



**UNITED
NATIONS**



**Framework Convention
on Climate Change**

Distr.
GENERAL

FCCC/SBSTA/2007/8
18 September 2007

Original: ENGLISH

SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE

Twenty-seventh session

Bali, 3–11 December 2007

Item 3 of the provisional agenda

Nairobi work programme on impacts, vulnerability and adaptation to climate change

Synthesis of information and views on methods and tools submitted by Parties and relevant organizations

Note by the secretariat

Summary

This document synthesizes information on existing and emerging adaptation assessment methodologies and tools identified in submissions received from Parties and organizations, as well as relevant outputs from the Least Developed Countries Expert Group, the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, and the Expert Group on Technology Transfer. This note also includes a summary of the views on lessons learned from the application of methods and tools, as well as opportunities, gaps, needs, constraints and barriers, and on possible ways to develop and better disseminate methods and tools, and training opportunities.

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I. Introduction

A. Mandate

1. At its twenty-fifth session, the Subsidiary Body for Scientific and Technological Advice (SBSTA) invited Parties and relevant organizations to submit to the secretariat, by 15 May 2007, information on existing and emerging assessment methodologies and tools; and views on lessons learned from their application; opportunities, gaps, needs, constraints and barriers; possible ways to develop and better disseminate methods and tools; and training opportunities.¹
2. The SBSTA requested the secretariat to prepare, by its twenty-seventh session, a synthesis report on the information and views contained in the submissions mentioned in paragraph 1 above, and the relevant outputs from the work of the Least Developed Countries Expert Group (LEG), the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) and the Expert Group on Technology Transfer (EGTT).

B. Scope of the note

3. This document synthesizes information on existing assessment methods and tools identified in 15 submissions received from Parties and organizations,² and relevant output from the LEG, CGE and EGTT. The information contained in this document will feed into the deliberations of an expert meeting on methods and tools that will be held prior to the twenty-eighth session of the SBSTA.

II. Summary of submissions

A. Background and synthesis approach

4. The overall objective of the Nairobi work programme on impacts, vulnerability and adaptation to climate change is to assist all Parties, in particular developing countries, including the least developed countries and small island developing States, to improve their understanding and assessment of impacts, vulnerability and adaptation, and to make informed decisions on practical adaptation actions and measures to respond to climate change on a sound, scientific, technical and socio-economic basis, taking into account current and future climate change and variability.³
5. Activities in the area of methods and tools are undertaken in line with the objective in the annex to decision 2/CP.11, to advance subthemes a (i), "Promoting development and dissemination of methodologies and tools for impact and vulnerability assessments, such as rapid assessments and bottom-up approaches, including as they apply to sustainable development", and b (i), "Promoting the development and dissemination of methods and tools for assessment and improvement of adaptation planning, measures and actions, and integration with sustainable development."
6. Activities in the area of methods and tools can contribute to efforts by Parties and organizations, inter alia:
 - (a) To apply and develop methodologies and tools for impact, vulnerability and adaptation assessments;

¹ FCCC/SBSTA/2006/11, paragraph 33.

² Compiled in FCCC/SBSTA/2007/MISC.12, FCCC/SBSTA/2007/MISC.13 and two online documents available at <<http://unfccc.int/3689.php>>.

³ Decision 2/CP.11, annex, paragraph 1.

- (b) To develop methodologies and tools for adaptation planning, measures and actions, and integration with sustainable development;
- (c) To disseminate existing and emerging methods and tools;
- (d) To facilitate the sharing of experiences and lessons learned, including those contained in the UNFCCC compendium on methods and tools to evaluate impacts of, and vulnerability and adaptation to, climate change, including the assessment of costs and benefits.

7. Submissions were received from eight Parties, five United Nations and intergovernmental organizations, and two non-governmental organizations (NGOs). The Parties were Argentina, Australia, Canada, Cuba, El Salvador, Germany on behalf of the European Community and its member States (hereafter referred to as the EU), the United States of America, and Uzbekistan. The United Nations and intergovernmental organizations were the Secretariat of the Convention on Biological Diversity (CBD), the Food and Agriculture Organization of the United Nations (FAO), the United Nations International Strategy for Disaster Reduction (ISDR), the Secretariat of the Pacific Regional Environment Programme (SPREP) and the World Meteorological Organization (WMO). The NGOs were the International Institute for Sustainable Development and the Tyndall Centre for Climate Change Research.

8. Submissions were made in the form of written descriptions of existing and emerging methods and tools for adaptation. In total, more than 150 methods and tools were identified. For its submission, the Tyndall Centre provided a list of references to impact, vulnerability and adaptation reports and research papers. Some submissions included other information in addition to assessment methods and tools, including descriptions of tools for climate change mitigation assessment and tools related to risk management and adaptation practices.

9. The information on methods and tools contained in this synthesis was summarized following the structure previously used in the relevant UNFCCC documents and sources,⁴ to ensure consistency in how the methods and tools are categorized. Thus, each method or tool is categorized as a framework, as a cross-cutting and multi-sector approach, or as a sector-specific approach⁵ (see box). To allow for the inclusion of the variety of new and emerging methods and tools contained in the submissions, these categories are treated with a degree of flexibility.

