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

Report on the workshop on climate-related risks and extreme events

Note by the secretariat

Summary

This note provides a summary of the first workshop held under the Nairobi work programme on impacts, vulnerability and adaptation to climate change, which focussed on climate-related risks and extreme events. The workshop was held in Cairo, Egypt, from 18 to 20 June 2007. Discussions focused on experience with assessment, prediction and management of climate-related risks and impacts, including those related to extreme events, in the agriculture and food security, coastal zones and health sectors. Discussions were also held on the contribution of traditional knowledge to understanding and managing climate-related risks and the implications for sustainable development. This note includes a summary of gaps, needs, opportunities barriers and constraints as well as a summary of recommendations and issues for follow-up and further consideration, including possible next steps under the Nairobi work programme on impacts, vulnerability and adaptation to climate change.

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I. Introduction

A. Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its twenty-fifth session, requested the secretariat,¹ under the guidance of the Chair of the SBSTA, to organize, before its twenty-seventh session, a workshop with the participation of Parties, experts and relevant organizations and institutions on the following issues:
 - (a) Experience with assessment and management of current and future climate-related risks and impacts, including those related to extreme events and in specific sectors;
 - (b) Ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards;
 - (c) Contribution of traditional knowledge to understanding and managing climate-related risks;
 - (d) Implications for sustainable development in relation to (a) to (c) above;
 - (e) Promoting understanding of impacts of, and vulnerability to, climate change.
2. The SBSTA further requested the secretariat to prepare a report on the workshop to be made available to it by its twenty-seventh session.

B. Scope of the note

3. This document provides information on the workshop referred to in paragraph 2 above. As requested by the SBSTA (FCCC/SBSTA/2006/11, para. 24), this report contains information on:
 - (a) Analysis of the issues addressed, including current status and lessons learned;
 - (b) Summary of identified gaps, needs (including any capacity needs), opportunities (including possible synergy among activities), barriers and constraints;
 - (c) Summary of recommendations.

C. Possible action by the Subsidiary Body for Scientific and Technological Advice

4. The SBSTA may wish to consider this workshop report at its twenty-eighth session as part of its general consideration of the outputs from preceding activities, and consideration of further activities under the Nairobi work programme on impacts, vulnerability and adaptation to climate change.

D. Background

5. The overall objective of the Nairobi work programme 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.²

6. Activities in the area of climate-related risks and extreme events under the Nairobi work programme are undertaken in line with the objective stated in the annex to decision 2/CP.11, which is to

¹ FCCC/SBSTA/2006/11, paragraph 48.

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

advance sub-theme a (iv), “Promoting understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme events, and the implications for sustainable development”.

II. Workshop proceedings

7. The UNFCCC secretariat, in collaboration with the Ministry of State for Environmental Affairs of Egypt, organized the workshop on climate-related risks and extreme events in Cairo, Egypt, from 18 to 20 June 2007. The Governments of Australia, Canada, Japan, the Netherlands, Norway, Spain and Switzerland have provided financial support for the organization of Nairobi work programme activities, including this workshop. Mr. Kishan Kumarsingh, Chair of the SBSTA, chaired the workshop.

8. Participants at the workshop included 77 representatives from Parties, relevant international organizations, intergovernmental organizations and non-governmental organizations (NGOs) that are active in the area of climate-related risks and impacts, including those related to extreme events, and the Chair of the Least Developed Countries Expert Group.

9. Discussions at the workshop were informed by submissions³ from Parties and organizations on relevant programmes, activities and views on the issues relating to climate-related risks and extreme events, and by a background paper⁴ on assessing, predicting and managing current and future climate variability and extreme events, and implications for sustainable development.

10. After the opening, in which Mr. Maged George Elias Ghattas, Minister of State for Environment Affairs of Egypt, delivered a welcome address, an introductory session provided background information on the Nairobi work programme and the mandate for the workshop, and included a presentation on the background paper.

11. The discussions on the assessment, prediction and management of climate-related risks and impacts, including those related to extreme events and on the contribution of traditional knowledge took place in three sectoral breakout groups. The three sectors – agriculture and food security, coastal zones, and health – were chosen based on their importance to Parties as highlighted in their submissions. Water resources was treated as a cross-cutting issue and covered by each of the breakout groups.

