainfall or flooding the farmers are losing crops or facing large damage. The farmers are using chemical fertiliser and insecticide and pesticide for increasing crop production. As a result, production cost is day by day increasing. If planting and harvesting is delayed due to floods it reduces crop yield for summer varieties of seed and delays winter crop planting. (SA)

India

The rain does not come at the right time. People start cultivating and there is no rain. Then it comes after a month, so the seeds die and again we have to plant. (Latika Sagar)

Uzbekistan

In recent years the change in climatic conditions in all seasons of the year is sharply felt. Changes in climate often influence agricultural yield – for example, many kinds of grain crops do not have time to ripen. In 2000–2003 because of a drought, none of the districts of Karakalpakstan could obtain productivity in grain. (JDA)

Partners report in some places that production is decreasing but demand remains high in the market so the prices of essentials have risen, and this is not offset by a rise in people's income. The poorest people are unable to buy food, leading to malnutrition and disease. The increase in extreme events and rising sea-levels also have an impact on food security, destroying crops.

Bangladesh

Waterlogging of sea water in coastal areas in the west due to higher tides is causing loss of crop land. Farmers are turning to shrimp farm production as an alternative. (HEED)

All of this has devastating effects on people's lives.

Bangladesh

Crop failures, loss of capital investment, failure to replenish the inputs essential for recovery not only increases food insecurity, but also loss of household assets. These events increase not only vulnerability but push more people into the vicious cycle of poverty. (HEED)

India

Water is the biggest problem for me: sometimes we face flood, sometimes drought. Agriculture is my one source of income, so during floods or drought my whole livelihood is threatened. (Kasti Bag)

In Uzbekistan the irrigation practices of the past mean that waterlogging and salinisation have made much of the agricultural land infertile.

Uzbekistan

Because of the drying of the Aral Sea, on its former coasts the influence of dust storms and sand drifts is strongly felt. Almost in the whole territory of the Republic of Karakalpakstan it is possible to see salt on the ground left over from evaporation. Salinity of the soil negatively affects vegetative cover. In many places trees and other vegetations are drying out. Huge tracts of land and agricultural fields are covered by copious saline deposits. As a result, productivity drops and quality worsens.

IPCC

Food insecurity appears to be the primary concern for Asia. Crop production and aquaculture would be threatened by thermal and water stresses, sea-level rise, increased flooding, and strong winds associated with intense tropical cyclones.

Human health

It is often difficult to isolate the exact causes of declining health but climate change is predicted to have a wide range of health impacts all across Asia, often exacerbating existing health issues.

The quotes below illustrate that climatic factors do seem to be contributing to various health issues.

Bangladesh

Due to lack of pure drinking water there is a rise in water-borne diseases (diarrhoea, dysentery, typhoid and hepatitis A). Due to a shortage of water, people are suffering from skin diseases and conjunctivitis. In the summer season, due to high temperatures, some people are affected with heat stroke and are dying. In the winter season, due to lower temperatures, people suffer. (SA)

Decreasing of temperature in the winter season makes the lives of children and old-age people miserable and increases death rates. (Koinonia)

India

Some people say that in certain parts of the country cancer cases are increasing as a result of increasing heat and harmful rays. Some also say that skin diseases are increasing in the last five years. (EFICOR)

Uzbekistan

In recent years as a result of the change in climatic conditions and pollution, the frequency of allergic and bronchial diseases has sharply increased. (JDA)

IPCC

Warmer and wetter conditions would increase the potential for higher incidence of heat-related and infectious diseases in tropical and temperate Asia.

The sea is already slowly encroaching in parts of India, causing some people to migrate to interior areas

Photo: Jim Loring



Migration

The annual growth rate in migration on a global scale has been greatest in developing countries of South and South-East Asia. In Bangladesh, population growth and land scarcity has encouraged the migration of more than ten million people to neighbouring states during the past two decades.²⁰ This migration is exacerbated by floods and droughts, which most affect the livelihoods of landless and poor farmers in the region.

Partners highlight migration as a result of floods and drought, as well as migration as a consequence of sea-level rise.

Bangladesh

The poor rush towards safest places during the flood, toward cities in search of jobs or even for alms. The flood waters damage their crops, houses, local infrastructures that put them into starvation, isolated, shelterless. (SA)

India

When the drought comes we migrate to another state to make bricks. We don't like it, but the situation compels us to go. Fifty per cent of the people in my village migrate. When food is not available, we don't wait to face starvation. Some of the family stay here but, as the breadwinner, I have to go in search of food. (Lalitkuman Dau)

On some islands there are places where people have to be rehabilitated to interior areas because the sea is slowly encroaching. (EFICOR)

²⁰ IPCC (2001), *Summary for Policymakers Climate Change 2001: Impacts, Adaptation, and Vulnerability*, online at www.ipcc.ch

IPCC

Future increases in the frequency and intensity of severe weather systems as a consequence of climate change can trigger mass migration, and land loss in coastal areas resulting from inundation from sea-level rise as a result of climate change is likely to lead to increased displacement of resident populations.

Biodiversity

Species diversity in the region is extremely high but increasing trends of extinction are evident in many countries.

Loss of biodiversity due to climatic changes is reported in Bangladesh and Uzbekistan, with particular mention made of the decline of the mangroves in Bangladesh.

Bangladesh

Seawater is intruding into estuaries and aquifers, making the estuaries inhospitable breeding grounds for the fishes and the aquifer water unfit for human consumption. Besides, salinity intrusion – due to sea-level rise and low water flow from upstream during the winter season – is causing excessive death of trees in the Sundarban mangrove, including its adjoining areas, and threaten regional/national food security. Recently, the production of our country's famous fish *hilsha* has declined to a minimum level and some other old varieties are in a state of extinction. (Koinonia)

Due to weather change, day by day we are losing natural forest and some forest animals are dying. (SA)

Uzbekistan

Little by little the extinction of not only many kinds of vegetation, animals and rare varieties of fauna fade away. (JDA)

IPCC

Climate change would exacerbate current threats to biodiversity resulting from land-use/cover change and population pressure in Asia.

