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Lessons Learnt From Using Modelling/Training Tools on Vulnerability & Adaptation Assessments In Developing Countries

A note for the workshop on the Status of Modelling Activities to Assess the Adverse Effects of Climate Change and the Impact of Implemented response measures

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CONTENT

1. INTRODUCTION

Background

The need for capacity building and training on methodologies and tools for vulnerability and adaptation assessment (V&A) for Non-Annex I Parties to the UNFCCC has been fully recognized by the UNFCCC process, in particular with the recent Marrakesh Decisions 2/CP7 and 5/CP7. These decisions were agreed upon because vulnerability to climate change, extreme events and climate variability is recognized being particularly high for developing countries and least developed countries (LDCs) where adaptive capacities are very low.

The need for training of Non Annex I Parties, adequate software and computer equipment with regard to V&A assessment in particular becomes even more evident when considering the requests from Non Annex I Parties for technical assistance and guidance on tools and methodologies with a view to the 2nd National Communications. A new request also arises out of COP7's decision with the agreement on the implementation and the funding of National Action Plans for Adaptation (NAPA) to climate change in LDCs. For the latter, the GEF Council of December 2001 responded to COP decisions by authorizing GEF support to LDCs for the preparation of NAPAs with anticipated funds from contributions towards the LDC fund. In April 2001, GEF produced operational guidelines for the funding of these NAPAs. LDCs are now able to apply for this funding and will be soon working on the formulation of their NAPAs. This exercise will again require relevant tools and guidance to help their successful implementation.

Several initiatives and support programmes were launched over the last few years to advance scientific knowledge on climate change impacts and vulnerability to climate change[1], to build up capacities on V&A assessment methods and adaptation measures identification, and to provide related training tools and materials, especially for developing countries. The UNDP/GEF's CC:Train programme and the joint

1 Such as the 3rd Assessment Report of IPCC on Impacts, Adaptation and Vulnerability, 2001.

UNDP-UNEP/GEF National Communication Support Programme were two of these capacity building programmes. Related training materials and sessions on V&A were implemented over these last 5 or 8 years through these programmes.
An evaluation of V&A assessment sections in National Communications of Non Annex I Parties though reflects many methodological, human and institutional constraints in assessments of vulnerabilities and definitions of adaptation measures. It shows scientific uncertainties in modelling climate change and in distinguishing impacts of natural climate variability and climate change on a regional scale.

Aim of this paper

This note is reviewing recent training efforts on V&A and offers a discussion on the validity of up-dating and expanding them on the basis of the latest scientific and methodological developments. The first step in such a process consists of a review of several documents and tools in order to identify weaknesses and strengths of existing, implemented training and research activities on V&A in developing countries. This review shall finally lead to the identification of the scope of work necessary for updating the existing training tool in a later stage.

The following programmes, documents and tools will be reviewed:

- The outcomes and training tools established by the UNDP/GEF UNITAR CC:Train programme and its related mid-term evaluation and review,
- The outcomes and training tools established by the UNDP/GEF National Communication Support Programme (NCSP).
- V&A sections of National Communications of Non-Annex I Parties representing a geographical diversity in Africa, Asia and the Small Island Developing States.

Further methods and tools applicable in V&A assessments are rapidly mentioned in section 4 on current trends and developments in V&A. The synthesis and conclusions finally:

- Summarize the situation of existing training tools on V&A, in particular their value and accessibility for Non-Annex I countries when measured to

the quality of information gathered from the reviewed National Communications; and

- Provide an analysis of existing facts to be used as a solid background for the questions raised for identifying the scope of work, including recommendations for the future.

