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

Report on the expert meeting on methods and tools and on data and observations

Note by the secretariat*

Summary

This document provides a summary of the expert meeting on methods and tools and on data and observations organized under the Nairobi work programme on impacts, vulnerability and adaptation to climate change. The expert meeting was held in Mexico City, Mexico, from 4 to 7 March 2008. Discussions on methods and tools focused on the application, development and dissemination of methods and tools and the sharing of experiences. Discussions on data and observations focused on promoting improvements in observations, the collection, management and use of observational data, and the exchange of and access to observational data and information. The document contains an overview of good practices, gaps and needs in methods and tools and in data and observations, as well as recommendations and issues for follow-up and further consideration.

* This document was submitted after the due date owing to the timing of the expert meeting.

CONTENTS

I. Introduction

A. Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its twenty-fifth session,[1] requested the secretariat, under the guidance of the Chair of the SBSTA, to organize, before its twenty-eighth session, an expert meeting with the participation of Parties, users and developers of methods and tools, relevant organizations and representatives from sectoral and other communities, to advance consideration of ways of promoting the development and dissemination of: methodologies and tools for impact and vulnerability assessments, such as rapid assessments and bottom-up approaches, including as they relate to sustainable development; and methods and tools for the assessment and improvement of adaptation planning, measures and actions, and integration with sustainable development.[2]

2. The SBSTA further requested the secretariat to include in the expert meeting consideration of matters related to improving the collection, management and exchange of, and access to and use of, observational data and other relevant information on current and historical climate and its impacts, and promoting the improvement of observations, including the monitoring of climate variability.[3] The SBSTA requested the secretariat to prepare a report on this expert meeting to be made available to it by its twenty-eighth session.

B. Scope of the note

3. This document provides information on the expert meeting referred to in paragraphs 1 and 2 above, drawing on discussions and presentations that took place at the meeting.[4]

4. As requested by the SBSTA,[5] this document contains:

(a) An analysis of the issues addressed, including current status and lessons learned (chapters III and IV);

(b) A summary of identified gaps, needs (including any capacity needs), opportunities (including possible synergy among activities), barriers and constraints (chapters III and IV);

(c) A summary of recommendations (chapter V).

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

5. The SBSTA may wish to consider this expert meeting report at its twenty-eighth session as part of its consideration of the outputs from activities completed prior to SBSTA 28 and its consideration of further activities under the Nairobi work programme on impacts, vulnerability and adaptation to climate change.

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[1] FCCC/SBSTA/2006/11, paragraph 35.
[2] Decision 2/CP.11, annex, paragraph 3 (a) (i) and (b) (i).
[3] Decision 2/CP.11, annex, paragraph 3 (a) (ii), and FCCC/SBSTA/2006/11, paragraph 39.
[4] Documentation is available at <http://unfccc.int/4259.php>.
[5] FCCC/SBSTA/2006/11, paragraph 24.

D. Background

6. 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 (SIDS), 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.[6]

7. Activities in the area of methods and tools under the Nairobi work programme are undertaken in line with the objective stated in the annex to decision 2/CP.11 to advance the sub-themes stated in paragraph 3 (a) (i), "Promoting development and dissemination of methodologies and tools for impact and vulnerability assessments, such as rapid assessments and bottom-up approaches, including as they apply to sustainable development", and paragraph 3 (b) (i), "Promoting the development and dissemination of methods and tools for assessment and improvement of adaptation planning, measures and actions, and integration with sustainable development."

8. Activities in the area of data and observations under the Nairobi work programme are undertaken in line with the objective stated in the annex to decision 2/CP.11 to advance the sub-theme stated in paragraph 3 (a) (ii), "Improving collection, management, exchange, access to and use of observational data and other relevant information on current and historical climate and its impacts, and promoting improvement of observations, including the monitoring of climate variability."

II. Proceedings

9. The secretariat, in collaboration with the World Meteorological Organization (WMO) and the Ministry of Environment of Mexico, organized the expert meeting on methods and tools and on data and observations in Mexico City, Mexico, from 4 to 7 March 2008. The Governments of Canada, Spain and the United Kingdom of Great Britain and Northern Ireland provided financial support for the organization of this expert meeting. In addition, the WMO secretariat provided financial support for the participation of a number of meteorological experts. Ms. Helen Plume, Chair of the SBSTA, chaired the meeting.

10. The expert meeting was attended by 78 participants: representatives and experts from Parties, relevant intergovernmental and non-governmental organizations, United Nations agencies and constituted bodies, and academia; and independent experts.

11. An introductory session provided background information on current and future developments in adaptation under the Convention, the objectives of the Nairobi work programme and the expected outcomes of the meeting. Also provided were material prepared to inform the discussions, including a baseline paper summarizing information and lessons learned from previous work under the Convention relevant to both themes, and examples of relevant activities carried out by partner organizations of the Nairobi work programme.[7]

12. The meeting was organized in two main parts, the first devoted to methods and tools, and the second to data and observations. A further session focused on conclusions and recommendations relating to both themes, including cross-cutting issues, and possible actions by organizations to address the recommendations.

