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Item 8 (a) of the provisional agenda

Development and transfer of technologies

Matters relating to the implementation of the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention

**Report on the seminar on the development and transfer of technologies  
for adaptation to climate change**

**Note by the secretariat**

*Summary*

In response to a request by the Subsidiary Body for Scientific and Technological Advice, at its twentieth session, the secretariat, in cooperation with the Expert Group on Technology Transfer organized a seminar on the development and transfer of environmentally sound technologies for adaptation to climate change from 14–16 June 2005, in Tobago, Trinidad and Tobago.

Participants at the workshop exchanged views and experiences on a range of activities relating to these technologies including concepts; needs for, and identification and evaluation of, technologies for adaptation; and lessons learned. Participants suggested areas where further work is needed, and specific activities on developing, transferring and applying these technologies that could be initiated within the UNFCCC process.

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## I. Introduction

### A. Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its twentieth session, requested the secretariat to organize in early 2005 a seminar on the development and transfer of environmentally sound technologies (ESTs) for adaptation to climate change in order to discuss case studies encompassing short-, medium- and long-term examples of their application, taking into consideration the terms of reference to be prepared by the Expert Group on Technology Transfer (EGTT) at its sixth meeting, and to report on the findings of this seminar to the SBSTA at its twenty-second session (FCCC/SBSTA/2004/6, para. 81 (b)).
2. This seminar is included in the programme of work of the EGTT for 2005. While endorsing this programme of work the SBSTA, at its twenty-first session, noted that the seminar would be held in June 2005.
3. The SBSTA, at its twenty-second session, noted that the secretariat will prepare a report on this seminar for consideration by the SBSTA at its twenty-third session (FCCC/SBSTA/2005/4, para. 59).

### B. Scope of the note

4. This report contains a summary of the 20 seminar presentations made by country-nominated representatives and experts and resource persons, of the general discussions and of outcomes of two parallel working group discussions. All presentations are available on the UNFCCC technology information clearing house (TT:CLEAR).<sup>1</sup> The report was prepared by the secretariat in consultation with the Chair of the EGTT taking into account the above-mentioned presentations and discussions. Ideas on possible further activities on technologies for adaptation to climate change, suggested during the seminar, can serve as input to further considerations of this matter by the SBSTA at its twenty-third session.

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

5. The SBSTA may wish to take note of the information contained in this document and, where necessary:
  - (a) Provide further guidance to the EGTT on possible next steps for advancing the work on technologies for adaptation to climate change to be considered for inclusion in its programme of work;
  - (b) Provide further guidance to the secretariat with regard to its efforts to facilitate the work of Parties on development, deployment, diffusion and transfer on technologies for adaptation to climate change;
  - (c) Consider the outcomes of this seminar when developing its five-year structured programme of work on the scientific, technical and socio-economic aspects of impacts, vulnerability and adaptation to climate change (hereinafter referred as the programme of work on adaptation).

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<sup>1</sup> <<http://ttclear.unfccc.int/>>.

## II. Proceedings

6. The seminar was organized by the secretariat in consultation with the EGTT, and with the kind assistance of Environmental Management Authority, Trinidad and Tobago. Financial support for the organization of the seminar was provided by the Governments of Canada and Norway, and the Climate Technology Initiative (CTI). The seminar was convened from 14 to 16 June 2005 at the Hilton Hotel, Tobago, Trinidad and Tobago. The terms of reference for the seminar were prepared by the EGTT at its sixth meeting.

7. The seminar was attended by 53 participants: 25 from non-Annex I Parties representing Africa (8), Asia and the Pacific (5), Latin America and the Caribbean (9)<sup>2</sup> and small island States (3); 9 from Annex I Parties; representatives from 5 international organizations and bodies; and 5 representatives from non-governmental organizations and other organizations. Mr. Paul Desanker, Chair of the Least Developed Countries Expert Group (LEG) also participated in the seminar.

