

SUBSIDIARY BODY FOR IMPLEMENTATION Twenty-seventh session Bali, 3–11 December 2007

Item 7 (a) of the provisional agenda Implementation of Article 4, paragraphs 8 and 9, of the Convention Progress on the implementation of decision 1/CP.10

Synthesis of available information related to the adverse effects of climate change under decision 1/CP.10, paragraph 14

Note by the secretariat^{*}

Summary

This synthesis report contains information from the compilation and synthesis of national communications of both Parties included in Annex I to the Convention and Parties not included in Annex I to the Convention and other relevant reports, related to the adverse effects of climate change.

^{*} This document was submitted late because it includes information that was not available earlier.

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I. Introduction

A. Mandate

1. The Conference of the Parties (COP), by its decision 1/CP.10, paragraph 14, requested the Subsidiary Body for Implementation (SBI) to consider at its twenty-seventh session available compilation and synthesis reports¹ of national communications of both Parties included in Annex I to the Convention (Annex I Parties) and Parties not included in Annex I to the Convention (non-Annex I Parties) and other relevant reports in relation to the adverse effects of climate change.

B. Scope of the note

2. The note contains information from the compilation and synthesis of the national communications of Annex I Parties and non-Annex I Parties. Other information was obtained from national adaptation programmes of action (NAPAs), reports by the Global Environment Facility (GEF), reports of the Intergovernmental Panel on Climate Change (IPCC), and reports by the Organisation for Economic Co-operation and Development that relate to the adverse effects of climate change. This document has been prepared to facilitate discussions in accordance with decision 1/CP.10, paragraph 14.

C. Possible action by the Subsidiary Body for Implementation

3. The SBI may wish to take into account the information provided in this document together with the documents listed in the conclusions on this matter contained in document FCCC/SBI/2007/15, paragraph 67 and annex III, when considering the progress on the implementation of decision 1/CP.10, with a view to considering what further actions may be required by the COP at its thirteenth session.

II. Review of available information

A. Information from Parties not included in Annex I to the Convention

1. Overview

4. Information reported by non-Annex I Parties indicated that they are experiencing stresses from climate-related events and phenomena that could be exacerbated by future climate change, and that this makes them highly vulnerable. Small island developing States (SIDS) and countries with long coastlines and low-lying areas pointed out their experiences with severe floods and drought, adverse effects from changes in the El Niño/Southern Oscillation (ENSO) phenomenon, tropical storms and changes in their patterns, saltwater intrusion, storm surges, coral reef damage and changes in migratory patterns of important fish species. Some countries stated that they are concerned about prospects for long-term sustainability, particularly in their arid and marginal regions.

5. Parties reported that poverty is a major problem among most developing country Parties, especially among the least developed countries (LDCs), a majority of whose people live in absolute poverty. Therefore, poverty alleviation, food security and access to safe potable water and to health-care facilities are priority development goals for most developing country Parties, especially LDCs.

6. Notwithstanding a wide variation in the relative importance of the major economic sectors of agriculture, industry and services, most Parties highlighted agriculture as a top development priority because of its contributions to both food security and gross domestic product. Agricultural production, processing and transportation also employ a large labour force. As agriculture is particularly vulnerable to the adverse impacts of climate change, many developing countries are likely to experience the negative impacts of climate change through its effects on food security.

¹ FCCC/SBI/2003/7, FCCC/SBI/2005/18 and FCCC/SBI/2007/INF.6.

7. Many Parties reported that activities to respond to climate change needs have to compete for scarce resources with activities that address fundamental needs relating to food security, water supply, poverty reduction, employment, energy services, health, including the growing devastation of HIV/AIDS, and economic development. Integration of climate issues in long-term development planning policies and decision-making, and setting up the requisite institutional arrangements and legal framework to permit this, are crucial challenges that all Parties continue to grapple with. Some have instituted measures to encourage involvement of non-governmental organizations and the private sector, to ensure sustainability of climate change activities; the preparation of initial national communications and NAPAs under the UNFCCC contribute to these efforts.

2. Vulnerability to the adverse effects of climate change

8. All Parties provided information on their current and future vulnerability to the adverse effects of climate change and on adaptation options, measures and strategies, but the sources of information, level of detail and the methods and tools used to assess vulnerability, impacts and adaptation needs varied considerably across Parties.² Some Parties used current experiential observations of impacts, speculation by experts, information available from the best international studies and science available (especially the IPCC Assessment Reports), and in-country studies and projections using internationally developed or local methodologies and models of varying degrees of sophistication. However, most Parties expressed concerns over limitations introduced by the uncertainties in using general circulation models, such as a failure to clearly establish the link between climate change and extreme weather events.