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[6] Decision 2/CP.11, annex, paragraph 1.
[7] <http://unfccc.int/4259.php>.

13. As requested by the SBSTA,[8] discussions at the meeting were informed by a number of documents. On methods and tools, the input was provided by two sources. First, submissions from Parties and organizations of information on existing and emerging assessment methodologies and tools, and views on lessons learned from their application; opportunities, gaps, needs, constraints and barriers; possible ways to develop and better disseminate methods and tools; and training opportunities.[9] Second, a report synthesizing these submissions and relevant outputs from the Least Developed Countries Expert Group, the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, and the Expert Group on Technology Transfer.[10]

14. On data and observations, the input was provided by submissions from WMO and its member States, the secretariat of the Global Climate Observing System (GCOS) and other relevant organizations on how their work could contribute to improved understanding of current and historical climate and its impacts, including the identification of gaps and deficiencies in data and observations, stakeholder data and capacity needs, especially at regional and national levels, and ways to improve technical infrastructure.[11]

15. The discussions on methods and tools were organized in three sessions, centred on (a) application and applicability; (b) development; and (c) dissemination and sharing of experiences. Each topic was introduced with one overview presentation and two or three presentations by Parties and/or organizations on relevant experiences, and followed by discussion in plenary. Discussions continued in breakout groups on each of the topics. The need for guidance on the proper use of methods and tools was identified in the discussions and the three breakout groups as a key area for action, and a small group was set up to elaborate a proposal on how to address it. The conclusions from this discussion were presented to plenary at the last session.

16. The discussions on data and observations followed the same format as those on methods and tools, and centred on: (a) promoting implementation and improvements in observations, including the monitoring of climate variability; (b) improving the collection, management and use of observational data; (c) improving the exchange of and access to observational data and information; and (d) gaps and deficiencies in data and observations, and opportunities and recommendations.

17. In addition to participating in breakout groups, participants provided information on priority issues, gaps, needs and recommendations in response to a questionnaire prepared by the secretariat under the guidance of the Chair of the SBSTA. They also shared information on ways in which they could address recommendations and made pledges for follow-up activities in the closing plenary.

III. Methods and tools

A. Application and applicability of methods and tools

18. An overview of different frameworks, methods and tools, including climate change and socio-economic scenarios, decision tools, stakeholder approaches and sector-specific modelling tools, was presented. A key message of the presentation was that the selection of methods and tools for a given assessment should be made depending on the aspect of vulnerability and adaptation to climate change that the assessment addresses, and that it is useful to combine different tools.

19. Addressing national experiences in applying methods and tools, the representative of Malaysia elaborated on Malaysia's work on fine-resolution regional climate projections for vulnerability

[8] FCCC/SBSTA/2006/11, paragraphs 35 and 38.
[9] FCCC/SBSTA/2007/MISC.12 and Add.1, and FCCC/SBSTA/2007/MISC.13.
[10] FCCC/SBSTA/2007/8.
[11] FCCC/SBSTA/2007/MISC.23.

assessment and adaptation. The representative of Botswana recounted some of the gaps and problems encountered; for example, the models available are of coarse resolution and some vegetation types, such as wetlands and salt pans, are not represented in the biome classification system. An expert from the World Bank introduced the World Bank's Climate Change Portal and resources for managing adaptation to climate change, emphasizing the importance of tools that are simple to access, that do not impose unnecessary burdens on project developers, and that provide guidance to appropriate resources including information on best practice in applying different methods.

20. A key point identified early on in the discussion was the need for more detailed information and guidance on what makes a tool or method useful. Participants underscored the importance of understanding the practical limitations of each individual approach and the lessons learned from its previous applications. An informal breakout group charged with discussing this issue further proposed that a survey be carried out to find out who the users of methods and tools are, what tools they are using and why, and how and in what context these tools are being used; and that a collaborative space be established to organize, share and disseminate user feedback. The group noted that the sharing of results of the survey could help ensure user feedback, and suggested that a database for online dissemination be housed at the UNFCCC secretariat in an interactive format.

21. The importance of understanding uncertainty was repeatedly emphasized – including the uncertainty inherent in the models and tools, in inaccurate data and in the wrong use of the tools. However, participants generally agreed that decisions must be made despite uncertainty. A high level of precision might not be necessary in all cases. Some participants suggested that focusing on identifying acceptable thresholds of uncertainty might be more productive than focusing on uncertainty per se, and proposed adopting a risk management paradigm that takes into account low probability but high impact outcomes.

22. Participants addressed the advantages and disadvantages of top-down versus bottom-up approaches. They noted that while top-down approaches (such as scenario- and model-driven assessments) are good for estimating climate change impacts, particularly on a large scale, they may not be appropriate on a smaller geographical scale and may fail to provide information on, for example, extreme events. In contrast, bottom-up approaches (which tend to be based on analysis of existing socio-economic conditions and livelihoods) are apt for addressing current vulnerabilities but are not suitable for assessing large-scale vulnerabilities and climate change impacts. A combination of top-down and bottom-up approaches should be used to plan pre-emptive adaptation and strengthen adaptive capacity, while addressing long-term climate change impacts and vulnerability.