2. V&A TRAINING PROGRAMMES ON CLIMATE CHANGE

2.1 CC:TRAIN PROGRAMME

Objectives and Activities:

The UNDP/GEF Training Programme to Support the Implementation of the UNFCCC (GLO/95/G/31), called CC:Train, was executed by UNITAR in partnership with the UNFCCC Secretariat, the Intergovernmental Panel on Climate Change (IPCC) and Regional Partners in Africa, Latin America/Caribbean and the Pacific such as Environnement et Développement du Tiers-Monde (ENDA-TM), Fundaciòn Futuro Latino Americano (FFLA) and the South Pacific Regional Environment Programme (SPREP). CC:Train had two goals:

⇒ To enhance the capacity of developing countries to implement the UNFCCC, and

⇒ To take advantage of the opportunities provided by the UNFCCC to harmonize climate change considerations with national development goals.

With regard to training and tools on V&A CC:Train has implemented the following main activities:

- **Training material on V&A**

CC:Train developed, tested and published several training material and tools on climate change issues, among them training material and a software package relating to the preparation of a V&A assessment. CC:Train has developed this global training programme under the UN TRAIN-X methodology for the development, testing and revision of its training material. This has facilitated the improvement of undertaking training courses for countries with limited access to trainers and trainees. In developing training material, CC:Train collaborated with regional partners from a global network. The material has been widely distributed, in three languages, on Internet and CD-ROM.

- **Certificate Courses**

CC:Train's capacity building strategy was to transfer climate change knowledge and skills through in-depth training based in developing country universities. The trainings are offered as courses where participants can gain a certificate of proficiency. Such certificate courses on V&A have been implemented at the University of the South Pacific in Fiji and at the National Institute of Ecology, Mexico.

CC:Train Training material on V&A:

CC:Train's training package on Climate Change Vulnerability and Adaptation Assessment was prepared in collaboration with the Centre for Environmental Resources Studies (CEARS) of the University of Waikato in New Zealand. This training package is targeted mainly to the country teams responsible for coordinating V&A assessments as basis for developing the initial National Communications, for instance. It therefore focuses on the practicalities of assessing national V&A to climate change and is designed to be used as the core material for organising workshops on Assessing V&A to climate change. The training package is modular, interactive and designed as a full simulation or role-playing exercise. The modules basically correspond to the seven steps of the 1994 *IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations*[2]. Each module has a set of exercises pertaining to an imaginary country (names "Vanda"), for which there are supplementary materials and a software tool (VANDACLIM). Each module focussing on the following eight major tasks in V&A assessment:

- **Module 1: Scoping the Assessment**

Workshop participants are to identify and carry out the range of tasks and sub-tasks required to define the scope of a V&A assessment. The module aims to identify sectors, exposure units, study area, time horizons and general data needed for estimations. It considers the relevance of non-climate stressors in a social, political and cultural context and shows dependencies within and among sectors. It introduces a sector sensitivity matrix and concludes with the preparation of a provisional work plan for Vanda.

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2 The seven IPCC steps are the following: 1. Define problem (including the study area, its sectors, etc.): 2. Select method of assessment most appropriate to the problems; 3. Test method/conduct sensitivity analysis; 4. Select and apply climate change scenarios; 5. Assess biophysical and socio-economic impacts; 6. Assess autonomous adjustments; 7. Evaluate adaptation strategies.

- **Module 2: Selecting Methods**

The module focuses on the range of methodological approaches available for a V&A assessment such as analogues, expert judgment, field surveys, experimentation or modelling. It provides examples for the different approaches and explains why they are used. Participants are trained to identify method-related advantages and disadvantages. Part two refers to methods evaluation and selection of sector-specific methods for a V&A assessment. A summary matrix is used to identify appropriate methods for the country in question.

- **Module 3: Developing Datasets and Baselines**

The module identifies data needs, availability and suitability. It helps to distinguish data requirements (such as climatic and non-climatic data), data sources (e.g. long term observation versus recent measurements) and discusses calibration problems. Part two develops the baseline climate dataset and the non-climatic dataset. It uses a raw data example from Bangladesh for baseline development and data interpretation.