Box. Definitions of frameworks, methods and tools

Framework refers to a combination of an approach (such as top-down or bottom-up) that prescribes an entire process of assessment and which may include a certain method or methods (sequence of actions designed to achieve a prescribed result), which in turn might employ various tools (such as computer climate models).

Cross-cutting and multi-sector approaches:

(a) Scenario methods and tools are used mainly by climate change analysts and decision makers to consider vulnerability and adaptation options in the context of different possible future conditions. There are several methods and tools that can be used for downscaling climate data or developing socio-economic scenarios. The downscaling techniques can be used to produce small-scale climate data of the type often required by impact models and to develop future climate scenarios at the local and national scales.

⁴ FCCC/SBSTA/2004/INF.13 and the UNFCCC Compendium on methods and tools to evaluate impacts of, vulnerability and adaptation to, climate change
<http://unfccc.int/adaptation/methodologies_for/vulnerability_and_adaptation/items/2674.php>.

⁵ Adapted from document FCCC/SBSTA/2004/INF.13.

(b) Decision-support tools are general analytical tools that assist analysts in making choices between adaptation options. Some of these tools rely on a single quantitative metric and focus on a single decision criterion. Others enable the user to define and incorporate more than one decision criterion. Other tools seek to inform the larger policy decision questions, taking into account the institutions involved and affected when pursuing given adaptation options.

(c) Stakeholder analysis tools typically include a range of techniques that can be used to gain or account for on-the-ground perspectives – for example, of highly vulnerable populations. They can also be used in processes aimed at clarifying the sometimes competing perspectives of stakeholder groups.

(d) Uncertainty and risk management tools enable the user to address the errors and unknowns often associated with data and information used to evaluate climate change adaptation measures. A key element of uncertainty and risk analysis is defining the decision criterion that is most appropriate for the question at hand.

Sector-specific methods and tools have been used in top-down/scenario-driven studies to assess impacts of climate change. Sectoral tools can provide a quantitative estimate of the possible harm to certain sectors and/or systems due to future climate change.

B. Summary of existing and emerging methods and tools, and experiences with their application

1. Frameworks

10. Some Parties reported using large-scale frameworks as a means of structuring their assessment and planning approach. Existing frameworks such as the Adaptation Policy Framework (APF) of the United Nations Development Programme, the framework provided in *Climate Adaptation: Risk, Uncertainty and Decision Making*⁶ by the UK Climate Impacts Programme (UKCIP) and the Spanish National Climate Change Adaptation Plan were mentioned, as were newer frameworks, such as El Salvador's conceptual framework to assess climate vulnerability and develop an adaptation strategy for rural populations in the country's coastal plains.

11. A precise evaluation of the level of effectiveness of these frameworks was not given in the submissions. However, some Parties did begin to analyse their applicability. Argentina, for example, saw the potential for the APF to be used at the national and regional levels, but acknowledged that most of the strategies and policies developed using this framework are still under consideration and have not yet been implemented.

2. Cross-cutting and multi-sector approaches

Scenario methods and tools

12. Scenario methods and tools are being used by a number of Parties to support climate change impact assessment. Most submissions emphasized the use of climate change scenarios rather than socio-economic ones.⁷ One reason for this is that Parties have encountered difficulties applying socio-economic scenarios. This is illustrated through an example reported by the EU. According to this submission, uptake of UKCIP socio-economic scenarios, developed in 2000 alongside the UKCIP 1998 climate change scenarios to produce an integrated assessment of potential impacts of climate change, has been poor. These scenarios have been perceived as being difficult to use, largely because

⁶ Connell R and Willows R (eds). 2003. *Climate Adaptation: Risk, Uncertainty and Decision-Making*. UKCIP Technical Report. Oxford: UKCIP.

⁷ For example, the EU listed a number of ongoing research projects to advance the science of climate modelling and the development of climate change scenarios, such as AICSEX (Arctic Ice Cover Simulation Experiment), ATEAM (Advanced Terrestrial Ecosystem Analysis and Modelling), high resolution climate scenarios for the Alpine region and KNM106 climate change scenarios.

dissemination strategies and training opportunities to help users interpret these scenarios are inadequate. A further difficulty is that some countries do not have access to the tools required to produce national or sub-national socio-economic scenarios.

13. The lack of suitable expertise and resources for scenario development are common concerns raised by the Parties, especially developing country Parties. For example, Uzbekistan has relied on scenarios to assess its water resource and irrigation needs in future but it noted that the lack of qualified modelling specialists, research groups, and technical and financial resources has been problematic. El Salvador also noted deficiencies in its national climate records and climate observing network.

14. One way of providing support in developing scenarios that was explored in the submissions is through the use of data storage and distribution tools. These have been identified primarily by the EU, and include a number of databases and data repositories. The Intergovernmental Panel on Climate Change (IPCC) Data Distribution Centre, for example, provides access to baseline and scenario data supplied by cooperating modelling and analysis centres, as well as providing technical guidelines on the selection and use of data and scenarios in research and assessment. Although the IPCC does not give training on the use of this resource, its Web interface attempts to clearly inform users as to what is available and how it can be used.