12. The outcomes from the breakout groups were discussed in a joint group. In addition, several organizations gave presentations on how they are addressing the assessment, prediction and management of climate-related risks and impacts, including those related to extreme events in the sectors under discussion. The workshop concluded with a session on outcomes at which possible next steps and follow-up actions under the Nairobi work programme were discussed.

III. Analysis of the issues addressed in the workshop

A. Introduction

13. The background paper and the associated presentation at the workshop confirmed that useful experience already exists in dealing with past and current climate-related risks. Climate-related risks encompass slow-onset events, including those associated with climate variability (such as variations in temperature and rainfall and loss of water resources) and with climate extremes (such as drought), and sudden-onset events (such as tropical storms and flooding).

14. Experts and practitioners in disaster risk reduction or relevant sectors are increasingly focusing their efforts on building resilience and adaptive capacity, in order to limit future adverse impacts.

³ Submissions from Parties are contained in documents FCCC/SBSTA/2007/MISC.4 and Add.1 and 2. Submissions from organizations are contained in document FCCC/SBSTA/2007/MISC.5.

⁴ The background paper is available on the UNFCCC website at <<http://unfccc.int/3953.php>>.

Existing approaches, methods and tools to assess and manage climate-related risks in areas such as agriculture, water resources, coastal zones and health can be of great importance in assessing and dealing with the additional risks posed by climate change. However, gaps and needs remain.

B. Experience with assessment and prediction of climate-related risks and impacts, including those related to extreme events

15. In general, participants emphasized the need first to identify hazards and then to assess their frequency of occurrence and potential impacts in order to understand the nature and extent of the associated risk. Many participants underlined the benefits of a disaster risk reduction approach to risk assessment and prediction, one that is people-centred and focuses on the prediction of impacts rather than on the prediction of the frequency and magnitude of extreme events.

16. Participants exchanged their experiences with undertaking risk assessments using a variety of methods and tools, the choice of which depended on the availability of data and on technical and financial resources. Methods and tools used by participants include impact modelling, environmental impact assessments, strategic environmental assessments and hazard risk mapping. It was mentioned that the Global Risk Identification Programme (GRIP)⁵ provides a framework for supporting risk estimation. GRIP aims to improve the availability of information on and analysis of disaster risks and risk factors (e.g. hazard characterization and data, vulnerability assessment and risk indices).

17. Participants agreed that the involvement of stakeholders is instrumental in risk assessment and prediction, as climate-related impacts, including those related to extreme events, are not only temporally and spatially specific but also experienced differently depending on socio-economic conditions, cultures, norms and values. Another major aspect of risk assessment is the economic analysis of impacts to facilitate the choice of risk reduction policies and measures.

18. In addition to sectoral risk assessments, systematic research needs to be carried out in the area of integrated risk assessment involving national meteorological and hydrological services and relevant sectoral experts and practitioners.

1. Agriculture and food security

19. Agriculture is one of the sectors most prone to climate-related risks such as adverse changes in temperature and precipitation and to more frequent extreme events such as droughts and flooding. The overall vulnerability of the agriculture sector to climate-related risks and extreme events in a country or community is usually determined by a complex mix of factors that include the extent of climate variability, the extent of exposure, agricultural practices, the pre-existing condition of the agricultural land base, institutional systems, cultural and social practices, and market factors – all of which need to be considered in risk and vulnerability assessments.

20. Food security depends not only on sufficient global and national agricultural food production, but also on livelihoods that are capable of providing access to sufficient, safe and nutritious food to meet all dietary needs. Assessments of food security also include factors such as household income, availability and access to food resources, human health, government policy, conflict, globalization and market failures, as well as environmental issues.

21. Participants argued that risk assessments for the agriculture sector at national and local levels need the active involvement of stakeholders; otherwise any risk reduction measures will fail because of a lack of ownership. Examples from Egypt showed that encouraging the involvement of farmers through farmers' associations can be successful. Other stakeholders relevant to the agriculture sector were highlighted, including the private sector, decision-makers, research institutions and local communities.

⁵ <<http://www.proventionconsortium.org/?pageid=32&projectid=3>>.