What are the causes of the perceived changes in climate?

LOCAL As in Africa, deforestation is a key cause mentioned at local level. Partners cite water management issues that exacerbate the impacts of climatic changes – for example, using underground water to increase agricultural production in Bangladesh, which depletes the water table. And in Uzbekistan the example of the draining of the Aral Sea is a hugely significant factor.

NATIONAL Deforestation and the general mismanagement of natural resources come up again at a national level. Partners also mention industrialisation and unplanned urbanisation resulting in increasing emissions (with a higher demand for bricks and cement).

INTERNATIONAL At the international level deforestation is still an issue. As mentioned above, deforestation in neighbouring countries increases flooding and siltation downstream, and in itself may impact regional climate. Dams and canals built in neighbouring countries upstream can also result in either shortage or overflow of water at different times of the season. Partners also raise the issue of the distribution of water resources between river-sharing countries and the problem of non-compliance with international water body sharing protocols. They blame industrial nations and the rise in greenhouse gas emissions, resulting in global warming, and particularly governments who have denied the connection between global warming and rising greenhouse gas emissions and who have made no effort to reduce emissions.

Climate change is going to have an impact on the poor and most vulnerable, particularly subsistence farmers. They are going to be hit hard. If the crops fail then eventually they are forced to sell their land and move to the cities. Climate change has an economic and social impact. These things are already happening. Millions more are going to be affected. (HEED)

Deforestation
in the Himalayas
is resulting in
increased flooding
further downstream,
especially during
periods of increased
rainfall

Photo: Geoff Crawford



Voices from Latin America

Contributions for voices from Latin America came from Honduras, Mexico and Peru.

We expect the impacts of a changing climate to increase, with a greater area of our country becoming desert, more woods and jungle being lost, torrential rains, hurricanes and greater seasonal instability. (AMEXTRA)

Changing frequency of extreme weather events

Certain regions of Latin America are more prone to extreme events than others. Central America and southern Mexico often experience the effect of tropical cyclones and associated heavy rain, flooding and landslides. The extremes that occur in north-western South America and north-eastern Brazil are closely related to El Niño.

Organisations involved in this study report that floods and droughts are becoming a more common feature, as well as storms. Whilst these phenomena have numerous impacts, one of the most obvious is on food security (see section below).

Honduras

Over the past five years the rainfall has been variable. Previously, the rains fell during six months of the year (June–December). Nowadays the rains come together at one time, causing floods and droughts. There are places in Honduras where floods occur every year. The time lapse between floods has been shortened from five years to one year. Storms are more and more frequent. For example, during March (summer) there have been regional storms. Previously there would not have been a single storm during the month of March. (OCDIH)

Mexico

We have at least five significant floods in our country every year without fail, especially with the increase of hurricanes. [The frequency of droughts is changing]; for example, in the Mixteca of Oaxaca they have three years of rain and one of extreme drought, almost like a pattern. It is evident that 40 per cent of Mexico's territory has turned into a desert. In rural areas harvests are lost due to drought, frost and hailstorms. Highway infrastructure, housing and cattle are lost because of flooding. In the droughts and the constant and drastic temperature changes there is an increase in respiratory and skin disorders. With the torrential rains and flooding, gastrointestinal illnesses increase. (AMEXTRA)

IPCC

Some regions of Latin America will experience increased rainfall; there will be increased risk of floods and droughts associated with El Niño events in many different regions. (El Niño is responsible for a large part of the climate variability on interannual scales in Latin America.)

The frequency of floods and droughts is reported to be increasing in Latin America

Photo: Mike Webb



Changing rains and water resources

The region is generally considered to be rich in renewable water resources but these are not distributed evenly and water availability varies greatly. In Latin America groundwater reserves are extremely important. Mexico is particularly dependent on groundwater, which accounts for one third of all reported freshwater extraction and for two thirds of urban drinking water. In terms of data, there is no consistent trend in precipitation patterns across the continent over the last few decades.²¹

Organisations here do report lengthened dry spells and/or higher temperatures, contributing to an increasing lack of water which is a common problem being experienced by all those involved in the survey.

Honduras

A number of communities installed a drinking water system. Right now, they have stopped using it because water has become so scarce. There is a higher mortality rate in these communities, as well as the fact that families are moving away from the area. (OCDIH)

In the Mosquitia region of Honduras, the organisation MOPAWI describes local climate changes caused by deforestation. When the landless farmers from other parts of Honduras first arrived in the southern zone of the Río Plátano Reserve (Culmi) in the 1960s and 1970s the area was very humid all year round, with mist over the forest and rain most of

²¹ UNEP, 2001. *Climate change in Latin America: impacts, adaptation and vulnerability*. Online at http://www.grida.no/climate/ipcc_tar/wg2/pdf/wg2TARchap14.pdf

the year. However, with the removal of the natural vegetation (mainly wet tropical forest), the local climate has changed. The annual dry periods are longer and the summer heat more intense. The flow of water in the creeks and small rivers has diminished or they have disappeared completely.

