adaptation assessment to action
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The UNFCCC Compendium on methods and tools to evaluate impacts of, and vulnerability and adaptation to, climate change is a web-based resource that provides key information on available frameworks, methods and tools, and their special features. It is designed to assist Parties and other potential users in selecting the most appropriate methodology for assessments of impacts and vulnerability, and preparing for adaptation to climate change.

The objective of this brochure is to inform Parties about the ongoing work of the Methods, Inventories and Science Programme of the UNFCCC secretariat to assemble and maintain its Compendium on Methods and Tools to Evaluate Impacts of, and Vulnerability and Adaptation to, Climate Change.

Importance

Parties to the United Nations Framework Convention on Climate Change (UNFCCC) are obligated by various decisions of the Conference of the Parties (COP) to assess their national-level impacts of climate change and their efforts to adapt to these impacts as inputs for their national communications. Parties need to select from a daunting array of potentially applicable methods and tools for making these assessments, and from various sources of information concerning their use. New methods and tools are constantly being developed and the application of those that are already in use is steadily being refined. There is therefore a need for a centralized source of information that can be maintained and regularly updated.

Through the introduction of the compendium, the secretariat hopes to meet this need while furthering its broader goals of:

- Increasing the quality of information available on methods for assessing vulnerability and adaptation;
- Enhancing the dissemination of methods;
- Assisting Parties to the Convention, especially Parties not included in Annex I to the Convention (non-Annex I Parties), to identify and select the best available methods and tools to assess their vulnerability to climate change and prepare for adaptation to climate change;
- Initiating a process of continuous refinement and innovation of available information on methodologies.

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Background

Mandate

The initial mandate for the work of the secretariat on the collection and dissemination of methods for vulnerability and adaptation assessment stems from decision of the Conference of the Parties to the UNFCCC (9/CP.3), by which the COP requested that the secretariat accelerate the "development of methodologies for adaptation technologies, in particular decision tools to evaluate alternative adaptation strategies." In response, the secretariat has undertaken a number of activities, including the preparation in 1999 of an initial compendium of decision tools for evaluating adaptation strategies and options.

At several subsequent sessions of the Convention bodies, the Subsidiary Body for Scientific and Technological Advice (SBSTA) endorsed a request for acceleration and expansion of this collection and dissemination of information on methods and tools to assess not only adaptation options, but also impacts of and vulnerability to climate change. The secretariat has convened a series of expert meetings to explore new developments in vulnerability and adaptation assessment techniques presented in the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), and how these developments apply to the needs of developing countries.
Goals and challenges

Directed by this expanded mandate, by the insight these meetings produced and by decision 17/CP.8 encouraging non-Annex I Parties to use the compendium for the evaluation of adaptation strategies, the secretariat decided to expand the scope and improve the structure of the initial compendium. In doing so the secretariat had several goals:

- To incorporate new approaches to the assessment of impacts, vulnerability and adaptation, as well as methods, tools and sources of information;
- To include additional sector-specific methods and methods requested by Parties;
- To enhance its usefulness for non-Annex I Parties;
- To ensure consistency with both the Guidelines for the Preparation of National Communications from non-Annex I Parties (decision 17/CP.8) – and the accompanying user manual.

A major challenge was not only to expand the structure of the compendium to include new tools that have come into use and to modify it to include tools applicable to the entire process of vulnerability and adaptation assessment, but also to reorganize it so as to capture the range of thinking reflected in the different approaches to the assessment process, that can be represented by two main approaches.

The first generation of work in climate change impacts and adaptation studies was focused more on impacts, and generally based on climate scenarios derived from general circulation models and applied to biophysical impacts models. These impacts were then carried forward to economic sectors (for example, agriculture, forestry, water resources), after which adaptation might be considered. Second generation studies begin by examining the relationship between current climate variability and current adaptation before considering future climate and adaptation in the broad context of environmental stressors, socio-economic change and sustainable development.
Climate Scenarios

Biophysical Impacts

Socioeconomic Impacts

Adaptations to Impacts

Residual or Net Impacts

First Generation Scenario Based Approach

Climate Science

Social Science

Second Generation Vulnerability Approach

Current Exposure

Current Adaptive Capacity

Future Exposure

Future Adaptive Capacity

Evolution of vulnerability and adaptation assessment
Design
The compendium provides users with key summary information about available frameworks, methods and tools that will assist them in developing and applying a process that meets their particular needs in assessing impacts, vulnerability and adaptation. It is organized in a way that allows existing adaptation analysis and decision frameworks and tools to be catalogued in a clear, easy to use and non-prescriptive manner. It reflects the current state of knowledge by collecting and summarizing information on three broad categories – frameworks, methods and tools.