23. Challenges to the proper application of methods and tools identified by participants include: the lack of knowledge of the existence of certain sophisticated tools and models; the limited availability of climate data sets; and the limited capacity to use methods and tools adequately and to modify them according to specific circumstances. Areas where assistance in the application of methods and tools was deemed necessary include: participatory processes; trend analyses; aggregation of existing data (including socio-economic data and data related to climate and ecosystems); determination of options or responses; and identification of the problem and of the target audience for communicating climate change risks.

24. Some concern was expressed about conducting assessments for the sake of assessing, instead of the more integrated approach needed to understand vulnerability and adaptation options. Best practices mentioned included taking a holistic approach to hazards, translating disaster risk management plans and materials into local languages, and testing scenarios.

B. Development of methods and tools

25. A presentation on further development of methods and tools by an expert from the Global Change System for Analysis, Research and Training (START) drew attention to the lack of methods and tools for vulnerability assessment in relation to those for impact and adaptation assessment. Using as an example changes in the fire regime in Indonesia related to climate change, the presentation described an approach that involves assessing the vulnerability of the structures and functions of ecosystems, and highlights the need for methods and tools that focus on the most vulnerable groups and increase their resilience through diversifying livelihood options.

26. Experiences, gaps and solutions in the development and improvement of methods and tools were presented in two examples. The first, presented by the Institute of Environmental Hydraulics of the University of Cantabria, Spain, consisted of a methodology for impact, vulnerability and adaptation assessment in coastal zones applied in Spain, which included methods to obtain regional vulnerability indices and projections of coastal dynamics to the end of the twenty-first century, and was deemed by participants to be a good practice that needs to be broadly disseminated. The second referred to the experience of the United Kingdom in screening its development programmes for risks of climate change. The presentation identified further work needed on: assessing sensitivity and adaptive capacity (including institutional needs); guidance on selecting cost-effective adaptation; dealing with uncertainty (possibly adopting adaptation road maps); and adapting national development plans.

27. A key point in the discussions on further development and improvement of methods and tools was the need to ensure more communication between users and developers, in order to provide more targeted and policy-relevant tools. Participants also stressed the need to substantially increase involvement by relevant sectors, ensuring greater input from town planners and engineers, for example, and to engage the private sector. They agreed that adaptation is closely linked to development and that discussions should be broadened to include a wider set of tools.

28. Tools that were identified for further development included: global information systems (GIS)/remote sensing tools that can help monitor changes in critical areas in, for example, glaciers and vegetation in order to develop responses (e.g. need for water storage over the summer, crop changes); planning tools to help with responses to impacts (e.g. water management, urban planning, crop and economic diversification); and tools or approaches for awareness-raising.

29. Methods and tools that use an ecosystem approach were highlighted as particularly useful, given their ability to take into account direct and indirect impacts as well as the effects of responses. With regard to vulnerability assessments, some participants noted the need for further work in clarifying the concept and criteria of vulnerability, and the need to include and disseminate the history of adaptation and cases of maladaptation and of vulnerability.

30. More analysis of decision-making was called for; some tools that could be applied are not being applied. It was proposed that this analysis include ways of integrating tools into decision-making. Participants also noted that most current studies are scenario driven, while what is now needed are more adaptation-driven studies.

C. Dissemination of methods and tools and sharing experiences

31. A presentation by an expert from the United Nations Development Programme (UNDP) on existing dissemination practices and sharing of experiences on methods and tools outlined the various organizations and initiatives undertaking such work, and noted the need to promote the use of common methods and tools with a view to standardizing assessments and enhancing coordination, particularly among bilateral and multilateral programmes or projects.

32. National and regional experiences with dissemination were recounted in presentations by representatives of the Cook Islands and the Ibero-American Network of Climate Change Offices (RIOCC). With regard to national experiences, the representative from the Cook Islands described gaps and barriers encountered in applying methods and tools, including the lack of baseline data and the limits of scenario-based approaches applied to SIDS, and highlighted some success in increasing resilience through working with disaster management agencies, taking a holistic approach to disaster management and using visual representations provided by GIS. The work of RIOCC on adaptation, carried out through the Ibero-American Programme for Adaptation to Climate Change, centres on identifying priorities, strengthening capacities, identifying and financing adaptation projects, and enhancing synergies among the institutions in the region that work on adaptation. Its work on dissemination includes training courses, outreach materials and the development of a dedicated website.

33. Current practices were noted, including dissemination of methods and tools through compendiums (in particular the UNFCCC Compendium),[12] guidance material (such as that developed by the United Nations Environment Programme (UNEP) and the Department for Environment, Food and Rural Affairs of the United Kingdom) and online resources (such as the Adaptation Learning Mechanism, an open knowledge platform). However, these are limited by the lack of evaluation of the usefulness of the methods and the dearth of more participatory approaches. Limited technological know-how and capacity were highlighted as major barriers in selecting and using appropriate methods.

