



## Capacity strengthening in climate change vulnerability and adaptation strategy assessments

Background on frameworks,  
methodologies and tools for  
vulnerability and adaptation assessments:  
How to move from reactive to proactive  
approaches

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In collaboration with:



Natural disasters linked to climate variability and climate change are likely to affect all sectors of a country and all layers of its population indiscriminately. In recent years, reducing vulnerability to natural disasters and climate change has become an urgent issue for developing countries, for at least two reasons. The first reason is that these countries lack resources or other necessities to fully deal with the social and economic effects of these disasters or changes; the second is that the economies of these countries are heavily dependent on sectors and resources highly sensitive to disasters, and climatic variation and change, such as agriculture, coastal resources, water resources and infrastructure. Consequently, for these countries, adapting to natural disasters, and climate variability and change is a major concern on the sustainable development policy agenda.

To be able to adequately address climate change in a sustainable development context, one must begin by carrying out vulnerability and adaptation assessments. These assessments will identify current hazards and threats and the strategies, policies and actions needed to cope with them. Addressing current vulnerability will assist in reducing future vulnerability due to worsening impacts. In the existing international legal context (see the Background Paper on International Developments in Climate Change Policy) a range of general conceptual frameworks, initiatives, mechanisms, financial and technical support schemes have been designed to assist in assessing vulnerability and in formulating adaptation strategies.

Multiple definitions of vulnerability and adaptation abound. Any one of these can often also be interpreted and employed in a number of ways. Thus it is imperative to define all terms and concepts to be used prior to beginning an assessment (see Glossary of basic terms and concepts). The definitions chosen may influence what is going to be measured, how it is going to be measured and who is going to use the information produced. Vulnerability is relative, not absolute. In assessing the degree of vulnerability and adaptive capacity, it must form an integral part of the social, institutional and political processes as it has important socio-economic and environmental consequences. Pragmatically, the vulnerability and adaptive capacity assessments need to take into account the development processes first.

Transparency and rigour are needed to define concepts, terms, and methods, and identify tools. The point is to arrive at a set of clear, pragmatic definitions that offer partners, stakeholders, involved groups and users a **common language**. A sound understanding of these definitions allows for the identification of appropriate methodological needs, modelling, quantification and evaluation tools, and their validation. By way of example, below are a few definitions of vulnerability and adaptation:

- ⇒ ***In general terms, vulnerability*** is the degree to which a system is likely to be damaged as a result of exposure to disturbances or stress.
- ⇒ ***In the case of climate change, vulnerability*** may be defined as the degree to which a system is likely to cope, or be incapable of coping, with the adverse effects of climate change, given the extent of the impacts and the adaptive capacity.
- ⇒ ***In general terms, adaptation*** refers to a system's ability to adapt in the face of current and future disturbances.

⇒ ***In the case of climate change, adaptation*** is a system's ability to adapt to changes in the climate, to reduce the potential damage, to capitalize opportunities and to cope with the consequences.

In practice, the choice of terms and concepts goes beyond a simple linguistic question, as this choice leads to significant consequences regarding the choice of methods and tools used and thus the results obtained from these assessments. When vulnerability to climate change is the entry point of the analysis, it must be measured by considering not only the adaptive capacities but also the fact that systems are, of course, sensitive to climate, **and** to a multiplicity of natural and anthropogenic processes and drivers. If these elements – which constitute the underlying causes and the background of vulnerability - are not taken into consideration, we may underestimate the magnitude of the risks, the extent of the social and environmental problems and the emergencies linked to natural disasters and climate change. In practice, the terms and concepts used in assessing vulnerability and adaptation may be set out in accordance with the following relationships:

