Step 2 Reviewing the science

Part 1a of the CEDRA Assessment

In Step 2, you will begin to answer the questions you wrote in Step 1. You will do this by accessing scientific information to find out about past, present and projected climate change and environmental degradation. After this Step, you will use your scientific research to inform your community consultations and risk assessment. Step 2 contains a number of different tables that show you where you can get scientific information. Exercise 5 on page 28 guides you through using these tables to do your scientific research.

IN STEP 2 YOU WILL

- Identify which people and information sources to consult.
- Contact scientists and other stakeholders.
- Consult national government sources of information.
- Look at internet sources of information.
- Summarise key scientific findings in Part 1a of your CEDRA Assessment.

2.1 Understanding and using scientific information

You need to have a good understanding of past and future climate and environmental change to ensure that your work with communities does not fail. Usually our work with communities builds on their existing knowledge and their past experiences of coping with poverty and disasters. The impacts of change mean that our normal humanitarian or development work will fail unless we understand what the most likely climate and environmental changes are and plan so that our projects will be able to withstand them. The strong evidence about current and projected climate and environmental changes that you gather in this Step, along with the experiences of communities in Step 3, will help you understand and prioritise the expected impacts (Step 4) and help you develop strong adaptation options (Step 5).

Finding out about scientific information may seem daunting. This is a common response. We should support each other as we gain experience and confidence. Sharing your scientific research and findings with others in your network will help all of you develop much better CEDRA Assessments, with less effort.

You need to dedicate enough time to finding out about local scientific projections so that your Assessment is accurate. It is good practice to consult several scientific sources to check your findings or identify any information that may be incorrect or misleading. Some sources will probably be more reliable than others.
Uncertainty

Climate science is quite advanced in making projections on a global and regional scale for many decades into the future. Projections are beginning to be available at a local level, but in many places this is not yet the case. There are lots of uncertainties in attempting to make projections of future climate, such as the volume of greenhouse gases that we will produce over the coming decades, or how the natural environment will react to warmer temperatures. Therefore, scientists produce a collection of projections of future climate, giving us a range of future conditions to prepare for. For example, if scientists predict an increase in rainfall of between 30 and 60 per cent, then we should make sure that our projects can definitely withstand an increase of 30 per cent. We should also come up with contingency plans for a 60 per cent increase and see whether we can afford to prepare our projects for this. We should also be aware that scientists use cautious language. When they say something is ‘likely’, they mean it has more than a 66 per cent certainty of happening, and when they say ‘very likely’, they mean more than 90 per cent certainty. It is important when exploring the science to ensure that we don’t just focus on the short-term projections. We also need to address long-term climate stresses that increase over time, for example, timeframes of 50 to 100 years.

Climate science will often show us that we need to plan for uncertain, unpredictable changes. For example, in the Sahel region of North Africa, we are advised that climate change will lead to a major change in rainfall, but it is currently not possible to forecast whether that means much more rain or much less rain. In cases such as this, we have to plan for a major change without knowing what it is. See Section 5.1 for more discussion on soft adaptation methods that help communities adapt to a wide range of changes.

We need to work with scientists to translate what they say into information that is of direct help to the communities we work with. This usually means building the adaptive capacity of communities so they are better prepared to deal with a range of different possible changes. Examples include: livelihoods diversification; setting up disaster early warning systems; and helping them gain better access to information, such as local weather forecasts, through good communications links and use of local advisory systems.

2.2 How to find information and make contacts

Each country and region will have its own sources of scientific information. Data, maps and graphs are available for both climate and environmental change, and for anticipated risks of disasters. The relevance, availability and quality of this information vary between locations and sectors. If you are unable to find information specific to your locations, use country- or regional-level information instead. More advice on finding sources of information is given below.