8. The expected outcomes of the seminar were:

- (a) To generate a broader understanding of key stakeholders, Parties, and IGOs on the issue of technologies for adaptation to climate change in order to advance the transfer of these technologies to developing countries;
- (b) To identify options for practical steps to be undertaken by Parties and relevant stakeholders;
- (c) To prepare a preliminary list of available technologies for adaptation and the context in which they were applied;
- (d) To provide substantive inputs for the forthcoming technical paper on applications of ESTs for adaptation to climate change, which will be available for consideration by the SBSTA at its twenty-fourth session (May 2006).

9. The agenda of the seminar<sup>3</sup> was prepared, in consultation with the Chair of the EGTT, to address issues relating to technologies for adaptation to climate change taking into account the above-mentioned terms of reference and recent work of the SBSTA on scientific, technical and socio-economic aspects of impacts of, and vulnerability and adaptation to, climate change.

10. In his opening remarks, Mr. Earl Nesbitt, Permanent Secretary, Ministry of Public Utilities and the Environment, Trinidad and Tobago, drew attention to climate change and ESTs for adaptation in the context of sustainable development.

11. Mr. Kishan Kumarsingh, the Chair of the EGTT, outlined the UNFCCC work on technology transfer and adaptation and noted that identifying and implementing technologies for adaptation will involve activities such as vulnerability assessment and technology needs assessment (TNAs).

12. Mr. Abdullatif Salem Benrageb, the Chair of the SBSTA, highlighted the importance of adaptation and technologies for adaptation, in addition to the need for immediate action to mitigate climate change. He said that the seminar's outcome will be considered by the EGTT and by the SBSTA. He hoped the seminar would generate practical ideas and would identify next steps in developing, transferring, and applying technologies that the EGTT could take up in its programme of work.

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<sup>2</sup> The seminar was attended also by nine local participants.

<sup>3</sup> The seminar agenda is available at <<http://ttclear.unfccc.int/ttclear/pdf/Workshops/Tobago/Agenda.pdf>>.

13. Mr. Janos Pasztor, Coordinator, Sustainable Development Programme, UNFCCC secretariat said adaptation has always been a priority for developing countries and that the seminar initiated the EGTT activities on technologies for adaptation. He said the secretariat, in consultation with the EGTT, would follow up on the seminar by producing the above-mentioned technical paper and practical information, and that the EGTT would select key ideas and turn them into concrete recommendations for the SBSTA and the COP.

14. In his keynote address, Mr. Orville London, Chief Secretary of the Tobago House of Assembly, underlining Trinidad and Tobago's vulnerability to extreme weather events such as floods and hurricanes, stressed that his country and region are committed to take action to mitigate climate change and to cope with disasters. He highlighted the importance of financial resources and technical expertise in order to address climate change and suggested that participants develop recommendations for policy-making processes especially regarding floods, water resources and agricultural activities.

15. Another keynote address was delivered by Ms. Penelope Beckles, Trinidad and Tobago's Minister of Public Utilities and the Environment. She stressed that small island developing States (SIDS) have already been suffering the negative impacts of climate change due to their geographical location, lack of technical and financial resources, and the vulnerability of their biodiversity to climate change. Ms. Beckles noted that these impacts are already influencing Tobago by changes in the duration of seasons, loss of agricultural land, and changes in water availability. She highlighted the importance of promoting technology transfer within the UNFCCC process and welcomed activities on the ground that transfer technologies for adaptation to developing countries. Stressing the need to increase the research on technology for adaptation, Ms. Beckles acknowledged the importance of partnerships to promote sustainable development in SIDS.