Climate downscaling tools

15. On the assessment of local climate impacts, climate downscaling techniques, in particular regional climate models (RCMs) and statistical downscaling, were described in several submissions. These tools are important for providing valuable local climate information.

16. For the most part, the downscaling tools identified in submissions are already in use. Parties reported the limitations of these tools and focused their discussions on ways to improve them or to find alternative approaches. Cuba, for example, cited the low temporal and spatial resolution of the simple climate model MAGICC (Model for the Assessment of Greenhouse-gas Induced Climate Change) as a reason to try an RCM approach to downscaling global climate projections.

17. Another difficulty encountered by Parties when using these tools is the lack of national expertise to interpret the results. As a result, Parties are looking for new ways to make existing downscaling tools more usable. For example, according to the EU, training on the use of the PRECIS (Providing Regional Climates for Impacts Studies) model in developing countries requires financial support. In some regions, this barrier has been overcome through the development of collaborative networks where responsibilities for the generation and dissemination of model results are shared among a number of countries. PRECIS-Caribe, for example, is a Web-based tool currently being used to disseminate PRECIS model outputs to several countries in the Caribbean region.

18. The challenge of making downscaling tools more accessible to practitioners in developing countries is of interest to organizations and research institutions. WMO reported that concerted efforts are being made by national meteorological and hydrological services and leading international climate modelling groups to develop RCMs for use in impact studies in developing countries. However, it reinforced the idea that the application of RCMs in developing countries requires users to have access to adequate computational resources, local observational data for model evaluation and regional expertise to define and interpret the simulated regional features.

19. WMO suggested that a coordinated effort be made to encourage greater use of statistical downscaling methods to generate useful and plausible local climate scenarios. Statistical downscaling tools are computationally inexpensive compared with RCMs and can be used to provide local area-specific information to support climate change impact studies. Furthermore, research efforts are under way to improve existing downscaling methods and tools. For example, the EU identified the STARDEX

(Statistical and Regional Dynamical Downscaling of Extremes for European Regions) project, which provides a rigorous and systematic comparison and evaluation of statistical, dynamical⁸ and statistical-dynamical⁹ downscaling methods for the construction of scenarios of extremes.

Decision-support tools

20. A number of decision-support tools were identified in the submissions, with Parties and organizations reporting varying degrees of effectiveness and scope. Some tools are designed to stimulate discussion and raise awareness of important issues related to climate change. For example, Eururalis was developed to support decision makers in discussions and decision-making on rural areas in Europe. It presents contrasting scenarios in a model framework as a starting point for discussions on policy options. Another example is the UKCIP Adaptation Wizard, a Web-based tool that supports users through the process of identifying climate change-related risks and opportunities. These tools offer a useful starting point for discussing climate change adaptation, particularly for decision makers who have previously had limited exposure to this kind of information.

21. A number of tools are available to those in the process of preparing adaptation plans. The Nottingham Declaration Action Pack, for example, provides online guidance to local authorities in the United Kingdom of Great Britain and Northern Ireland on assessing climate-related risk and the vulnerability of their operations to climate change, and to develop appropriate adaptation responses. Those who are in the process of evaluating potential adaptation strategies use established tools such as multi-criteria analysis (MCA). MCA, used to make a comparative assessment of multiple adaptation activities, was identified in the submissions as a useful tool that allows for the integration of views of a number of stakeholders.

22. A number of submissions also identified costing methodologies. The *Economic Issues Relevant to Costing Climate Change Impacts* study of the Australian Greenhouse Office¹⁰ explores a range of economic assessment methods useful for estimating the costs of climate change impacts and the benefits and costs resulting from investment and other actions to reduce impact costs through adaptation. Costing methodologies tailored to specific interests were also described in the submissions; for example, the CBD process has directed its efforts toward the valuation of biodiversity resources to assist with decision-making.

Stakeholder analysis tools

23. Stakeholder analysis tools, which were mentioned briefly in some of the submissions, relate primarily to the development of vulnerability indices. These indices, developed using historical and observational data as well as model-generated scenarios, deal with an assortment of climate change impacts across multiple sectors (such as the vulnerability of coastal zones to sea level rise). The subsequent vulnerability assessments are generally found to be successful when the work is conducted in a collaborative, interdisciplinary manner. Parties and organizations noted that community-level interests are a key driver of many vulnerability assessments and that traditional and local knowledge should be included as part of this work whenever possible.

⁸ A method of downscaling using physically-based RCMs.

⁹ A method of downscaling which incorporates aspects of both statistical and dynamical approaches.

¹⁰ Australian Greenhouse Office. 2004. *Economic Issues Relevant to Costing Climate Change Impacts*. Canberra: AGO.

Uncertainty and risk management tools

24. Some Parties recognized that effective adaptation strategies must result in climate-related risk being considered a normal part of strategic planning and decision-making. The positive response of decision makers to uncertainty and risk management tools may allow for more effective mainstreaming of climate change adaptation into broader decision-making processes. Both Australia and Canada produced risk management tools and guidelines¹¹ designed to help governments, industries and communities assess their vulnerabilities, plan for the effects of climate change, adapt to impacts and exploit opportunities. Risk management has also been incorporated into adaptation planning frameworks. For example, the Ad Hoc Technical Expert Group on Biodiversity and Climate Change, convened under the CBD process, created a framework for adaptation, integrating biodiversity concerns in a manner consistent with risk management approaches.