- **Module 4: Testing Methods**

The modules objectives are to assess the predictive capability and validity of the assessment methods under present-day and possible future conditions. Testing procedures are meant to determine whether the level of confidence in the performance of selected methods will be sufficient for the goals and objectives of the assessment. Participants evaluate the uncertainties of the methods, go through sensitivity testing and determine whether model calibration is necessary or new methods need to be selected.

- **Module 5: Constructing Scenarios**

The module provides a general checklist for scenario selection and development considering scope, time horizon, time and space resolution, expertise, resources, data, consistency and uncertainties. It develops scenarios of future environmental and socio-economic baselines as far as scenarios of future climate and sea-level changes. Exercises include e.g. the construction of scenarios from direct use of GCM output.

- **Module 6: Analysing Impacts**

The module focuses on the application of methods, baselines and scenarios. Part one leads participants to the determination of impacts and presentation of results. It demonstrates with the help of various examples the outcomes using different

approaches and explains the interpretation of the results. Examples of impact assessments are given.

- **Module 7: Evaluating and Selecting Adaptations**

Objective of the module is the evaluation of adaptation strategies. It discusses the identification of options, the selection of evaluation criteria, the collection of data necessary to evaluate each option and the evaluation of tradeoffs among options. Types of possible responses are classified, "screening criteria" are suggested and evaluation is fit into national aims.

- **Module 8: Synthesis**

The objective of the last module consists in a synthesis of the major results across the entire assessment and the preparation of a logical structure and organization for the final national report. Key conclusions, reporting format, sectoral reporting and cross-sectoral themes are discussed.

- **VANDACLIM**

Participants are asked to prepare a full V&A assessment on an imaginary country with Vandaclim. The Vanda Report provides all the necessary information and data available for the assessment.

At the end of the workshop the participants will have completed a "mini-assessment" of V&A for the country of Vanda. The focus of the training package is though on the broad processes and major tasks involved in V&A assessment rather than on detailed, technical knowledge of individual impact sectors such as human health, water resources or agriculture. The training package is designed for workshop duration of 10 working days for 8 to 20 participants.

2. 2 PICCAP

PICCAP[3], the regional project for Pacific Island Climate Change Assistance Programme was another UNDP capacity building programme recently implemented by the South Pacific Regional Environment Programme (SPREP) in 10 Pacific Island countries in close cooperation with the UNITAR team. It was a three year US$3.22 million project funded by GEF and regional counter part funding, from mid 1997 to mid 2000. V&A assessment was a key component of the programme. The CC:Train UNITAR activities planned in this region were integrated to the PICCAP work

[3] The statements in this chapter are compiled from several briefing papers under the third Multipartite Review of PICCAP, Raratonga, Cook Islands, 29.30 November, 1999.

programme and were also coordinated by the SPRP. The main activities undertaken included:

- The development, implementation and completion of a 6 months Certificate Training Programme on V&A based upon CC:Train's 2 weeks training package on V&A.
- The development of an island version of an integrated climate assessment model (VANDA ISLANDS) as a training tool.
- The transfer of the entire 6 months training course from one institution (International Global Change Institute) to the University of the South Pacific in Fiji for further training courses during 1999 and beyond.
- The development of a regional scenario generator, as a prototype development of a Pacific Islands Integrated Climate Assessment Model (PACCLIM). It includes output from the simple global climate model (MAGICC), region-wide climate and Global Circulation Model (GCM) patterns, and country boundary data.

All 10 participating countries have produced initial, preliminary V&A assessments identifying sectors and potential impacts from climate change. In addition each country has prepared national V&A statements, which form the basis of the V&A chapter within the initial National Communication. PICCAP also prepared and completed Regional Vulnerability and Adaptation Synthesis based upon the preliminary national V&A assessments.