New sources of scientific information are constantly being developed and climate change and environmental degradation are advancing rapidly. It is therefore very important that you check, at least annually, whether scientific projections have been updated. This is further discussed in Step 7.
2.2.1 Stakeholder analysis (and choosing other sources of information)

Most of us tend to use our own experience or consult immediate colleagues or regular contacts when planning our work. However, it is critical that you consult people who have more expertise and experience than you do regarding climate and environmental change, or ultimately your projects may fail. If possible, we recommend that you invite a scientific expert to join you in your first CEDRA workshop to help participants understand the scientific projections for the country and region, and interpret what they mean for the local communities you work with. Try and encourage them to stay for the whole workshop so they engage with the process.

You can use what is known as a 'stakeholder analysis tool' to identify relevant stakeholders and sources of information and knowledge – and effectively draw up a plan of action for your research. There are a number of different ways to do this and we explain one method in Exercise 4 below.

Exercise 4
Conduct a stakeholder analysis

Create a table with three to five columns to categorise different stakeholders – and also other sources of information. Discuss in your group what these categories could be. Write down all the different people, agencies, groups and other sources of information you can think of.

Read through the rest of Step 2 and add to your table of stakeholders. When you have done this, rank (prioritise) which stakeholders or information sources you think may be the most useful. Then, plan which of you will consult them to answer your questions.

If you are a group of organisations carrying out a joint CEDRA Assessment, you will be able to consult more stakeholders and sources of information. The more you consult, the more likely you are to get a strong understanding of the most likely risks your projects will face. If you are a single organisation working through CEDRA, you may not have enough time to do as much research.

Example Stakeholder analysis
Compiled by Tearfund Partner Consortium from the Diocese of Aru, DRC

<table>
<thead>
<tr>
<th>STAKEHOLDER ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>National or local government departments</td>
</tr>
<tr>
<td>Department for the Environment and Sustainable Development</td>
</tr>
<tr>
<td>District Health and Sanitation Department</td>
</tr>
<tr>
<td>Agriculture, Fishing and Rearing Inspectorate</td>
</tr>
<tr>
<td>National Climate Change Focal Point</td>
</tr>
</tbody>
</table>

NOTE
The numbers here are an indication of priority.
2.2.2 Stakeholders with scientific knowledge

Your stakeholder analysis will have helped you identify some people in your area who have knowledge or interest in the environment and who want to share this information with you. They may include other agencies, community workers and local government officials, such as environmental, water, health, agricultural or food security technical officers. It is really important to contact these people. They in turn may be able to provide you with other useful contacts. There will be other experts whom you do not yet know but whose contact details can be found online or by contacting the organisation they work for.

These people can be added to your stakeholder analysis, to keep a record of everyone you are contacting. You should ideally include some of the people listed in the tables below.

Some agencies have a key contact person or group called a Focal Point, as well as a country adaptation strategy. Try to access them. Networking with such people may also lead to opportunities to influence local or national policies and even to fruitful funding contacts.

The ease with which reliable scientific information can be accessed varies between countries and regions. Tearfund partner Bangladesh Nazarene Mission found local and national scientific data relatively easy to access in Bangladesh. ‘To collect the science data, we used an IPCC [Intergovernmental Panel on Climate Change] report, reviewed three reports from the local agriculture, fisheries and meteorological departments, and checked these against information from the national government office. We had not worked with these agencies before. This was very new to us, but it helped us and changed the way we now plan our work.’ The government’s National Adaptation Programme of Action (NAPA) was available online, and the World Bank Climate Portal also gave detailed projections of changes to rainfall, frequency of cyclones and temperature.

For organisations implementing CEDRA in Uganda, however, it was a more difficult process. Experts at both district and national levels told them they could not release information, and some advised that there was an official fee to access the data. However, some national-level information was still available on the internet: for example from Tearfund’s website, a UNDP Climate Change Country Profile and the World Bank Climate Portal (see Table C), and local information was eventually found through contacting the World Meteorological Organisation.