Other methods and tools

25. FAO identified tools that bring consideration of gender into assessment ('gender mainstreaming tools') in its submission. Climate change is expected to have gender-specific impacts and therefore FAO believes climate change adaptation should include gender disaggregated approaches. It stated that there are a number of gender mainstreaming tools that can be applied to climate change adaptation policy-making and implementation; however, training on gender mainstreaming for policy makers in the climate change area is needed. Argentina and the EU also identified two mitigation assessment tools: LEAP (Long-range Energy Analysis and Planning) and NEEDS (New Energy Externalities Development for Sustainability).

3. Sector-specific approaches

26. According to submissions, the tools described in this section have been applied in impact and vulnerability assessments within specific sectors. With the exception of the agriculture sector, few submissions contained a detailed discussion of sector-specific tools or the lessons learned from their application.

Agriculture sector

27. Assessments for the agriculture sector rely on the use of crop and hydrological models; however, the need for complementary tools to integrate these modelling results was evident in the submissions. One organization carrying out work towards filling this gap is FAO. Members of its Environment, Climate Change and Bioenergy division have been developing a climate change adaptation strategy and work plan that includes the identification of tools and methodologies available that can assist in climate change adaptation. FAO listed among its examples agroecological zoning methodology and related decision-support tools, which are used for the analysis of land productivity, crop intensification, food production and sustainability issues. It also identified a number of climate impact assessment tools such as agroclimatic water stress mapping, AgrometShell (software designed to assess the impact of climatic conditions on crops, conduct climatic risk analysis and forecast regional crop yields), AquaCrop (an irrigation model) and CLIMWAT 2.0 (a climatic database for AquaCrop).

28. According to FAO, the strength of its climate impact assessment tools is that they support efforts to render agriculture more resilient and responsive on various spatial scales. These tools have been

¹¹ For example, *Climate Change Risk and Vulnerability: Promoting an Efficient Adaptation Response in Australia* (Australian Greenhouse Office, 2005, Canberra: AGO) and the "Risk Management Guidelines for Adaptation Decision-Making in Municipalities" project to develop risk management guidelines for Ontario municipalities and conservation authorities.

tested and used extensively by countries and are appropriate for vulnerability risk assessments and to define best practices for climate change adaptation. How these tools will be applied to the climate change adaptation strategy and workplan of the FAO, however, remains to be seen.

29. Canada reported that it has been working toward integrated sectoral assessments as a means of providing the data needed to directly inform adaptation decision-making. As an example, it identified an integrated assessment which focuses on agriculture production on the Canadian prairies. This scenario-driven impact assessment combines a biophysical model, EPIC (Environmental Policy Integrated Climate), and a socio-economic model, CRAM (Canadian Regional Agriculture Model), to assess future benefits and risks, and evaluate possible adaptation options.

Terrestrial vegetation sector

30. Terrestrial vegetation sector tools were mentioned twice in the submissions and included the numerical simulation model LPJ-DGVM (Lund-Potsdam-Jena Dynamic Global Vegetation Model) and the GLCN (Global Land Cover Network) software and methodologies. Both have been developed to support information gathering and research relating to land-cover and its dynamics; however, LPJ-DGVM is limited by the fact that it is not designed to be an end user tool and therefore lacks a convenient interface for non-scientists. GLCN, on the other hand, is intended to support stakeholders in developing countries who have difficulty accessing reliable land-cover and land cover change data, and therefore places an emphasis on outreach and data dissemination. FAO information tools require a limited amount of data to run and may be well-suited for use in countries where the number of climate observation stations tends to be low.

Water sector

31. Although activities in the water sector are important to livelihoods in many communities, there was little discussion of the tools being used to assess impacts and adaptation in this sector. Uzbekistan identified two water sector tools: WEAP (Water Evaluation and Planning System) and IWMR (Integrated Management of Water Resources). It acknowledged that views on water management of neighbouring countries often conflict with one another, making assessment of regional adaptation measures difficult. It suggested that IWMR may help to address this, as it takes into account the interests of different sectors and hierarchy levels, and involves multiple stakeholders in the decision-making process.

32. Canada has also made an effort to take an integrated approach to water sector assessment through the development of OSWRM (Okanagan Sustainable Water Resources Model). OSWRM combines scenario-based information on impacts and adaptation with local expert knowledge of the current state of the Okanagan water system in British Columbia, providing a learning tool for assessing the effectiveness of adaptation options within various scenarios of climate change and population growth in the Okanagan Basin.

Coastal zones sector

33. As is the case for the water sector, there was little mention of assessment tools for the coastal zone sector in the submissions; discussion was limited to vulnerability assessment tools. DIVA (Dynamic Interactive Vulnerability Assessment), for example, is a software tool used for assessing coastal vulnerability to sea level rise and for exploring different adaptation strategies. It has been widely used in scientific, policy and training activities; however, a limitation of this model is that its spatial resolution and underlying global data sets do not make it suitable for coastal planning and decision-making. Coastal zone vulnerability is also being assessed by monitoring physical processes using tools such as sea level fine resolution acoustic measuring equipment and other ocean monitoring tools.

