

This key sheet is part of a series aimed at DFID staff and development partners examining the impact of climate change on poverty, and exploring tools for adaptation to climate change.

This key sheet concentrates on climate change in Latin America. It aims to guide the reader through the key issues of:

Latin America's climate;

- Climate change in Latin America;
- Impacts on development;
- Implications for development; and
- Implications for international policy.

# 12 Climate change in Latin America

Latin America's recent progress in development is at risk from increasing climate variability: Better policies are required now to reduce the impact on the poor.

*'As the river burst its banks in Ocotal (in north west Nicaragua) families sought refuge in trees, but as help didn't come their arms grew tired and their children fell to their deaths in the torrent.'*

Luis Armaya, Nicaraguan commenting on Hurricane Mitch.

The poor in Latin America are already vulnerable to the climate, including hurricanes and the effects of El Niño. Climate change will worsen this picture, with changes in temperatures and rainfall, and an increasing frequency and severity of El Niño, storms and hurricanes. If the effects of the climate on poverty are not recognised and managed, then gains in development made over decades will remain at risk to a few days of adverse weather. Latin America cannot afford to ignore climate risks.

Those in the frontline – the poorest – need more help now. Governments and the international community can help by removing the barriers that prevent the poor from coping with the climate, for example, by recognising land rights, improving services, and providing early warning and disaster management systems. National economic and social policies can be developed to mitigate climate risks, complementing actions to achieve pro-poor economic growth by



reducing inequality and marginalisation, improving employment opportunities, and providing effective social protection.

## Coping with today's climate

Even without future climate change, Latin American countries face regular climate risks including variable rainfall, droughts, floods, and windstorms. In a region where agriculture remains one of the main sectors (employing 30 to 40% of the economically active population) changes in the timing and intensity of rainfall have serious consequences. Climate variability is associated with both the El Niño Southern Oscillation (ENSO) phenomenon and with hurricanes that are common in the region<sup>1</sup>.

- Hurricanes are notorious for the destruction they leave in their wake. In 1999, Hurricane Mitch hit Central America and resulted in losses in Nicaragua and Honduras equalling their combined GDPs, and setting back the development of Honduras by an estimated 20 years. The poor were the hardest hit, often living on exposed and marginalized slopes that gave way into landslides during the heavy rainfall. Following the event only 25% of rural households were food-secure<sup>2</sup>;
- In particularly strong years (e.g. 1982/3 and 1997/8) El Niño has been associated with increased risk of floods and droughts<sup>3</sup>;
- The 1982/3 El Niño led to losses of up to US\$14 billion worldwide. US\$2 billion were lost in Peru mainly from the loss of fishing revenue (see Box 1), and the destruction of infrastructure<sup>4</sup>;
- During the 1987/88 El Niño the second winter crop in Bolivia (sorghum and soybeans) was badly affected by excessive rains in June followed by dry weather in July<sup>5</sup>.

## What do we know about climate change in Latin America?

### More frequent and worse El Niño events

The most concerning aspect of climate change in Latin America is the predicted increase in magnitude and frequency of strong El Niño events. This is likely to result in the following conditions<sup>6</sup>:

### Box 1

## The impact of El Niño on Peruvian fisheries

The 1998 El Niño severely affected Peru's second biggest foreign currency earner by reducing fish catch volume by 45% (compared to the 2002 catch level). Peru's fishing industry contributes around 4% to its GDP, employs 20,000 people in industrial fishing, and 50,000 small-scale fishers.

In normal conditions, prevailing offshore winds blow warm water off the coast, allowing nutrient rich cool water to flow upwards ('upwelling'). This supports a productive anchovy fishery. During an El Niño event these winds weaken, and the upwelling does not occur, severely reducing the productivity of coastal fisheries. Small-scale fishermen are badly affected particularly as they cannot fish in the rough weather associated with El Niño conditions. This is significant for food security because the anchovy fishery produces 70% of fish for direct human consumption in Peru.