Local authority agricultural advisers often have a wealth of information about what is happening in the region and what the government is doing. They may also recommend other networks and stakeholders to contact.
### Stakeholders with scientific knowledge

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists from your country’s national meteorological office (or similar)</td>
<td>Meteorological offices study the atmosphere, maintain national and local weather records, and focus on weather processes and forecasting. Some offices provide climate projection data.</td>
</tr>
<tr>
<td>and local climate stations</td>
<td></td>
</tr>
<tr>
<td>Scientists in relevant faculties in your country’s universities</td>
<td>Contact university departments such as: Environment, Ecology or Earth Sciences.</td>
</tr>
<tr>
<td>Other scientists</td>
<td>Consider contacting environmental research agencies or environmental NGOs.</td>
</tr>
<tr>
<td>Government officials</td>
<td>Try to contact the Focal Points related to climate change and DRR, for example:</td>
</tr>
<tr>
<td></td>
<td>• National Climate Change Focal Points – see a list of country Focal Points here: <a href="http://maindb.unfccc.int/public/nfp.pl">http://maindb.unfccc.int/public/nfp.pl</a> This person or group of people should help you identify useful contacts in relevant government departments.</td>
</tr>
<tr>
<td></td>
<td>• Many governments also have a person who is a national Focal Point for the country’s DRR programme: <a href="http://www.unccd.int/en/about-the-convention/Official-contacts/Pages/default.aspx">www.unccd.int/en/about-the-convention/Official-contacts/Pages/default.aspx</a></td>
</tr>
<tr>
<td></td>
<td>• There may also be a National Platform for DRR. This website <a href="http://www.unisdr.org/partners/countries">www.unisdr.org/partners/countries</a> contains links to governments which have a National Platform, along with details of the relevant national Focal Points.</td>
</tr>
<tr>
<td></td>
<td>• It may be useful to consult the government ministry responsible for gender equality or women to see if they have researched climate and environment from a gender perspective.</td>
</tr>
<tr>
<td></td>
<td>It would also be useful to speak to people in national or local government offices, such as officials in the environment, health, water or agricultural ministries.</td>
</tr>
<tr>
<td>UN and other multilateral agencies working in the area of climate change and environmental degradation</td>
<td>Try for example:</td>
</tr>
<tr>
<td></td>
<td>• GEF – Global Environment Facility</td>
</tr>
<tr>
<td></td>
<td>Regional or country Focal Points may be available via the following websites: <a href="http://www.gef-ngo.net">www.gef-ngo.net</a>  <a href="http://www.gefonline.org/Country/CountryProfile.cfm">www.gefonline.org/Country/CountryProfile.cfm</a></td>
</tr>
<tr>
<td></td>
<td>• FAO – Food and Agriculture Organisation</td>
</tr>
<tr>
<td></td>
<td>The FAO representative’s email address is shown on each Country Profile page. Click on the ‘Select a country’ tab on the left-hand side of the page: <a href="http://www.fao.org/countryprofiles">www.fao.org/countryprofiles</a></td>
</tr>
<tr>
<td></td>
<td>• IFAD – International Fund for Agricultural Development</td>
</tr>
<tr>
<td></td>
<td>Country programme managers’ email addresses come up in the bar at the bottom of the following webpage, when you hover your cursor over the person relevant to your country: <a href="http://www.ifad.org/operations/projects/regions/country.htm">www.ifad.org/operations/projects/regions/country.htm</a></td>
</tr>
<tr>
<td></td>
<td>• UNDP – United Nations Development Programme</td>
</tr>
<tr>
<td></td>
<td>Country information can be found via the following website (which may also have information on DRR strategies): <a href="http://www.undp.org/countries/">www.undp.org/countries/</a></td>
</tr>
<tr>
<td></td>
<td>• UNEP – United Nations Environment Programme</td>
</tr>
<tr>
<td></td>
<td>Country information can be found via the following website (In some countries, UNDP represents UNEP): <a href="http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=296">www.unep.org/Documents.Multilingual/Default.asp?DocumentID=296</a></td>
</tr>
<tr>
<td>Other development agencies or networks interested in climate change, environmental degradation or DRR</td>
<td>• Preventionweb <a href="http://www.preventionweb.net/english">www.preventionweb.net/english</a> Go to the ‘Countries and regions’ tab, then click on ‘National platforms’ in the list on the left side of the screen. The details of the national Focal Point will then be displayed.</td>
</tr>
<tr>
<td></td>
<td>• Red Cross / Red Crescent Climate Change <a href="http://www.ifrc.org/en/what-we-do/where-we-work">www.ifrc.org/en/what-we-do/where-we-work</a> Click on your region and then your country, and the contact details are displayed.</td>
</tr>
</tbody>
</table>
2.2.3 **National government sources of information**