Throughout much of Honduras the story is the same, particularly around the capital Tegucigalpa and in the area of Siguatepeque. Before widespread deforestation these areas were cooler and moister; now they suffer from severe water shortages during the drier months of the year and more extreme fluctuations in temperature both between seasons and on a daily basis (as in desert areas). These changes can be traced back to the end of the Second World War, with the development of heavy equipment for agriculture and forestry and the opening up of roads into the mountains.²²

Mexico

Each year there is less water in the aquiferous layer. In the cities they have water on fewer days. The water supply is cut back to just two days a week. The wells supplying the villages now dry up for three months so that drinking water does not reach those communities during that time. They therefore have to transport water by boat from smaller wells. There are violent problems between states over the use of water. The same thing happens between small communities. [The decreasing water supply] increases the burden on women and children especially in the rural communities, since they are already the ones, according to local tradition, who are in charge of this task. In the cities it increases expenses of poor families since they have to pay for piped water, spending 15 per cent of their income on this item. (AMEXTRA)

Peru

It has been observed that some springs are drying and sources that provide water to the population of communities in the lower part of the Andes are declining. (Shalom)

IPCC

- The implications of climate warming on the hydrological cycle and its consequences for precipitation distribution, intensity, and timing; surface runoff; and underground water resources, will be aggravated in certain areas by population growth and unsustainable development of water-consuming activities.²³
- In some Latin American regions global warming will substantially change the availability of freshwater; estimates of availability in Mexico and Central America indicate that about 70% of their populations will live in areas with low water supply as soon as the first quarter of the 21st century.

²² Information from Oswaldo Munguía, Director of MOPAWI.

²³ IPCC, 1997. IPCC Special Report *The Regional Impacts of Climate Change: An Assessment of Vulnerability – Summary for Policymakers*, online at www.ipcc.ch

Changing seasons and food security

Agricultural land (excluding pastures) represents about 19 per cent of the land area of Latin America. Agriculture is a key sector because it employs 30–40 per cent of the economically active population. It is very important for the food security of the poorest sectors of the population. Extremes in climate variability already severely affect agriculture in Latin America, resulting in, for example, changes in yields of maize and soybean during the different phases of the Southern Oscillation (related to El Niño).

A common phenomenon reported in several countries in the quotes and information below is the experience of the seasons becoming less distinct and predictable.

Honduras

In the past, the two seasons of the year could be distinguished quite clearly in our country (summer and winter). Nowadays it is difficult to distinguish between the two. The growing season has varied by about a month, compared with how things were five years ago. The time for sowing crops used to be in June. This custom has now changed. Sowing now takes place at the end of July. In spite of this, some crops have still been ruined by drought (there are three municipalities where they been unable to harvest at all for three years, due to drought). The lack of dependable seasons of the year in our country is causing nutritional instability since agriculture is the backbone for families in rural areas. (OCDIH).

In the Mosquitia region of Honduras reports show that what used to be the rainy season is now dry, and the dry season is wetter. The amount of rainfall seems to have decreased overall. One area in the south of the region used to be very cloudy with lots of rain, but now it has long periods without rain and it is quite dry with increased temperatures.

Partners in Peru, Mexico and other parts of Honduras also report that they are unable to depend on the seasons.

Mexico

The time when the rains start is delayed by at least two months compared with the situation 20 years ago. The seasons are not dependable. During the same week it can be very hot and very cold. As far as the people are concerned the seasons have disappeared. In the Valley of Mexico they used to plant maize from March onwards. Now they sow up until May. In Chiapas in the forest region they used to sow as much as twice a year (the extra sowing is the 'tornamilpa' between November and February). This is now difficult to achieve because there is less humidity. (AMEXTRA)

These changes have dramatic impacts on agricultural cycles, and ultimately crop yields. In Peru, crops in the high Andean zones are failing because they depend on the rains, and in turn this affects the low zones where agricultural production is dependent on water supply from rivers. This results in delayed harvests, very low yields, and sometimes no yield at all. In some places productivity is also affected as a result of too much rain.

Irregularity in the timing of the rains is affecting crop production

Photo: Geoff Crawford



Honduras

Production has dropped considerably, owing to two factors. Firstly the effect of Hurricane Mitch which caused the fertile layer of the earth to deteriorate, and secondly both the lack of water and its over-abundance during the growing season. (OCDIH)

Peru

Crop growth is affected by the irregularity of rains and often the hailstorms which damage them – they don't obtain the expected level of growth. (Shalom)

The above quote came from those in the Apurimac region, but frost and colder weather than normal during the rainy season is also reported in the Puno region of Peru.

Mexico

Crop yields are less reliable due to the potential droughts, frosts and potential rains that sweep away the maize, strong winds that damage the plants, and less land now suitable for cultivation due to soil erosion. We have reached the point where we import 40% of the maize and beans needed to feed the population. (AMEXTRA)

IPCC

Dry season is expected to become longer and more intense in many parts of Latin America.²⁴ Predicted increases in temperature will reduce crops yields in the region by shortening the crop cycle.

24 ibid

Migration

Latin America is the region with the highest urbanisation rate. Migration is significant in some countries, with large groups of people migrating internally and regionally from rural drought-prone areas or poverty-stricken communities to well-developed cities.²⁵

Partners from Latin America reveal that, due to the issues discussed above relating to climate, certain people are forced to leave their homes in search of other livelihoods.

Honduras

A number of producers have been forced to leave their life in the country and have to devote themselves to non-agricultural work... Many of those living there (where there is drought) are forced to leave their homes. (OCDIH)

Mexico

Impacts on food security have caused a significant drop in production of basic grains: maize and beans. The climate changes have especially affected the agriculture of the poor because they most depend on the seasons. This great instability in the seasons, and therefore instable production, is causing increased migration to the USA, reaching over 400 thousand immigrants last year, the majority being from the indigenous population, the poorest of the poor in Mexico. (AMEXTRA)

Peru

It causes families to be separated when the head of the family and older children have to migrate to other places to find work to generate an income, leaving the women and younger children... (Shalom)

IPCC

Because weather and climate events already are affecting environmental conditions, climate change may be expected to have a host of direct and indirect effects on human settlements (including migration).²⁶

What are the causes of the perceived changes in climate?