9. Taking the number of Parties reporting key vulnerabilities by sector as a rough indicator of the relative significance of their vulnerabilities, the agriculture sector emerges as the most significant (80 per cent of Parties), followed by water resources (76 per cent), coastal and marine (59 per cent), terrestrial (forest) ecosystems (57 per cent), human health (50 per cent) and finally other sectors including biodiversity, energy, human settlements and tourism (37 per cent).³

10. SIDS emphasized concerns over their particularly high vulnerability to possible losses of agricultural production due to inundations from sea level rise, in addition to potential devastation of human life, property and infrastructure in coastal communities.

11. Latest scientific evidence from the Fourth Assessment Report of the IPCC (AR4) confirms many of the climate impacts on agriculture reported by non-Annex I Parties. The AR4 shows that warmer and drier conditions have led to a shorter growing season, with detrimental effects on crops in the Sahelian region of Africa. Also, longer dry seasons and more uncertain rainfall are already inducing adaptation measures in southern Africa. Yields from rain-fed agriculture could be reduced by up to 50 per cent by 2020 in some African countries. At the same time, while yields could increase by up to 20 per cent in East and Southeast Asia, they could decrease by up to 30 per cent in Central and South Asia by the midtwenty-first century. Even modest increases in local temperature of $1-2^{\circ}$ C are projected to reduce crop productivity at low latitudes, especially in seasonally dry and tropical regions, thereby increasing the risk of hunger.⁴

12. Many Parties reported that water resources are already under severe stress and that the quality and supply of water are at risk. This is mostly due to rapid population increase, burgeoning demand from

² The contribution of Working Group II to the Third Assessment Report of the IPCC defines vulnerability as "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes" and as "a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity."

³ These percentages are drawn from table 3 of the sixth compilation and synthesis of initial national communications (FCCC/SBI/2005/18).

⁴ See the summary for policymakers of the contribution of Working Group II to the AR4 http://www.ipcc.ch/SPM13apr07.pdf>.

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agriculture and industry, expanding and often poorly planned urbanization, saltwater intrusion into and degradation of the quality of coastal water resources arising from sea level rise (e.g. Cook Islands, Egypt and Vanuatu) and pollution of bodies of water (e.g. Lesotho, Philippines and Uganda). Parties such as Argentina and Zimbabwe reported water losses of up to 30 per cent to higher evaporation levels, water shortages, droughts and an increase in water demand for irrigation. According to the IPCC, by 2020, 75–250 million people are projected to be exposed to an increase of water stress due to climate change in Africa alone.

13. Parties also expressed concerns over the rising frequency and intensity of surface run-off, soil erosion and drought, as well as decreases in surface water/run-off and groundwater, which all cause negative impacts on agricultural lands, grasslands and terrestrial and aquatic ecosystems, and higher rates of evaporation from reservoirs, undermining power generation. Many Parties emphasized concerns over effects of extreme events on hydroelectric power generation, food and fish production, and transport and biomass degradation.

14. Most Parties reported negative projected impacts of climate change on forests and rangelands as estimated by changes in biomass, species composition and vegetation types. These include increased forest fires and subsequent soil erosion, loss of moisture, altered forest extent and type, biodiversity losses, loss of fodder, rising incidence of disease and tree mortality, increase in arid areas, lowered food production and decrease in animal habitats.

15. Qualitative analysis undertaken by some Parties of the vulnerability of their fishery resources to climate change revealed similarly negative impacts arising from changes in temperature and salinity, sea level rise and associated flooding. Specific concerns include destruction of breeding and nursery areas (e.g. mangrove forests and coral reefs), changes in nutrient availability and potential reduction in fishery resources owing to ENSO events (e.g. Peru).

16. A small number of Parties assessed the vulnerability of their tourism, infrastructure, energy systems and biodiversity sectors. Overall, it was found that the increased frequency and intensity of storms and hurricanes associated with climate variability would have negative impacts on these sectors.

17. Increased incidence of water- and vector-borne diseases (such as malaria, dengue fever, cholera and diarrhoea) and the possibility of an increase in cardiovascular and intestinal diseases, cases of influenza and yellow fever and general morbidity, are the potential health impacts reported by many Parties. However, the paucity of data linking health and climate change limited the assessments largely to qualitative analyses. Many Parties fear that the incidence of endemic disease may increase owing to higher temperatures, exacerbated by high population growth and inadequate sanitation.