First, it contains information about complete frameworks (both first and second generation approaches), those methods that prescribe an entire process for the assessment of vulnerability and adaptation, as part of a broad strategic approach. Second, the compendium catalogues methods and tools that are applicable to multiple sectors. These come in two types: those that assist in addressing key cross-cutting themes (such as socioeconomic scenario development, regional models and downscaling of the outputs of Global Circulation Models) and those that can be applied at different stages during a vulnerability and adaptation assessment (such as stakeholder approaches and expert judgment). Third, the compendium describes discrete tools and methods that are specific to assessments of impacts and adaptation in particular sectors. The compendium includes methods and tools for five sectors: agriculture, coastal zone, water, health, and forestry and vegetation.
Structure of the Compendium

• Chapter 1: Introduction
• Chapter 2: Frameworks and Supporting Toolkits
• Chapter 3: Cross-Cutting and Multi-Sector Approaches
  – Application of Scenario Data in Impact and Adaptation Assessment
  – Decision Tools
  – Stakeholder Approaches
  – Other Multisectoral Tools
• Chapter 4: Sectoral Tools
  – Agriculture
  – Coastal zone
  – Water
  – Health
  – Forest and vegetation

Scope

The compendium currently summarizes information on more than 90 methods and tools. However, it is not intended to provide a comprehensive listing of approaches, cross-cutting issues or sectors, or of all the potential frameworks, methods and tools that might be available. Its structure is designed to accommodate the addition of existing and future approaches.

Summary tables in the compendium provide an overview of the framework, method or tool in question, including a summary description of the tool, how the tool might be used, where it is applicable, data requirements, expected products, projects where the tool has been used, costs involved and contact details for more information.

Example of an output from the compendium methodology.
National coastal vulnerability profiles using the IPCC common methodology

### Example of a summary information about methodology in the compendium

#### APSIM (Agricultural Production Systems sIMulator)

<table>
<thead>
<tr>
<th>Description</th>
<th>APSIM is a modeling framework with the ability to integrate models derived in fragmented research efforts. This enables research from one discipline or domain to be transported to the benefit of some other discipline or domain. It also facilitates comparison of models or submodels on a common platform. This functionality uses a “plug-in–pull-out” approach to APSIM design. The user can configure a model by choosing a set of submodels from a suite of crop, soil, and utility modules. Any logical combination of modules can be simply specified by the user “plugging in” required modules and “pulling out” any modules no longer required. Its crop simulation models share the same modules for the simulation of the soil, water, and nitrogen balances. APSIM can simulate more than 20 crops and forests (e.g., alfalfa, eucalyptus, cowpea, pigeonpea, peanuts, cotton, lupin, maize, wheat, barley, sunflower, sugarcane, chickpea, tomato). APSIM outputs can be used for spatial studies by linking with geographic information systems (GIS).</th>
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<tbody>
<tr>
<td>Appropriate Use</td>
<td>The APSIM environment is an effective tool for analyzing whole-farm systems, including crop and pasture sequences and rotations, and for considering strategic and tactical planning. APSIM allows users to improve understanding of the impact of climate, soil types, and management on crop and pasture production. It is a powerful tool for exploring agronomic adaptations such as changes in planting dates, cultivar types, fertilizer/irrigation management, etc.</td>
</tr>
<tr>
<td>Scope</td>
<td>Site-specific but can be extrapolated to national and regional levels using GIS.</td>
</tr>
<tr>
<td>Key Output</td>
<td>Changes in crop and pasture yields, yield components, soil erosion losses, for different climate change scenarios.</td>
</tr>
<tr>
<td>Key Input</td>
<td>Soil properties, daily climate data, cultivar characteristics, and agronomic management.</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>For trained agronomists. Requires advanced knowledge of plant growth and soil processes.</td>
</tr>
<tr>
<td>Training Required</td>
<td>APSIM training takes approximately one week to acquire minimum skills to conduct simple simulations.</td>
</tr>
<tr>
<td>Training Available</td>
<td>Training courses are offered by APSRU (see Contacts below).</td>
</tr>
<tr>
<td>Computer Requirements</td>
<td>Windows-based PC.</td>
</tr>
<tr>
<td>Applications</td>
<td>Used in Australia, APN projects in Asia, and in a number of countries in South America under the Assessments of Impacts and Adaptations to Climate Change (AIACC) projects.</td>
</tr>
<tr>
<td>Contacts for Framework, Documentation, Technical Assistance</td>
<td>Christopher Murphy, APSRU, PO Box 102, Toowoomba, QLD, 4350, Australia; Tel: +61.07.4688.1394; e-mail: <a href="mailto:Christopher.Murphy@dpi.qld.gov.au">Christopher.Murphy@dpi.qld.gov.au</a>; Support desk: <a href="http://www.apsim.info/apsim/default.asp">http://www.apsim.info/apsim/default.asp</a>.</td>
</tr>
<tr>
<td>Cost</td>
<td>Not identified.</td>
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Use
Use