2. 3 LESSONS LEARNT FROM THESE V&A TRAINING PROGRAMMES

The CC:Train training package on V&A has been used in many countries and probably most prominently in Pacific island countries in the programme PICCAP where it was also adopted and further developed to regional circumstances. The training package provides a thorough exercise leading the participants through the whole process of a V&A assessment. The limitations of this training tool for workshop participants and coordinators that were identified are the following:

- The lengthy, two-weeks exercises dealing with an imaginary country with limited added value for the own country,

- Rankings between sectors or detailed sector-specific or case study vulnerability assessments are not possible, and
- It needs a thoroughly, time consuming adaptation by the workshop coordinator to the specific country situation and needs.

In the V&A assessments established under PICCAP, rankings between sectors or sector-specific or case study vulnerability assessments were also lacking. With regard to adaptation options, additional needs have been assessed as being very large. A survey of 13 Pacific Island climate change country team members (10 of whom are under PICCAP) revealed that over **90% thought that much more detailed sector and case study specific vulnerability assessments including the development of national specific climate modelling tools were a high priority** for further work. Such detailed tools could then lead to a more precise assessment of how to implement specific adaptation options (stage II adaptation) in all different sectors.

From an institutional perspective, a global mid-term evaluation in early 1999 assessed the progress in implementing the GEF funded CC:Train programme. Recommendations were made for the remainder of the project as well as for the future. The most important key messages and recommendations with regard to providing training, developing training material and tools and implementing capacity building programmes were:

1. Offering certificate-training programmes (such as in the case of PICCAP) is an **innovative** approach based around universities or other relevant institutions. It has proven to be effective as a modality for national and regional capacity building with respect to climate change. It is therefore recommended to **expand the number and range of certificate programmes at existing regional institutions**, in order to meet the ongoing needs of country Parties for in-country expertise while at the same time achieving economies of scale, more sustainable institutional arrangements and enhanced regional cooperation (Hay, 1999, p. 28).

2. As the needs of developing countries might change, the present existing training packages, materials and tools might fall short of meeting the

requirements of the target countries. It is recommended to **take a more pro-active approach to the preparation of information, methodologies, and tools** necessary to support the training that addresses the emerging needs for implementing activities, such as development and application of integrated assessment methods (Hay, 1999, p. 28).

3. In order to maintain the quality and **assure continuing relevance** of the training packages ongoing efforts to update the packages are needed (Hay, 1999, p. 30). As the training package on V&A is based upon IPCC methodologies – and these being periodically revised – also the training package would **need an update in order to keep pace with the newest scientific developments, accumulated experience and increased knowledge**.

4. **The regionally integrated approach** as followed by PICCAP might be used as a model allowing other regions to bring together all the developing country Parties in a coordinated technical assistance programme designed to strengthen in-country experience (Hay, 1999, p. 29).

3. THE NATIONAL COMMUNICATION SUPPORT PROGRAMME - NCSP

3.1 THE OBJECTIVES

A few years later, the NCSP was launched by UNDP and UNEP, in cooperation with the Secretariat of the UNFCC with GEF funding and several co-funders (EC, the governments of Finland, Denmark and Norway). The NCSP worked during a phase I (1998-2000) with more than 130 countries in 8 sub-regions, helping 50 NAI Parties complete their initial National Communication and organized more than 30 workshops. As of 2001 (phase II), NCSP was funded by various bilateral and multilateral donors and continuing providing technical support to enhance the capacity of NAI Parties to prepare their Initial National Communication and to promote NC's quality, comprehensiveness and timeliness. The objectives of phase II are:

⇒ To facilitate implementation of top-ups, enabling activities, and regional projects,

⇒ To prepare and refine technical materials, especially of a methodological nature,
⇒ To translate and disseminate technical materials by "training trainers",
⇒ To strengthen expert networks and enhance regional co-operation, and
⇒ To enhance communication and outreach.

With regard to capacity building on V&A, the NCSP provided – besides the organization of several international workshops – mainly two outcomes: the development of a Climate Scenario Generator and the development of an Adaptation Policy Framework which will be further elaborated and tested in a three-years regional capacity building project in the Central American Region that are analysed in the following sections.