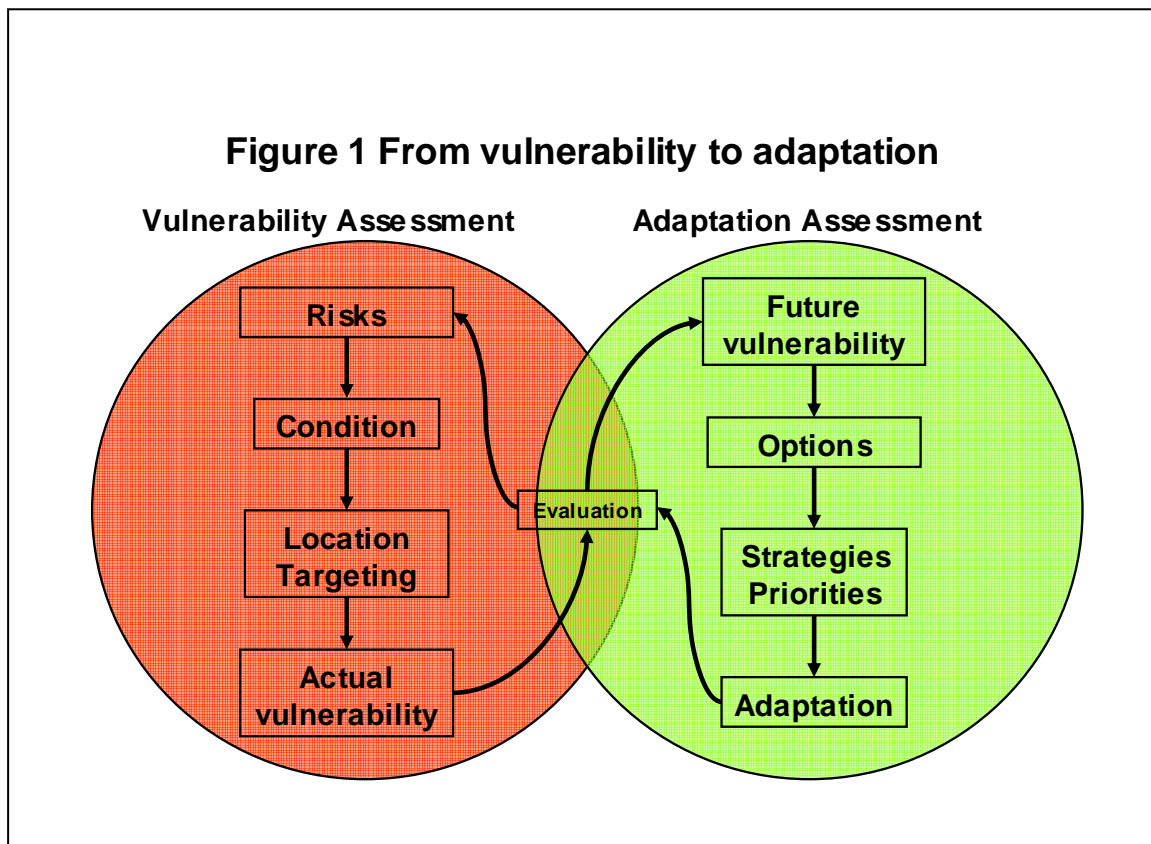
- Vulnerability may be considered as a function of the risks, hazards, exposure and adaptation options and coping responses.
- Risk depends on the probability of occurrence and magnitude of hazards.
- Hazard may be considered as a function of the potential threats to humans and their well-being as well to ecosystem goods and services.
- Exposure depends on the susceptibility to impacts' effects and/or losses.
- And finally, adaptation options and responses may be considered as a function of the mechanisms used, coping strategies defined or actions taken in reaction to the impacts or to prevent them.

Beyond terms and concepts, the choice of the frameworks, methods and tools used to understand and assess vulnerability and adaptation in response to natural disasters and climate change should be guided by a sound understanding of the problem, taking into account the context and an analysis of users and their information needs.