LOCAL The causes identified at a local level obviously vary. As we have seen elsewhere, in Honduras deforestation is a key issue resulting in local-level climate change, particularly highlighted in the Mosquitia region. Deforestation is also highlighted as a cause of climate change in Mexico and Peru. Local authorities are blamed in Honduras for poor management of natural resources, and in Peru for lack of knowledge on environmental protection issues.

25 ibid

26 ibid

NATIONAL At national government level, partners mention poor national planning in relation to natural resource management (Mexico), a lack of political will (Honduras), and little importance given to environmental damage (Peru). Then there are specific industries, such as mining companies in Peru, which have poor waste management and no control of emissions, as well as emissions from vehicles, particularly second-hand cars. Partners in Mexico also raise the issue of inadequate education.

INTERNATIONAL The main causes proposed at international level are the practices of industrialised nations, resulting in the release of greenhouse gases and ozone-depleting substances. It is considered that these countries are not doing enough to regulate their own emissions and do not respect international agreements, as well as allowing their companies to use destructive practices in poor countries.

Unless the necessary steps are taken, climate change will provoke enormous disasters in the world. Every impact we have mentioned will become more acute in the future. (OCDIH)



Deforestation is a key issue resulting in local-level climate change in Latin America

Photo: Geoff Crawford

Recommendations to the international community

It is high time that the 'big' people in this world make sure that their meetings and their pious pledges do not just end up putting out a fire in a sailboat or whatever little corner is burning. If you do nothing and yet you are in the boat (the earth) your decision will catch up with you sooner or later, and sometimes it is impossible to know when the winds will change direction and speed. (TNT)

Those interviewed were asked to suggest any action that they would like to see richer countries take in relation to climate change. The responses they gave in the questionnaire have been collated and summarised below in three main categories.

Mitigation

Rich countries were urged to take seriously the need to tackle rising greenhouse gas emissions and were called upon to address the cause of climate change at source by supporting initiatives aimed at reducing such emissions. Specifically they were asked to:

- comply with the Kyoto Protocol (or to sign up to it in the case of countries which have not yet done so, particularly those which have the resources and capability to address the issue of emissions)
- respect other agreements that are already in place regarding the protection of the environment (for example the WSSD Johannesburg Plan of Action)
- develop a global solution to tackle greenhouse gas concentrations (looking ahead to post-2012 when the Kyoto Protocol will be reviewed)
- develop and use alternative energy sources that are environmentally friendly, and make this technology available to developing countries at low cost
- stop locating industries that cause pollution in developing countries
- support education across the world to highlight that our behaviour can have far-reaching effects.

It is known that developed countries are harming the atmosphere by producing CO₂ through industries, so there needs to be a common demand for all the global people against it. (Koinonia)

Adaptation

In addition, Tearfund partners urged the international community to support measures that will help developing countries and poor communities adapt to the effects of climate change that they are already experiencing, and that will become more severe in the future. This included supporting activities at national and local level. Specifically they were called upon to:

- invest resources in helping communities recover from the impact of climatic changes
- support the creation of food security and environmental protection programmes in countries that are being affected by climate change
- provide resources to help national governments implement specific adaptation measures
- build capacity by strengthening developing countries' meteorological data-gathering systems and providing timely information
- support local initiatives for the protection and rehabilitation of the environment.

Once the Kyoto agreement is supported by the countries that haven't yet signed up, projects could be put in place that will drive forward the process of protecting and restoring the environment. (OCDIH)

Justice

As well as being urged to support initiatives aimed at tackling both the cause and effects of climate change, rich countries were also called upon to address more over-arching structural problems that exacerbate poverty and hinder communities from being able to adapt to climate change. Tearfund partners urged them to tackle injustice, both at international and national level, in the following ways:

- by supporting empowerment of local communities through promotion of democracy and good governance
- by tackling the corruption of international companies who exploit tropical rainforests
- by aiming for a more equitable distribution of resources globally
- by cancelling debts owed to developed nations and investing in environmental protection programmes.

Tearfund's assessment

Current experience

Communities across the world are experiencing changes to their local climates that have been happening most notably over the last two decades. Whilst each situation represented here is slightly different, there are some common trends:

- Extreme events, including floods and droughts, are becoming increasingly frequent and severe.
- Rainfall is decreasing in many places and becoming less predictable, resulting in a disruption of the seasonal patterns to which people are accustomed.

Communities' vulnerability to these changes currently is very striking. The implications are wide-ranging and differ according to partners' specific context. But in terms of general impact, there are recurring themes arising across the three continents. These include:

- WATER RESOURCES – drying-up of water sources for humans, livestock and the wider environment
- FOOD SECURITY – shorter growing seasons, floods and droughts, resulting in lower yields
- HEALTH – increase in malnutrition and water-borne diseases
- MIGRATION – movement to towns in search of alternative sources of income as agriculture becomes a less viable livelihood.

Waruma Diafar in Burkina Faso, collecting water for her family (she walks for five hours to do this every day). Commenting on the climate, she says: 'It is not raining now as it was before. When it rains and we prepare to plant, it stops raining and the time for planting passes.'

Photo: Marcus Perkins



Behind the climate changes

Tearfund partners suggest a number of causes for the changes they are experiencing, summarised as follows:

- LOCAL LEVEL – unsustainable use of natural resources, particularly deforestation
- NATIONAL LEVEL – lack of national policies in relation to resource management, as well as regarding industrial emissions
- INTERNATIONAL LEVEL – industrialisation and the emission of harmful gases.