Human health sector

34. Few Parties and organizations mentioned the health sector in their submissions. Cuba has developed the MACVAH/AREEC (models of anomalies of climate variability and change and their impact on human health/Assessment of epidemic risk and cost estimation) model and reported that it has been used in Cuba and other Latin American countries with good results. The EU identified the climate Change and Adaptation Strategies for Human health (cCASHh) project, which combines a number of approaches, including a conceptual framework, vulnerability assessments, policy analysis, economic analysis and integrated assessment models to investigate four climate-related health outcomes.¹²

4. Methods and tools used in the disaster risk reduction community

35. Methods and tools for disaster risk reduction (DRR) were mentioned repeatedly in submissions, primarily by organizations, as a means to respond to the need to assess and reduce the risks and impacts associated with climate hazards.

36. DRR tools have been developed by a number of institutions including research centres, government agencies, intergovernmental organizations and NGOs. These tools are designed to be used at a range of spatial levels, to be implemented in cooperation with diverse partners, and to respond to numerous hazards. The reporting Parties and organizations suggested that, provided that adequate levels of training and expertise in the DRR tools are made available where needed, they have few concerns over their usefulness. It was warned, however, that many of these tools were developed to deal with existing climate-related risks. New risks, or the aggravation of existing risks by climate change, may need to be more comprehensively addressed in DRR tools.

37. The variation in scope and scale of DRR methods and tools was evident in the submissions. They mentioned modelling tools (e.g. the MONSAC storm surge model), extreme event databases (e.g. IMFREX database on climate change scenarios in France¹³), decision support tools (e.g. CRiSTAL (Community-based Risk Screening Tool)), stakeholder analysis tools (e.g. mapping vulnerabilities to extreme climate events) and frameworks (e.g. the CCAIR (Climate Change Adaptation through Integrated Risk Reduction) framework and methodology). Several submissions noted the development and use of early warning systems, such as the Famine Early Warning System Network (FEWS) of the United States Agency for International Development and the National Oceanic and Atmospheric Administration (NOAA), and WMO Climate Watches.

38. Both ISDR and WMO discussed DRR methods and tools at length. In accordance with the key thematic areas of the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters,¹⁴ ISDR identified in its submission a number of guidelines and tools currently being used by the DRR community,¹⁵ noting that all of these tools place emphasis on taking a holistic view of DRR and on linking with diverse stakeholders.

¹² These outcomes are (a) health effects of heat and cold; (b) health effects of extreme weather events; (c) vector-borne and rodent-borne diseases; and (d) water-borne and food-borne diseases.

¹³ Ministère de l'Écologie et du Développement Durable. IMFREX (Impact des changements anthropiques sur la fréquence des phénomènes extrêmes de vent, de température et de précipitations)
<<http://medias1.mediasfrance.org/imfrex/web/index.fr.php>>.

¹⁴ <<http://www.unisdr.org/eng/hfa/hfa.htm>>.

¹⁵ For example, the Comprehensive Hazard and Risk Management (CHARM) tool of the South Pacific Applied Geoscience Commission, *Community-Based Disaster Risk Management Field Practitioners' Handbook* (Abarquez I and Murshed Z, 2004, Klong Luang: Asian Disaster Preparedness Center) and *Natural Disaster Mitigation in Drinking Water and Sewerage Systems: Guidelines for Vulnerability Analysis* (Pan American Health Organization, 1998, Washington, DC: PAHO).

39. The WMO Disaster Risk Reduction programme addresses the need to strengthen international and national collaboration in disaster risk reduction. The programme seeks to improve the development and delivery of DRR methods and tools by: (i) strengthening capacity for meteorological, hydrological and climate-related hazard monitoring, databases, and methodologies for hazard analysis in support of risk identification, risk reduction and risk transfer activities; (ii) strengthening capacity for operational meteorological, hydrological and climate-related hazard early detection and warnings built upon strong governance, organizational and operational processes; and (iii) strengthening capacity for provision of meteorological services in support of pre- and post-disaster emergency response and relief operations.

III. Output from relevant expert groups constituted under the Convention

A. Background

40. Activities and publications by the expert groups constituted under the UNFCCC, namely the LEG, the CGE and the EGTT, contribute to efforts by Parties and organizations to develop and disseminate methods and tools for adaptation assessment and planning.

41. Each group has a unique mandate. The LEG provides advice to least developed countries (LDCs) on the preparation and implementation strategy for national adaptation programmes of action (NAPAs), and on related capacity-building needs. The LEG also provides technical advice on identifying relevant data and information to be synthesized as part of an integrated assessment during NAPA preparation. The CGE supports the preparation of national communications by Parties not included in Annex I to the Convention (non-Annex I Parties) through the development of training materials and organization of regional hands-on training workshops on vulnerability and adaptation (V&A) assessments, greenhouse gas inventories and mitigation. The EGTT analyses and identifies ways to facilitate and advance technology transfer activities (technology needs and needs assessments, technology information, enabling environments, capacity-building and mechanisms for technology transfer) and makes recommendations to the SBSTA.

