Developing a climate change analysis

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extract adapted from CHRISTIAN AID ADAPTATION TOOLKIT

Introduction

The basic approach to developing a climate change analysis is to obtain information from two sources of climate expertise:

- **Climate science**: what meteorological/weather and climate modelling data says about the past, present, and future in terms of both weather/seasonal variability and longer-term climate change trends.
- **Community or local knowledge** of those most directly affected by these processes.

These can be used to develop a 'most-likely scenario' with communities, showing what climate trends are emerging and how they might affect livelihoods in the future. The analysis can feed into a participatory vulnerability and capacity assessment (PVCA), which may focus on several priority factors increasing vulnerability, including climate change. This in turn could be used as a basis for climate change adaptation planning by communities.

Figure 1 shows the process of developing a climate change analysis. Community feedback may well reveal climate factors that were not investigated with climate scientists in step 1, so an iterative process to get maximum benefit from the science is needed. This is best done by bringing climate scientists into direct contact with communities, but this is often not possible (they are a scarce resource) so intermediaries such as agricultural extension or NGO staff need to facilitate.

Accessing climate science

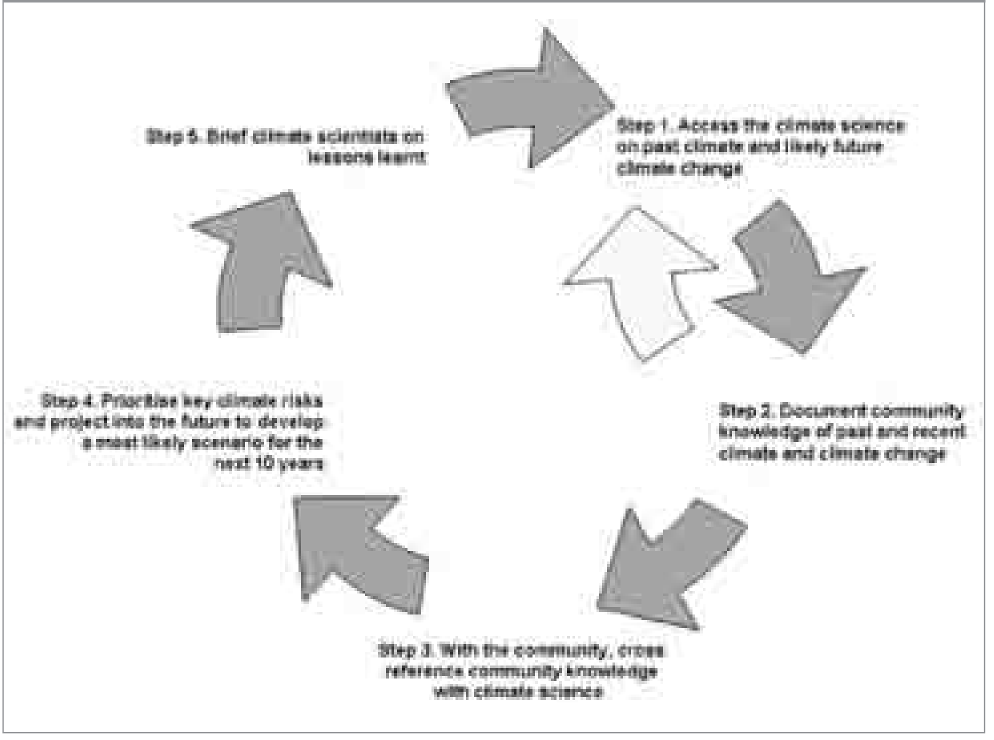
Useful scientific data for a climate change analysis includes:

- **Historical data** from meteorological departments, academic departments, weather stations, etc.
- **Seasonal forecasts** for the next year from meteorological departments and early warning systems.
- What **longer-term climate science** can say about future climate change from climate change models.

However, there are a number of challenges in accessing climate science (Figure 2):

- **Gaps in the science**: for example, at present longer-term general circulation

Figure 1: Five steps to developing a climate change analysis.



models of climate change are not able to provide predictions at the national level, or even the regional level.

• **Structures**: for example, meteorological institutions are often poorly resourced, understaffed, lack facilities for generating climate data, and are not computerised, so that data is not easily accessible.

• **Awareness and communication**: community understanding of the cause and effect relationships within climate change may be poor, information on climate change is often expressed in probabilities and statistics, which makes it difficult for communities to understand, and access to information about short-term weather and longer-term changes is limited, and such information is often not trusted by communities when it is available.

