

Methodological framework

The methodology to assess vulnerability of tropical forests to climate change is comprised by a set of twelve. It acknowledges the close link existing between the processes of adaptation and development and, hence, it departs from the identification of the development priorities where the assessment will be focused.

This generic methodology sets the framework for the development of specific methodologies for each of the topics selected by each region and for the assessment of carbon (link between adaptation and mitigation) and biodiversity. The methodologies will be implemented through a period of two years in each region. The following box summarises the type of tools that will be used in the methodology.

Box 1a. Tools

Scenarios: Representation of the future state of a system, including a projection of selected variables that determine that state. The project will use climate, social and biophysical scenarios, which will be developed primarily through modelling.

Models: A model is a representation of reality. The project will use models for several purposes, including for the development of scenarios, to relate climatic variables to biophysical parameters and to assess changes in the provision of goods and services from the changes in biophysical parameters. Models to be used in the different steps of the project range from allometric equations to economic models.

GIS: Geographical information systems will assist in the selection and analysis of case studies.

Data bases: Climatic data bases will be used to develop climate scenarios and to analyse current and past climate changes.

Expert judgement: The opinion of experts, primarily scientists from the project and from the scientific advisory panel, will be used as a means to elaborate scenarios and to relate climatic variables with biophysical parameters and the provision of goods and services from forests.

Literature reviews: Although adaptation is a relatively new topic, it is nothing else than a specific application of knowledge that has been developed by several disciplines for other reasons. A thorough literature review will serve as a basis for the identification of models, for the support of expert judgement and, in general, to fill in gaps whenever inputs needed for the project have already been produced.

Following is a description of the 12 steps that comprise the methodology:

1. Definition of the areas/topics from the national development policies:

Forests in context: The project will depart from the traditional assessment of impacts of a specific system by linking impacts on forests to social vulnerability. TroFCCA will raise the importance of social vulnerability and the role that forests play within it.

In conjunction with national governments, the project will identify the areas/topics from the development policy where forests could play a significant role. These areas/topics will be identified according to the expectations on how climate change

impacts over forests are related to social vulnerability. Departing from this information, the idea is that the project will be focused at goods and services from forests that may be affected by climate change and, hence, increase the vulnerability of society.

Main output of Step 1: A clear definition of the topic(s)/area(s) of the development policy in which forests play a significant role and where impacts of climate change may hinder development.

Example: Forests play a significant role in the water cycle and could be crucial in determining the quality and quantity of water in a given watershed. Hence, TroFCCA could make an emphasis on how climate change impacts over forests are related to future plans on water and development.

Tools and means: Contacts with governments, regional kick off meetings, literature review.

2. Specification of the goods and environmental services (G/S) that support/relate to the areas/topics identified in the previous step

Once the areas/topics of work have been identified, the next step will be to identify those goods/services from the forests that relate to the identified area. This step will be mainly undertaken through the revision of literature.

Main output of Step 2: The description of the goods and services from forests that relate to the topic(s)/area(s)s selected.

Example: in some cases, forests contribute to increasing the quality of water. This step will be the specification of which services are relevant for the region/country under study, as not all forests will provide the same services in the same regions

Tools and means: Contacts with governments, regional kick off meetings, literature review, national studies and surveys, maps.

3. Assessment of the ecosystem functions underlying the goods and services identified in the previous step

Goods and services from forests derive from specific ecosystem functions. This step comprises the identification of those functions important for the goods and services that contribute to the areas identified in the first step.

Main output of Step 3: A detailed description of the ecosystem functions that support the provision of the goods and services described in step 2; indicators to link ecosystem functions to the provision of specific goods and services and, to the extent possible, the type of relation (e.g. an algorithm that shows changes in ecosystem functions vs. changes in the provision of goods and services).

Following the above example, the project will describe the goods and services from forests that relate to the topic under study. If water is the topic(s)/area(s) under

study, this step will develop a thorough description of, for example, the role of forests in regulating the water cycle or in improving its quality, as appropriate. Literature will indicate the types of forests as well as the landscape configuration, including geology, that define the provision of the specific good/service.