3. 2 PRODUCTS AND OUTCOMES

MAGICC (**M**odel for the **A**ssessment of **G**reenhouse Gas **I**nduced **C**limate **C**hange) and SCENGEN (a global and regional **SCEN**ario **GEN**erator) by Wigley et al. (2000) are coupled, interactive software that allows the user to investigate future climate change and its uncertainties at both the global-mean and regional levels. MAGICC carries through calculations at the global-mean level using the same climate model that has been and is employed by the IPCC. SCENGEN uses these results, together with results from a set of General Circulation Models (GCMs) and detailed baseline climatology, to produce spatially detailed information regarding future changes in temperature, precipitation and a range of other variables.

MAGICC/SCENGEN converts scenarios of future greenhouse gas (GHG) and sulphur dioxide (SO_2) emissions into estimates of global-mean surface air temperature, sea-level change and then into descriptions of future changes in regional climate. The user can intervene in the design of the global or regional climate change scenario by:

- Selecting and/or specifying the GHG and SO_2 emissions scenarios,
- Defining the values for a limited set of climate model parameters in MAGICC concerned with uncertainties in the carbon cycle, in the magnitude of sulphate aerosol forcing, and in the overall sensitivity of the global climate system to changes introduced by humans,
- Selecting which set of GCM results are to be used,

- Specifying for which future period during the 21st century the results are to be displayed.

3. 3 LIMITATIONS AND FUTURE DEVELOPMENTS

The main limitation of this software is the restricted coverage of the 0.5° observed climate data set only for four large regions (Europe, South Asia, USA and Southern Africa). This resolution is too coarse for some countries or regions, especially for Small Island Developing States (SIDS) and mountainous countries. A second main restriction is the lack of any consideration of inter-annual climate variability. These limitations are however planned to be eliminated by a yet to be developed new version of the MAGICC/SCENGEN software (Version 3) which shall also integrate the results of the 3rd Assessment Report of IPCC and take into account new understanding about gas cycles, concentration-forcing relationships, and climate sensitivity.

3. 4 THE ADAPTATION POLICY FRAMEWORK (APF)

Overview

In response to developing countries' requests expressed when implementing the activities of the NCSP, a new project was initiated to develop an "Adaptation Policy Framework" (APF) that may be used as basis for building capacity to design studies for prioritising adaptation policies and measures in the context of national sustainable development. The APF builds upon methods used in V&A studies, including the 1994 IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations. It is based on recent experiences in coping with climate variability and extremes, and assesses the effectiveness of adaptation to recent climate change experiences. The APF is deliberately **grounded in present climate risks, and helps to build adaptation policy and to plan incrementally upon current practice to respond to risks induced by climate change**. The APF also helps in the evaluation of adaptations and in the selection of the most effective measures for reducing vulnerability is not a methodology or does not provide tools for conducting V&A assessments. It.

However, the APF makes a shift from the dependence upon still highly uncertain climate change scenarios to **making research for adaptation policies** the main focus of the assessment by following four principles:

⇒ It considers recent climate experience, impacts and adaptation as part of the development of a baseline for adaptation analysis.

⇒ It includes adaptation to climate variability and extreme events as a step towards reducing vulnerability to longer-term climate change.

⇒ It focuses on vulnerability in the present *and* future in order to ground future policy in present-day experience. It also includes current development policies and proposed future activities and investments.

A draft APF was reviewed at a workshop for "*Developing An Adaptation Policy Framework for Climate Change*" was hosted by Environment Canada in St. Adele, Montreal on June 11-14, 2001. The workshop was held in association with a UNFCCC workshop on Methodologies on Climate Change Impact and Adaptation. It also considered the next steps for the APF development. 45 participants from 30 countries reached at a general consensus on the new approach upon incorporation of a number of suggested changes and recommended the further development of the APF, together with the preparation of a number of Technical Support Papers. The purpose of these papers is to assist **national research teams to carry out studies for developing adaptation policies, strategies and measures in the context of national sustainable development**. Eight papers on the following issues have been identified so far which shall be elaborated during the year 2002:

- Project scope,
- Stakeholder identification and engagement,
- Characterising current and future vulnerability,
- Characterising current and future climate risks,
- Socio-economic conditions, drivers and development,
- Adaptation capacity, coping range and thresholds,
- Preparing for adaptation,
- Reviewing and monitoring adaptation.