In practice, the goals of vulnerability and adaptation assessments consist of turning the data into relevant information and that information into action; this should help to raise awareness amongst the population and provide appropriate guidance to decision-makers in implementing appropriate policies and making decisions. For example, in the case of natural disasters, evaluation and information may form part of a process for promoting awareness of the possible dangers and impacts; it may help to establish early warning systems to prevent the possible consequences, support adaptation policy decisions to reduce the risks and improve planning and land-use. Figure 1 below illustrates the way in which vulnerability and adaptation assessments should form part of an integral process to produce relevant information on actual and future vulnerability and adaptation strategies in order to transform information into action.

From this viewpoint, we need to choose a framework, a method and tools according to the needs and the context of the assessment and of the users. These should enable us to at least:

- Identify the problems, raise awareness, improve knowledge, and define and develop policies;
- Develop strategic planning and set objectives, create and outline programmes, and operationally implement projects; and
- Evaluate and monitor the implementation of policies, projects and programmes.



We need to put a rigorous process in place, including the choice of a framework, which will enable us to use appropriate methods for assessing the situation and place tools and information in a relevant context for public policies and their implementation. In practice, this means that vulnerability must be adequately defined and all appropriate sustainable adaptation options must be explored.

With regard to overall assessment frameworks, we should highlight:

- **Frameworks focussed on the analysis of resources/sectors** and those defined according to the focus of actors/social groups. The former takes, as its starting point in the analysis, specific resources or sectors confronted with problems linked to climate change. The latter views actors or social groups as the main focus of the analysis and considers that perceptions and needs of these groups should be incorporated into the assessment and planning.
- **Frameworks defined as a function of climatic impacts** and those that are defined by the socio-economic vulnerability. The former considers that climate impacts will determine the analysis and impacts of socio-economic factors. The latter considers

that the socio-economic system and vulnerable groups will determine the analysis of climatic impacts on the various types of vulnerability.

In the “climate change” context, three major **frameworks** are currently being used globally and nationally for carrying out vulnerability and adaptation assessments.

- ⇒ The framework proposed by the IPCC (Carter *et al.*, 1994) is a top-down approach that begins with climate change scenarios, then identifies impacts that feed into the definition and assessment of adaptation measures;
- ⇒ The framework proposed by the UNDP in the *Adaptation Policy Framework*, (Lim and Spanger-Siegfried, 2005) is a more bottom-up approach that examines current and future vulnerabilities, as well as adaptive capacities, in order to define adaptation strategies which are considered as a continuous process. This approach wants to be flexible and outlines the involvement of all stakeholders at all stages of the assessment.
- ⇒ The guidelines proposed for the NAPA (National Adaptation Programme of Action, Annotated Guidelines – LEG, 2002; UNFCCC/LEG, 2004) also propose a bottom-up strategy in which vulnerability is the entry point, the aim being to improve endogenous adaptive capacities with regard to urgent and immediate needs for adaptation. The participative approach aims to contribute to the definition of vulnerability, to identify how populations face current climate variability and participate in the choice of adaptation options to reduce current and future vulnerability.

It is important to note that the latter two frameworks explicitly include stakeholders and their needs.

With regard to **methodologies**, two main types may be distinguished:

- Component-based methods, such as the livelihoods approach, which analyzes the vulnerability and subsistence strategies of the components or the different development capitals (natural capital, social capital, human capital, physical capital, financial capital); and
- Multi-scale and multi-level methods, such as diagnosis - forecasting - responses, or sensitivity - exposure - resilience, which analyze vulnerability and adaptation strategies and responses on several resource scales and decision-making levels.