Most countries have prepared national documents that contain important information on climate change and environmental degradation. They provide scientific information but also explain the government’s strategy for addressing risks and impacts. It is important to try to access these if possible. Not only will they help you find out about the science, but they tell you who is working on different issues so you can contact them to collaborate. They can also indicate potential sources of funding. You can usually find these documents on the internet, or from your government’s Climate Change Focal Point (see Table A on previous page). These core documents are listed in Table B below, along with websites where you might find them.

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Communication (NC)</td>
<td>Contains information on greenhouse gas emissions and both current and projected impacts of climate change and environmental degradation, along with information on country adaptation strategies.</td>
<td><a href="http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php">http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php</a></td>
</tr>
<tr>
<td>National Adaptation Programme of Action (NAPA) and National Adaptation Plan (NAP)</td>
<td>Most Least Developed Countries (LDCs) have developed NAPAs. They contain information on current and projected impacts of climate change and environmental degradation and on national priority adaptation activities to make the country less vulnerable to climate change. NAPAs are gradually being replaced by NAPs. Check whether your government has produced them.</td>
<td><a href="http://unfccc.int/adaptation/napas/items/4585.php">http://unfccc.int/adaptation/napas/items/4585.php</a></td>
</tr>
<tr>
<td>National Action Programme to Combat Drought and Desertification</td>
<td>These documents contain useful information such as maps on soil and wildlife patterns and other environment-related records, as well as national plans to combat drought and desertification.</td>
<td><a href="http://www.unccd.int/actionprogrammes/menu.php">www.unccd.int/actionprogrammes/menu.php</a> Follow the links to the relevant region and country.</td>
</tr>
<tr>
<td>National Development Plans or strategies</td>
<td>In some countries, these are the key documents (often called National Poverty Plans, National Development Plans or National Action Plans Against Poverty) on climate change and environmental degradation, rather than a NAPA or NAP. Countries also have documents called NAMAs (Nationally Appropriate Mitigation Actions) and national disaster management documents that may prove useful.</td>
<td>There is no central website for all of these documents. You will need to search your government website or ask government stakeholders.</td>
</tr>
<tr>
<td>National Biodiversity Strategies and Action Plans (NBSAPs)</td>
<td>These outline countries’ commitments under the Convention on Biological Diversity and address climate threats and adaptation needs for protected areas.</td>
<td><a href="http://www.cbd.int/nbsap/search/">www.cbd.int/nbsap/search/</a> You are able to search by country.</td>
</tr>
</tbody>
</table>
2.2.4 Internet sources of information

Internet sources of information about climate change are developing very rapidly. Unfortunately, the same is not currently true for information about environmental degradation. As with other sources of information, it is important to ensure the internet source is reliable. These sources include documents that you can download and also online tools which you need to search, select options and input information. Often, the information from these tools is provided in the form of tables, graphs or maps, rather than as a written document. They can provide very specific information, such as projected rainfall and temperature change for a particular place over a particular period of time. Some also suggest adaptation options.

The Intergovernmental Panel on Climate Change (IPCC) is one of the most reliable sources (see Table D, below). However, it presents its findings in long documents with many graphs and data which can be hard for a non-scientist to interpret accurately, and it is only published at five- or six-yearly intervals. We recommend that you look at the information the IPCC has produced for your region. However, we would suggest that you begin by reading the country summaries on the websites in Table C (although not all countries are covered). These summaries often use IPCC data but are more accessible than IPCC reports and some of the other ‘second-stop’ internet sources (see Table D, below). You should also consider using the second-stop internet sources as they may provide important information not contained in the country summaries. This is particularly true if summaries for your country are not available from the websites in Table C.