Sources: Prado. J 1999 Research and Development in Fishing Technology in Latin America, FAO Fisheries Department & The Environmental and Societal Impacts Group (ESIG) of the US National Centre for Atmospheric Research  
<http://www.esig.ucar.edu/un/ecuador.html>

- Drier conditions across Central America;
- Drier conditions across the North east of Latin America during July to March;
- Wetter conditions across the south east of Latin America during November to February;
- Wetter conditions along the west coast of Ecuador and Peru;
- High temperatures along the western coast during May and April; and
- Increase in peak wind and rain intensity during storms and hurricanes.

### Changes in temperature, rainfall and sea levels

Alongside increased El Niño conditions, there will also be gradual changes related to rainfall and temperature although the direction of these changes varies across the continent.

1 Typically during an El Niño event, the west and southeast Latin American countries are wetter than usual and those in the northeast experience drier conditions.

2 Morris, S., Neidecker-Gonzales, O., Calogero, C., Munguia, M. and Wodon, Q. 2000 Hurricane Mitch and the Livelihoods of the Poor.

3 Charveriat, C. 2000 Natural Disasters in Latin America and the Caribbean: An Overview of Risk. Inter-American Development Bank Research Department Working Paper 434.

4 Freeman, P.K., Martin, L.A., Mechler, R., and Warner, K. 2002 Catastrophes and Development: Integrating Natural Catastrophes into Development Planning. Disaster Risk Management Working Paper Series No. 4 Washington DC: World Bank.

5 Downing, T.E. 1992 Climate change and vulnerable places: Global food security and country studies in Zimbabwe, Kenya, Senegal and Chile. Oxford: University of Oxford, Environmental Change Unit.

- Increased temperatures for the next century of between 0.2 and 2°C (if emissions of greenhouse gases do not continue to rise significantly), or between 2 and 6°C (if they do)<sup>7</sup>. It is highly certain that there will be warming during summer months, and some areas will be characterised by hot and cold waves;
- Changing in rainfall patterns. Climate models give predictions for several Latin American countries:
  - Nicaragua: a decrease in rainfall of around 30%;
  - Brazil: a small increase in rainfall in southern areas;
  - Mexico: increases in rainfall in the northwest; and
  - Costa Rica: a decrease in rainfall along the west coast of 25% and a small increase along the east coast; and
- Rising sea levels. As with global predictions, sea levels are expected to rise by 0.11 to 0.77m by 2100.



Jeremy Horner, Panos

### Uncertainty of predictions

There is currently very little information – that is of practical use to decision makers – on the precise extent and impacts of climate change,

especially for any specific location within a country. Climate models do not all make the same predictions for Latin America (e.g. some predict a decrease in rainfall while others predict an increase), and all make their predictions in ranges. This is due to the scientific difficulties in modelling current and future climate patterns and in estimating future levels of greenhouse gas emissions. Although new models will continue to be developed giving predictions on a smaller scale, the only predictions currently available are for broad areas (300km<sup>2</sup> in global climate models) and the long-term (2050-2100).

Nevertheless, climate change will inevitably present a significant challenge for developing countries, and the need to adapt to these changes remains an inescapable conclusion. In a practical sense we can start by reducing their vulnerability to today's climate.

## Impact on development

Vulnerability to the current climate, and its variability, provides the strongest indication of the impact of climate change on development. The links between climate and poverty that we see today will be magnified.

**Food security** will be affected, risking livelihoods, food security, and economies. Water availability affects grain crop and livestock production in Central America (Mexico, Costa Rica and Panama), the Andes and parts of Brazil, Chile and Argentina. Fisheries-based livelihoods will be damaged as the changing climate disrupts fisheries (e.g. through altering ocean currents). Ecosystem change will change the environmental 'services' that agricultural and manufacturing industries rely on. For example, increased severity of droughts will add further pressure on forests that are important for water cycling, timber, sources of materials and food for local communities.

**Health** will be put at risk by increased prevalence of malaria, dengue, and water-borne diseases. For example, studies in Venezuela and Columbia have shown a direct correlation between malaria cycles and El Niño years. Dengue is already in evidence at higher elevations than previously known (e.g. in Mexico). In Bolivia, cholera and salmonella episodes have followed El Niño events<sup>8</sup>.

