**DFID** Department for International Development

**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 focuses on information needs in planning for and reducing risks to current climate and future climate change. It aims to guide the reader through the key issues of:**

- **Current use of information in reducing the poor's vulnerability to climate change;**
- **Challenges in making information of practical value;**
- **Using information to inform responses to climate change; and**
- **Actions to improve the generation and use of information.**

**Lastly, this key sheet advises on the way forward to make more effective use of information in adaptation to climate variability and change.**

07

# Adaptation to climate change: The right information can help the poor to cope

## Climatic information must be delivered and disseminated in ways that increase its practical value to poverty eradication.

Climate change will increase the poor's vulnerability and make pro-poor growth more difficult. The poor's range of response options to climate variability is known as their 'adaptive capacity'. The poor's adaptive capacity is supported by macro-level policy and institutions and mechanisms, and should be reflected in development planning.

Ensuring that planning processes integrate climate risks will require 'risk identification', i.e. bringing together and effectively disseminating information on vulnerability and hazards. It will also require a range of risk reduction and risk spreading options. This key sheet focuses on the information needed to understand climate risks i.e. the first step in the approach.

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## Using information about the climate

There is a fast-growing body of information on the climate, including information about current climatic variability, and improving global and regional models of the future climate. Understanding of climate systems and the ability to forecast short-term and medium-term weather and seasonal climates[1] has also improved over the past few decades.

1 'Short-term weather forecasts' are predictions of actual conditions for up to 5 days. 'Medium-term weather forecasts' are predictions of actual conditions for 5-20 days ahead. 'Seasonal climate forecasts' are probabilistic forecasts, i.e. forecasts of likelihood, of the average values of air temperature, humidity, rainfall, wind speed etc.

However, this information needs to be well targeted and interpreted so it can be used by different audiences to manage risks. It is also important to combine climate information with other environmental data and with an understanding of people's vulnerabilities.

### Demand and timescales of information

Information requirements on climate risks relate to different timescales, associated with different audiences and means of communication (Box 1). For example, short-term weather forecasts, including cyclones and flooding prediction, will help communities save lives and property. Medium-term, seasonal weather predictions can assist farmers, health service providers and food security planners in preparing for famine or disease outbreaks. Long-term climate change scenarios of changing rainfall patterns, temperature and sea level rise can inform more strategic decisions about the approach and location of development.

While farmers may use short-term forecasts to decide when to plant or harvest crops, they can use seasonal climate predictions to decide which crops or cultivars to grow, and use longer term climate scenarios to plan migration, livelihood diversification or alternative land-uses.

There is a also a need for clearer messages concerning short and long term climate risks, including numbers of people affected and estimated economic impacts, that enable governments' planning and finance departments to act. The quantification of financial and economic impacts is difficult, but is important in highlighting the cost-effectiveness of integrating climate risks in comparison to a business-as-usual approach.

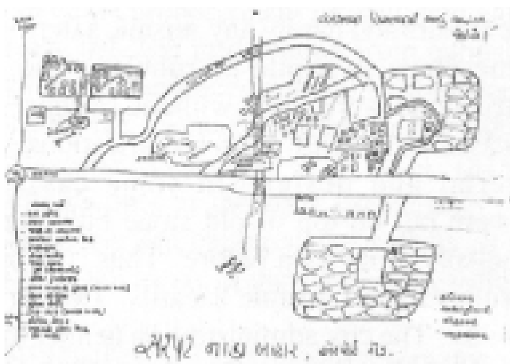
### Combining vulnerability and hazard information

Climate information on its own does not always allow individuals, communities or governments to assess their risks or undertake risk reduction activities. Climate information needs to be combined with a number of other types of information to give an indication of risk. For example, in the case of flooding it is necessary to combine weather forecasts with hydrological data to provide governments with the likelihood of flooding and predicted impacts according to known vulnerabilities.

There are a number of methodologies for 'vulnerability assessment' emerging, including the Red Cross Vulnerability and Capacity Assessment, and the Action Aid Participatory Vulnerability Assessment. Some of these can be used to assess vulnerabilities at broad levels across society.