22. Some participants stressed that, in order for farmers to be involved in risk assessment, they need to be able to understand not only climate variability, but also climate change. Some also argued that while farmers have to some extent adapted to dealing with current risks such as variability in precipitation, new risks that farmers have not yet adapted to, such as the salinization of soil due to sea level rise, could pose new threats to agricultural production systems and livelihoods.
23. As regards the prediction of impacts on agriculture and food security, experience from Sudan has shown the difficulties in integrating the results from bottom-up and top-down analyses. Sudan has not yet upscaled the results from the vulnerability analysis from its national adaptation programme of action or downscaled from the general circulation model results from its national communication.
24. On the issue of improving communication among stakeholders, work undertaken by the International Research Institute for Climate and Society⁶ has shown that communication between forecasters and the users of their predictions can be improved and capacity built through regional outlook forums, for example on droughts.

2. Coastal zones

25. Coastal zones are already experiencing some of the changes that are expected to accelerate with climate change, such as the increased frequency of extreme events. Coastal erosion and ecosystem loss are already taking place and are exacerbated by human activities. Coastal zones are at risk from a number of hazards. Some of these hazards are well known, such as sea level rise leading to salinization and coastal erosion, and cyclones leading to coastal flooding; others, such as harmful algae bloom and ocean acidification leading to loss of ecosystems, have emerged more recently.
26. The assessment and prediction of climate-related risks and impacts, including those related to extreme events for coastal zones, carried out at various levels, by local and regional meteorological offices, water authorities, and regional and global research and prediction centres. Whereas assessment and prediction at the regional and global levels focuses on specific hazards such as sea level rise and cyclones through modelling, assessment and prediction at the national and local levels focuses on multiple hazards and combined risks and potential impacts through systematic observation as well as modelling.
27. Depending on the coastal hazard, the time frames for forecasts of extreme events and impacts vary considerably. For example, high winds, cyclones and salinization of groundwater are forecast daily or weekly. Other hazards, such as changes in ocean circulations, are forecast on a seasonal basis, whereas long-term forecasts are provided for sea level rise. Similarly, the comprehensiveness of risk assessments depends on the type of coastal hazard as well as the availability of technical, financial and human resources. Although the risk of coastal flooding has been assessed in terms of number of people, economic infrastructure and valuable sand beaches at risk, other risks such as harmful algae bloom or changes in ocean circulation are not yet well assessed.
28. Many participants pointed out that, because of resource constraints, risk assessments at the national level are often project-based, using environmental impact assessments instead of being comprehensive assessments for all risks and all coastal zones. In Central America, land-use maps are increasingly used for coastal zones to identify areas such as mangroves that are at risk and need to be protected. Some participants highlighted the importance of expert panels to complement data and observation in risk assessments.
29. Participants exchanged information on difficulties in integrating the risk assessments of various hazards, including the fragmentation of risk assessments caused by different data sets being used and the different roles of institutions involved in prediction. In some cases, the applicability of the type of data

⁶ <<http://portal.iri.columbia.edu>>.

collected to the relevant risk assessment effort was a concern; risk assessment in the Cook Islands, for example, has shown gaps in cyclone assessments that focus on wind speed rather than on resulting storm surges, which cause more damage.

30. An example of good practice in this sector was highlighted by the Mauritius Meteorological Service (MMS). After the 2004 Indian Ocean tsunami, the MMS began to issue multi-hazard warnings instead of tsunami warnings only, in order to include hazards such as flooding and disease outbreaks. The warnings from the MMS are evaluated by an interdisciplinary national committee, which decides on appropriate steps. Thus the MMS is encouraged to predict impacts rather than just the occurrence of extreme events such as storm surges.

31. With regard to the involvement of stakeholders in the assessment of risks and prediction of impacts, participants stressed the need to involve all coastal zone stakeholders, including coastal residents, the fishing community, the tourist industry, local/regional government, the offshore oil and gas industry, the shipping industry and the insurance industry, as well as those dependent on coastal ecosystems. At the national level, consensus conferences and workshops have proved to be successful in securing the involvement of stakeholders, whereas at the community level, engagement of stakeholders through rapid rural appraisal has been useful.