**Water security.** Studies in Latin America show there has already been an increase in

6 Watson, R.T., Zinyowera, M.C., Moss, R.H. and Dokken, D.J. 1997 The Regional Impacts of Climate Change: An Assessment of Vulnerability. IPCC Special Reports. <http://www.grida.no/climate/ipcc/regional/>

7 McCarthy, J.T., Canziani, O.F., Leary, N.A., Dokken, D.J. and White, K.S. (Ed.s) 2001 Climate Change 2001: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the

Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

8 PAHO (PanAmerican Health Organisation) 1998 Climate Change and Infectious Diseases: The Implications of El Niño. Provisional Agenda Item 5: Subcommittee on planning and programming of the executive committee 30th Session, 30-31 March 1998.

temperature leading to a decrease in size of glaciers in the high mountains. This will result in an eventual decrease of runoff from snowmelt leading to a decrease in available water. Estimates of freshwater availability and the impacts of climate change in Mexico and South America over the next quarter century indicate that about 70% of the population will live in regions with low water supply by 2025.



Clive Shirley, Panos

**Displacement of people.** People living in overcrowded shanty towns around large cities, especially in flood-prone areas and unstable hillsides, are particularly vulnerable to flooding. El Niño events cause damage to critical infrastructure and disrupt access to vital services. El Niño-related flooding in 1997/8 across Ecuador and Peru caused damage to 34 hospitals and 485 small health centres<sup>9</sup>. Climate change may have already led to an increased land loss along the coast of Brazil and degradation of protective coral reefs along the coast of Ecuador resulting from bleaching related to increased sea temperatures.

**Beneficial impacts.** Not all changes will be negative: growing seasons may lengthen with better rains in some areas, or increasing temperature may deliver increased crop, livestock and fisheries yields. However predicting precisely what any of these changes are in the short term is currently speculative,

and beneficial impacts are likely to be outweighed by the adverse impacts of unpredictable change.

## Impact on the poor

The poor are already finding it difficult to cope with the effects of El Niño and hurricanes. For example, following Hurricane Mitch, households who lacked savings to draw from and access to alternative employment suffered for longer than others.

The ability of the poor to cope with the climate is being eroded by economic changes, increasing urbanisation, increased population densities along coasts, and environmental destruction:

- Changes in the economies of many Latin American countries have led to more fluctuating markets in the place of fixed and guaranteed prices. This has reduced the security of farmers and decreased their ability to deal with further shocks;
- An increasing proportion of the population are concentrated in coastal states and in urban areas, so there will be an increasing population vulnerable to sea level rise and increased frequency and intensity of coastal storms. Current estimates suggest that 75% of Latin America's population is urban, 60% live in coastal areas, and 60 out of 77 of the largest cities are located on the coast; and
- Environmental degradation, including deforestation and soil erosion, are increasing vulnerability of settlements, agricultural lands and industry to flooding and windstorms.

## The country-level response

The poor should be supported to manage climate risks. Governments can do this by improving planning and services.

Although storms and hurricanes are a regular feature of the climate in Latin America, examples of mitigation of these risks are rare. Action is required today to support the poor's coping strategies and reduce their vulnerability to current climate variability and extremes.

Firstly, agencies and governments should improve understanding of how current climate patterns affect the vulnerability of the poor, so that informed decisions can be taken on how to support poor people's coping strategies. This

The poor should be supported to manage climate risks

<sup>9</sup> PAHO 2001 Disasters: Preparedness and Mitigation in the Americas. Issue No. 84: <http://www.paho.org/>

<sup>10</sup> ISDR 2002 Living with Risk: A global review of disaster reduction initiatives. ISDR (with UN, WMO and the Asian Disaster Reduction Centre), Geneva. Preliminary version prepared as an inter-agency effort coordinated by the ISDR Secretariat: <http://www.unisdr.org/unisdr/>

will help identify which development policies are of greater urgency, and which should be adjusted to integrate future scenarios.