34. It was pointed out in the presentations and the plenary discussions that the growing awareness of the urgent need for adaptation has created an increasing demand for policy-relevant information to be used in impacts, vulnerability and adaptation assessments, which has led to a rise in the application of methods and tools that have been developed in related fields, particularly risk management.

35. The increasing number of professionals requiring information, training and support points to the need to create spaces where experiences can be shared and practitioners can teach other practitioners. Establishing user networks and providing incentives for participating in them and providing feedback on the use of methods and tools was identified as a key challenge to be addressed.

36. Centres of excellence were deemed essential for sharing expertise and experiences in the application of tools and methods. Regional initiatives were thought to be particularly valuable for sharing experiences on a regular basis, as done by, for example, RIOCC or the Caribbean Community Climate Change Centre (CCCCC).

37. The importance of documenting local knowledge in parallel with scientific assessments was repeatedly stressed, particularly for countries such as the Cook Islands, where the population relies heavily on such knowledge to make decisions. Participants referred to the need to gather information on the extent to which local predictions based on traditional knowledge are effective in the light of changes in the climate, and to analyse observed changes and practices undertaken as a result of impacts. Lack of resources to undertake such studies was identified as the key barrier.

38. In line with the commonly perceived need for more guidance on existing methods and tools, discussions highlighted the need to urge developers of methods and tools to: better publicize their tools and explain how they should be used and under what circumstances; submit tools to the secretariat for inclusion in the UNFCCC Compendium; and respond to the needs of users through user networks.

[12] <http://unfccc.int/2674.php>.

IV. Data and observations relevant to impacts and vulnerability assessment

A. Promoting implementation of and improvements in observations

39. The first section of the second part of the expert meeting focused on ways to promote improvements in observations, including monitoring climate variability and promoting the implementation of systematic observations. Presentations and discussions also outlined work undertaken by WMO, GCOS and other relevant organizations that could contribute to improved understanding of current and historical climate and its impacts.

40. The representative of the GCOS secretariat gave an overview of GCOS activities and the relationship between GCOS and the Convention, including: the GCOS mission and strategy; the Implementation Plan for the Global Observing System for Climate in Support of the United Nations Framework Convention on Climate Change (GCOS implementation plan); work on essential climate variables (ECVs); the regional workshop programme, including regional action plans and the resulting Climate for Development in Africa programme (ClimDev Africa); and ongoing follow-up activities in Central America and the Caribbean. He also referred to the adaptation-related outcomes of a workshop on future climate change research and observation needs resulting from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).[13] Noting the need for improved monitoring and denser networks for improving climate services and supporting decision-making on adaptation, the GCOS representative spoke of the importance of greater spatial and temporal detail in data and observations, and of the need for improved regional climate models and projections.

41. The representative of the WMO secretariat outlined the recently approved WMO Strategic Plan and the organization's strategy for climate change, as well as a number of activities aimed at increasing knowledge of climate and climate variability and improving climate data, observations, forecasts, projections and assessments. Referring to the need for information to support adaptation, he noted that information on thresholds and extremes is key to planning for adaptation, and that adaptation requires local expertise, regional climate information and open exchange of knowledge and data.

42. An expert from the Met Office Hadley Centre of the United Kingdom provided an overview of the PRECIS (Providing Regional Climates for Impacts Studies) regional climate modelling system and the centre's capacity-building and collaborations programme. He mentioned the benefits of regional climate models and the current outputs of the PRECIS Programme, which include detailed climate scenarios and simulation of the recent climate (over the last 50 years) for many developing country regions as well as capacity-building activities and technology transfer (for example, scientific and technical support and training for development and use of scenarios and climate research).

43. A key point to emerge from the discussions was that without reliable data, there are no effective methods and tools to assess impacts, vulnerability and adaptation options. Continued accumulation of basic climate data and observations is essential to understanding past and current climate change, testing, verifying and improving global and regional models, improving projections of future climate, and developing effective adaptation strategies.

44. Data and information from the past was also widely regarded as highly important. The more historical data and information are available the better future climate predictions will be. Data rescue and recovery was therefore identified as an area of great potential which, it was suggested, could be of interest to some development organizations and funding agencies.

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[13] Workshop titled "Future climate change research and observations: GCOS, WCRP and IGBP learning from the IPCC Fourth Assessment Report", held in Sydney, Australia, 4–6 October 2007. For the report of the workshop see: <http://www.wmo.int/pages/prog/gcos/Publications/gcos-117.pdf>.

45. Discussions highlighted the need to improve present observations and develop high-quality, high-resolution historical data sets and metadata, at local, national, regional and global levels. This implies improvements in both human expertise and instrumental quality (intercomparability of instruments was deemed to be very important). Training is essential, in particular at a local level.