3. Health

32. Climate variability and change pose significant risks to human health through thermal extremes such as heat waves and cold spells; extreme events such as droughts, floods and cyclones; degradation of food quality and quantity; water-borne diseases such as diarrhoea; vector-borne diseases such as malaria and dengue fever; and degradation of air quality.

33. Health impacts are greatest in developing countries (particularly among the urban poor, the elderly and children), in traditional societies, among subsistence farmers and among coastal populations. Participants highlighted the importance of integrated risk assessments, noting that health is also affected through climate change effects on other areas such as agriculture and water resources.

34. Participants noted that so far, few detailed health risk assessments related to climate change have been carried out, since there are only limited data on the health sector for integration into a climate change analysis. As most health risks are exacerbated by increasing impacts from climate change, ministries of health, NGOs that provide health care (such as the International Federation of Red Cross and Red Crescent Societies (IFRC)) and health practitioners need to modify existing programmes for controlling climate-sensitive diseases (such as malaria control programmes) to take climate change risks into account. Stakeholder involvement and awareness is crucial for modifying health policies and programmes.

35. Participants agreed that existing tools and methods for risk assessment are too general and that there has so far been little progress in integrating health aspects into climate change risk assessments. There is a need to establish commonly agreed metrics on health impacts and subsequently to monitor changes in these impacts.

C. Experience with management of climate-related risks and impacts, including those related to extreme events

36. According to the Inter-Agency Secretariat of the International Strategy for Disaster Reduction (ISDR), the management of climate-related risks and impacts, including extreme events, entails a systematic process including administrative decisions, organization, operational skills and resources in order to implement policies, strategies and coping capacities of communities. This includes all forms of

activity, including structural and non-structural measures to avoid (prevention) or limit (mitigation and preparedness) adverse effects of hazards.⁷

37. Participants noted that risk management, especially as it relates to climate-related risks, is in many cases at a preliminary stage, in both developed and developing countries. Management measures can include early warning systems, which are essential for reducing adverse impacts, and risk-sharing mechanisms such as insurance.

38. An important aspect of risk management is the communication of climate-related risks. Issuing early warnings involves a trade-off between accuracy of prediction and efficiency and effectiveness of associated responses.

39. Participants discussed a number of criteria for choosing between various policy responses, including the capital cost, cost of maintenance, level of technical requirements, and stakeholder involvement.

1. Agriculture and food security

40. A range of options exists to manage risks in the agriculture sector. At the national level, specific risk management options include a more informed choice of agricultural policies, practices and technologies to ensure optimal management; new cultivars; large-scale expansion of irrigation to areas previously dependent on rain; and fertilizer application. Farm-level interventions include the choice of crop varieties, changes in planting dates and local irrigation techniques, and diversification of the crops grown instead of reliance on single crops that are vulnerable to the adverse effects of climate change.

41. Participants noted that seasonal weather forecasts and early warning systems help reduce the possibility of yield losses from climate-related impacts and extreme events. For instance, early warning of the occurrence of El Niño/Southern Oscillation can help in planning and decision-making to reduce negative impacts. With regard to improving the communication of forecasts and warnings, messages need to translate climate parameters into practical yield forecasts that are understandable to farmers. As for the means of communication, some participants cited the use of modern techniques such as radio, television, the Internet and even mobile phones in Central America. Others suggested that personal communication through extension workers, as experienced in Egypt, and at local markets, as seen in Morocco, is a more powerful tool to convey information on climate-related risks and extreme events.

42. Participants agreed that an economic assessment of impacts in the agriculture and food security sector at the national level is as important as assessment at the farming level. Quantitative information on the societal costs and benefits of impacts is also needed for their assessment and for the design of appropriate response strategies. At the farming level, it is important that climate-related risk management options are profitable for the farmer.

43. Participants also highlighted the potential of insurance, be it traditional crop insurance or index-based weather risk insurance, to help farmers cope with the adverse impacts of climate change. The remaining challenges include ensuring the financial sustainability of micro-insurance providers while providing affordable premiums to poor and high-risk communities, and creating partnerships and institutional frameworks that contribute to credible and trusted micro-insurance systems.

2. Coastal zones

44. Participants noted that non-climatic stresses, such as environmental degradation and population growth, play a major role in increasing coastal vulnerability to climate-related risks and impacts,

⁷ More information on disaster risk reduction terminology is available at <<http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm>>.

including those related to extreme events. Hence an integrated coastal zone management approach is needed to manage climatic and non-climatic factors.