HUMAN-INDUCED CLIMATE CHANGE AS A RESULT OF LOCAL ACTIVITIES It is evident that in many cases there are clear local or regional factors responsible for climate changes experienced at a local level. One example highlighted in nearly every country is deforestation. This activity alone can have massive implications for the local climate. It can affect rainfall for a number of reasons – for example, because there is more evaporation of water over forests than grassland, and because a forest reflects less sunlight. The resulting changes in rainfall can contribute to the process of desertification. As those involved here have expressed, the impact of local resource management practices can also directly result in problems associated with climate change. For example, deforestation can increase flooding by the removal of a natural flood defence and poor irrigation practices can lead to a decline in water availability. Deforestation and other local resource management practices are having a huge impact so, clearly, a lack of national policy on these issues is highly problematic.

HUMAN-INDUCED CLIMATE CHANGE AS A RESULT OF GLOBAL ACTIVITIES (GLOBAL WARMING) Scientists now recognise that climate change as a result of rising greenhouse gas emissions is a fact and that it is disrupting climates globally.^{27 28} It is therefore reasonable to assume that human-induced global climate change is already influencing people's experiences at a local level in the different regions. The kind of changes documented here, and the impact they have in different areas, are also consistent with scientific predictions for human-induced global climate change, as the IPCC quotes show. Interestingly, changes in land use, primarily deforestation in tropical areas, currently constitute about 20 per cent of global anthropogenic CO₂ emissions. This means that local activities discussed above can also make a contribution to global warming.²⁹

The diagram opposite summarises the different factors that can influence climate change and the impacts it has.

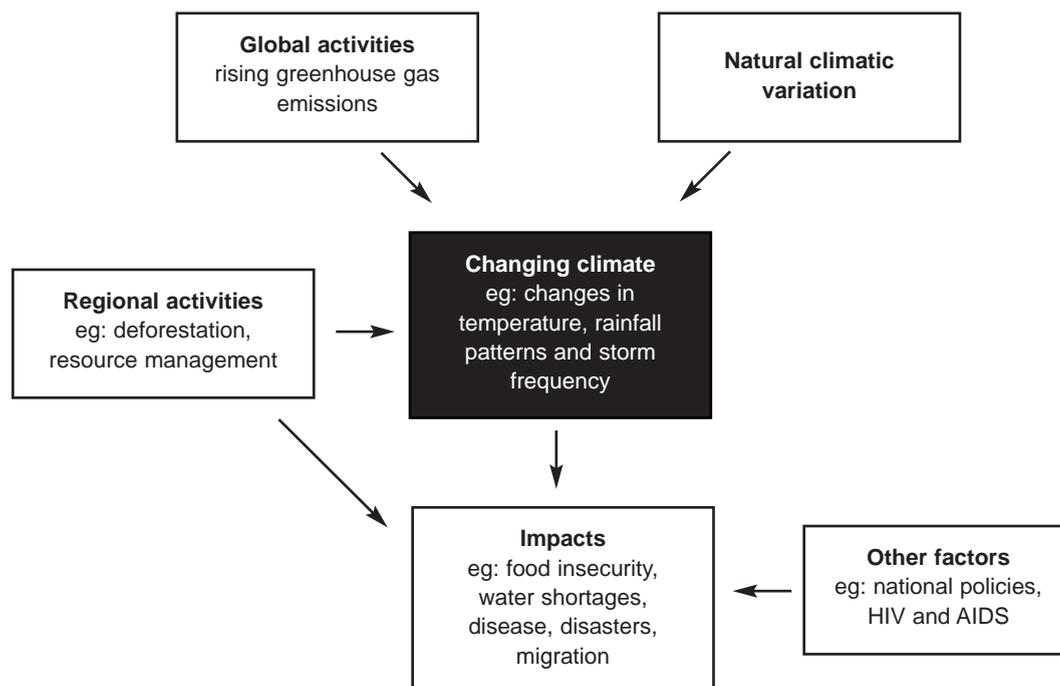
The impact of each factor will vary, and factors also interact. This means that we cannot attribute any particular change in climate to human-induced global climate change alone.

27 For example, the IPCC reports that the global average temperature has increased over the 20th century by about 0.6°C and states that, 'There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.'

28 For more details on how rising greenhouse gas emissions are causing climate change, see Tearfund report *Climate Change and Poverty*.

29 FAO, 1999. Committee on Forestry, *Challenges and opportunities for the forestry sector under the Kyoto Protocol*.

Climate change: influences and impacts



For example, estimates for sea-level rise are of about 1 metre by 2050, including 30cm as a direct result of global warming, but the remaining 70cm is attributed to subsidence because of land movements and removal of groundwater.³⁰ In other cases too, establishing the exact cause of climate change can be difficult. For the Sahel region, the exact contribution of global warming to the changing climate and desertification is unclear due to the wide number of factors involved (for example, deforestation, overgrazing, temperature changes in the Atlantic, and natural climate variation). Identifying the respective roles of these factors is a challenge to scientists.³¹

Human-induced global climate change will interact with regional issues (eg: resource management practices) with differing results. The IPCC acknowledges this: it asserts that in Latin America the impact of climate change must be considered alongside the impact of unsustainable land-management practices and increasing population. The IPCC states, *'In most cases, it is impossible to separate the effects of these impacts, and land-use impacts and population growth are expected to result in more severe changes than are changes in climate.'*³² The IPCC observes, for example, that even if climate change brought wetter conditions to Latin America, human activity could *'... escalate the desertification process.'*³³