**TABLE C**

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDP Climate Change Country Profiles</td>
<td>S2 country profiles giving a wealth of current and projected climate information.</td>
<td><a href="http://country-profiles.geog.ox.ac.uk/">http://country-profiles.geog.ox.ac.uk/</a> Click on ‘Reports’ next to the relevant country</td>
</tr>
<tr>
<td>Adaptation Learning Mechanism</td>
<td>Provides summaries of changes in the climate in different countries, and links to relevant documents and resources. Encourages users to use the World Bank Climate Change Portal (below) for detailed climate information.</td>
<td><a href="http://www.adaptationlearning.net/country-profiles">http://www.adaptationlearning.net/country-profiles</a></td>
</tr>
<tr>
<td>World Bank Climate Change Portal</td>
<td>Provides climate and climate-related data for development practitioners and policy makers. Click on local areas on the map to find out scientific projections of climate change, or type your country into the ‘search for a place’ box. It also provides adaptation options for certain projects (although the number of projects is limited).</td>
<td><a href="http://sdwebx.worldbank.org/climateportal/">http://sdwebx.worldbank.org/climateportal/</a> For country profiles see: <a href="http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile">http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile</a></td>
</tr>
<tr>
<td>Tearfund Climate Country Profiles</td>
<td>Country profiles compiled for some countries where Tearfund partners work.</td>
<td><a href="http://www.tearfund.org/CEDRA/ClimateProfiles">www.tearfund.org/CEDRA/ClimateProfiles</a></td>
</tr>
</tbody>
</table>
Exercise 5
Gathering your scientific information

If you have access to the internet, you may find that many of your questions can be answered from internet links in Tables B, C and D. Identify which sources may best answer your questions (see Exercise 4, page 23).

Once you have created the table in Exercise 4, plan who should contact which stakeholder, and who should research which documents or internet sources. As mentioned above, it is a good idea to cross-check your sources with other information. Consider the following:

- Think about people you already know who have knowledge or interest in the environment. These may include other agencies, community workers and local government officials such as environment, water, health, agricultural or food security officers. Ask them whether they have scientific information on the local impacts of climate and environmental change, and see if they can answer your questions from Section 1.4. Ask them for the contact details of other people who may have more relevant information.
- Try to visit your country’s National Focal Point. Request relevant documents.
- Visit the websites listed in Tables B, C and D to answer some of your questions.

Finally, summarise key scientific findings that answer your questions from Exercise 3 in Part 1a of the CEDRA Assessment. See an example of a completed part of the report on page 31. It is important to provide source references for all the scientific information you provide. You can reference documents, websites and stakeholder interviews. Divide the scientific information into sections so it is easier to read and understand. For example, your section headings might be: Rainfall changes; Temperature changes; Soil salinity; Sea level; Soil quality; Health etc.