45. With regard to early warning systems, participants stressed that these are effective only when warnings are issued in a timely manner. For example, owing to the centralized warning approach in the Pacific Ocean, countries such as the Cook Islands sometimes receive warnings from the tropical cyclone centre of Fiji⁸ hours after the cyclone has made landfall and damage has occurred.

46. Participants also discussed the management of risks through risk-sharing instruments and mechanisms such as insurance. In addition to accelerating economic and social recovery following a disaster, insurance can act as a deterrent for new developments in hazard-prone coastal areas.

3. Health

47. In terms of managing climate-related risks in the health sector, participants noted that economic growth could reduce some of the impacts, but only if it comes with accompanying benefits such as education and awareness, health care and improved public health infrastructure. Short- and long-term health management strategies are needed.

48. Participants noted that, for effective management of climate-related health risks, closer interaction is needed between public and private health-care providers, on the one hand, and climate change, disaster risk reduction and development experts and practitioners on the other.

49. Participants also highlighted the importance of surveillance and early warning systems in managing and limiting the health impacts of climate-related risks. Heat/health warning systems have been implemented in some countries, for example France and the United Kingdom of Great Britain and Northern Ireland. The warning is normally issued by the health sector, based on the model run by the national meteorological agency. The systems often include outreach, education and interventions by the health and social care sectors for the most vulnerable groups in order to achieve appropriate responses to the warnings. Similarly, early warning systems for disease outbreaks are being developed, such as malaria early warning systems,⁹ which use simple disease-transmission risk indicators such as excess rainfall.

D. Contribution of traditional knowledge to understanding and managing climate-related risks

50. Participants highlighted that traditional knowledge can complement other scientific sources of knowledge, and that there should be greater integration and more use of such knowledge in the assessment and management of climate-related risks, particularly through partnerships with grass-roots organizations.

51. With regard to the convergence of traditional and scientific knowledge of climate change, experience from Canada has shown the advantages of involving both traditional knowledge and modern science to better understand and explain climate and environmental change issues in northern Canadian communities.¹⁰

⁸ The Regional Specialized Meteorological Centre (RSMC) in Nadi, Fiji, is one of six RSMCs specializing in tropical cyclones designated under the World Weather Watch programme of the World Meteorological Organization. They are tasked with providing 'first level' information on tropical cyclones (i.e. basic information covering the present and forecast position, movement and intensity of the tropical cyclone) in the South-West Pacific Ocean.

⁹ <<http://www.who.int/malaria/epidemicsmews.html>>.

¹⁰ <http://www.msc-smc.ec.gc.ca/saib/atmosphere/atmch_e.html>.

52. Participants noted the need for effective mechanisms to document and share traditional knowledge. Available resources to support sharing of experiences include the UNFCCC database on local coping strategies.¹¹

E. Implications for sustainable development

53. Climate-related risks and impacts, including those related to extreme events, can have a profound effect on the livelihoods and well-being of millions of people; hence disaster risk reduction and adaptation to climate change should be integrated into national sustainable development policies and plans. Building adaptive capacity and resilience to climate-related risks is essential for meeting development goals, including the United Nations Millennium Development Goals that address issues such as poverty alleviation, hunger, access to water and human health.

54. Efforts to integrate climate change risk considerations into sustainable development should involve national governments, international organizations, the research community, NGOs, community representatives and groups, and private-sector representatives.

55. Examples from several organizations showed how they are already addressing the assessment, prediction and management of climate-related risks and impacts, including those related to extreme events in the various sectors. The Food and Agriculture Organization of the United Nations is integrating climate-related risk reduction and adaptation into its operations, including in the areas of agriculture, forestry and fisheries. A comprehensive adaptation strategy will be presented at the workshop on adaptation planning and practices to be held in Rome in September 2007.