18. Many non-Annex I Parties noted that climate change is an additional stress to other natural and anthropogenic stresses on the ecological and socio-economic systems. Climate change undermines the capacity of these ecological systems to provide goods and services needed for successful economic and social development, including sufficient food, clean air and water, energy, safe shelter, safety from disease and employment opportunities. The climatic and other stresses interact in different ways and produce varying outcomes in different contexts and regions, but most Parties and growing scientific evidence show that the net effect is generally negative.

19. A serious constraint in the assessment of vulnerability and adaptation (V&A) in non-Annex I Parties was the lack of data needed to meet the high methodological demands. Table 1 summarizes needs and constraints relating to V&A assessments from non-Annex I Parties, by region. Many Parties explained that the data required for impact models and assessments were absent (uncollected or inaccessible) or inappropriate (e.g. of the wrong geographic scale). Another challenge is the inability of many Parties to conduct V&A assessments robust enough to generate reliable results that can be used in national planning processes. Most Parties, especially the LDCs, indicate that guidance provided by the

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UNFCCC in this area is inadequate. Parties emphasized the need for improved accessibility of methods, tools and models and for assistance on efforts to improve data quality and systematic monitoring, data collection and archiving.

20. Integration of adaptation into long-term planning within a sustainable development context is the next major challenge and a step in the implementation of adaptation options that virtually all Parties recognized should be taken in order to elevate the prominence of climate change issues nationally.⁵ To this end, almost all Parties reported an urgent need for support in education, training and public awareness. Areas of training include negotiating skills, preparation of project proposals for GEF funding, database management and the use of climate models. The need for flexibility in approaches to adaptation stood out. The need to develop national and regional networking and information services on climate change was also emphasized, including access to the Internet.

	Africa	Asia and the Pacific	Latin America and the Caribbean
V&A assessments	 Guidance provided by UNFCCC is inadequate^a 	 V&A assessment is an ongoing process V&A assessment needs to be explicitly mentioned in the UNFCCC guidelines 	
Methods and approaches – models, tools and data	 Use of GCMs and GCM- based scenarios Improve data availability, quality, archiving and updating Standardize methodologies and models 	 Expand the use of climate models Improve access and availability of methods Identify gaps in data and monitoring Establish new and upgrade existing stations Enhance expertise to manage stations Improve access to national climate data 	 Standardize methodologies and models Use of hydrometeorology data to augment, verify and validate GCM outputs
Key vulnerable sectors	 Agriculture, water resources, coastal zones, forestry, rangelands, biodiversity, human health No cross-sectoral assessments 	 Water resources, agriculture, coastal zones, natural ecosystems (forests) 	 Water resources, agriculture coastal zones, fisheries, health/human settlements, LULUCF/ecosystems, desertification/land degradation, industry and energy Should focus on key sectors
Capacity- building needs (human and institutional)	 Climate change issues and longer term training in V&A Retention of expertise Establish national climate change committees Strengthen national institutions to take on work to develop GCMs at 	 Improve capacity for V&A Establish appropriately skilled and resourced national teams 	 Organize workshops in the use of data and application of models and methods Develop databases Develop human capacity to archive information and manage databases Establish national climate

Table 1. Overview of needs and constraints relating to vulnerability and adaptation assessments from Parties not included in Annex I to the Convention, by region

⁵ FCCC/SBI/2005/18/Add.1.

Table 1 (continued)

	Africa	Asia and the Pacific	Latin America and the Caribbean
	appropriate scalesImprove institutional framework for implementation		 change committees Establish regional climate centres Strengthen national institutions to take on work to develop GCMs at appropriate scales
Financial and technical support	 Adequate funding is required for V&A work Financial and technical support from United Nations agencies 	 Establish and maintain databases Integration of V&A with national development planning Disaster preparedness 	 Financial and technical support is crucial for V&A activities Establish and maintain databases on population, socio-economics, geomorphology, human health and settlements, risky areas Develop and disseminate regional climate models
Education, training and public awareness	 V&A project proposals and negotiations for GEF funding Integration of climate change issues into national planning Introduction of GPG for V&A Encourage participation by stakeholders Adaptation planning and implementation needs to be integrated 	 Regional training where appropriate Training for both basic and advanced levels Development of national experts in the use of climate model outputs Development and application of methods and preparation of scenarios Use of impact models Establish and manage databases Identification and collection of information Interpretation of results 	 Encourage outreach through regional integration units Identify needs and develop plans V&A project proposals and negotiations for GEF funding Introduction of GPG for V&A Provision of equipment, technical support training and information systems
Networking and information	 Strengthen collaboration, cooperation among national/regional experts in dealing with trans-national issues, e.g. water resources Guidelines need to be translated into other languages Cooperation and collaboration with WMO on health issues 	 Create, use and maintain Internet services Regional and national networks of national teams and experts 	 Strengthen regional technical information exchange, climate change networks Cooperation and collaboration with WMO on health issues Enhance regional exchange of experiences