### **III. Summary of the discussions**

#### **A. Setting the scene**

##### **1. Background and context**

16. Ms. Wanna Tanunchaiwatana, UNFCCC secretariat, outlined the background and context for the seminar. She stressed that adaptation is a cross-cutting activity under the UNFCCC and that the SBSTA, as requested by decision 1/CP.10, is preparing a five-year structured programme of work on adaptation that would address four main themes: methodologies, data and modelling; vulnerability assessments; adaptation planning, measures and actions (where most of the work on technologies for adaptation fits); and integration into sustainable development. Ms. Tanunchaiwatana asked delegates to consider practical next steps to promote the development and transfer of ESTs for adaptation to climate change, possible contributions this seminar could make for the development of the programme of work on adaptation and how the EGTT could support this work.

17. Mr. Florin Vladu, UNFCCC secretariat, gave an overview of technologies for adaptation to climate change in the UNFCCC process. After describing previous work on technologies for adaptation to climate change, he said that defining these technologies is difficult, and suggested that an operational definition might be "the application of technology in order to reduce the vulnerability, or enhance the resilience, of a natural or human system to the impacts of climate change". Mr. Vladu noted that technological approaches to adaptation include both "hard" technologies such as capital goods and hardware, as well as "soft" technologies such as knowledge of methods and techniques which enable "hard" technologies to be applied. Stressing various uncertainties, he suggested that investments in these technologies may begin with present-day needs that address climate variability concerns and are further justified by consideration of climate change.

18. Mr. Richard Klein, Potsdam Institute for Climate Impact Research, Germany, and UNFCCC consultant, presented the draft background paper on “Technology to understand and manage climate risks”.<sup>4</sup> He noted that the paper provides an overview of current knowledge and understanding of adaptation to climate change and of the process of development and transfer of technology as relevant to adaptation to climate change, challenges, experiences and lessons learned in developing, deploying, transferring and applying ESTs for adaptation. Mr. Klein highlighted some issues outlined in the draft paper, including: concepts and definitions of adaptation to climate change; implications for developing and transferring technology; a proposed conceptual framework for addressing technologies for planned adaptation to climate variability and change;<sup>5</sup> and policy issues.

19. Mr. Klein noted that adaptation to climate change involves more than merely the application of a particular technology. Adaptation measures include increasing robustness of infrastructural designs and long-term investments, increasing flexibility of vulnerable managed systems, enhancing adaptability of vulnerable natural systems, reversing trends that increase vulnerability, and improving societal awareness and preparedness. He stressed the importance of adaptation noting that: climate change cannot be totally avoided and it may be more rapid and pronounced than currently suggested; anticipatory adaptation<sup>6</sup> is more effective and less costly than emergency measures; and immediate benefits can be gained from better adaptation to climate variability and extreme events. He underscored also some factors that determine adaptive capacity of human systems, including the level of economic wealth, access to technology, information, knowledge and skills, and existence of institutions, infrastructure and social capital.

## 2. Seminar expectations

20. In discussing seminar expectations, Ms. Pamela Kertland, Canada, stressed the importance of institutional changes for successful implementation of technologies for adaptation. She hoped for a discussion on impacts that technology changes may have in communities, and on technology and adaptation measures and their successful applications. Mr. Rawlestone Moore, Barbados, expected participants to discuss the importance of financial resources for transferring technologies for adaptation and ways to strengthen institutions and promote cooperation among developing countries.

Mr. William Kojo Agyemang-Bonsu, Ghana, said his expectations focused on identifying technologies that can promote both climate change mitigation and adaptation activities. Ms. Izumi Kubota, Japan, urged discussion on improving TNAs, exchanging and disseminating information on existing technologies for adaptation, and mainstreaming adaptation in sustainable development policies at national levels. Mr. Ji Zou, China, noting that his country faces numerous challenges for adaptation to climate change, highlighted the need for coordinating the design and implementation of measures to promote technology transfer, which could include defining concepts, awareness-raising, enhancing early warning systems and models, building human capacity, and identifying priorities for adaptation.