56. With regard to coastal zones, the United Nations Environment Programme (UNEP) is undertaking activities in adaptation and disaster risk reduction. For example, UNEP is supporting field level assessment of environmental factors affecting risk and climate change adaptation as part of a 'safer islands' analysis in the Maldives, and preparedness for effective response and recovery in Aceh, Indonesia, as part of a Strategic Environmental Framework for Recovery.¹²

57. In terms of health, experience of the Red Cross/Red Crescent Centre on Climate Change and Disaster Preparedness has shown that climate-related risk reduction is a key entry point for cooperation between humanitarian, development and environmental experts and practitioners. The Center for Environment and Development for the Arab Region and Europe is dealing with climate-related risk issues for water resources, which are particularly important for North Africa since aquifers are being depleted and run-off from the Nile is expected to decrease under many climate change scenarios.

58. Through its work, ISDR has identified a number of conditions for the successful integration of climate change adaptation, disaster risk reduction and development. First, it is important to identify and understand information, experience and methodologies that experts in disaster risk reduction, climate change and development can provide, and to design a system to share such experience and link knowledge. Second, institutional barriers (structural, managerial, informational or financial) must be overcome to facilitate the integration of knowledge, experience and information and to establish working relationships between the experts.

IV. Summary of identified gaps, needs, opportunities, barriers and constraints

59. A number of gaps, needs, opportunities, barriers and constraints were identified during the discussions relating to the assessment, prediction and management of climate-related risks and impacts, including those related to extreme events; the contribution of traditional knowledge; and the implications for sustainable development.

¹¹ <<http://maindb.unfccc.int/public/adaptation>>.

¹² <<http://postconflict.unep.ch/index.php?prog=indonesia>>.

A. Assessment and prediction of climate-related risks and impacts, including those related to extreme events

60. Participants noted that local and global risk assessments are disconnected in terms of geographical detail and timescales, which makes it harder to compare their results and use them as a basis for decision-making. Participants also highlighted gaps in terms of cooperation and collaboration between weather forecasters and climate modellers in the agriculture and food security, coastal zones and health sectors.

61. To improve the prediction of extreme events and other impacts, participants agreed that the following are needed: resources to improve climate and weather monitoring and systematic observations; availability and access to current and historical data; higher resolution models for impact prediction; and assimilation of used data sets to increase the accuracy of models. Participants highlighted the need for better integration of climate-related data and models with sectoral data and models such as hydrological and groundwater models. There is also a gap between climate information and agricultural information, which forms a barrier to the formulation of better forecasts of agriculture production.

62. There are still many uncertainties in the prediction of climate variability and extreme events. These include the ability to predict the frequency of extreme events as well as the change in the nature of extreme events over the next century. Methods and tools need to be developed in order to better communicate this uncertainty.

B. Management of climate-related risks and impacts, including those related to extreme events

63. With regard to risk management, participants noted constraints in terms of developing robust and effective policies that take into account possible adverse effects on multiple sectors. For example, agricultural policies in Ethiopia aimed at enhancing water availability for irrigation through increased water storage resulted in an increase in the incidence of malaria.

64. Along with a need to improve early warning systems and to address adequately the inherent uncertainties in predictions, participants identified the need for an adequate and appropriate system for responding to the identified risks. To facilitate planning and management of climate-related risks and impacts, particularly in the health sector, adaptation scenarios for climate impacts spanning the next 10 to 20 years need to be developed, in a format that is easily accessible to decision-makers.

65. Participants also highlighted trade-offs between economic and environmental goals that can affect risk and impact management. For example, in coastal zones some programmes to enhance tourism increase climate-related risks. Similarly, some policies for coastal zoning or groundwater extraction, which aim at minimizing risks, are often not enforced in order to enhance economic development.

66. Another identified barrier to effective risk management is low awareness of climate change among sectoral practitioners. For example, participants suggested that the large majority of medical practitioners do not know enough about climate change. Training, awareness-raising, communication and above all education is needed. Some participants elaborated on the opportunity for the Organisation for Economic Co-operation and Development to analyse domestic policy frameworks for adaptation to climate change in the agriculture and health sectors, similar to its previous work on the water and coastal zones sectors.

67. In addition to discussing risks and extreme events, participants also discussed opportunities for enhancing knowledge and the institutional base to support climate change adaptation. Some participants called for an invitation from the Conference of the Parties (COP) to the Intergovernmental Panel on Climate Change (IPCC) to prepare a special report on adaptation in impacted sectors, using case studies from risk and impact management to provide examples of good practice.