Source: FCCC/SBI/2005/18/Add.5.

Abbreviations: GCM = general circulation model, GEF = Global Environment Facility, GPG = good practice guidance, LULUCF = land use, land-use change and forestry, V&A = vulnerability and adaptation, WMO = World Meteorological Organization.

^a The guidelines for the preparation of national communications from Parties not included in Annex I to the Convention were subsequently revised in accordance with decision 17/CP.8.

3. Adaptation to the adverse effects of climate change

21. Most of the non-Annex I Parties underscored adaptation to climate change as a major issue, and included a list of potential adaptation options in their initial national communications. Most Parties did not evaluate, prioritize or cost the adaptation options. Many explained that they lack capacity, appropriate technologies, data and adequate financial resources to perform effective analyses of V&A options that adequately cover vulnerable sectors.

22. Common adaptation options reported by non-Annex I Parties include introduction of water policy reforms with a focus on water conservation, inter-basin water transfer and technological options such as desalination, flood management and dam construction, development of drought-tolerant crops, improvement of early warning systems, enhancement of erosion control, training and assistance to farmers, integration of coastal zone management, improvement of health-care systems, enhancement of forest management, protection of tourism infrastructure, strengthening of environmental legislation and promotion of conservation. Table 2 summarizes adaptation options, measures and strategies developed for key vulnerable sectors in non-Annex I Parties.

23. Many Parties reported efforts at integrating climate change concerns into long-term development planning processes. Many have also taken the first step in implementing adaptation by prioritizing their adaptation measures through the NAPA process or national environmental action plans. Other Parties reported instigating legislative reviews in order to facilitate the inclusion of climate change adaptation in future development efforts. Various aspects of education, training and awareness-raising for target groups ranging from farmers to policymakers, as well as the public, form an important part of adaptation strategies in almost all Parties.⁶

24. Priorities for adaptation in the most vulnerable sectors generally vary by geographic region and across Parties. Countries in the Africa, Latin America and Caribbean regions consider adaptation in the agriculture and water resources sectors as the top priority, whereas in Asia adaptation in agriculture, forestry and terrestrial ecosystems are regarded as high priority. For SIDS, adaptation in water resources and coastal zones, including adaptation to sea level rise, is the top priority.

B. Information from Parties included in Annex I to the Convention

25. Parties included in Annex II^7 to the Convention provided information on their financial support to activities relating to V&A in developing countries. There is wide variation in the magnitude of financial flows by donor, region, type of aid (grants, loans and commercial sales), recipient country needs, the geography and the investment environment. The total official development assistance from the European Community for 2005 was USD 9.39 billion, six per cent higher than in 2004. Of this, EUR 300 million funded over 200 bilateral projects related to climate change.

26. Improving assessment of vulnerability to climate change as a tool for decision-making and development planning is one of the major areas supported by Parties. In its fourth national communication, the United Kingdom of Great Britain and Northern Ireland reported that it provided 6.1 million pounds sterling (GBP) to African countries for programmes for mapping vulnerability to poverty and for climate change, on climate change risk assessment and management, and for mainstreaming local adaptation in development policies. In its third national communication, the United States of America reported contributing USD 9.4 million during 1997–2000 to the United States Country Studies Program, whose work helped 56 countries to build human and institutional capacity to assess climate V&A options.

⁶ FCCC/SBI/2002/16.

⁷ While the provisions of decision 5/CP.7, paragraph 14, refer to information from Annex I Parties, this section focuses on Annex II Parties given their commitment to provide support to developing country Parties in accordance with Article 4, paragraphs 3–5, of the Convention.