30 Houghton, J. 2004. *Global Warming, The Complete Briefing*. Cambridge University Press.

31 <http://www.cru.uea.ac.uk/tiempo/floor0/archive/issue09/t9art1.htm>

32 IPCC, 1997. IPCC Special Report *The Regional Impacts of Climate Change: An Assessment of Vulnerability – Summary for Policymakers*, online at www.ipcc.ch

33 *ibid*

Climate change
will exacerbate
existing vulnerability
and have an even
more devastating
impact on future
generations

Photo: Jim Loring



Future implications

The effects of human-induced global climate change will become more and more apparent in the coming decades (see box on future predictions, page 44). As the IPCC predicted in 2001, the poorest communities will continue to be worst affected: *'The effects of climate change are expected to be greatest in developing countries in terms of loss of life and relative effects on investment and the economy.'* Developed countries have a far greater ability to adapt to climate change and mitigate its effects. Proof of this can be found in statistics produced by the IFRC:³⁴ on average, 13 times more people die per reported disaster in low human development (LHD) countries than in countries of high human development (HHD). While some communities in developing countries are adapting to the changes they are experiencing (as has been documented elsewhere³⁵), helping them to adapt more effectively is becoming increasingly crucial.

Climate change will be a major impediment to achieving some of the Millennium Development Goals (MDGs) for poverty reduction. The experiences illustrated in this report from around the world highlight just how vulnerable poor communities already are to changes in climate. Food security, water supplies, public health and people's livelihoods are all being damaged and undermined. In agriculture-based societies particularly, changes in seasonal water availability brought about by climate change seriously impede development. Whatever the exact cause at the moment, it is very clear that ongoing and future changes brought about by global climate change will exacerbate existing vulnerability and have an even more devastating impact. It is therefore vital that greater attention is given to achieving MDG 7 of 'ensuring environmental sustainability', which includes indicators relating to greenhouse gas emissions, forests, and biodiversity.

34 International Federation of Red Cross and Red Crescent Societies

35 See Tearfund report *One Disaster Too Many*; and *Up in Smoke*, a report of the UK Working Group on Development and Climate Change, of which Tearfund is a member.

Climate change will have disastrous effects because of increasing populations. A small change affects thousands and thousands of people in our country (India). It is a threat to human development; with one disaster, years of development can be wiped away. (EFICOR)

Climate change adaptation and measures to reduce disaster risks must be fully integrated into national and international development and poverty reduction policies and programmes. This must include considering and addressing climate impacts in appropriate national sectoral and cross-sectoral strategies, including those relating to land and water management, agriculture, rural development, health and education.

It is extremely important to assess the management of natural resources as a fundamental component of adaptation programmes in developing countries, as the experiences documented here highlight. Local environmental management practices play a big part, both in how much communities in developing countries are affected by climatic changes, and in how well they are able to adapt to them.

In 2002 Tearfund produced a paper which highlighted how climate change could affect poor people living in Latin America, Africa and Asia by describing some of the impacts that it is likely to have on them. The aim was to show that climate change must be a key development issue.³⁶ This new study has shown that many of the predictions are already being realised. Further climate change will only exacerbate the effects spoken of here by communities from around the world. Communities are vulnerable and are struggling to cope now. If things are already bad, and are only set to get worse, we must listen to the voices of those who are living in climates that are changing. And we must take serious action – immediately.

36 Tearfund, 2002. *Climate Change and Poverty*. Online at www.tearfund.org

Latest climate change predictions

The Intergovernmental Panel on Climate Change produced its latest assessment report in 2001. The fourth assessment is currently under way and is due to be completed in 2007. But in terms of predictions, refinement of models and scenario developments are being made all the time.

Latest global predictions on global climate change from the Hadley Centre in the UK³⁷

The Hadley Centre has developed a method to estimate the uncertainty in climate models, which in turn are a large source of uncertainty in climate predictions. Preliminary results suggest that:

- The most likely global average temperature rise for a doubling of the concentration of atmospheric carbon dioxide is predicted to be 3.5°C, with a 90 per cent probability that the warming will be between 2.4°C and 5.4°C.
- At many locations, extreme temperatures are predicted to increase more than the seasonal average. At some locations, seasonal average rainfall is predicted to decrease, while the intensity of extreme rainfall will increase.
- Some climate change events have a low probability of occurring in the present-day climate but the impacts of these changes could be very large. For example, a collapse of the oceans' thermohaline circulation and deglaciation of Greenland.
- During 2003 Europe experienced its most intense heatwave on record, causing more than 15,000 deaths. Estimates are that man-made climate change has already doubled the risk of such heatwaves. It is predicted that by the 2060s such summer temperatures will be unusually cool.

Global land temperatures in 2003 were about 1°C above those at the end of the 19th century, making it the third warmest year on record. It was also third highest in terms of land and sea temperatures together, now about 0.8°C above the figure for the late 19th century.

Global Climate Models (GCM) can also be used to predict changes at regional level. For example, for Africa, results from GCMs project an overall increase in temperature but with predictions in precipitation being less consistent. The following results have emerged:³⁸

- NORTHERN Decrease (10–25 per cent) in precipitation June–August and 10–60 per cent on March–May for 2010–2039
- WESTERN Progressive increase in precipitation (10–35 per cent) for December–February (which is normally dry)
- EASTERN Net increase in precipitation for December–February and September–November (10–30 per cent)
- SOUTHERN Net trend towards decreased precipitation (15–62 per cent) predicted for June–August, and September–November

However, global climate models predict future climate on scales of 300km or more, whereas regional climate models (RCMs) provide information on scales of 25km or 50km. The Hadley Centre has developed a regional modelling software tool that can be used in any part of the world (PRECIS).³⁹ This system is being installed in countries all over the world and is likely to be a very useful tool in assessing regional impacts.