Given the challenges of accessing climate science, practitioners may well have to rely heavily on community knowledge of past changes and assessment of likely future changes.

Using climate science

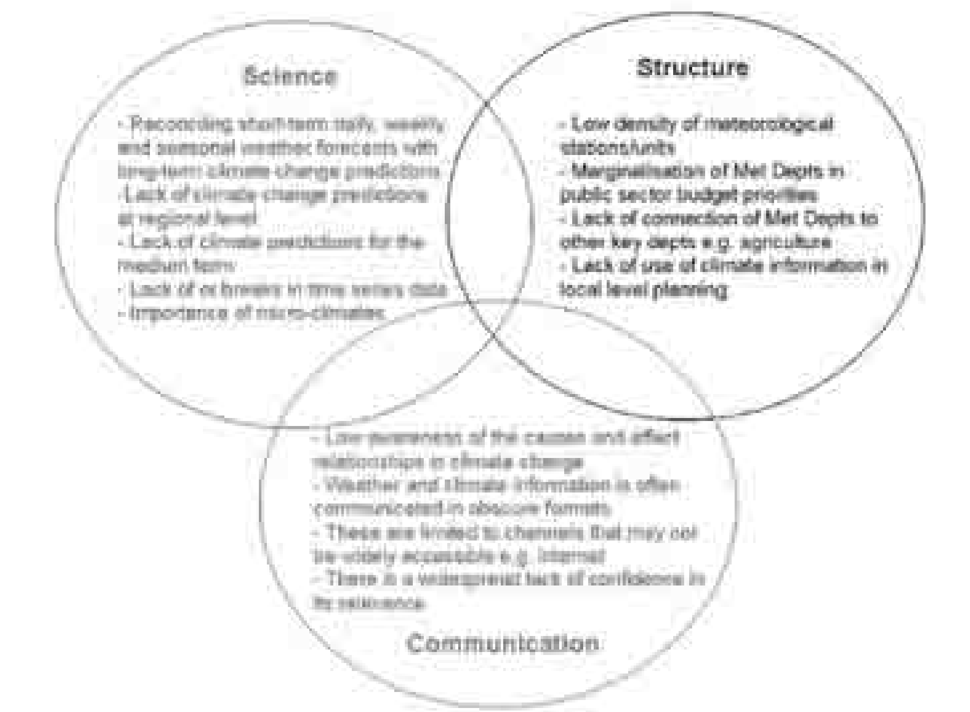
Even when scientific information is available, it needs to be presented in a format that communities can understand, and to be locally verified where possible, to ensure credibility with users. Participatory ways of presenting climate science, and combining it with local knowledge, are therefore central to the process of developing a climate change analysis.

The case studies below, drawn from Christian Aid and other valuable experience, show some examples of how this can be done.

Case study one: integration of seasonal forecasting, Zimbabwe

Farmers in the research area plant a mixture of short-season maize, sorghum, and millet as their staple crops. These communities already have access to the seasonal rainfall forecasts developed at the annual Southern African Regional Climate Outlook Forum (SARCOF). The SARCOF

Figure 2: Challenges in accessing climate science



forecasts are downscaled, interpreted, and disseminated by the Zimbabwe Department of Meteorological Services, with radio being the most common medium for people to learn of them. The forecasts contain the rainfall estimates for the early (October to December) and late (January to March) parts of the growing season, in the form of probabilities for rainfall totals falling in the ranges of:

• below normal (compared to the 10 driest of the past 30 seasons);
• normal; and
• above normal (compared to the 10 wettest of the past 30 seasons).

Participatory climate forecast workshops

Beginning in September 2000, a series of annual participatory climate forecast workshops were held in each village, designed to help a group of 50 farmers better understand the forecast and be able to apply it in their farm management decisions.

A random group of farmers, half women and half men, was selected by local coordinators (extension staff, village chiefs, etc.). The following year, the coordinator randomly invited half the participants from the previous year's workshop and a new random sample of 25 women and men.

The workshops took place in the village primary school, lasted three hours, and were conducted in the local language. Each workshop was videoed to obtain a transcript of farmers' questions and comments.

The workshops followed a common format.

• Firstly, farmers were asked to comment on the previous season's rainfall data, and whether it agreed with their recollection of the forecast.
• Farmers were then asked to comment on the success of their management practices in the past year, given the rainfall that occurred.
• They then offered their insights on the coming year's rainfall, based on their inter-

pretation of local, traditional rainfall indicators.