21. Several participants from developing countries highlighted the need to focus on the means to transfer technology, provide concrete examples of transferring technologies for adaptation, and promote stakeholder participation in defining needs for technologies for adaptation in TNAs. Several developed countries underscored the importance of assessing practical next steps to promote the transfer of these technologies, analysing the means for disseminating useful technology information to countries, exploring synergy between adaptation and mitigation technologies, and enhancing the capacity of countries that need technologies.

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<sup>4</sup> The paper is available at <<http://ttclear.unfccc.int/ttclear/pdf/Workshops/tobago/BackgroundPaper.pdf>>.

<sup>5</sup> Main steps of this conceptual framework are: information development and awareness raising; planning and design; implementation; and monitoring.

<sup>6</sup> Adjustments prior to the manifestation of impacts based on the expectation of changes.

22. One participant underscored the need to establish ways to communicate the implementation of adaptation measures and risk reduction to insurance companies in order to see these actions reflected in insurance premiums and conditions. Another participant expressed concern about ways to capture and apply endogenous knowledge regarding adaptation measures.

## **B. Environmentally sound technologies for adaptation to climate change**

### 1. Needs for technologies for adaptation to climate change

23. Mr. Yamil Bonduki, United Nations Development Programme (UNDP), presented an overview of the UNDP handbook on *Conducting Technology Needs Assessments for Climate Change*. He pointed out that conducting a TNA for technologies for adaptation is more complex and challenging than for mitigation technologies and highlighted several key aspects in the identification of technology needs for adaptation. Mr. Bonduki also presented a preliminary analysis of 14 TNA reports conducted by developing countries with support from UNDP. Noting that most countries adopted a sectoral approach for TNAs, he outlined criteria for prioritizing options and the share of adaptation and mitigation options by sector. He said that this process has shown that: development is the biggest priority for developing countries; government and stakeholder involvement and capacity-building are essential; cross-sectoral issues should be addressed, including links between mitigation and adaptation priorities; and cost is one of the highest barriers in technology transfer.

24. Mr. Mahendra Kumar, United Nations Environment Programme (UNEP), presented experiences and lessons learned from TNAs conducted with support from UNEP. He outlined the needed technologies, criteria for their selection, and barriers to adaptation identified by TNAs for several sectors: coastal zones, energy, forestry and land use, industry, transport, waste management, and water resources. He said many countries identified soft technologies, such as geographic information systems and technologies for measurement, monitoring, and verification such as tide gauges, rather than hard technologies for adaptation. He stressed the need to increase capacity, particularly in the area of science and technology, and to strengthen links to policy.

25. Mr. Kumarsingh outlined the particularities of the TNA methodology relating to technologies for adaptation, which includes: identifying and prioritizing vulnerable sectors; identifying specific characteristics of prioritized sectors; compiling list of response or adaptation measures that can be implemented to address the specific vulnerability issues; elaborating a prioritized list of practicable options and identifying technologies that can address these options; identifying capacity-building needs to use such technologies; and compiling a report. He stressed that the TNA should examine the reasons for selecting the proposed technologies, carry out alternative analysis for the chosen technologies, examine the lifetime of technologies and promote stakeholder participation.

26. Mr. Elmer Holt, CTI, highlighted CTI experiences in supporting countries to prepare their TNAs. Noting that CTI aims to foster rapid development of climate technologies, he stressed that TNA needs to be followed-up and implemented. Mr. Holt said that the UNFCCC technology transfer clearing house (TT:CLEAR) shows some TNA results and provides opportunity for possible “matchmaking” between countries’ interests regarding technology transfer. He said that the existing TNA methodology guidelines, as embodied in the above-mentioned UNDP handbook, should be considered a living document that continues to be informed and enhanced through countries’ experiences.