C. Contribution of traditional knowledge to understanding and managing climate-related risks

68. Participants emphasized that traditional knowledge is important for understanding and managing climate-related risks, but it is being lost rapidly and needs to be documented and preserved.

D. Implications for sustainable development

69. Participants suggested that integrating efforts to minimize the impacts of climate-related risks and extreme events into various developmental processes is a considerable challenge, as is creating synergies with existing disaster risk reduction activities.

70. Institutional frameworks, political processes, funding mechanisms, information exchange forums and practitioner communities have developed independently of each other, and to date remain largely separate. Some participants suggested the creation of an international adaptation agency to coordinate, support and monitor adaptation, whereas others preferred using existing specialized agencies and to leave the responsibility for adaptation to the national and local authorities.

71. In many cases there is limited interaction between the various institutions and activities; lack of awareness of climate-related risks is an additional barrier. At the national level, climate-related risks and impacts, including those related to extreme events are dealt with mainly by meteorological, environmental and civil defence offices, which in many cases have limited influence on other key offices and ministries in finance, economics, agriculture, water and health, which need to be involved in integrated efforts.

V. Summary of recommendations

72. In general, participants recommended the adoption of a cross-cutting and interdisciplinary approach to reducing climate-related risks, in which stakeholders are actively engaged. It was noted that since they contribute to the reduction of climate-related risks and impacts, including those related to extreme events, activities in disaster risk reduction¹³ are an important complement to climate change adaptation activity.

73. In particular, participants recommended a number of sector-specific and cross-sectoral activities in order to address the identified gaps, needs, barriers and constraints and to take advantage of the identified opportunities with regard to the assessment, prediction and management of climate-related risks and extreme events, the contribution of traditional knowledge and the implications for sustainable development.

A. Assessment and prediction of climate-related risks and impacts, including those related to extreme events

74. Participants recommended that:

- (a) Providers of data at the national, regional and global levels should make available information on, and allow continuous access to, relevant data archives and databases necessary for risk assessment and prediction;
- (b) Organizations active in health, such as the World Health Organization (WHO), should develop and standardize key indicators to monitor changes in health impacts and the effectiveness of climate-related risk reduction and adaptation measures;

¹³ These activities in disaster risk reduction include the goals identified in the context of the Hyogo Framework for Action. More information on the framework is available at <<http://www.unisdr.org/eng/hfa/hfa.htm>>.

- (c) Providers of data relevant for prediction and users of such data should build capacity for the integration of climate-based information and services through collaboration and dialogues in the form of agricultural and food security outlook forums or health outlook forums, especially for malaria;
- (d) The IPCC, the World Meteorological Organization (WMO), the World Climate Research Programme (WCRP) and the wider scientific community active in developing climate models and evaluating relevant model results should develop and apply downscaling techniques and should increase awareness of the available models and build capacity for their use.

B. Management of climate-related risks and impacts, including those related to extreme events

75. Participants recommended that:

- (a) Research institutes at the national, regional and global levels should undertake research, risk mapping, capacity-building, training and outreach to address climate-related risks effectively, especially in the area of health impacts;
- (b) The scientific community and coastal management practitioners should strengthen their efforts to understand the links between people's livelihoods and ecosystem services provided by coral reefs, mangroves and wetlands with a focus on identifying and disseminating options for risk management in particularly vulnerable coastal communities;
- (c) National and sectoral planners should identify and build on existing initiatives to improve communication of, and capacity-building related to, climate-related risks;
- (d) Research institutes at the national, regional and global levels should undertake research to understand better the role of insurance not only in coping with climate-related risks and impacts, including those related to extreme events, but also in inducing changes in decision-making towards more risk reduction;
- (e) The research community, national and sectoral planners and the insurance industry should explore opportunities for, and collect good practices in, innovative risk sharing and transfer mechanisms and partnerships among stakeholders in coastal development, since the availability of insurance for climate hazards in coastal areas is decreasing;
- (f) Research institutes at the national, regional and global levels should undertake a thorough and systematic review of good practices, which should identify institutional mechanisms and processes available to undertake and support action in the area of climate-related risk management in coastal zones;
- (g) Organizations and stakeholders active in health-care delivery and disaster response, such as WHO, ISDR and IFRC, should develop a strategy for climate-related risk reduction and adaptation in the health sector.