As discussed, we recommend that you share your stakeholder analysis, scientific research and stakeholder consultation findings with others in your network, so you can support each other in your CEDRA Assessments.
### TABLE D
'Second-stop' internet sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPCC (Inter-Governmental Panel on Climate Change)</td>
<td>Summaries of scientific information on climate change according to region, and the impacts on ecosystems and societies.</td>
<td><a href="http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter11.pdf">www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter11.pdf</a></td>
</tr>
<tr>
<td>The Climate Information Portal</td>
<td>A useful website providing detailed data on past and present climate change in Africa and projections for the future. It also provides guidance on how to interpret the data.</td>
<td><a href="http://cip.csag.uct.ac.za/webclient/introduction">http://cip.csag.uct.ac.za/webclient/introduction</a></td>
</tr>
<tr>
<td>Climate Wizard</td>
<td>Shows precipitation and temperature projections under various scenarios.</td>
<td><a href="http://www.climatewizard.org">www.climatewizard.org</a></td>
</tr>
<tr>
<td>The Red Cross / Red Crescent Climate Centre</td>
<td>The Climate Centre contains useful information about climate change, DRR and adaptation options.</td>
<td><a href="http://www.climatecentre.org">www.climatecentre.org</a></td>
</tr>
<tr>
<td>UNEP/GRID-Arendal</td>
<td>See maps and graphics filed by region, covering eg deforestation and coastal intrusion.</td>
<td>For maps and graphics: <a href="http://maps.grida.no/">http://maps.grida.no/</a></td>
</tr>
<tr>
<td>International Research Institute for Climate and Society</td>
<td>Some useful descriptions of climate change adaptation projects and data by region, sector and sometimes by country.</td>
<td><a href="http://portal.iri.columbia.edu/portal/server.pt">http://portal.iri.columbia.edu/portal/server.pt</a></td>
</tr>
<tr>
<td>PreventionWeb (International Strategy for Disaster Reduction)</td>
<td>Contains country information on past disasters, including occurrences and number of people affected.</td>
<td><a href="http://www.preventionweb.net/english/Go">www.preventionweb.net/english/Go</a> to 'Countries &amp; regions' tab</td>
</tr>
<tr>
<td>EM-Dat Database</td>
<td>Contains information on past disasters. Searches can be carried out, eg by disaster type and country.</td>
<td><a href="http://www.emdat.be/Database">www.emdat.be/Database</a></td>
</tr>
<tr>
<td>Famine Early Warning System</td>
<td>Features articles and reports on droughts and food shortages; up-to-date information clearly listed by region or country.</td>
<td><a href="http://www.fews.net">www.fews.net</a></td>
</tr>
<tr>
<td>Coordinated Regional Climate Downscaling Experiment (CORDEX)</td>
<td>Downscales global climate change computer models' projections, which are being prepared for the next assessment report of the Intergovernmental Panel on Climate Change (IPCC), in order to give climate change projections for local areas (every square 50km) across Africa.</td>
<td><a href="http://wcrp.ipsl.jussieu.fr/SF_RCD_CORDEX.html">http://wcrp.ipsl.jussieu.fr/SF_RCD_CORDEX.html</a></td>
</tr>
<tr>
<td>Regional Climate Outlook Forums</td>
<td>Many regions have Regional Climate Outlook Forums (RCOFs) generating seasonal forecasts.</td>
<td><a href="http://www.wmo.int/pages/prog/wcp/wcasclips/outlooks/climate_forecasts.html">www.wmo.int/pages/prog/wcp/wcasclips/outlooks/climate_forecasts.html</a></td>
</tr>
<tr>
<td>UK Met Office country reports on climate observations, projections and impacts</td>
<td>These include useful summaries of past climate change and future projections. However, they are only available for a small number of countries.</td>
<td><a href="http://www.metoffice.gov.uk/climate-change/policy-relevant/obs-projections-impacts">www.metoffice.gov.uk/climate-change/policy-relevant/obs-projections-impacts</a></td>
</tr>
</tbody>
</table>

**NOTE**
The IPCC is currently working on a 5th assessment report which will have more and up-to-date information on impacts on particular countries. This is likely to be available in 2013 or 2014.

**NOTE**
These sources of scientific information do not have to be accessed in any particular order.
Complete Part 1a of the CEDRA Assessment.

See the worked example on the following page.

Gathering scientific information may be a new experience for you. Using the sources we suggest here will make this much less daunting a task than it might at first appear. Working with others in your network and sharing your findings with each other will also make it easier. Your scientific findings will be compared with your community findings from Step 3 – and it is important not to lose sight of the fact that your aim is to find practical, acceptable, local and sustainable adaptation options.

Questions for reflection and learning:

- What have you learnt as you’ve carried out this Step?
- Have you achieved what you set out to do when you started?
- Is there anything you need to change in your approach as you address the other Steps?
- Are there any skills you’ve learnt that it would be useful to pass on to others in your organisation?
- How can you feed back your learning into your annual planning cycle and organisational strategy / strategic review?
**Findings**

**Projections of average rainfall**

The scientific and community data was collected over a period of two months in early 2010. Collecting local scientific data was challenging as our region has no meteorological office. However, information was given to us by the Agriculture, Fishing and Rearing Inspectorate, the Department of the Environment, INERA (the National Institute for Agricultural Research and Study) and some of the tobacco companies in the area. We also researched scientific information from online documents and tools. The government has produced a National Communication (NC) and a NAPA, which we accessed online. The NC describes the struggles to make accurate projections in the DRC given the size of the country, the diversity of ecological conditions and the lack of relevant data throughout the country. It goes into more detail about certain towns or areas, but unfortunately, none in Orientale Province. However, it does give more detailed information on the northwest of Congo, and we therefore assume this will bear some relevance for our Diocese. As we are very close to the Ugandan border, we have also used some data for northern Uganda from some good and reputable sources.