Tools and means: This step deepens strongly on a literature review and the search for local case studies.

4. Assessment of the biophysical processes and parameters that control the functions identified in the previous step

This step comprises the identification and analysis of those biophysical processes and parameters that determine the ecosystem functions specified in the above step. The assessment will identify those parameters relevant for adaptive management and which are likely to be influenced through policy and through the implementation of specific adaptation activities.

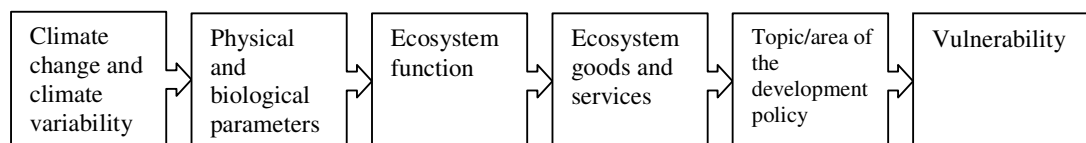
Main output of Step 4: A detailed description of the biophysical processes and parameters that support the ecosystem functions described above. Indicators to link biophysical parameters to ecosystem functions and, to the extent possible, the type of relation (e.g. an algorithm that shows changes in biophysical parameters vs. changes ecosystem function).

For example, factors such as evapotranspiration and root structure play a fundamental role in defining water cycle regulation and water quality. The study will aim at establishing the relation between changes in these parameters and changes in the provision of goods and services from a theoretical point of view. An example would be the development of a model that, having identified the appropriate indicators, will relate changes in root structure to changes in water quality.

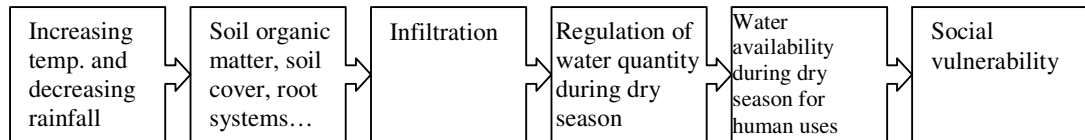
Tools and means: literature review, models and expert judgement.

5. Assessment and analysis of the climatic variables/parameters that can have a direct effect in the parameters assessed in the previous step.

The connection between the ecology of forests and vulnerability to climate change will be assessed through an analysis on how changes in climate, climate variability in particular (temperature, rainfall and extreme events), will affect the ecological parameters that control ecosystem functions underlying goods and services. The project aims to make a thorough assessment of how positive or negative changes in climatic variables are related to the vulnerability according to the following chain:



EXAMPLE



Depending on the quality and quantity of literature and available studies, this step should aim to relate changes in climate variables (rainfall and temperature mainly) to changes in the biophysical parameters identified in the previous step.

Main output of Step 5: A detailed description of how climatic variables like rain and temperature can have an effect on the biophysical parameters identified in the previous step. The study will include, where relevant, the effects of extreme events. Indicators to link climatic to biophysical parameters and, to the extent possible, the type of relation (e.g. an algorithm that shows changes in climate to changes in biophysical parameters).

This step is the final step of the theoretical part of the study, which is intended to provide the scientific information for a thorough analysis of vulnerability applied to case studies.

Tools and means: literature reviews, expert judgement, models.

6. Selection of case studies

Case studies from each region and country will be selected taking in conjunction with the previous steps. In particular, vulnerability will be assessed by selecting forest ecosystems that are relevant to the areas of work and that provide the goods and services for these areas. The selection of case studies will also take into consideration the fact that findings could be extrapolated to the countries/regions.

Main output of Step 6: The selection of case studies for each country/region on the basis of their relevance for the topic(s)/area(s) and for which information is available.

Tools and means: Maps, forest inventories, GIS, expert judgement, contact with governments and national experts.