The process of going through a vulnerability and capacity mapping analysis with a flood-prone community in Bhuj, India, allowed the most vulnerable households to be identified and simple actions to be taken to reduce risks (Figure 1 illustrates the community risk mapping exercise).

**Figure 1. Community risk mapping exercise from Bhuj, India**



### Effective dissemination

The key to the successful use of information is presenting it in a form that is useful to the audience. The elements to be considered will include the message, delivery system, frequency, language and style of communication.

Short-term early warnings for cyclones may be most effectively disseminated through popular media such as the radio or TV, while longer-term climate risks (incorporating vulnerabilities) may be best illustrated through maps or GIS databases, to allow planners to integrate a wide range of information.

### Community-level information

Climate information is so important to rural communities that people everywhere already use the available tools to forecast future harvest conditions. For example, in the Andes, farmers use star observations to forecast rainfall (Box 2). By understanding traditional systems of weather or climate forecasting, we can see how best to develop new, locally relevant methodologies.

Box 1

# Timescales and audiences for information

| Required hazard information and tools | Required vulnerability information | Process of assessing the risks | Target audiences | Examples of outputs and dissemination |
|---|---|---|---|---|
| **Short-term weather forecasts (1-5 days)** | | | | |
| Forecasting techniques. | Vulnerability assessments of communities, infrastructure and property for insurance. | Mapping vulnerable populations. | Vulnerable populations who may be affected need warning of upcoming extreme events and what action to take.<br>Emergency response networks.<br>Insurance companies. | Simple messages for early warning systems for extreme events and weather forecasts through radio, TV and emergency networks. |
| **Medium range weather forecasts and seasonal climate predictions (5-20 days)** | | | | |
| Historic climate data and understanding of seasonal relationships.<br>Seasonal climate forecasts of likely extent of rainy season. | Vulnerability assessments of communities, infrastructure and economies. | Seasonal planning methods that can incorporate climate data and act upon it. | Organisations involved in seasonal planning e.g. extension services, farmers, international disaster agencies, insurance markets. | Early warning systems for disease outbreaks, maps of forecasting food insecurity, and maps of vulnerability floods. |
| **Future-term climate change scenarios (e.g. 2020, 2050, 2080)** | | | | |
| Historic meteorological data, global climate models and regional climate models. | Longer term vulnerability scenarios for communities and regions. | Strategic planning systems that can incorporate climate change predictions into planning processes. | Strategic planners at national level, decision-makers at all levels of government, NGOs, and communities.<br>Insurance and financial markets. | Vulnerability maps of communities, or infrastructures, with messages on adaptation options. |

Box 2

### Traditional weather forecasting in the Andes

Farmers in some Peruvian and Bolivian communities use observations from the Pleiades star constellation to forecast rainfall during the growing season. Farmers observe the overall brightness, the size, and the date of first appearance and position of the brightest star to assess when to plant for a successful harvest of potatoes.

Scientists have found that the visibility of the constellation is associated with the warm phase of El Niño. Andean farmers have in effect been 'forecasting' El Niño for at least 400 years.

The process and the capacity for integrating climate information into develop-ment planning is currently lacking

Communities can make critical contributions to understanding the wider context of shocks and stresses they experience, and by specifying the type and form of climate information that could help them to manage climate shocks and variability. Communities can also provide vital information in 'ground-truthing' forecasts and providing surveillance data. There needs to be improved dialogue between information providers and policy-makers so that climate information can be demand-driven and correctly interpreted.

## Challenges in providing information

Despite the need for timely and well-targeted information on climatic risks, there are currently a number of gaps and challenges in providing these needs.

**Climate information is often not effectively targeted or disseminated**

An increasing amount of climate information (in the form of weather forecasts, seasonal forecasts and climate change scenarios) is available and could be used for a range of audiences and timeframes. However, the information is not always delivered to potential end-users (either strategic decision-makers, communities or individuals) in an accessible way so that they can interpret its relevance or be aware of its use.