• The forecast for the coming season was explained to farmers, in terms of the probabilities for below-normal, normal, and above-normal rainfall.

• The forecast was downscaled using farmers' own historical data for local rainfall quantities, to estimate likelihoods for ranges of actual rainfall.

• The information used to generate the forecast was explained in simple terms and questions were invited, including a discussion of El Niño.

• Finally, a discussion was facilitated between the farmers and the local extension officer on farm management practices for the coming year, taking into account the forecast, local indicators, and seed availability.

Farmers were able to take advantage of good conditions to produce higher yields, so it may be that forecasts are of most value to farmers in good years, in contrast to national-level planners who need to know about drought years, enabling them to prepare for food insecurity.

Source: Effects of seasonal climate forecasts and participatory workshops among subsistence farmers in Zimbabwe – Anthony Patt, Pablo Suarez, and Chiedza Gwata (PNAS, August 2005)

Case study two: Climate Field Schools, Indonesia

Climate Field Schools (CFSs) were first developed in Indonesia, modelled on the Farmer Field School approach designed to promote integrated pest management.[1] The basic objective was to develop an effective method for communicating climate forecast information to end-users. More specifically, CFSs intended to:

• increase farmers' knowledge on climate and their ability to anticipate extreme climate events;

• assist farmers in observing climatic parameters and their use in guiding farm activities; and

• assist farmers to interpret climate (forecast) information, in particular for planting decisions and cropping strategy.

CFS development followed a two stage process:

• a 'socialisation phase' which lasted for eight months and focused on increasing farmer knowledge on climate and the use of seasonal forecast information to develop a cropping strategy; and

• an 'institutionalisation phase', which covered a further 32 months and focused on putting this strategy into operation and capacity-building farmer groups to integrate climate and forecast information into their farming activities.

In order to prepare for the implementation of these two stages, agricultural extension workers were trained by Meteorology Department staff to act as intermediaries/trainers and a number of modules were developed and field tested, including:

• elements of weather and climate and the difference between weather and climate;

• rain formation processes;

• understanding terminology used in seasonal forecasting;

• understanding probability concepts;

• use and calibration of non-standard weather/climate measurement tools;

• use of climate forecast information in planting strategies;

• using water balance concepts to estimate irrigation requirements and flood risks; and

• quantifying the economic benefits of using climate forecast information.

CFSs took a strongly participatory 'learning-by-doing' approach, with farmers putting module information into practice over the agricultural season and reflecting on their experience through a

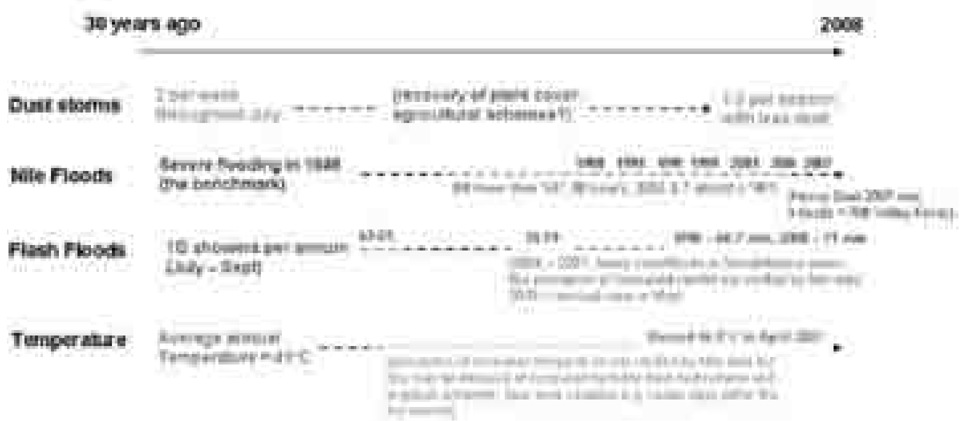
[1] Farmer Field Schools (FFS) are where farmers share their experience, strengthen their ecological literacy through learning experiments, and identify ways of improving agriculture through group problem-solving. See also Sherwood and Bentley, this issue.

Box 1: Climate timeline, Sudan

Atbara Partners Consortium members developed a climate timeline as part of a workshop to review a climate change awareness-raising project. The members determined the main climate features that affected their lives and livelihoods and discussed the trend over the past 30 years, but with a focus on the last 10 years as this was (a) easier to remember and (b) a time in which there was agreement that changes away from the normal variation had occurred. Also involved in the discussion were two staff from Atbara Meteorological Station, who questioned consortium members' perceptions, corrected dates, and gave statistical evidence from their records.