46. There was also a common understanding among participants that what is presently collected for global observations will not be sufficient for impacts assessments at the regional and local levels. Moreover, in order to develop effective adaptation strategies, climate system data and observations must be linked to non-climatic data and socio-economic information if they are to result in accurate assessments of vulnerability and adaptation potential.

47. Participants drew attention to the need for a thorough appreciation of the uncertainties and constraints associated with the use of data for regional and global models, and for an understanding of the limits and benefits of the use of regional model outputs for adaptation planning. Addressing gaps in data and observations would help to reduce the uncertainties associated with the results of such models.

48. Discussions highlighted the disparity among regions with regard to promoting implementation of and improvements in observations, often due to differences in leadership by specific institutions and the need for regional 'heroes' to advance the work. The work of CCCCC was mentioned as an example of best practice. In this regard, participants also noted the usefulness of the 10 GCOS regional action plans for improving observing systems and the importance of regions following up on these plans. Coordinating and strengthening subregional Climate Outlook Fora was presented as an opportunity for advancing regional initiatives.

49. Participants expressed concern over dwindling resources for climate monitoring and a deteriorating state of climate observation networks, in both developed and developing countries. Needs are great and continuing, while resources are not. With observation networks declining, the risk of losing data is growing. ClimDev Africa, for example, will continue for six more years but it is not expected that all data needs can be fulfilled in that time.

B. Collection, management and use of observational data

50. An expert from the National Meteorological Administration in Romania described the country's meteorological network and database management, including the collection, availability, use and exchange of observational data, and provided the results of an experiment on parallel observations at automatic and traditional stations. The importance of quality control, filling in data gaps and homogenizing monthly, seasonal and annual data was emphasized.

51. Presenting a national perspective, an expert from the National Meteorological Office in Mali described the country's meteorological service and its data management and transmission systems. He illustrated a project to promote the use by farmers of meteorological information in planning and managing agricultural activities. Highlighting the importance of cooperation between national meteorological and hydrological services and international partners, he called for a multidisciplinary approach to engaging sectoral representatives, in particular from national meteorological services, the agriculture sector, research institutions and the media, to enable better use of climate data for development purposes.

52. From a regional perspective, an expert from the Abomey-Calavi University in Benin focused on water needs in West Africa and the work of the African Monsoon Multidisciplinary Analysis Programme, and described the current situation of the data collection systems at regional and national levels. Despite the fact that the West African research community is well integrated at the regional level as regards collection, management and use of climate data, a number of persistent problems relating to the quality of the hydrological services and the exchange of data weaken the region's ability to undertake

adaptation (e.g. hydrological data and climate information are widely scattered and unavailable for operational use; poor dissemination of data results in the repetition of data acquisition or in the formulation of adaptation projects based on incomplete information). The need to rescue historical hydrometric data and restore and update hydrometric observations was also noted.

53. Participants agreed that effective adaptation requires both high-quality climatic data (in the broad sense, including land surface parameters) and non-climatic data. For the development of integrated assessments, the use of the same scenarios for different sectors is a challenge. Ensuring that countries have the capacity to use the data held in their archives is fundamental to effective adaptation.

54. Participants referred to the importance of regional, national and local level data for gauging sectoral impacts and vulnerability, with some pointing to the need to separate global from regional and sectoral needs and reinforce the collection of regional and sectoral data.

55. Data requirements concern, inter alia: upper-air and surface weather observations (rainfall rates); marine observations; hydrological observations (particularly groundwater); ecological and phenological observations; soil data; bathymetry and topography; crop yields; global solar radiation data; and monitoring of transboundary water resources. In addition, there remains a need to strengthen the link between hydrological and meteorological services in some places to facilitate integrated information and service.

56. It was emphasized that resources are needed for personnel, equipment and maintenance of facilities, and that, in order to improve the use of data and observations, people should be retrained to acquire new skills in statistics and in computational technologies. Open source technology was proposed as a means of acquiring off-the-shelf technology to build cheap but effective computers, and it was suggested that some development agencies could facilitate the acquisition of this material.

57. Participants recognized the need to be aware of the risks represented by the uncertainty of the information (whether it is derived from direct observations or from observations that have been synthesized with the aid of models), and to take those risks into account in policymaking and decision-making. It was also noted that decision makers must be made aware of available information that is essentially free from uncertainty, and that this can be used to inform adaptation decisions.

58. Discussions also highlighted the need for dialogue between data providers and the users of the information generated in order to inform users about the conclusions that can be drawn from observations and to inform analysts and researchers of how they should proceed to best meet adaptation information needs.

C. Exchange of and access to observational data and information

59. A presentation by an expert from the Climate Research division of Environment Canada emphasized the need for daily data to quantify the frequency and extent of impacts in the future, and discussed data collection approaches, including CLIMAT and the daily archive of the GCOS Surface Network, recent improvements in data collection and remaining gaps. He also presented an alternative approach taken by the Expert Team on Climate Change Detection and Indices, which can provide important information for impact assessments and adaptation. Regarding data exchange, data increase their value with use and should therefore be openly disseminated, tested, validated, documented and supported by metadata; arrangements such as the GNU General Public License (a free ‘copyleft’ licence for software and other works), which would require users to provide information on their use or modification of the data, could be explored.