Key vulnerable sector	Anticipatory adaptation	Reactive adaptation
Agriculture and food security	 Development of tolerant/resistant crops (to drought, salinity, insects/pests) Research and development Soil/water management Diversification and intensification of food and plantation crops Policy measures, tax incentives/ subsidies, free market Development of early warning systems 	 Erosion control Dam construction for irrigation Changes in fertilizer use and application Introduction of new crops Soil fertility maintenance Changes in planting and harvesting times Switch to different cultivars Educational and outreach programmes on conservation and management of soil water
Coastal zones and marine ecosystems	 Integrated coastal zone management Better coastal planning and zoning Development of legislation for coastal protection Research and monitoring of coasts and coastal ecosystems 	 Protection of economic infrastructure Enhance public awareness of coastal and marine ecosystems Building sea walls and beach reinforcement Protection and conservation of coral reefs, mangroves, sea grass and littoral vegetation
Water resources	 Better use of recycled water Conservation of water catchment areas Improved system of water management Water policy reform including pricing and irrigation policies Development of flood controls and drought monitoring 	 Protection of groundwater resources Improved management and maintenance of existing water supply systems Protection of water catchment areas Improved water supply – groundwater harvesting and desalination
Human health	 Development of early warning system Better and/or improved disease/vector surveillance and monitoring Improvement in environmental quality Changes in urban and housing design 	 Public health management reform Improved housing and living conditions Improved emergency response

Table 2. Examples of types of adaptation to climate change envisaged for key vulnerable sectors reported by Parties not included in Annex I to the Convention

Source: FCCC/SBI/2005/18/Add.5.

27. The United States provides support for over 20 years to 21 developing countries in the operation of the Famine Early Warning System Network (FEWS NET). This is an example of a programme that combines capacity-building and adaptation. FEWS NET integrates remotely sensed satellite data with local social and biophysical data, such as information on climate and crop production, and provides early warning of impending food shortages to decision makers.

28. Some Parties (e.g. Australia, Denmark, Japan and New Zealand) provided financial support for research and implementation programmes designed to meet the special climate adaptation and socioeconomic development needs of SIDS. Japan supports the Pacific-Japan Project, whose aim is to identify and promote adaptation measures in South Pacific SIDS. Australia is the largest financial supporter of the Pacific Regional Environment Programme (SPREP), based in Samoa. SPREP seeks to bring a coherent strategic approach to climate issues in the region.

29. Some Annex II Parties also mention projects on the integration of climate risk information in decision-making processes and efforts to increase the long-term availability of climate observations. Examples include funding for projects in Africa of GBP 5.0 million over five years provided by the United Kingdom, support by Finland for the protection of marine coastal areas and flood control, support by Switzerland for adaptation projects in semi-arid areas, and assistance in forestry and agriculture

activities from Belgium, Canada, the European Community, Finland, Germany, Japan, the Netherlands, the United Kingdom and the United States.

30. The most common means of providing support for capacity-building on adaptation include training and workshops on various topics, information exchange, advisory services, institutional strengthening and technology transfer projects. For example, Japan funded the training of 13,000 international experts in environment and climate-related issues between 1998 and 2004, and France, through the French Global Environmental Facility, provided EUR 43.6 million for 33 capacity-building projects on climate change.

31. The main channels for Annex II Parties to contribute to climate change-related multilateral assistance include the GEF Trust Fund and two special funds: the Special Climate Change Fund (SCCF), which is operated by the GEF, and the Least Developed Countries Fund (LDCF). With regard to the GEF Trust Fund, Annex II Parties contributed USD 1 billion to be made available for climate change projects during the fourth replenishment period (2007–2010). Regarding the special funds, as at 30 April 2007, 13 Annex II Parties (Canada, Denmark, Finland, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom) have pledged contributions to the SCCF amounting to USD 62.0 million, while 17 Annex II Parties (Canada, Denmark, Finland, Sermany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom) have pledged contributions to USD 115.8 million.

32. Other channels for climate change-related multilateral assistance include multilateral financial institutions, the United Nations Development Programme, the United Nations Environment Programme, the World Meteorological Organization and various multilateral scientific, technological and training organizations and programmes. Climate change is a cross-cutting issue among activities supported by these organizations.

33. The secretariat has prepared a report⁸ on experiences of international financial institutions and other sources of funding, which describes initiatives on adaptation by each financial institution. This report contains detailed information on funding for adaptation, including the current access and level of funding, as well as a discussion on the potential role of the GEF.

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⁸ FCCC/TP/2007/4.