42. As a result of these differences in mandates and activities, each expert group makes a different contribution to the development and dissemination of methods and tools. The work of the LEG and CGE contributes primarily to efforts to develop and disseminate existing and emerging methods and tools for impact, vulnerability and adaptation assessments, whereas the work of the EGTT contributes to the development and dissemination of methods and tools related to the development and transfer of technologies.

B. Least Developed Countries Expert Group

43. The LEG “Annotated guidelines for the preparation of national adaptation programmes of action”¹⁶ were developed to provide guidance on the preparation of NAPAs. They elaborate on methods for key aspects of this process, and on selection and prioritization of adaptation options.

44. Work by the LEG provides information on how Parties prepare NAPAs and which methods and tools are commonly used. Various tools are used by Parties at each stage of the NAPA preparation, whereby multi-disciplinary teams of stakeholders, including local communities, conduct an integrated assessment to identify key vulnerabilities and adaptation needs.

45. Once key vulnerabilities have been identified, urgent and immediate adaptation needs are defined. Activities to address these needs are then identified based on stakeholder inputs. A ranking of the needs and activities is then generated using a variety of methods, from community consensus-building to semi-quantitative methods such as cost-benefit analysis, cost-effectiveness analysis and

¹⁶ <http://unfccc.int/files/cooperation_and_support/ldc/application/pdf/annguide.pdf>.

multi-criteria analysis that help LDCs prioritize their adaptation activities. For example, Bhutan¹⁷ applied MCA to select the country's top priority NAPA projects, whereas Samoa¹⁸ used community consensus-building to rank its needs.

46. The framework for NAPA preparation is bottom-up, requiring stakeholder inputs in defining urgent adaptation needs and actions, as well as in the choice of priorities. It relies on existing information and past assessments, and therefore does not require comprehensive assessments involving analysis of new climate change scenarios or impact assessment models. Emphasis is placed on identifying adaptation solutions to key vulnerabilities and on activities to enhance adaptive capacity of rural communities. By addressing immediate urgent needs, NAPA activities complement longer-term adaptation needs that are commonly expressed through national communications.

C. Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention

47. The CGE has developed a training package on methods and tools for V&A assessments,¹⁹ which was used for the regional hands-on training workshops²⁰ for the Africa region, the Asia and Pacific regions, and the Latin America and Caribbean regions. The hands-on training workshops were aimed at familiarizing experts with methods and tools for V&A assessments to aid non-Annex I Parties in selecting appropriate V&A assessment approaches, methods and tools needed to prepare second and, where appropriate, third national communications. Focusing more on top-down approaches derived from general circulation models (GCMs), this training resource describes sectoral (agriculture, coastal zones, health and water) methods and tools, and integrated approaches to V&A assessments.

48. In its examination of initial national communications from non-Annex I Parties,²¹ the CGE noted that most Parties did not clearly specify the methods and tools they used during the course of their V&A assessments. Some applied the seven step framework for climate impact assessment of the Second Assessment Report of the Intergovernmental Panel on Climate Change and the *Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies* of the United Nations Environment Programme,²² whereas others reported using statistical, historical, downscaled and national methods, and expert judgement.

49. Despite the limited information on methods and tools used, the CGE found that a number of concerns were raised by non-Annex I Parties regarding their usefulness, particularly in taking into account varying conditions at the regional and subregional level, and in many cases these issues mirrored the concerns of Parties and organizations in their submissions. For example, the CGE noted that Parties generally reported a lack of input for impact models and assessments, national capacity and expertise to develop and/or use socio-economic scenarios, and financial resources for assessment work.

¹⁷ "Bhutan National Adaptation Programme of Action (2006)", available at <<http://unfccc.int/resource/docs/napa/btn01.pdf>>.

¹⁸ "National Adaptation Programme Of Action Samoa (2005)", available at <<http://unfccc.int/resource/docs/napa/sam01.pdf>>.

¹⁹ <http://unfccc.int/resource/cd_roms/na1/v_and_a/index.htm>.

²⁰ Information on these workshops can be found in documents FCCC/SBI/2005/22, FCCC/SBI/2006/8 and FCCC/SBI/2006/25.

²¹ FCCC/SBI/2006/4.

²² Feenstra JF et al. 1998. *Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies*. Nairobi and Amsterdam: UNEP and Institute for Environmental Studies/Vrije Universiteit.

D. Expert Group on Technology Transfer

50. The EGTT technical paper “Application of environmentally sound technologies for adaptation to climate change”²³ provides a comprehensive overview of methods and tools for selecting technologies for adaptation, with examples from five sectors (agriculture, coastal zones, infrastructure, public health and water resources). Several technologies and tools are available to develop information and raise awareness, to plan and design adaptation strategies, to implement adaptation strategies, and to monitor and evaluate their performance. The EGTT has contributed to the development of the UNDP–GEF handbook for conducting technology needs assessments (TNAs), which includes guidance on identification and prioritization of needs for technological adaptation to climate change.²⁴

51. The EGTT guidebook on preparing technology transfer projects for financing²⁵ outlines the basic steps for preparing, presenting and customizing project proposals. The aim of this publication is to provide assistance to project developers in developing countries in converting ideas and concepts into proposals.