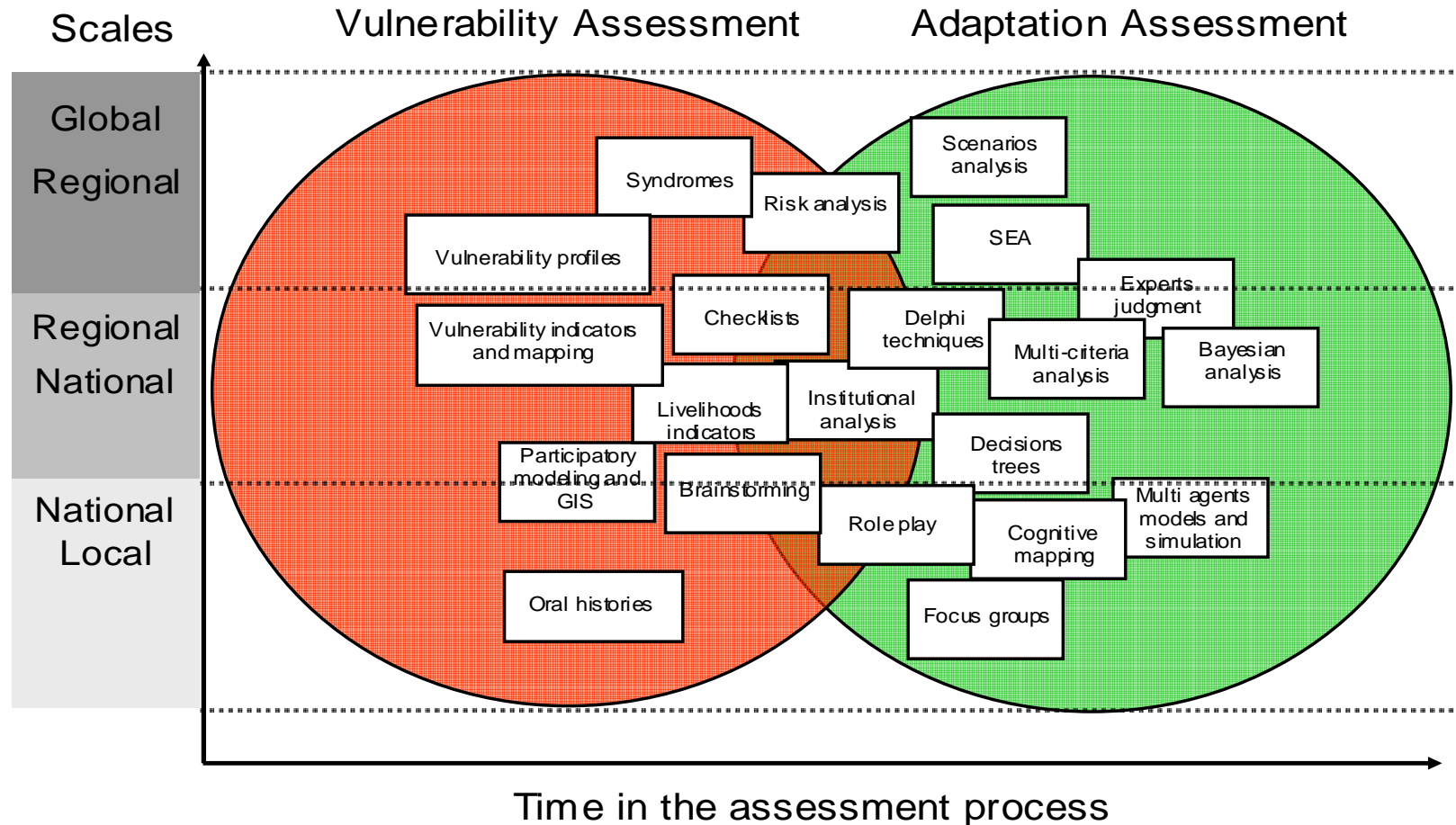
In practice, the choice of methods is not just linked to the framework used but also to the context, type and scope of the assessment. At least seven questions should be considered when choosing assessment methods. These are:

- What is the context and who are the assessment's users/clients? For example, the assessment goal could be the decisions made by local groups, regional or national authorities, national and international decision-makers.
- What is the time scale of the problem? For example, is it an immediate problem, a short- to medium-term problem (5 to 20 years), or a long-term problem (20 to 100 years)?
- What are the expected results of the policies? Expected results could include: awareness raising, operational advice, strategic planning, programme outlines, policy evaluation and/or monitoring.