4. OTHER METHODS AND MODELLING TOOLS FOR V&A ASSESSMENTS

Decision tools for evaluating adaptation strategies have been collected in a compendium prepared by Stratus Consulting Inc. in May 1999 for the UNFCCC Secretariat. An overview of the tools is given is given in the following table.

Sector	Tool
General tools	Expert Judgements
	Screening of adaptation options
	Historical or geographic analogs: Forecasting by Analogy
	Adaptation Decision Matrix
	Tool for Environmental Assessment and Management (TEAM)
	CC:Train/Vandaclim
	Uncertainty and Risk Management
	Estimating Adaptation Costs: M-CACES
	Benefit-Cost Analysis
Water Sector	WaterWare
	Water Evaluation and Planning System (WEAP)
	RiverWare
	Interactive River and Aquifer Simulation (IRAS)
	Aquarius
Coastal Sector	IPCC Common Methodology
	UNEP Handbook Methodology
	Decision Support Models (COSMO, CORONA, NATWEST)
	The South Pacific Island Methodology (SPIM)
	RamCo
Agricultural Sector	International Consortium for Application of Systems Approaches to Agriculture (ICASA) – International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT) Family of Models
	General-Purpose Atmospheric Plant Soil Simulator (GAPS 3.1)
	Erosion Productivity Impact Calculator (EPIC)
	CROPWAT
	Alfalfa 1.4
	AFRC-Wheat
	RICEMOD
	GOSSYM/COMAX
	GLYCIM
	Econometric (Ricardian-based) Models
	Input-Output Modeling (with IMPLAN)
Human Health Sector	MIASMA (Modeling Framework for the Health Impact Assessment of Man-Induced Atmospheric Changes)
	DENSiM (Dengue Simulation Model)

This document describes a wide range of decision tools actively used across and within different natural resource and socio-economic sectors. The compendium provides users with key information about available tools, special features of each tool, and information about how to obtain documentation, training, or publications supporting each tool. This variety of tools offers many choices that are sometimes difficult to select for a developing country climate change team. In addition, new tools were developed since then and this list is therefore not up to date.

5. V& A SECTION IN NATIONAL COMMUNICATION OF NON-ANNEX I PARTIES

The reading of National Communications of Non-Annex I Parties submitted to UNFCCC until March 2001 as well as the reports of regional and interregional meetings organized by the CGE or the NCSP tells a number of constrains and difficulties encountered by developing countries.

Specific guidance on reporting on V&A are therefore not yet available. Parties are only encouraged to present "*information on their specific needs and concerns arising from the adverse effects of climate change...*" (para 5 under National Circumstances) but also "*policy frameworks for implementing adaptation measures and response strategies in the context of coastal zone management, disaster preparedness,...*" (para 15 under General description of steps).

However, most communications are giving information on their vulnerability to climate change and indicate a strong exposure to current climatic stresses (such as droughts, floods or desertification) that will aggravate in the case of climate change. Most NCs also indicated preliminary adaptation options. However, because of the lack of guidance and variation in national capacities there are large differences in where and how information is presented, and in approaches undertaken within the underlying V&A studies.

The main findings on methodological issues and constraints can be summarized as follows:

- Most of the V&A studies in the NCs used either the IPCC Technical Guidelines for V&A (Carter et al., 1994) or derived methodologies like those

used by the US Country Studies Programme (Benioff et al., 1996) or included in the UNEP Handbook (Feenstra et al., 1998). Although widely used, these guidelines were considered by NAI Parties **to be difficult to use**.