IV. Summary of lessons learned, opportunities, gaps, needs, constraints and barriers, ways to develop and disseminate methods and tools and training opportunities

A. Lessons learned from the application of methods and tools

52. The information gathered from submissions and expert output clearly indicates the need to improve the usefulness of tools for climate change-related assessment and planning and to find ways to integrate them into comprehensive assessment and planning activities. Some Parties and organizations reported having success with the application of certain tools, but there are still numerous gaps, needs and barriers preventing these tools from being widely disseminated and applied (see para. 56, below).

53. Some Parties and organizations provided some insight into what makes some tools more useful than others. Methods and tools are generally well received by users when they:

- (a) Can be used to address adaptation at different temporal and spatial scales;
- (b) Are developed and applied in a transparent, flexible and participatory manner, taking into account multiple perspectives and interests, in particular those of end users;
- (c) Can be applied in a number of research contexts, or can be modified in such a way as to accommodate multiple applications;
- (d) Are simple, requiring little input data or specialist knowledge.

54. It should be noted that many Parties and organizations acknowledged the value of applying methods and tools as part of an integrated assessment approach. Integrated assessments are viewed as a useful way to comprehensively assess social, economic and environmental impacts of climate change, accounting for the interaction between climate change and other processes. Some Parties acknowledged

²³ FCCC/TP/2006/2. This document has also been converted into a brochure available at <http://unfccc.int/resource/docs/ublications/tech_for_adaptation_06.pdf>.

²⁴ Gross R, Dougherty W and Kumarsingh K. 2004. *Conducting Technology Needs Assessments for Climate Change*. New York: UNDP. Available at <<http://ttclear.unfccc.int/ttclear/jsp/>>. Thirty-four TNA studies are available at the same website and a synthesis of 23 TNAs and 25 national communications is available in document FCCC/SBSTA/2006/INF.1.

²⁵ UNFCCC. 2006. *Preparing and presenting proposals. A guidebook on preparing technology transfer projects for funding*.

in their submissions that the tools needed to facilitate this integration are not always available or readily accessible.

B. Opportunities, gaps, needs, constraints and barriers

55. Some Parties and organizations identified opportunities that should be explored in order to advance the development and application of adaptation methods and tools, summarized as follows:

- (a) **Harnessing political momentum:** The current political momentum behind climate change is raising the level of resources for and activity in the development of methods and tools for adaptation. Furthermore, the scope and pace of climate change reinforces the need for more rapid development of tools and adaptation options for communities;
- (b) **Integration with sustainable development:** Parties are recognizing the benefits of incorporating climate change adaptation assessment into sustainable development activities. For example, SPREP noted that many small island developing States (SIDS) in the Pacific are establishing national sustainable development strategies or equivalent processes that would provide opportunities to include adaptation to climate change as part of the overall sustainable development strategy;
- (c) **Consideration of traditional and local knowledge:** In many countries, traditional and local knowledge is available and can help inform adaptation activities. For example, El Salvador and ISDR noted that there is local knowledge available on climate related risks and a good level of local awareness of the causes, impacts and response measures to climate change which could enrich V&A research and adaptation initiatives such as those relating to risk identification and early warning tools.

56. A number of recurring gaps, needs, constraints and barriers were highlighted in submissions which can be addressed in order to make methods and tools available and useful to a wider group of users. They are:

- (a) **Limited integration:** A number of Parties and organizations acknowledged that the capacity to undertake integrated assessments is still absent in many countries and that the tools needed to coordinate such assessments are not always available or readily accessible. Developing country Parties, in particular, have stressed the need for greater capacity to undertake integrated assessments at the subnational and national levels. The United States suggested that integrated approaches are critical for identifying and responding to the social, economic and environmental impacts of climate change, and are quickly emerging as one of the best mechanisms available to address the multifaceted nature of climate change in a comprehensive manner;
- (b) **Limited capacity for local and sectoral assessments:** Parties and organizations called for strengthened institutional capacity for carrying out local and sectoral assessments (including strengthening capacity for regional climate modelling). Improving the effectiveness of these assessments, however, requires fine-tuning of current assessment methods and tools, increased interaction with stakeholders and greater integration of existing knowledge of local climate change and variability;
- (c) **Need for community-level participation:** Many tools developed to date are focused at the agency level. The need for more community-level involvement in assessment and planning was highlighted. A greater participatory process that engages stakeholders in identifying livelihood assets, the potential effects of climate change and possible responses could greatly complement and strengthen the effectiveness of existing tools;