60. The expert from the Pakistan Meteorological Department illustrated how the country’s national meteorological and hydrological services contributed to minimizing economic losses. He spoke about

the importance of data and observations in, for example, early warning of flood risks, prediction services for energy load forecasts or assessing the potential area for wind power generation. Difficulties encountered included problems related to capacity-building and human resources, the acquisition of new tools and technologies for speedy utilization of data, outreach to end users, the effectiveness of dissemination systems and maintaining data quality.

61. An expert from the National Autonomous University of Mexico, speaking on behalf of the IPCC Task Group on Data and Scenario Support for Impact and Climate Analysis (TGICA), presented the work of the TGICA on facilitating the availability of climate change related data and scenarios to enable research and the sharing of information. She described the IPCC Data Distribution Centre, which is coordinated by the TGICA and which provides data sets (e.g. observations, model projections, socio-economic variables), climate and other scenarios, and guidance documents on the use of scenario data for impacts, vulnerability and adaptation assessments. Further guidance concerning sea level scenarios, socio-economic scenarios and the analysis of observed impacts is expected to be produced in the near future.

62. A key barrier identified in exchanging data and information, besides the fact that some data are privately held, is that the mandates of institutions holding data are not necessarily aligned with the needs of users for impacts, vulnerability and adaptation work. In this regard, WMO Resolution 40, which urges members to strengthen their commitment to the free and unrestricted exchange of meteorological and related data and products, was noted.

63. Good practices mentioned included a government plan in Mali to create two new observation stations every year for the next 10 years, and the regular purchase of equipment for all stations. There were other examples from Ethiopia, where data are considered a public good, freely available when not for commercial purposes, and Pakistan, where data are made available free of charge to research organizations.

64. It was emphasized that GCOS has identified the systematic observations needed for climate monitoring, prediction and research, but there is still a need to identify data and observations necessary for impacts, vulnerability and adaptation work – that is, the ECV specific to impacts, vulnerability and adaptation. This requires a close link to, and an iterative approach to be used with, the methods and tools, in order to build a framework for adaptation. It also requires close consultation with users of the data. A challenge that will have to be overcome in undertaking this task is the fact that requirements are sector- and region-specific.

D. Data, capacity and user needs for impacts and vulnerability assessment in support of adaptation

65. A presentation by an expert from CCCCC described a number of ongoing adaptation activities relevant to observations, including: the Mainstreaming Adaptation to Climate Change project; collaboration with other countries in the region and international partners, covering, for example, installation of stations, the use and interpretation of models and downscaling and vulnerability assessments; and a recent workshop to promote implementation of the GCOS regional action plan in the region. Data and observations requirements for the region mainly concern data rescue, recovery and management; opportunities involve, for example, the strengthening of regional and subregional data centres and Climate Outlook Fora.

66. On the importance of historical climate data sets, an expert from the Rovira i Virgili University in Tarragona, Spain, described the current availability and use of historical data, including the limitations and gaps in those data, and illustrated the expected improvements and benefits from addressing such gaps. She outlined a number of WMO climate-related activities, including the Mediterranean Data

Rescue Climate Initiative, and spoke of the need for long-term, high-quality, high-resolution historical climate data sets on a regional scale to improve knowledge of historical climate variability and change, reduce uncertainties, and ensure more robust and reliable climate scenarios.

67. A presentation by the representative of Uzbekistan focused on gaps and needs with regard to undertaking vulnerability and adaptation assessments of climatic systems and water resources in Uzbekistan, including the lack of monitoring of transboundary water resources in the region, out-of-date equipment resulting in low-quality observations, uncertainty in water use estimates and the lack of reliable climatic and non-climatic data for vulnerability assessments in all relevant sectors.

68. The representative of Cuba stressed the need for integrated cross-sectoral assessments, especially for water resources and agriculture, as well as the need to validate impact models, which in many developing countries is often not possible given resource limitations. He noted that complete data sets for climate variables are very difficult to build in developing countries – in particular in the case of global solar radiation, which is the driving input variable for agricultural and water resources impact models. Looking forward, he pointed to vulnerability and adaptation assessments being developed on a wider, regional scale that will include the development of new high-resolution scenarios based on regional climate models, and to joint capacity-building efforts in the Caribbean that are expected to allow further in-depth studies. In this regard, the importance of appropriate training, including follow-up activities, was emphasized.