The notable disagreements centred on rainfall patterns, with meteorologists conceding that with limited rain stations and the localised nature of flash floods, these could be missed in the records. Increased average temperatures were not verified by the statistics but members' perceptions could be linked to increased humidity (which feels hotter) and increased variation (hence the 2007 record high), which was suggested as an emerging pattern by the climate scientists. The challenges agreed by the consortium are to:

- deepen the analysis to include differences in trend and variability;
- continue the process to determine what the likely scenario for the next 10 years will be;
- how this will affect the vulnerability of their livelihoods; and
- what therefore the consortium should do in terms of project development and implementation.



Source: Review of the CC Innovation Fund 2007-8, Christian Aid

continuous process of group discussions and analysis with extension staff to inform subsequent action and strategy revision.

When the process was evaluated, 78% of farmers felt that their ability to integrate climate and forecast information into their cropping strategies had increased significantly (7/10 or better). The key challenges identified were translating climate information into user-friendly language for farmers and integrating this into effective adaptation.

Source: Communicating Climate Forecasts to Farmers through Climate Field Schools: the Indonesian Experience – Rizaldi Boer, Kusnomo Tamkani, and A.R. Subbiah

Documenting community knowledge of past and recent climate change

Local communities, particularly those relying on natural resources, have developed a high degree of local knowledge and it is important to capture this.

This kind of knowledge can be captured through participatory tools such as community charts or timelines (see Box 1).

Some tips for facilitating timelines:

- Try to cover extreme weather events over the past 30 years, e.g. severe droughts and floods, as well as late onset of rains, increased occurrence of dry spells within rainy seasons, and their effects on livelihoods.
- Cover any of these events that are clearly

Table 1: Seasonal analysis chart, India

Season	Timing	Typical conditions	Emerging conditions
Summer	April/May	Hot and dry, 30–40°C	**Summer** tending to hotter temperatures (high rather than low 30s), curtailed abruptly by early rains in May
Early rains	June	Early planting rains which break the heat of the summer	When rains arrive, they arrive earlier (April/May) and tend to be constant over 6/7 days with little respite, followed by hot, humid dry spells
Main monsoon and	July – September	30–35°C, increased humidity, main growing season	
Harvest rains	October/ November November	Mainly showers, cloudy weather with vivid blue skies, lower humidity and temperature – a 'happy time'	Harvest rains seem to have diminished
Dew	December – March	Cooling temperatures, dry but with morning dew on plants	Dew season seems to be disappearing
Winter	March	Cold dry weather, 10°C or lower	Winter tends to be shorter and warmer, rarely dropping below 10°C
Spring		Warming, dry weather	Spring seems to be disappearing as winter passes rapidly into summer

Source: Climate Change Review of DRCSC – Richard Ewbank, Christian Aid.

outside existing experience or unprecedented. This will give an indication as to whether the experienced change is really climate change or part of a decadal cycle (a climate feature that cycles over a multi-year period). Make sure the knowledge of older members of the community are accessed as they will be able to remember older events and can confirm whether a more recent event really is unprecedented.

• Include local responses associated with these events, such as any temporary migration (rural-urban, to other rural areas), particular coping mechanisms used, members of the community most severely affected, and why. These can provide further information as to the relative severity of a particular event.

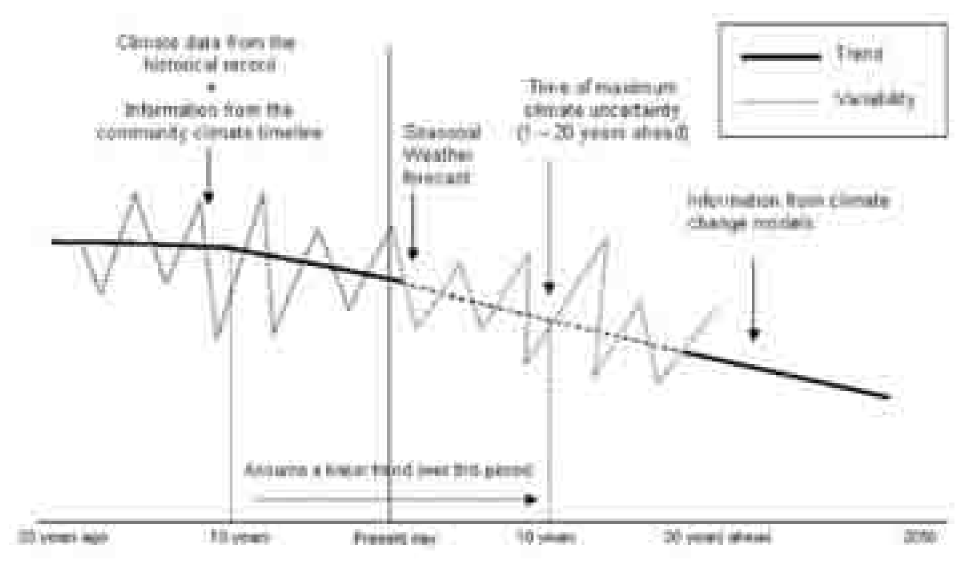
• For the most recent 10 years, increase the level of detail and highlight good, average, poor, and very poor seasons and significant climate features and note any interrelationships.