37 Hadley Centre, 2004. *Uncertainty, risk and dangerous climate change: Recent research on climate change science from the Hadley Centre.*

38 Nyong, 2005. *Impacts of climate change in the tropics: the African Experience.*

39 See UK MET Office, Hadley Centre: <http://www.metoffice.com/research/hadleycentre/models/PRECIS.html>

APPENDIX 1 **Participating organisations**

Africa

ETHIOPIA MKC (**Meserete Kristos Church**) is a church with regional offices and local congregations spread throughout the country. Its relief and development programme is involved in relief, rehabilitation, and development projects in the southern, central and north-western parts of the country. The project officer refers to changes in the last five years. Tearfund's programme support advisor in Ethiopia has also contributed.

Thanks to: (MKC) Sahle Mariam Mennamo; (Tearfund) Tadesse Dadi.

MALAWI Two organisations participated in this discussion. **RoL (River of Life)** is a church that has been involved in providing distributions during times of drought in Chikwawa and Nsanje districts of Malawi (south of Blantyre). **Eagles** is an organisation based in Blantyre but runs projects targeting villages in the disaster-prone area of Chikwawa. The directors of these organisations describe changes observed over the last ten years.

Thanks to: (River of Life) Rev Mvula Mvula; (Eagles) Victor Mughogho.

MALI TNT (**Tahanint N'Massinag E Tinbuktu**) is the development arm of the evangelical churches in Mali, working mainly in the north of the country on a variety of projects. **BADS (Bureau d'Assistance et de Développement Social)** is another organisation working in several regions of Mali on areas including agriculture, water and sanitation, disaster preparedness and mitigation, and conservation. Several members of both organisations were involved in the survey documenting changes observed in at least the last ten years or so.

Thanks to: (TNT) Pasteur Nouh Ag Infa Yattara, Amkalla Ag Aleyda, Aboucacrine Aljoumatt and Chef Slacaer; (BADS) Caleb Dembele, Amonon Doumbo, Coulibaly Maiga, Jean Pierre Doubia and Danaya Dembele.

MOZAMBIQUE MCL (**Ministerio Centro de Louvor**) is a church based in Maputo with congregations mainly in the centre and south of the country. One of its parishes is in the province of Gaza (headquarters in Chokwe), and it has been involved in relief and rehabilitation following the floods in 2000. The staff team in Chokwe were involved in responding to the survey (including agricultural workers) as well as some families involved in their agricultural programmes. They refer to changes they have experienced over the last 15 years.

Thanks to: Samuel Maunze, Nelda Nhantumbo, Amida Nharre, Arlete Honwane, Dino Omar, Abel Chauque and Reginaldo Chauque.

RWANDA MOUCECORE (**le Mouvement Chrétien pour l'Évangélisation, le Counselling et la Réconciliation**) is involved in grassroots participative community mobilisation through the local church and provides training and loans to communities on a number of issues. Several members of the organisation, including agricultural workers, were

involved in responding to the questionnaire, commenting on changes in Rwanda and the Central Africa region as a whole over the last 15 years.

Thanks to: Michel Kayitaba, Damien Mbonitegeka and William Kabera.

The thoughts of some community members in **BURKINA FASO** [through **ODE (Office de Développement des Eglises Evangéliques)**, the development wing of the Evangelical Churches, involved in a wide range of development activities in various regions of the country] and **NIGER** [through **JEMED (Jeunesse en Mission Entraide et Développement)**, working with the semi-nomadic Tuareg people in Niger to reduce their vulnerability to drought] are also included.⁴⁰

Thanks to: (Burkina Faso) Pastor Elie Kabore, Hamado Sebgo and Moustrapha Congo; (Niger) Ahmed Astaleh and Abraham.

Asia

BANGLADESH Three organisations have provided input from Bangladesh: **HEED (Health, Education and Economic Development)** runs a variety of development programmes throughout Bangladesh including responding to the needs of disaster-prone populations. Koinonia implements a number of different but complementary programmes in various parts of the country. This includes disaster management, working with vulnerable people to help mitigate and cope with disasters. **The SA (Salvation Army)** is working mainly in the south-west of the country and areas around Dhaka on community-based development. Project staff plus community support group members in villages of Jessore District contributed to the survey. These organisations report changes observed over the last 15–20 years.

Thanks to: (HEED) Sylvester Halder; (Koinonia) Dennis Datta; (Salvation Army) Ethne Flintoff, SK Nandi, Horen Chacroborty, Monira Perveen, Shiva Pada das, Pronab Dhar and Horosit Biswas.

INDIA **EFICOR (The Evangelical Fellowship of India Commission on Relief)** is a long-established relief and development organisation in India. Relief operations are usually in co-operation with a local partner agency, for example local churches or an indigenous Indian mission. EFICOR has wide experience of all types of relief work. The manager of Integrated Development Programmes contributed to the survey with changes noted in the last ten years. The thoughts of some community members in Orissa are also included.⁴¹

Thanks to: Salathiel Nalli, Kasti Bag, Latika Sagar, TK Joy and Lalitkuman Dau.

UZBEKISTAN **JDA (Joint Development Associates)** works in five regions of Uzbekistan and two regions of Afghanistan, assisting in the transformational development of local communities by helping initiate and implement projects in a number of areas, including clean water and agriculture. The regional director and project staff contributed to this discussion.

Thanks to: Oktyabr Dospanov and Dan Feistel.

Latin America

MEXICO AMEXTRA (*Asociación Mexicana de Transformación Rural y Urbana*) is an NGO working in seven states in the southern centre of Mexico, in both rural and urban areas, working on issues including water, agriculture and health. The director carried out the survey with consultation from a group of programme participants in the Palenque region. They mention changes they have observed in the last 30 years in central and south-east Mexico.