V. Summary of recommendations

A. Methods and tools

69. With a view to promoting more informed and practical use of methods and tools, participants proposed the following actions:

(a) Provide guidance on different methods and tools and their application, limitations and usefulness for different types of task. This could include establishing information-sharing mechanisms (such as a web-based clearing house) that give users an interactive way to share information on experiences in applying different methods and tools. This work might entail:

(i) Analysing available methods and tools (e.g. those in the UNFCCC Compendium);

(ii) Making available information on existing methods and tools that can be modified for climate change adaptation (e.g. community planning tools such as Strategic Environmental Assessment and Environmental Impact Assessment, and water conservation tools);

(iii) Providing guidance on when to use which method or tool, emphasizing the usefulness of the application of specific methods and tools for different areas and types of assessment;

(iv) Adopting a tiered approach (i.e. simple, medium and sophisticated approaches);

(v) Establishing mechanisms to enable intercomparison of methods and tools;

(vi) Promoting the use of common methods and tools, with a view to standardizing assessments and reducing misinterpretation;

(b) Establish, support and strengthen user networks and centres of excellence and encourage them to share expertise and experiences in the application of methods and tools. This

work could entail encouraging centres of excellence and regional centres to disseminate information on methods and tools, including information gathered through surveys to facilitate the obtaining of tools and contribute to the updating of the UNFCCC Compendium. In addition, developers of methods and tools should be urged to better publicize their tools and explain how they should be used and under what circumstances;

(c) Further develop and promote methods and tools to assess adaptive capacity and vulnerability;

(d) Integrate climate and non-climate stressors in vulnerability and adaptation assessments;

(e) Promote intersectoral integrated assessments, sharing experiences on criteria and decision-making in different sectors;

(f) Apply an ecosystem approach to address direct and indirect impacts, bearing in mind that adaptation in one place can affect the security or resources of another place;

(g) Allow for more demand- and stakeholder-driven approaches to increase ownership;

(h) Develop and apply tools and approaches for awareness-raising, including, for example, guidance for the media on the links between climate change and weather events;

(i) Enhance coordination in the dissemination, training and use of methods and tools, particularly among bilateral and multilateral programmes and projects, and ensure the dissemination of good practices and lessons learned, taking into account the experiences and expertise accumulated outside the climate change community;

(j) Consider the feasibility of holding a week-long annual international conference to share experiences on adaptation, including best practices on methods and tools.

B. Data and observations

70. With a view to promoting improvements in observations, as well as to improving the collection, management, use and exchange of, and access to, data and observations, participants proposed the following actions:

(a) Define an authoritative set of data and information needs for adaptation. This could include identifying the essential variables (climate, ecosystems, economic and social) specific to impacts, vulnerability and adaptation, for example, through a process of consultation with providers and users of data or through an adequacy report;

(b) Identify and recommend a minimum network to be operated specifically for adaptation needs in line with existing international agreements. Existing structures should be used to the maximum extent possible;

(c) Catalogue and assess countries' climatic and non-climatic data holdings, including:

(i) Assessing the adequacy of networks from an adaptation perspective, including whether they are of sufficient density, and gathering the elements needed to satisfy adaptation needs and those needed to meet regional and global data exchange requirements;

(ii) Assessing the efficacy of data collection, quality control and documentation systems;

(iii) Collecting and documenting local and traditional knowledge;

(iv) Assessing the accessibility of the various data collections to users;

(v) Assessing the extent to which data sets relate to each other (i.e. the ease with which multidisciplinary teams using certain data can access and interlink various types of data needed for work on adaptation);

(d) Use the assessment mentioned in paragraph 70 (c) above to develop integrated management and collection systems capable of providing the information required for adaptation;

(e) Make available assessment and documentation describing the uncertainties that affect the data and information provided by the countries' data and information systems (such documentation should include the provision of comprehensive metadata, assessment of the possible effects of limitations in observing network coverage, and assessments of modelling uncertainties);

(f) Improve awareness of data and information already available, for example by establishing a forum for user experiences to promote learning about available data and information and how they are used and applied. A compendium of data providers and/or of data and information available could be prepared, which could be linked to the UNFCCC Compendium. The use of open source initiatives for access to free software and cost-effective equipment should be encouraged;

(g) Create regional web-based databases of specific data for vulnerability assessments, both climatic and non-climatic (including, for example, hydrological observations in run-off formation zones, or death rate from relevant diseases);

(h) Promote the formation of multidisciplinary teams of specialists, including experts in data and observations, when undertaking work on adaptation to ensure appropriate interpretation of the data and effective communication of information to policymakers, decision makers and other users;

(i) Promote a continuing dialogue between the providers of data relevant for adaptation and the users of the data, including policymakers and decision makers, in both the public and the private domains, in order to better meet the needs of different users when providing and 'packaging' information. This involves engaging stakeholders at municipal and state levels, as well as in relevant sectors, to ensure ownership at the various levels, in particular local levels;

(j) Enhance links between climate-system data and observations and socio-economic information. In addition, incorporate local and indigenous knowledge, and information from local forecasters;

(k) Raise awareness among policymakers of the need to strengthen data and observations not only for global purposes, but also to assist them in their own development and adaptation objectives. This could be done through presenting cost-benefit analyses and illustrating the cost of inaction;

(l) Enhance and promote data recovery, as historical data is of great importance for improving the reliability of predictions and projections of climate variability and change;

(m) Identify data needs and barriers to the dissemination of data with a view to developing a legal framework for exchange of data or regional solutions. This may include: working closely with partner international agencies for access to data collected under their

programmes, clearly identifying the costs of 'free exchange' of data to give providers arguments in raising funds; and securing high-level political support for improving data and information exchange, highlighting the importance of free access to data needed under the Convention;

(n) Encourage regions and Parties that have GCOS regional action plans to take action on them and on the GCOS implementation plan.