C. Contribution of traditional knowledge to understanding and managing climate-related risks

76. Participants recommended that:

- (a) Holders of traditional knowledge should document, catalogue, use and, as appropriate, disseminate this knowledge to assist climate risk reduction and adaptation planning;

- (b) Research institutes at the national, regional and global levels should assess how indigenous practices can be blended with scientific knowledge in the assessment, prediction and management of climate-related risks;
- (c) The research community should validate traditional knowledge and practices in order to improve and reinforce scientific research focused on practical actions to address climate-related risks and impacts in the areas of agriculture, water resources, coastal zones and health.

D. Implications for sustainable development

77. With regard to the integration of issues relating to climate-related risks and extreme events into national policies and sustainable development planning, participants recommended that:

- (a) National focal points for climate change and disaster risk reduction should share information on the use and availability of data, information and tools for reducing hazards, risks and vulnerability across all sectors;
- (b) National climate change and planning teams within sectoral ministries should include all appropriate sectoral and disaster risk reduction stakeholders to ensure comprehensive development and implementation of policies;
- (c) Research institutes and economic organizations should enhance efforts in developing and applying methods for assessing the costs and benefits of climate adaptation options and the costs of inaction in all sectors, especially in coastal zones. This assessment should include non-monetary costs associated with impacts on ecosystem services and indigenous cultures.

VI. Issues for follow-up and further consideration

A. Suggestions made to address the recommendations

78. Representatives from some organizations described how their organizations could address some of the gaps and needs and take some of the recommendations forward.

79. With regard to modelling, WCRP is undertaking a workshop programme aimed at training the trainers on how to interpret and use the results of the models from the IPCC Fourth Assessment Report.¹⁴ The Global Climate Observing System¹⁵ is seeking to enhance its activities in the area of regional modelling in collaboration with WMO and WCRP. The WMO pledged to undertake activities in the area of data rescue and capacity-building. ISDR explained that it is intending to consider climate change as a component of the upcoming Global Review of the Value of Disaster Risk Reduction.¹⁶

80. As regards the implications of climate-related risks and impacts, including those related to extreme events, for sustainable development, the World Bank highlighted that it has 90 ongoing adaptation-related projects and that it is planning a multi-year study on the economics of climate change. The Munich Climate Insurance Initiative and the International Institute for Applied Systems Analysis pledged to undertake work in the area of insurance-related instruments for coping with climate variability and change. A workshop is planned for late September 2007.

81. With regard to managing climate-related risks in the health sector, the WHO is developing a strategy for all climate change-related health issues, which will be released at the thirteenth session of the COP in Bali. In addition, the 2008–2009 ISDR ‘safer hospitals’ campaign could promote broader action

¹⁴ <<http://www.wmo.ch/pages/prog/wcrp/index.html>>.

¹⁵ <<http://www.wmo.ch/pages/prog/gcos/index.php>>.

¹⁶ <<http://www.preventionweb.net/globalplatform>>.

to reduce climate change-related health risks. Finally, it was suggested that a meeting be held with major foundations to discuss funding for health-related issues that could be affected by climate change.

**B. Next steps under the Nairobi work programme on impacts,
vulnerability and adaptation to climate change**

82. Participants discussed ways to implement the recommendations from the workshop and possible additional activities to be undertaken under the Nairobi work programme with a view to achieving the objective of the sub-theme on climate-related risks and impacts, including those related to extreme events, which is to promote the understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme events, and the implications for sustainable development.

83. Participants agreed to consider and elaborate on recommendations relating to other subthemes of the Nairobi work programme, including methods and tools, data and observation, climate modelling, scenarios and downscaling, adaptation planning and practices and research at subsequent workshops.

84. The UNFCCC secretariat, under the guidance of the Chair of the SBSTA, will follow up on the identified gaps, needs and recommendations, taking into account the submissions from Parties and organizations, as well as questionnaires distributed to workshop participants. It will make the information gathered available in a user-friendly format so that Parties and organizations engaged under the Nairobi work programme can undertake their own activities to promote understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme events, and the implications for sustainable development.