27. Mr. Vladu presented needs for adaptation technologies as expressed in TNAs, national communications and other national reports. He summarized results from the third national communications of Parties included in Annex I to the Convention (Annex I Parties) and gave examples of initiatives in the water resources, forestry, agriculture, human health, fisheries, and infrastructure and service sectors. He cited examples of cooperation projects, conducted with bilateral assistance, focused

on vulnerability assessment, disaster preparedness and risk management, integrated water management, prevention of desertification, and support of meteorological networks. In national communications of Parties not included in the Annex I to the Convention (non-Annex I Parties), he noted that the main vulnerable sectors identified were: agriculture and food security; water resources; coastal zones and marine ecosystems; terrestrial ecosystems and forests; and human health. He also presented some examples of technologies for adaptation identified in TNAs completed by Albania and Mauritius and in national adaptation programme of actions (NAPAs).

28. Ms. Virginia Sena, Uruguay, outlined identification of adaptation measures and related technologies in Uruguay's second national communication. She said that Uruguay developed a programme of measures for mitigation and adaptation that includes vulnerability analysis, and identified adaptation measures for agriculture, biodiversity, coastal resources, water resources, fishery resources, and human health. She underscored that the programme also includes cross-sectoral measures oriented to institutional strengthening on climate change matters, development of a programme on climate change information dissemination, public awareness and education, improvement of capacity for development and transfer of ecologically rational technologies and promotion of research and systematic observation.

29. Mr. Rasack Nayamuth, Mauritius, presented results of the country's TNA. He summarized vulnerability and adaptation assessments for agriculture, water resources, coastal zones, forests and other land use, health, and fisheries in his country. Mr. Nayamuth stressed that agriculture, particularly the growing of sugar cane, and water resources were identified as highly vulnerable sectors. Summarizing the process and methodologies used in developing the TNA of Mauritius, he noted that difficulties included inadequate capacity, limited response from stakeholders, and the need for financial resources.

30. Mr. Bonduki presented an overview of the UNDP Adaptation Policy Framework (APF), and said the framework treats technologies for adaptation as coherent packages of "soft" and "hard" responses. He highlighted the APF project design, which involves assessing current vulnerability, characterizing future climate risks, developing adaptation strategies and continuing the adaptation process. Mr. Bonduki said that the adaptation learning mechanism aims at maximizing global learning and contributing to the incorporation of adaptation strategies into development planning. He underscored that the UNDP/Global Environment Facility (GEF) adaptation strategy includes four phases, namely methodology improvement and dissemination, regional assessments, national assessments, and implementation.

31. In the general discussions that followed, several participants underscored the importance of national development policies to the elaboration of TNAs and the synergy between NAPAs and TNAs. Participants also highlighted some issues relating to conducting TNAs, including limitation of technology options available, ways to identify and prioritize technologies for adaptation, and the challenge to implement TNAs and to access GEF funding for these technologies.

## 2. Identification and evaluation of technologies for adaptation to climate change

32. Mr. Anthony Nyong, University of Jos, Nigeria, presented particularities of technologies for adaptation in the water and agriculture sector through a case study in the Sahel. Noting that climate variability, rather than climate change, is an ever-present regional concern, he said that coping with present-day variability would go a long way down the road towards adapting for climate change. On adaptation, he pointed out that households have been implementing different technologies for adaptation for decades, and that many decisions on adaptation are taken at the community level through farm associations. Using participant identified indicators of success, he said that water harvesting technology is one of the most desired technologies. Mr. Nyong concluded that local knowledge is a major underutilized resource in adaptation, and that development efforts should be applied with an understanding of, and sensitivity to, local communities.

33. Mr. Klein said that some first-order effects of climate change on coastal zones are sea-level rise, increases in seawater temperature, increased precipitation intensity, changes in wave climate, storm frequency, river run-off, and enhanced productivity in coastal ecosystems due to increasing atmospheric carbon dioxide. Focusing on sea-level rise, Mr. Klein noted that the few impacts are assessed in vulnerability studies. He stressed that even if stringent mitigation measures would be implemented they would have limited impacts on the number of people at risk from floods, because of lag times in the atmosphere and ocean systems. Mr. Klein noted the existence of several tools and strategies for information, planning and implementation, and said there is a need for consultation and coordination with stakeholders in coastal zone management. He noted that coastal zones are among the environments under most stress, yet offer important opportunities for economic development.