- What is the targeted scale / spatial level? Individuals, families, villages, watersheds, regions, productive sectors, countries; multi-scale, macro-scale are all possible spatial scales.
- Which stakeholders are involved in the assessment? Is it a few decision-makers, a limited number of villages, groups of experts, or a wide range of stakeholders?
- What is the time scale for the assessment? Is it a rapid evaluation, an assessment of medium-term projects, or a long-term programme?
- What resources are available for the assessment? Are there groups of experts or multidisciplinary teams of consultants? What are the financial resources and data that are available?

Having chosen the appropriate framework and methods, we can now select the appropriate **tools** for carrying out the vulnerability assessment, the adaptation assessment or the vulnerability and adaptation assessment. Though vulnerability assessments are generally carried out before adaptation assessments, the two processes may sometimes overlap. Figure 2 below, which is not exhaustive, illustrates the main tools that are available according to the scale of the study (local to global, on the ordinate axis), and the type of assessment (vulnerability – adaptation on the horizontal axis).

**Figure 2 Tools for vulnerability and adaptation assessments in function of scales and process**



Source: Downing and Zwiervogel, 2004

In all circumstances, efforts to assess vulnerability and adaptation options should take into account the context and processes that allow stakeholders to participate. These stakeholders are those who are vulnerable and who must adapt, thus it is imperative to consult them, to understand their needs and constraints and to know their views and knowledge. This consultation will thus improve the decision-making process and governance while encouraging the implementation of adaptation measures, options and strategies.

For example, **oral histories and focus groups** are suitable participatory tools for researching and analyzing vulnerability and for determining the views of local groups (individuals, families, villages). However, if the vulnerability assessment needs to be undertaken at larger scales, such as town, department or country levels, tools such as **livelihoods indicators** may be most appropriate. These tools can help to distinguish and analyze the typologies and features of the most characteristic groups in terms of risks and vulnerability. **Vulnerability indicators and mapping** may be the most appropriate tools for evaluating the vulnerability at different spatial scales. For example, they can determine which resources and groups are at risk or whether there is vulnerability in access to resources, basic services or income levels. Indicators may be aggregated into indices to determine which groups of individuals are vulnerable according to socio-economic or other factors, or on the basis of geographical clusters to identify specific geographical areas characterised by vulnerable resources. Geographical Information System (GIS) indicators and indices may be used to map the vulnerability and thus identify vulnerability “hotspots” for different categories of resources or groups of individuals at local, national and regional levels.

Comparing and categorizing countries and regions is also helpful in assessing vulnerability. At the regional and global levels, the **syndromes** method may be a useful tool for comparing regions with similar society-environment interactions. Such interactions, combined with global change, such as climate change or desertification, may be used as a context in which to explore vulnerability and adaptation options on finer scales, such as the national level.

We need to evaluate the significance and extent of the adaptive capacity of individuals, groups, countries or systems. Even though this is a real challenge, there are a number of ways of measuring adaptive capacity and coping strategies using methods that establish a relationship with economic indicators and other indicators linked to social and political factors that may improve or hinder adaptation. The best tools are those that allow us to assess and select the most appropriate adaptation strategies for a country, system or stakeholder.

If the main goal is to determine which adaptation strategies should be implemented at the local level by stakeholders groups, the most appropriate tools may be **participatory techniques**. These include **brainstorming** and **role-play** techniques that allow communities to reflect on the adaptation strategies that are currently being used or that have been used in the past, and to explore their impacts. We can then explore new adaptation strategies and evaluate the capacities of local institutions to implement them, using **institutional analyses**.

To determine whether adaptation strategies are suitable at national or regional levels, we can use **multi-criteria analyses** that offer a formal method for comparing adaptation



options using monetary or non monetary values. **Expert judgement** may be helpful in deciding which adaptation options should be considered as well as identifying potential problems associated with the various strategies. **Multi-agent simulations and models** may be used to formalize adaptation strategies as part of a model for evaluating and assessing how different strategies can have variable impacts on different groups of agents or stakeholders such as individuals or families.