**Lack of process in interpreting information**

In some cases, information on climate variability is available, but the process and the capacity for integrating this information into vulnerability and capacity assessments, to feed into poverty reduction strategies and sectoral planning, is lacking.

**Predictions are difficult without sufficient meteorological data**

In many developing countries there is a lack of historical meteorological data on which to base more accurate future predictions. For example, maps of changes in weather extremes published in the 2001 report of the Intergovernmental Panel on Climate Change (IPCC) Third Assessment show no data for South America, and large parts of Africa and Asia, due to a lack of suitable observations. Seasonal predictions are less of a problem and have operated in southern Africa for several years with relative accuracy.

**Building on communities' traditional approaches**

Information should be provided to communities in a way that builds on, rather than weakens, their traditional approaches to weather prediction. Providing locally relevant information should build on the tools already used in the local context.

**Risk assessments are not available for the shorter cycles of decision-making**

Adapting to current climate variability is an essential first step in adapting to future climate change. However, rather than focusing on the near future (i.e. the 5-10 year period favoured for strategic and financial planning cycles in government), most climate-risk assessments look to the distant future (i.e. 20, 50 or 80 years ahead).

**Integrating longer-term trends into approaches to address vulnerability to the current climate**

Tracking longer-term climate trends, and integrating this information with approaches to deal with current climate variability, can ensure that these approaches do not inadvertently increase vulnerabilities to longer-term climate change. However, the lack of observational climate data, in Africa particularly, is recognised as a constraint to understanding current and future climate variability.

# Information in the toolkit for adaptation

The crucial role of climate information and assessments is to provide an understanding of how climate change increases the vulnerability of the poor through the impact on their livelihoods, health, and economic opportunities. To avoid either under-investment or over-investment in information gathering – and ensure that this crucial role in adaptation is fulfilled – the following approach is necessary:

Climate information can improve our understanding of poor people's vulnerability

- Adapting to the current climate (including average conditions, seasons, climate shocks and inter-annual variability) will address part of the response to longer-term changes in the climate. Information related to climate risks in the short- and medium-term will, therefore, be as important as long-term predictions;
- Climatic information must be delivered and disseminated in ways that increase its practical value. This will require improved integration with vulnerability assessments, and assessment of risk. This is an iterative process and will require co-ordination across sectors collecting these different types of information;
- Communities themselves will be an important part of this process, providing traditional means of forecasting and surveillance data necessary in ground-truthing predictions;
- Climate information should be integrated into vulnerability and risk assessments, participatory poverty assessments, Poverty Reduction Strategies (PRS) and other planning processes.

# New approaches

New and novel approaches to providing information on hazards, vulnerabilities and assessment of risks are being developed across the range of short-, medium- and long-term timeframes.

**Short-term risks**

Experience in Bangladesh has illustrated how early warning systems can be developed in close collaboration with communities to disseminate very short-term information on extreme climate events. The cyclone early warning system has been combined with capacity building of the community in responding to the warnings, and has saved numerous lives (Box 3). A similar approach is now being piloted with flood-prone communities.

Box 3

## Bangladesh cyclone warning system: Prior warning saves lives

A successful cyclone warning system, set up in coastal communities along 710km of Bangladesh's coastline, has saved countless lives. The programme is run by volunteers at the grassroots level and has been developed into a highly efficient system where warnings from the Meteorological Office feed through a number of chains to reach village-level radios. Local volunteers combine warnings with traditional weather predictions and ground-truth the forecasts by taking measurements of wind speed and direction.

Similar approaches to flood warnings are being piloted by the Government's Flood Warning Centre, by turning meteorological information into simple messages on which people can act to protect themselves and their assets. Support to enable people to respond to the warnings is key to the success of these initiatives.