- (d) **Need for better coordination and sharing of lessons learned:** Although there has been a recent proliferation of tools for vulnerability assessment and adaptation planning, there has been limited sharing of research results and lessons learned from the application of methods and tools. Greater cooperative and coordinated efforts, such as south–south cooperation, will allow for more rapid and effective assimilation of methods and tools among those using them, and will ensure that there is less overlap and duplication, and more coherence between current V&A efforts;
- (e) **Absence of expertise:** Parties identified a lack of expertise in the application of methods and tools and the interpretation of the results. Furthermore, some countries, particularly non-Annex I Parties, have found it difficult to hold on to the expertise that they currently have. For example, SPREP highlighted an inability of many Pacific SIDS governments to retain personnel trained in climate change matters;
- (f) **Data problems:** Several submissions indicated that there are problems related to the quantity of data available for adaptation assessment and planning. For example, most developing country Parties reported that raw data are often inaccessible, that climate observations are incomplete or that there are significant gaps in the data required to drive assessment models. Social data were also reportedly unavailable, making it difficult to monitor the adaptive capacity of communities. The quality of available data has also been inconsistent, and the lack of standards and common methods for data gathering has led to incompatible data sets, especially historical ones;
- (g) **Financial constraints:** Many submissions highlighted a lack of necessary funds to engage users in adaptation assessment and planning. As such, many developing countries are unable to access the technological and training resources that they need in order to successfully use existing and emerging methods and tools. El Salvador stated that the rigid administrative framework of some entities playing the role of financing mechanisms or implementing agencies for V&A initiatives has made adaptation research and action difficult;
- (h) **Insufficient awareness of methods and tools:** Many decision makers do not have sufficient awareness of the implications and importance of climate change to select and use a particular method or tool. More work needs to be done to engage potential users in accessing information, methods and tools that are being developed. The development of methods and tools for establishing policies and practices that are adaptive and able to respond to changing circumstances and surprises is needed, and may encourage more decision makers to adopt them.

C. Possible ways to develop and disseminate methods and tools

57. Several ideas were proposed, particularly from Parties, for possible ways to improve the development and dissemination of methods and tools, including:

- (a) **Regional and subregional workshops:** Parties have requested additional regional and subregional workshops for training and capacity-building on adaptation methods and tools;
- (b) **Cooperative research programmes:** Some developing country Parties have called for more cooperative research programmes as well as postgraduate programmes for young researchers to help augment the research capacity in these countries;

- (c) **Face-to-face knowledge transfer:** Additional work is required to increase the level of interaction between members of the adaptation community. Development of practitioners' networks, for example, can help users come together and share experiences and insights on methods and tools;
- (d) **Electronic knowledge transfer:** The World Wide Web provides many opportunities for the dissemination of methods and tools. Some Parties suggested developing downloadable programs and simple Web-based interfaces to facilitate the use of tools, whereas others suggested using flexible, open Web-based platforms to allow users to post their questions, experiences, suggested adjustments, etc., regarding specific methods and tools. In order to effectively make use of this medium, it is important to ensure that practitioners, particularly those in developing countries, have access to information and communications technology;
- (e) **Publication of results and case studies:** Dissemination activities should include not only a description of methods and tools, but also the results of the application of these methods and tools. Publication of the main features of methods and tools as well as relevant project results and case studies would be of great benefit to current and potential users.

D. Training opportunities

58. Training opportunities were proposed primarily by organizations. Often these were described as training packages or delivered as regional and national training workshops. The WMO Climate Information and Prediction Services Project and Regional Climate Outlook Forums are good examples of initiatives that focus on capacity-building and training in methods and tools, as well as on providing greater national and regional coordination of climate products and services, particularly in developing countries. Several submissions demonstrated that training opportunities are already integrated into existing projects and adaptation initiatives and are therefore geared toward helping make specific tools more widely usable.²⁶

59. The need for education and training on a large scale was strongly expressed in the submissions. SPREP identified the University Consortium of Small Island States (UCSIS) as an example of a way to offer training opportunities to SIDS. UCSIS brings together five regional and national SIDS universities and draws on their respective strengths to offer enhanced educational opportunities. Part of the challenge, however, is finding ways to attract and retain personnel who have been trained in climate change matters. Certain specialist professionals such as coastal zone managers and coastal engineers are mostly unavailable to SIDS governments.

V. Issues for further consideration

60. According to the submissions, future work on methods and tools may take the following questions into consideration:

- (a) **What is the best way to share the information on adaptation methods and tools?**
Given the wealth of adaptation methods and tools submitted by Parties and organizations, efforts may need to be made under the Nairobi work programme to disseminate this information to existing and potential users. One option is to use this

²⁶ For example, FAO noted that all its climate impact assessment tools are intended for use by agrometeorological, agricultural and extension services professionals with the appropriate background and experience, and therefore developed a training package called "Crop Monitoring Box" for this purpose. It also developed regional and national training workshops for its GLCN tool.

information to update the UNFCCC compendium on methods and tools. A complementary approach may be required, however, to reach out to practitioners who do not have Internet access. This dissemination effort may also provide opportunities to share information on databases and tools that have been developed by other agencies and partners involved in the Nairobi work programme.

- (b) **What information is missing?** Careful consideration needs to be given as to whether the current information on adaptation methods and tools is suitable as is, or whether supplementary information is required to improve the quality and delivery. Details on key input and output, appropriate use, technical requirements, training required, documentation and practical examples or case studies may be needed to make this information more useful to Parties and organizations. Given that a number of Parties and organizations are still waiting to see how effectively certain methods and tools were being applied, updating information on methods and tools is likely to be an ongoing effort.
- (c) **How can we use the information that we already have?** The information gathered in this synthesis should be used to identify some of the next steps for the development and dissemination of methods and tools. Many gaps, needs, barriers and constraints need to be addressed in order to make adaptation methods and tools more useful to practitioners and to facilitate greater dissemination and training opportunities. Steps also need to be taken to develop and refine existing tools, to facilitate the sharing of lessons learned and to encourage greater use of integrated and interdisciplinary assessment approaches.