7. Development of climate scenarios

In order to understand the likely future situation of the climatic variables identified in step 5 (such as rain and temperature), there is a need to develop climate scenarios. Some of them have already been developed for individual countries in the past to serve as an input to national communications. Some others are in the process of being developed. The project will benefit from the existing climate models and will develop, if needed, specific scenarios relevant for the chosen case studies.

Two sources for the climate change scenarios will be used:

- First, regionalized climate change models, where available.
- Second, past and current climate changes from climate databases

Main output of Step 7: Climate scenarios that are applicable to the case studies, regions and countries. The scenarios will be taken from other studies if available.

Tools and means: existing climate data bases, statistical tools, GCMs and regionalized climate models, and expert judgement

8. Identification of current and future biophysical impacts

This step will identify what are the likely effects of climate change over the physical and biological parameters identified in step 5 for the case study areas and having as a basis the climate information derived from the climate scenarios developed in the previous step. The study will assess the likely effects of temperature and rainfall variability as well as the increase of the frequency and intensity of extreme events such as hurricanes and drought in the regions where these are relevant.

The parameters identified in step 5 will be used as indicators of vulnerability. Step 5 has already indicated the relation between changes in climate and changes in biophysical parameters from a theoretical point of view. This step will use the theoretical assessment of step 5 and apply the climate scenarios so that an assessment of possible effects of climate change over the selected case studies can be developed.

Main output of Step 8: An assessment of the possible impacts of the current and expected climate variability and extreme events over the biophysical parameters and ecosystem function for the selected case studies.

Tools and means: Information from literature reviews, expert judgement, models, GIS.

9. Assessment of the derived impacts

Following from the previous step, this one will assess how the expected changes in the biophysical parameters are translated into changes in forest functions (identified in step 3) and then in the provision of the goods and services (identified in step 2) for the selected case studies.

Main output of Step 9: An assessment of the implications on the provision of goods and services in measurable terms (i.e. through criteria and indicators).

Tools and means: Information from literature reviews, expert judgement, models, GIS.

10. Vulnerability assessment

The assessment of vulnerability will be focused at the policy topics/areas identified in step 1. Changes in the provision of goods and services as the edge of the impact chain will be assessed in the broader context of other processes that may affect the topic(s)/area(s) under study and any implications relevant for the development policy.

The step will provide a thorough assessment of the importance of forest ecosystems in the respective topic(s)/area(s) as well as how and how likely are impacts from climate change over forests affect the topic(s)/area(s). The assessment of vulnerability will be undertaken at the environmental and socioeconomic levels.

Main output of Step 10: An assessment of the vulnerability, including possible costs to society, of the specific topic(s)/area(s) selected specifically deriving from impacts of climate change over forests. The analysis should incorporate other processes and pressures (such as deforestation) and will identify priority areas that can be addressed through policy instruments and through the participation of the private sector and other relevant actors.

Tools and means: Policy analysis, economic modelling, expert judgement, contact with governments.

11. Vulnerability mapping

After having assessed the vulnerability of the specific case study and whenever data permits, the project will extrapolate the case study results to the country/region level. The objective of this step is to have a “big picture” overview of the vulnerability. This step will make use of social scenarios whereby the results of the previous step are superposed on social and climate scenarios.

Main output of Step 11: A map of the vulnerability related to the topic(s)/area(s) for the country level.

Tools and means: Social and climatic scenarios, GIS.

12. Adaptation pre-screening

Step 11 is the formal initiation of the work on adaptation and the last step of the methodology. A policy dialogue will have the objective of assessing the priorities and national interests for reducing vulnerability. The results of the application of

the previous steps will be presented to several actors, including government agencies and the private sector. The sub steps include:

- Identification of relevant actors
- Definition of possible response options with experts of concerned sectors
- Analysis of the interest of society to respond to the identified vulnerability and to use the proposed options.
- Prepare analyses of the costs and benefits of the response options that the concerned sectors have selected.

The results of the application of the methodology will be the main input to the work on adaptation. Planning adaptation will be undertaken directly with the government and other actors through 1 or 2 workshops per region. The specific work will be elaborated at a later stage.

Annex II

Logical framework for the first year

(see attached Excel file)