**Medium-term risks**

Recent developments in forecasting the El Niño Southern Oscillation phenomenon have allowed meteorologists to give seasonal forecasts on predicted occurrence of rainfall and drought. The US National Oceanic and Atmospheric Administration (NOAA), working with a number of partners[2], has set up a series of Regional Outlook Fora across Africa, Latin America, the Caribbean and South East Asia. The fora bring together a range of national and international meteorologists to produce probabilistic, consensus-based seasonal forecasts (Box 4) to inform farmers, the Famine Early Warning System (FEWS) and other interested parties. The fora are supported by an ongoing programme of training[3] and research programmes. Current research[4] is testing the statistical relationship between seasonal climate and long-term climate change and the social response of southern African farmers to seasonal forecasts.

2 With the support of the United States Agency for International Development (USAID), Institute for Climate Prediction (IRI), the European Network for Research in Global Change (ENRICH), the World Meteorological Organisation (WMO), the Inter-American Institute for Global Change Research (IAI), and the UK Met Office.

3 The training program is managed jointly by US National Centres for Environmental Prediction, the International Activities of the National Weather Service, and the World Meteorological Organization.

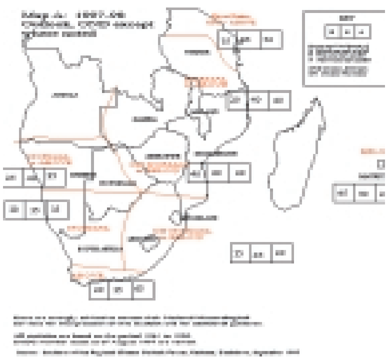
4 Tyndall Centre research at Oxford University and the Stockholm Environment Institute.

Box 4

**Regional Climate Outlook Fora** NOAA has been working on seasonal forecasts in Africa since 1994, with three fora covering West Africa, the Greater Horn of Africa and Southern Africa (SADC region) respectively. The Regional Outlook Fora bring together national and international meteorological offices and information users.

Fora meet prior to each rainy season (i.e. October-March for southern Africa, September-December for the Greater Horn of Africa, and July-September for West Africa) to analyse global climate systems and the range of predictions from different meteorological offices, to formulate a single set of predictions based on consensus. The implications for farmers and for food security are highlighted.

The forecasts are probabilistic (e.g. 'there is a 60% likelihood that there will be below normal rainfall', thereby allowing for the possibility that wet conditions could prevail). While the predictions in southern Africa have been reasonably accurate, predictions vary from year to year with generally lower levels of accuracy in El Niño years. The fora have always included application design workshops, which involve the exploration of the use of predictions with a number of sectors, including agriculture, fisheries, and water resources. For instance, the 2003 Regional Outlook Forum in Kenya highlighted the cumulative impacts of below normal rain predictions for Kenya and Tanzania, following on from previous low rainfall years. Representatives from disaster management organisations and the media attend, so they can play their key role in disseminating climate information across the region.



Regional Climate Outlook Forum Seasonal Forecast for rainfall and drought in Southern Africa 1997/8

Medium-term climate risk information is also being used to inform preventative action in other sectors. For instance, health early warning systems are being developed that use a combination of climate information, vulnerability assessments and feedback from surveillance networks. The World Health Organisation (WHO) is currently promoting a Malaria Early Warning System to allow environmental controls and personal protective measures (e.g. mosquito nets) to be put in place (Box 5).

Box 5

## World Health Organisation: The Roll-Back Malaria Initiative

This initiative has been developing a Malaria Early Warning System (MEWS) in order to identify populations at risk of malaria epidemics and help co-ordinate preventive and responsive interventions. The framework for MEWS makes use of climatic data, local environmental factors, population movements, vulnerability assessments, surveillance of malaria morbidity and other health indicators. It suggests the use of a simple three flag warning system with responses based on each level of risk, using indicators and threshold diagnostics. There is an opportunity for this system to work closely with Famine Early Warning Systems (FEWS), and to be extended to cover other climate-related diseases including river valley fever (a virus affecting livestock), and meningitis.