Case study three: seasonal analysis chart, India

In Purulia (West Bengal), community groups analysed the way in which seasons had changed over the past five to six years, the agreed time over which group members felt that changes in seasonality had emerged. Farmers talked of a trend over the last five to six years toward only three seasons – winter, summer, and monsoon – rather than the six they used to experience. This was something that even older community members highlighted as unprecedented, citing problems with the timing of traditional ceremonies in the harvest rains period (see Table 1).

Changing conditions **within** the three main seasons – summer, monsoon rains, and winter – were also noted, such as warmer winters, hotter summers, and extended hot spells within the monsoon season that caused visible heat stress in crops and other plants. In the past, the

Figure 3: Developing a climate change timeline



main monsoon rains tended to bring heavy rain early in the day, which then subsided to allow working in the paddy fields, with rain often resuming in the evening. The current trend is for constant rainfall for extended periods followed by hot, dry spells. This affects work patterns, making cultivation of supplementary crops (which are an increasingly important adaptation strategy) difficult.

In terms of livelihood response, the community highlighted crop diversification (including increased cultivation of maize, groundnuts, cowpeas, and vegetables), moving from hybrid 60-day to traditional 30-day rice varieties which are more drought tolerant, increased use of ponds for supplementary irrigation, as well as fish farming.

Projecting into the future

Unlike probabilistic weather forecasts that give a percentage likelihood of something happening, the community needs an agreed 'most-likely scenario' with which to guide future adaptation. This can be achieved by:

- Prioritising the three to four (maximum) factors that are considered the highest priority climate change threats to livelihoods i.e. those causing most damage to livelihoods. These can be identified by listing all climate factors affecting livelihoods identified with communities, and pairwise ranking them.[2]
- Using the assumption that the direction of change experienced over the past 10 years will continue for the next 10 years, do this for both trend and variability but use any available long-term climate modelling information as a guide to whether this assumption needs to be adjusted.
- For each of the priority climate factors, allow for discussion amongst the community members. This is not an exact process but the analysis must be agreed to be credible.
- Follow the logic of Figure 3 above, but use a way of recording that the community can easily understand – they will probably want to use less mathematical ways of representing their view of past and future climate (such as the seasonal analysis chart or climate timeline).

[2] For more information on pairwise ranking see e.g. 'Pair wise ranking made easy,' Tim Russell, in *PLA Notes* 28. Online: www.planotes.org/documents/plan_02806.PDF

• Where communities have already developed action plans, the analysis can be integrated into these plans. Detailing the likely impact on resources and features identified in community maps is a useful tool in this respect.[3]

• Given the focus on anthropogenic or man-made climate change, it is important to ensure that the most-likely scenarios are related as far as possible to climate change, rather than other factors that may have a livelihoods impact e.g. diversion of rivers reducing irrigation water resources rather than reduced rainfall.

Reporting back lessons learnt to climate scientists

If possible, report the process back to climate scientists (primarily in meteorology departments/institutions, but also academic institutions or specialised climate/climate change organisations) so that they are aware of:

• the results of the exercise;
• the constraints and challenges encountered; and
• the community priorities that future climate science could address.

This will be important in developing or strengthening climate science–community linkages and highlighting the importance of increased resources for this.

Source: adapted from Christian Aid (2009). 'Module I: Framework and Approach.' *Christian Aid Adaptation Toolkit: Integrating adaptation to climate change into secure livelihoods.* Christian Aid: UK. The manual (available from Christian Aid) gives fuller details of this process, including how to find and interpret scientific meteorological and climate change data.

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[3] See e.g. Gaillard and Maceda, this issue, for more on community mapping tools.