- There were **scientific and technical constraints revealed** in dissociating potential impacts arising from climate change from those that are due to **natural climate variability**, including extreme events.
- The majority of NAI Parties used climate change scenarios based on equilibrium GCM's experiments. Only a few (16 out of 50) used the MAGICC/SCENGEN software. But these climate **change scenarios are either too coarsely resolved** (5° latitude/longitude) – especially for Small Island Developing States (SIDS) and mountainous countries – or their **variables are too limited or derived variables related to extreme events are not available**. As too many large uncertainties remain, **V&A assessments are strongly limited, leaving only broad sensitivity analyses possible**.
- Impact models were used primarily in the agriculture and water sector. This allowed some quantitative assessment of biophysical impacts. Thus, the suitability of international impact models for national/local conditions is limited and the **cost to acquire such tools** and the related **training are assessed to be quite high**. Very few studies quantitatively evaluated the **socio-economic impacts of climate change or did an integrated analysis of impacts**.
- **Data required as input to impact models are often not consistently collected** in Non Annex I countries, inaccessible or of poor quality.
- Only 15 NAI Parties (out of 50) used **socio-economic scenarios** indicating that the future socio-economic situation could exacerbate their vulnerability to climate change.
- **Adaptation options** were identified mainly in the agriculture, water resources and coastal zones sectors, but without **costing, evaluating or prioritising** them. Only very few Parties presented action plans to implement such adaptation strategies.

Needs with regard to methodologies and tools were identified, such as:

- The **non-availability of technical material in other languages than English** severely limits the capacity of national experts to conduct V&A studies and to identify adaptation options.
- Where different countries share natural resources (e.g. coastal zones, catchments, rivers systems), there is a need for **regional and sub-regional V&A assessments**.
- The **lack of appropriate data** constrains many aspects of V&A assessments.
- The methodologies developed to undertake V&A studies **need to be adapted to local circumstances** (e.g. regional climate change scenarios, national impact models). There is also a need for a process to **select methodologies and models by sectors**.
- Further **guidance is needed with regard to assessing adaptation options** and related techniques such as **cost-benefit analyses** as well as integrating adaptation to climate change into all aspects for **sustainable development**.

6. SYNTHESIS

This present review has basically looked at the features, implementation and limitations of two training tools on V&A. Their value for Non-Annex I Parties when measured towards the quality of information gathered from the reviewed V&A chapters in the National Communications is assessed as follows:

- **CC:Train's training package on Climate Change V&A Assessment**

Much of the recommendations expressed in the CC:Train Mid-term Evaluation (Hay, 1999) are still valid. To regularly update an existing training package is a must when it shall respond to changing needs and requirements of developing countries and therewith assure continuing relevance. The training package on V&A has been widely applied in the last three years but an update on basis of the newest scientific and methodological developments is required. The modelling exercises focusing on an imaginary country, VANDA, are not necessarily any longer justified if not a considerable added value can be generated for the workshop participants' country. Therefore, this training package, including the software tool VANDACLIM, is most

successfully applied when adapted and further developed to the regional or national circumstances, as it was the case in the PICCAP project. The key was the transfer and adoption of already existing material, rather than starting from the scratch (Hay 1999, p. 70). But such an **adaptation requires adequate funding, time and human resource**s. Still, in the V&A assessments established under PICCAP, rankings between sectors or sector-specific or case study vulnerability assessments, for instance, were lacking. And with regard to adaptation options additional needs have been assessed as being very large.

- **MAGICC/SCENGEN Climate Scenario Generator of the NCSP**

With this software there is a tool available for modelling global and/or regional climate change and its impacts on sea-level, temperature and precipitation. This however is only **one** step in a V&A assessment. For Small Island Developing States or regions not (yet) covered by the model (therein fall a lot of LDCs) a projection on climate change for their country is not possible. All impact/vulnerability assessments in the National Communications analysed used scenarios of climate change as the base to conduct the V&A study. This however is the main source for uncertainties. The review revealed **weaknesses in the assessment of vulnerability in all** sectors, mainly due to uncertainties in scenarios from General Circulation Models (GCM). Those using MAGICC/SCENGEN faced limitations with regard to limited availability of variables, especially related to extreme events.