**DEFORESTATION:** Gallery forests are disappearing rapidly and scrub savannah is becoming grass savannah. This is particularly the case in Zali, Alur and Lu chiefdoms, the eastern part of Kaliko and Kakwa, and the eastern part of Nido district. The scrub and trees are gradually disappearing because the wood is used for firewood, making bricks and charcoal, and for drying many tones of tobacco. Many wild plant species are also disappearing as land is cleared. There is no government initiative for reforestation. Some actors, such as the churches and some tobacco companies, are engaging in reforestation. However, the species used for reforestation by the tobacco companies is mostly eucalyptus. These trees impoverish the soil by consuming too much water, and their leaves make the soil acidic. In addition, this reforestation is based purely on economic objectives and not the sustainability of the ecosystem. Deforestation and clearance data for the period 2008–2009 shows that 103,617.76 hectares have been emptied of forest and plant species and 227,025 cubic metres of wood.

**SOIL AND WATER POLLUTION:** The tobacco-growing companies, mining operators and major urban centres are causing extensive soil pollution through chemical fertiliser use (NPK) in tobacco growing, contravening national standards; bush fires (farmers) and poor waste management (urban centres). An average of 8,968 ha per year is used for growing tobacco, with six bags of chemical fertiliser (NPK) applied to each hectare, totalling 53,808 bags per annum. This leads to contamination of the water table and river and drinking water.

**SOLID WASTE:** More than six tonnes of solid waste are produced daily throughout the district, in Ingoboko, Aniwara, Ondolea, Atsinia, Aru town and other trading centres. However, no waste treatment facilities exist, apart from some direct-to-ground burial or open-air burning.

**RAINFALL:** A gradual reduction in the rainfall measured has been observed since 2004. The March-to-November rainy season and December-to-February dry season have changed, with the rainy season now generally starting around mid-April and ending in mid-November. Streams have dried out due to prolonged drought, as in the case of the Okelven stream in the Panduru district in the Lu chiefdom. Others that flow during the rainy season see their flow reduced, or completely dry up during the dry season, as is the case of the Andruvo spring developed as a water supply with the support of the Aru Diocesan Development Office. The flow diminishes year on year.

According to the National Communication (2009), a summary of the range of projected variations for precipitation in 2010, 2025, 2050 and 2100 throughout the entire country is as follows:

<table>
<thead>
<tr>
<th>Precipitation (%)</th>
<th>2010</th>
<th>2025</th>
<th>2050</th>
<th>2100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3 to 2.5</td>
<td>0.4 to 4.2</td>
<td>0.3 to 7.5</td>
<td>0.8 to 11.4</td>
</tr>
</tbody>
</table>

However, it is important to note that despite the increases in annual rainfall, the rainy season is likely to become shorter, with more rain falling in heavy rainfall events. More detailed information in the National Communication for the north-west of DRC shows an increase in average annual precipitation from 1758.1 mm to somewhere between 1758.1 and 1810.8 mm in 2025, from 1810.8 to 1866.8 mm in 2050 and from 1866.8 to 1925.8 mm in 2100.

**References:**

1 Oli and Dikya group in the township of Aru.
2 Interviews with the Department of the Environment (the Higher Institute of Agricultural Research and Study).
3 Annual Reports of the Environment and Health Departments of the town.
4 Interviews with the Agriculture, Fishing and Rearing Department and the district and local chiefdoms.
5 Interviews with tobacco companies.
6 Interviews with the District Health and Sanitation Department and statistical report from the District Health and Sanitation Department (2009).
7 BBT’s rainfall tables.
8 2009 Annual Report of the district’s Agriculture, Fishing and Rearing Inspectorate.