### Understand the vulnerabilities and capacities of the poor

Understanding the poor's vulnerability and capacities will help both development agencies and governments identify what action is appropriate. If carried out using participatory approaches these assessments can help communities to recognise their risks and take action. The Peruvian NGO, Ecocuidad, has undertaken participatory risk assessments in Lima by holding community meetings to map out threats, vulnerabilities and capacities. This

#### Box 2

### Examples of action to help the poor reduce their risk to climate

#### Support land rights

Following heavy rainfall in Venezuela, poor households were restrained by a lack of land rights to rebuild their homes in less vulnerable locations. Many were forced to reconstruct their houses in flood-prone ravines<sup>11</sup>.

#### Facilitate communal action

In Guyanan coastal towns, community groups in squatter settlements have undertaken collective drain digging and successfully reduced damage caused by annual coastal flooding. In contrast communities reliant on ineffective municipal agencies have suffered from poorly maintained drains and flood damage<sup>12</sup>.

#### Improve access to micro-credit

In Mexico poor rural households are often more restrained by their lack of credit than their ability to predict rainfall. Deep tillage is a good water conservation technique in dry years but requires the financial liquidity to rent a tractor at the required time of year. Often farmers are forced to leave this task until the spring – too late to help in moisture conservation or to take advantage of the first rains<sup>13</sup>.

has led to creation of volunteer brigades specialised in emergency rescue<sup>10</sup>.

### Reduce the vulnerability of the poor

#### a) Support the poor's coping strategies

Based on an understanding of the vulnerabilities, capacities and risks of the poor, ways of supporting the coping strategies of the poor can be identified. Breaking down barriers and constraints that weaken their coping strategies is a necessary first step. This may include supporting the recognition of land rights and land reform, communal action in risk reduction or access to financial services (see Box 2).

#### b) Support government action

Governments, with the support of their partner development agencies, also have responsibilities to share the burden of climate risks and reduce the vulnerability of the poor through:

- **Delivery of essential services** e.g. water and sanitation services. Investments of US\$5.9 million in water and sanitation could have prevented the 1991 cholera in Peru epidemic costing US\$232 million in economic losses (e.g. tourism, loss in earnings, reduction in fishery productivity and patient care)<sup>14</sup>. Investments in water and sanitation services across Latin America would benefit the health of the poor substantially and prevent outbreaks of disease following El Niño and other climate extremes.
- **Environmental protection.** It is widely accepted that environmental degradation contributed to the devastation of Hurricane Mitch. In response, NGOs in El Salvador have begun programmes to help reverse deforestation and soil erosion across Central America. The programme focuses on participation of local residents in water basin management planning, increasing security of land tenure and promoting sustainable practices in farming.
- **Land use planning.** Municipalities in Nicaragua are taking climate risks into account during land-use planning. Hazard maps and land use zoning is being undertaken with the participation of local residents to take account of local knowledge.
- **Early warning systems.** A programme of community-based disaster preparedness in La Masica, Honduras, successfully prevented any casualties during Hurricane Mitch. The success of the programme was related to

We need to understand how the climate affects the vulnerability of the poor

11 Red Crescent Society 2001 World Disaster Report: Focus on Recovery. International Federation of Red Cross and Red Crescent Societies, Geneva.  
12 Pelling, M. 1998 Participation, Social Capital and Vulnerability to Urban Flooding in Guyana. *Journal of International Development* 10: 469-486.  
13 Eakin, H. 2000 Political-Economic Uncertainty and Climatic Hazards: The Utility of Climate Forecasts for Small-scale Farmers in Tlaxcala, Mexico. IRI

Proceedings.  
14 Petrerá M. and Montoya A. 1992 Loss in the time of cholera; Peru 1991. *PAHO Epidemiological Bulletin* 13 (3): 9-11.  
15 InterAmerican Development Bank 1999 Facing the Challenge of Natural Disasters in Latin America and the Caribbean: An IDB Action Plan. Sustainable Development Department: Special Report.

timely information on the onset of the hurricane and effective community organisation and know-how to protect lives and property. DFID is supporting an awareness-building programme across Latin America to increase understanding of the risks associated with hurricanes. The innovative programme makes use of a radio soap opera to communicate ways of reducing risks. The Inter-American Development Bank is also currently assessing how weather forecasting can be modernised in Latin America and how risks are communicated<sup>15</sup>. These pilot approaches can be applied elsewhere.