**Scenario analyses** may be used to evaluate and explore the impacts of processes in the future. They provide a qualitative and quantitative assessment of the potential future impacts of adaptation strategies. Work is underway to develop relevant scenarios at a local level, though this type of analysis is usually done at the global, regional or national level.

Land-use changes could have important impacts on the environment and economy of populations, regions and countries. Natural disasters and climate change could also have important consequences on present and future land-use and productivity. Consequently, there is a need to explore the causes and consequences of land-use changes in function of climate variability and change, which will not affect all populations, regions and countries in similar manner. At the same time, depending on the location of land-use changes, the consequences of natural disasters and climate change could have different impacts. **Land use change models** are useful complex tools to analyze the cause-effect relationships, as well as to identify the factors that determine problems associated with the varying scales at which resources are located and decisions are taken. **Land use change models and multi-agent models** may be combined to provide dependence analysis of scales and interrelations between levels and to provide an understanding of ecological and institutional processes, the collective behaviour of stakeholders, and synergy mechanisms operating between environmental and socio-economic components.

To conclude this brief overview of vulnerability and adaptation assessments, we should strongly emphasize the need to ensure that the **grassroots reality** (institutional context and limits, technical capacity, the needs of stakeholders and partners) is linked to the methods and tools used as well as to the on-going processes. **Information needs** vary according to realities and needs, the people involved, interest groups and decision-making objectives. The information set should be politically relevant, socially acceptable and technically valid to ensure that assessments are not based solely on partial, anecdotal or temporary issues. To achieve this, the information on vulnerability, impacts and adaptation options should be **translated** from **scientific** language and time scales into the language and time scales of **decision-makers** and **stakeholders** at all levels, from global to local. In all circumstances, it is important to link spatial entities (villages, landscapes, watersheds, ecosystems) to social entities (individuals, families, communities, towns) and to place the vulnerability and adaptation assessments in the context of the development process (local, regional or national).

This approach will ensure credibility of the assessments. It will also increase the political and social appropriation of the problems related to vulnerability, prevention and adaptation, so that these problems may finally be perceived as **investments**, and not just as **costs**. Assessment processes should be used to define regional strategies, develop national policies, identify options and implement actions at a local level. It then becomes possible to change the cycle that moves from the **resolution of the consequences** of natural disasters, climate variability and climate change towards

processes aimed at **preventing the causes**, based on the planning of possible impacts, adaptation to adverse consequences, prevention of negative effects and reduction of the direct and indirect causes.

**Conclusion:** Above and beyond the risks and vulnerability, the challenges in terms of strategies and policies for sustainable development lay in the exploration of adaptive capacity, the building of resilience and the recognition of emerging advantages and opportunities in order to cope with the consequences of climate variability and climate change, and above all to promote policies and preventive measures.

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Compendium of methods and tools to assess vulnerability impacts and adaptation effects on climate change (UNFCCC):

[unfccc.int/adaptation/methodologies\\_for/vulnerability\\_and\\_adaptation/items/2674.php](http://unfccc.int/adaptation/methodologies_for/vulnerability_and_adaptation/items/2674.php)

Compendium on methods and tools to assess impacts and adaptation effects on climate change and climate variability based on applied cases studies (AIACC):

[www.aiaccproject.org](http://www.aiaccproject.org)

Compendium on methods and tools based on cases studies to assess vulnerability and adaptation to climate (START):

[www.start.org](http://www.start.org)

Compendium of publications, cases studies, examples, and tools on vulnerability and adaptation assessments methods to climate change (VulnerabilityNet):

[www.vulnerabilitynet.org](http://www.vulnerabilitynet.org)

Compendium of exercises, cases studies and examples to build vulnerability and adaptation assessments to climate change, in the context of National Adaptation Programmes of Action (NAPAs).

[www.unitar.org/ccp/NAPA/index.htm](http://www.unitar.org/ccp/NAPA/index.htm)