Thanks to: Eugenio Araiza and Jorge Perez.

HONDURAS Two different organisations have provided input: **OCDIH (Organismo Cristiano de Desarrollo Integral de Honduras)** is an organisation Tearfund worked with in the aftermath of Hurricane Mitch. Focusing on the west of the country, OCDIH works with communities on issues relating to sustainable development. Various members of the organisation, including regional co-ordinators, have given input on experiences of changing climate over the last five years. **MOPAWI (Mosquitia Pawisa)** works in the region of La Mosquitia in eastern Honduras (isolated from the rest of the country) in a variety of areas aiming to facilitate integrated sustainable development and biodiversity conservation. The director of MOPAWI has provided some thoughts here on the climate changes that are being experienced.

Thanks to: Carlos Santos, Nelson Fiallos, Lesly Toledo, Orvin Colindres, Magdalena Chavarria, Francisco Valle, Roberto Miranda, Edjardo Chevez, Oswaldo Munguía, Steve and Jude Collins.

PERU **Shalom (Association for International Development)** works in southern Peru running a number of rural development projects with a particular focus on mobilising women. A large number of people were consulted for the survey from Apurimac and Puno areas, including project staff, local authorities, community members and church leaders.

Thanks to: Carlos Quintana Jamanca, Benancio Quispe, Andres Gutierrez, Santiago Centeno, Walter Hurtado, Moisés Quispe, Herminio Altamirano, Alfonso Pariona, Jaime Castillo, Filiberto Vargas, David Chani, Luis Muñoz and Victoria Gomez.

40 Interviewed by Mari Griffith (Tearfund) in January 2005 during a campaigns trip to Burkina Faso, and Steve Adams (Tearfund) in Niger for the Tearfund Harvest Pack, *Sahel*.

41 Interviewed by Sophie Harding of Tearfund in September 2004.

APPENDIX 2 **Questionnaire** (MAIN SECTION)

Experience

- 1 Are you experiencing anything that indicates that weather patterns are changing:
 - a) in your country as a whole?
 - b) in your region?

- 2 Have any of the following phenomena changed more than you would expect with normal variation alone?
 - a) Seasonal weather patterns
 - b) Rainfall patterns
 - c) Temperature
 - d) Frequency of flooding
 - e) Frequency of droughts
 - f) Frequency of storms
 - g) Over what time-frame(s) have these changes been observed?
 - h) Any other indicators/observations that weather patterns are changing?

Impacts

AGRICULTURE

- 3 If there are changes in climate, please give as much detail as possible about how they are affecting any of the following:
 - a) Planting times
 - b) Harvesting times
 - c) Growing season
 - d) Crop yields

- 4 How are the impacts described above affecting food security?

- 5 Any other impacts on agriculture not covered above?

WATER

- 6 Are changes in climate affecting water security?
 - a) If yes, how?
 - b) What impact do these changes have on everyday lives?

HEALTH

- 7 Are you aware of any direct health impacts as a result of changing weather patterns? If yes, please give details.

GENERAL

- 8 Please describe any other impacts of changing climate that are not covered above.
- 9 Are these impacts affecting the work of your organisation? If yes, please give details of how.

Causes

- 10 What do you think is/are the cause(s) of these changes in climate?
- 11 Please explain any specific activities that you think are to blame at the following levels: Local level, National level, International level.
- 12 Who do you think is responsible for the causes you have given above?

Beneficiaries

- 13 Do your beneficiaries raise concerns about the issue of changing climate? If yes, what do they say?
- 14 Traditionally, how have communities coped with climate variability?
- 15 Have these coping mechanisms been hindered in any way? If yes, how?
- 16 Do you expect the impacts of changing climate to increase in the future? If yes, how?

Solutions

- 17 Are you aware of your government addressing this issue of changing climate in any way? If yes, please explain how they are addressing it.
- 18 What could your government do to help:
- a) your organisation deal with these changes?
 - b) your beneficiaries deal with these changes?
- 19 Is there any action that you would like to see rich countries taking in relation to these changes?
- 20 Do you think the fact that the G8 is prioritising global warming is going to make any difference to: your organisation; your beneficiaries?
- 21 How do you think the Kyoto Protocol will impact: your organisation; your beneficiaries?

Useful resources

(Available at www.tearfund.org)

Climate Change and Poverty

Tearfund paper looking at the causes of climate change and general predictions of its impacts. It discusses the implications of climate change for sustainable development within Latin America, Africa and Asia.

Three Climate Changes

Briefing paper outlining three specific 'climate changes' Tearfund asked Tony Blair to make in 2005.

Africa and Climate Change Briefing Paper

Tearfund's suggestions on what should be included in a climate change plan of action for Africa.

Tearfund Sustainable Living Guide

Lifestyle actions for reducing climate change that Tearfund is encouraging supporters to take.

Sahel – Tearfund church pack

Pack introducing the issues of the environment and climate change to a church or group.

A Tearfund guide to Sustainable Development – what future for the poor and the planet?

One Disaster Too Many – Why thousands are dying needlessly each year in preventable disasters

Tearfund report outlining that thousands of lives could be saved by simple measures to prevent and prepare for disasters.

Tearfund case-studies:

- *Community-based Disaster Risk Reduction in the Indian State of Bihar*
- *Development and Risk Reduction in Hazard-prone Communities of Andhra Pradesh in India*

Up In Smoke? Threats from, and responses to, the impact of global warming on human development

A report produced by the UK Working Group on Development and Climate Change, of which Tearfund is a member.

Africa Up in Smoke?

The second report of the UK Working Group, produced for the G8 summit in 2005.



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