Expected users

Assessment managers and technical researchers, as well as teams responsible for the preparation of national communications may find the compendium particularly valuable. Users with differing degrees of technical expertise can navigate the compendium easily and find tools suited to their particular goals and capacities. Actual implementation of some of the frameworks, methods and tools described may require particular expertise: these requirements are explicitly described in the summary tables.

Appropriate application

The compendium is structured as a survey and not as a comprehensive source of information on any particular method. It provides users with key information about a manageable number of representative frameworks and tools, about special features of each framework or tool, and about how to obtain documentation, training or supporting publications. Users will be able to quickly review a large number of potentially applicable tools and identify those that warrant further investigation.

The compendium encourages users to carefully investigate and consider potential approaches in more detail, before making any decisions on implementation. In many cases frameworks, methods and tools may overlap with one another and users may find that one or more might be suited to their goals. In this case, they could benefit from combining elements of different approaches. Summary tables in the compendium will help users to see how different frameworks might fit together or be combined with discrete tools to create a custom approach.

Improvements and maintenance

The compendium is a first and important step in what will be an ongoing effort. It is a living document, and encourages users to see themselves as more than passive consumers. As the frameworks and tools are field tested, they will be steadily improved and their application refined. Users will play an important role in this process. Similarly, as understanding of climate change impacts and adaptation strategies expands and as social and economic circumstances change, there will be a continued need for new approaches and new research tools and methods. The compendium will be updated to reflect the state of the art on methodology.

The compendium has already undergone expert review, and the secretariat is actively planning important next steps based on feedback from this process. These include a number of short-term steps and more major long-term modifications that would further improve the usefulness of the compendium for non-Annex I Parties.
Example of an output from the compendium methodology

Source: India First National Communication. Spatial patterns of seasonal rainfall over India as simulated by a regional model.
Short-term steps might include:

- Development of explicit criteria for the inclusion of new methods;
- Further refinement of the structure with regard to the classification of frameworks, methods and tools;
- Inclusion of a glossary of terms;
- Updating of sectors to reflect new methods and tools that have come into use recently.

Long-term modifications might include:

- Development of an on-line database to house the compendium’s information;
- Design of a more user-friendly interface;
- Adoption of a more evaluative approach to guide users in the selection of tools;
- Formation of a network of experts for regular review of the compendium.

Summary

- The compendium is designed to be a reference document to help users with varying technical expertise to identify approaches, methods and tools that might contribute to their particular assessment goals, and to direct them to more information.
- The information in the compendium will be of particular use to the Parties in preparing their national communications or in the course of engaging in other vulnerability and adaptation assessment activities.
- The compendium represents the start of an ongoing effort to continuously catalogue the growing number of frameworks, methods and tools that are applicable to vulnerability and adaptation assessment.
- If proved useful, the compendium will evolve into a living database with periodically updated content, including information based on the experiences of the Parties in applying its tools and methods.
Resources

The compendium is available at:
unfccc.int/program/mis/meth/index.html

National communications and reporting guidelines for Annex I Parties are available at:
unfccc.int/issues/comumnoann1.html

Contact and further information

Contact the Methods, Inventories and Science programme within the secretariat for more information, comments or assistance with the compendium.

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