### Long-term risks

Long-term climate risk assessments are available at a general level through Global Climate Change models. Regional models are also now being developed with a higher resolution (typically 50 $km^2$) for limited areas and for shorter periods (20 years or so). These regional models give more useful information for policy makers. The UK Department for Environment, Food and Rural Affairs (DEFRA) funds the development of the Hadley Centre's Regional Climate Model and specific collaborations focused on its use over India, southern Africa and China.

DFID has supported the development of the PC version of the Hadley Centre's model – 'PRECIS' – which has now been run for the Indian subcontinent and southern Africa. The model is designed for use by local meteorological offices or research institutes with support from the Hadley Centre. In Bangladesh, a DFID-funded programme will use the PRECIS model and will also develop the process for integrating climate predictions into disaster management and pro-poor development. The Bangladesh project will include collection of the required meteorological data to validate models, vulnerability assessments of communities, and a process of interpreting and communicating appropriate information to a range of targets including ministries, municipalities, media, communities, businesses and individuals.

To tackle gaps in observational climate data that are necessary for predicting long-term climate change, a decision was taken at the 9th conference of the UNFCCC (COP 9) in December 2003), to establish the Global Climate Observing System Cooperation Mechanism, by members of the sponsoring agencies of the Global Climate Observing System (GCOS) under the guidance of the GCOS steering committee (see Box 6).

Box 6

## The Global Climate Observing System (GCOS)

The GCOS, a collection of different networks observing the atmospheric, oceanic and terrestrial environments, published a 'Second Adequacy Report' in 2002, showing that many of the networks continue to be incomplete. It even stated that some are in decline, in particular in developing countries. Mechanisms of support for developing countries (e.g. bilateral agreements, and the World Meteorological Organisation's Voluntary Co-operation Programme) have existed for many years. However they have not prevented these deficiencies, so the need for a new initiative – the GCOS – was recognised.

The GCOS will depend on existing funding routes. The UK is a member by virtue of its participation in the Voluntary Cooperation Programme, and will consider additional financial support to the GCOS after the preparation of an implementation plan, forecast for late 2004.

# The country-level response

There are a number of opportunities for the international community to stimulate improved use of short-, medium- and longer-term climate data to reduce the vulnerability of the poor:

- **Support participative research** (such as vulnerability assessments) which identify the type of information that end-users need in order to inform decision-making;
- **Support the feeding in of this participative research into national development planning;**
- **Stimulate and participating in fora, such as the Regional Seasonal Outlooks,** which assess climate risks and disseminate information to those who need it; and
- **Influence other organisations** within developing countries – including other development agencies, government institutions responsible for meteorology and climate prediction, disaster management agencies, and the insurance sector – to ensure that their work is relevant to developing countries and the most vulnerable communities within them.
- **Co-ordinating with other departments of the UK Government** involved in filling gaps in climate predictions and disseminating the results (e.g. Department for Environment, Food and Rural Affairs, Foreign and Commonwealth Office, and the Hadley Centre of the Ministry of Defence).

DFID is already working with meteorological offices, disaster management agencies and research institutes in identifying information needs and filling gaps (e.g. by disseminating the PRECIS model through regional workshops).

The following key sheets examine further issues of adaptation:

- 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 08 Adaptation to climate change: Can insurance reduce the vulnerability of the poor? and
- Key sheet 09 Taking initial steps towards adaptation.

## Further reading

Houghton, J.T., Ding, Y., Griggs, D.J., Noguer, M., van der Linden, P.J., Dai, X., Maskell, K., and Johnson C.A. (Eds) 2001 Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY USA, 881 pp.

Karl, T.R. and Haeberli, W., 1994 Climate extremes and natural disasters: trends and loss reduction prospects. Proceedings of the conference on the World Climate Research Programme: achievements, benefits and challenges, Geneva, 26-28 August 1997, WMO/TD 904, International Council of Scientific Unions/WMO Geneva 1998.

United National General of Humanitarian Affairs, Living with Risk: A global review of disaster reduction initiatives: http://www.unisdr.org/unisdr/

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