- **National disaster planning and coordination.**

The benefits of a national disaster plan were illustrated in Cuba where, during Hurricane Michelle in 2001, over 700,000 people and 777,000 were evacuated and moved to safety. This required effective coordination across all levels of government.

### **Integrate climate risks into development planning**

While economic growth will be vital in providing opportunities for the poor, careful planning will be necessary to avoid misconceived policies increasing the vulnerability of the poor.

The danger of ignoring climate risks in development forecasts was illustrated in a recent study of disaster impacts on poverty. The study simulated two development forecasts for Nicaragua: one forecast assumed no disaster would take place, and predicted that poverty would be halved by 2008; the other included disasters as a factor influencing development, and showed that only one disaster would result in no progress in reducing poverty. It is clear that the possibility of disasters needs to be recognised and specific steps taken to protect achievements in poverty reduction.

Poverty reduction strategy processes, and other national level policy frameworks, can be used to address climate risks and incorporate measures to reduce the risks faced by the poor. This complements efforts to achieve pro-poor growth by reducing inequality and marginalisation, improving employment opportunities for the poor, and providing effective social protection. Bolivia's PRSP recognises that Bolivia's economy and the poor are vulnerable to natural shocks. Their vulnerability has been addressed by a social protection component, which forms one of the four main components of the PRSP. However,

as yet, no specific fiscal or other measures to reduce the impact of adverse weather on economic growth have been identified<sup>16</sup>.

The following key sheets explore these issues in more detail:

- Key sheet 05 Responding to the risks of climate change: Are different approaches to poverty eradication necessary?
- Key sheet 06 Adaptation to climate change: Making development disaster proof;
- Key sheet 07 Adaptation to climate change: The right information can help the poor to cope;
- Key sheet 08 Adaptation to climate change: Can insurance reduce the vulnerability of the poor? and
- Key sheet 09 Taking initial steps towards adaptation.

## The international response

To support adaptive capacity in Latin America, there are a number of implications for international policy and research, including the UN Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). The UK Government will:

- Work to foster a collective process allowing the exploration of options and negotiation of solutions for a global emissions reduction regime in partnership with developing countries;
- Work with Latin America governments to place the voice of poor countries in Latin America more effectively in the negotiation process;
- Encourage the international research community to develop research agenda that reflect the needs of poor countries, are based on an understanding of current poverty and vulnerability, and provide tools to predict and understand current climate variability and extremes and short term climate change within planning timescales (3-5 years); and
- Support Latin American governments to identify the practical implications of information arising from the research community, including long-term scenarios generated by global or regional climate models.

16 Moser, C. and Antezana, O. 2001 Social Protection Policy and Practice in Bolivia: Its implications for Bolivia's Poverty Reduction Strategy Paper (PRSP). ODI Working Paper 156, London: Overseas Development Institute; and International Monetary Fund and The International Development Association 2001 Bolivia: Poverty Reduction Strategy Paper Joint Staff Assessment.

## Further reading

Regional climate change impacts (Chapter 6):  
<http://www.grida.no/climate/ipcc/regional/>

Maps of climate change impacts  
(World Resources Institute):  
<http://www.climatehotmap.org/>

Living with Risk: A global review of disaster  
reduction initiatives:  
<http://www.unisdr.org/unisdr/>

Risk reduction Network, ProVention  
Consortium:  
<http://www.proventionconsortium.org/>

Caribbean Disaster Preparedness Network:  
<http://www.cpacc.org/>

Community risk reduction in the Caribbean  
and Latin America: <http://www.ciir.org/ciir.asp>

Health prevention and programmes in  
Caribbean and Latin America:  
<http://www.paho.org/>

Report on Adaptation to climate change in the  
developing world (IIED):  
[www.iied.org/docs/climate/adapt\\_to\\_cc.pdf](http://www.iied.org/docs/climate/adapt_to_cc.pdf)

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