VI. Issues for follow-up and further consideration

A. Suggestions for activities to address the recommendations from the expert meeting

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

72. The representative of UNDP outlined the two broad ways in which UNDP supports objectives of the Nairobi work programme: through the Adaptation Learning Mechanism (see para. 33 above); and through the provision of technical and policy support to Parties at the national level, including through supporting the preparation of national adaptation programmes of action and national communications, developing guidance documents to support the use of methods and tools, and analysing outputs from national communications in user-friendly formats.

73. The representative of UNEP/GRID-Arendal pledged that it will further its work on adaptation in the Arctic and in SIDS as part of the Many Strong Voices programme (which includes the provision of support to communities on adaptation and development of climate change networks to facilitate the sharing of knowledge and best practices within and between vulnerable regions). Furthermore, on data and observations, UNEP/GRID-Arendal pledged to increase its efforts in respect to Polar View, a part of the Global Monitoring for Environment and Security initiative that provides monitoring and forecasting services in the Polar region. A proposal was made to hold a workshop on integrating traditional knowledge and climate change science focusing on climate-related risks and the Arctic.

74. The representative of the World Federation of Engineering Organizations (WFEO) welcomed the federation's engagement with the Nairobi work programme; WFEO will, for the first time, attempt to hold a side event during the twenty-eighth session of the SBSTA. The representative of RIOCC explained that RIOCC is preparing an action pledge detailing its actions in each of the nine areas of work under the Nairobi work programme. The representative of the WMO secretariat said the organization will continue to streamline and disseminate, and facilitate the exchange of, data and continue its collaboration with the UNFCCC secretariat.

75. The representative of the GCOS secretariat reiterated the proposal elaborated jointly with the World Climate Research Programme and WMO in its submission for a programme of three interlinked regional workshops, to address the need for regional observations and climate modelling in support of adaptation. These workshops would, inter alia, assess the adequacy of regional observations and models and provide advice on how model outputs could be best used to develop adaptation strategies. A pilot project on climate observations and regional modelling in support of climate risk management and sustainable development is under way for the East African region with the support of the World Bank, with the aim of enhancing regional capacity in the use of the data and model projections, including the understanding of limitations, for adaptation planning.

76. The representative of the Global Terrestrial Observing System (GTOS) secretariat reaffirmed the support of GTOS to the UNFCCC process and gave an overview of relevant current and potential further activities related to data and observation requirements for vulnerability analyses and assessment of available data and tools for adaptation, including support to terrestrial networks and developments of

standards for terrestrial observations. Relevant results from the High-Level Conference on World Food Security and the Challenges of Climate Change and Bioenergy of the Food and Agriculture Organization of the United Nations (3–5 June 2008) would be provided in support of the Nairobi work programme.

77. The representative of the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) drew attention to the work of IOC as part of the Global Ocean Observing System on ocean-related assessments of climate impacts and vulnerability, and to a project on coastal zone management in West Africa. The development by UNESCO of a grassroots observatory of climate change impacts using indigenous knowledge and focusing on SIDS was also mentioned.

78. The representative of the United Nations Institute for Training and Research expressed the institute's readiness to contribute to the Nairobi work programme through its three-year programme for regional centres based in developing countries, and through pilot projects involving fieldwork on adaptation, which provide an opportunity to test methods and tools and listen to the views of the target populations.

79. The representative of the World Health Organization drew attention to the organization's Executive Board resolution on climate change and health of January 2008, which includes a request to the Director General to engage actively in the Nairobi work programme, "in order to ensure its relevance to the health sector, and to keep Member States informed about the work programme in order to facilitate their participation in it as appropriate and access to the benefits of its outputs."[14] She also noted that World Health Day (7 April 2008) focuses on the need to protect health from climate change.

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

80. The recommended activities could be undertaken by Parties, relevant organizations and other stakeholders engaged under the Nairobi work programme to address the identified gaps, needs, barriers and constraints and to take advantage of opportunities with regard to methods and tools and to data and observations. These recommendations could also serve as input into the general consideration by the SBSTA at its twenty-eighth session of the outcomes and further activities under the Nairobi work programme.

81. Participants also agreed to further consider and elaborate on identified recommendations relating to other areas of the Nairobi work programme, including climate modelling, scenarios and downscaling, and technologies for adaptation, at subsequent workshops and expert meetings.

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[14] <http://www.who.int/gb/ebwha/pdf_files/EB122/B122_R4-en.pdf>.