In sectors such as human health or terrestrial ecosystems, models were not available or known. In the meantime, new models have been developed jointly by WMO and WHO to assess the impacts of climate change on malaria, dengue or schistosomiasis. Few country study teams, however, have the capacity, resources or time to undertake dedicated experiments using global or regional climate models for the production of national or regional climate scenarios. Additionally, the **cost to acquire such modelling tools and the related training are quite high** for developing countries.

A review of the V&A sections in National Communications of NAI Parties further reveals that only a minority used **socio-economic scenarios**. Another key difficulty has been the integration of adaptation into sustainable development plans, and linking longer-term climate change to current problems caused by climate variability.

Up to now, the emphasis in such integrated assessments, particularly in integrated modelling, has been on mitigation. Only few studies have focused on adaptation and/or determinants of adaptive capacity. Methods designed to include adaptation and adaptive capacity explicitly in specific applications need to be developed.[4]

- **The Adaptation Policy Framework of the NCSP**

The APF makes research for adaptation policy the main focus. Thus, the APF offers a methodological framework on how to proceed for a vulnerability assessment of priority sectors and sets up an approach in which projects can be designed from the outset to evaluate adaptation in a wider context. It is not a tool or a training package as the two described above contributing to V&A assessments as required by the Initial National Communications. The implementation of the APF is however a highly challenging undertaking, time-consuming and requires skilled human **resources, specifically by trying to include socio-economic trends into current and future vulnerabilities. Methodological knowledge is still limited in most developing countries.** It is currently used in a pilot implementation in Central America, Mexico and Cuba, a UNDP-GEF proposal[5] for in three-years" starting in 2002. The project is designed to elaborate and apply the flexible APF for preparing adaptation strategies, policies and measures in priority systems (such as water resources, agriculture and human health) to reduce vulnerability to climate change and risks of the pilot region. This objective shall be achieved by strengthening the systematic, institutional and individual capacity of stakeholders at different levels. The strong stakeholder participation, assuring that also the most vulnerable and usually poor populations are able to implement own adaptation strategies, is a clear strength but also a challenging task of the project. The project proposal was elaborated in a consultative, country-driven and participatory manner, which should guarantee a broad national and regional ownership and the commitment of all stakeholders. Sustainability of the process shall be largely enhanced and assured by building upon national priorities, connecting to regional and national institutions and links to other, similar programmes (such as the World Bank Regional Caribbean Adaptation project), and coordination among implementing agencies mandated with implementation of stage II adaptation projects. No outputs are currently available but the project shall also serve as a demonstration project in other vulnerable regions of the world.

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[4] This is also a conclusion in the Third Assessment Report (IPCC 2001).
[5] "Capacity building project on Stage II Adaptation in Central America, Mexico and Cuba

7. RECOMMENDATION FOR FUTURE TOOLS

What seems to be needed most are **methodologies and tools for conducting detailed sector and case study specific vulnerability assessments**, and the **development of national or regional specific climate modelling tools** which could lead to a more precise assessment of how to implement specific adaptation options. And it is recommended to prepare information, methodologies, and tools necessary to support the training that addresses the emerging needs from developing countries for implementing activities, such as development and application of integrated assessment methods.

Any proposed initiative to create new training packages on V&A might have to follow a dual-strategy:

- On the one hand there are recommendations to turn away from technology-centred strategies and approaches undertaking technical studies only and to shift towards a more holistic approach where **policy** is the primary focus. Mature, sustainable policies and the development and implementation of integrated national action plans will facilitate prevention of strong impacts of climate change on the environment, society and economy.

- On the other hand, there are increasing requests from developing countries for support in providing **sector, national and regional specific** climate change modelling methodologies and tools as described further above.

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