34. Mr. Francis Agyemang-Yeboah, School of Medical Science, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, stressed that changes in both physical and biological factors in the ecosystem affect the distribution and abundance of disease vector organisms and intermediate hosts. He presented a case study from Ghana that linked air temperature and humidity projections with distribution of diseases by showing that periods of high meningitis, diarrhoea and malaria cases coincide with periods of high air temperature. He suggested some health adaptation strategies and identified technologies for preventing and curing diseases. For malaria, he suggested the development of vaccines, herbal preparations, insecticide, impregnated nets and combined therapy. For cerebrospinal meningitis, he suggested altered house designs, early vaccination initiatives, mobile clinics and health education. For cholera, he suggested the use of bore-hole drills for capturing water, the employment of activated charcoal domestic water filtration systems, and the establishment of locations for disease screening and medical care. Mr. Agyemang-Yeboah said the socio-economic impacts of such diseases include reduced income of affected individuals due to loss of productivity. For coping with climate change and health issues, Mr. Agyemang-Yeboah underscored the need for socio-economic adaptation, capacity-building initiatives, coordinated health policies, evaluation and monitoring, strong institutions, cost-effective technologies, and financial resources.

35. Mr. Ian Burton, independent consultant, Canada, stressed the importance of motivating individuals to spread technologies for adaptation, especially relating to extreme events. He noted that with regard to infrastructure and adaptation requirements, developers have an apparent preference for more exposed or dangerous locations, which can have particular economic benefits. For coping with extreme climate events, Mr. Burton suggested revision of civil construction codes and standards taking into account weather extremes, raising stakeholders' awareness of climate change impacts, providing advice on ways to incorporate climate change into stakeholders' decision-making processes, developing insurance products through the private insurance industry and lowering insurance premiums for areas where adaptation measures have been implemented.

36. Mr. Abhayasingha Bandara, Sri Lanka, addressed the issue of adaptation to increased thunderstorm hazards among low-income families. In Sri Lanka the practice of building houses with aluminum roofs on mountain tops and without earth terminals attracts lightning and causing loss of human lives and damage to properties. He suggested that precautionary steps be considered during construction, such as low-cost lightning rod technologies.

37. In addition, a participant noted that severe weather events such as tropical cyclones are a major problem. Another underlined the links between water system storage and diseases and suggested analysing the connections between malnutrition and the spread of diseases in the Ghana case study.

### **C. Ongoing activities and possible synergy**

#### **1. Financing the transfer of technologies for adaptation to climate change**

38. Mr. Daniele Violetti, UNFCCC secretariat, presented an overview of trends in financial flows and ongoing work on innovative financing for the development and transfer of technology. He noted that funding for technology transfer is available from bilateral activities of Parties, multilateral activities such as the GEF, the World Bank or regional banks, the Special Climate Change Fund (SCCF), the LDC Fund, financial flows generated by Joint Implementation and clean development mechanism projects, and the private sector. He surveyed funding flows outside the Convention, noting the increasing role of the private sector in mobilizing funding.

39. Ms. Bonizella Biagini, GEF secretariat, gave an overview of GEF funds available for adaptation activities. For implementation activities, she noted that four programmes are available: the Strategic Priority on Adaptation (SPA) trust fund; the LDC Fund; the SCCF; and the Adaptation Fund under the Kyoto Protocol. Noting that the SPA projects are designed to “show how adaptation planning and assessment can be practically translated into projects that will provide real benefits,” she summarized SPA projects in Kiribati, Colombia, the Caribbean, and Africa. She clarified that whereas the SPA funds the incremental costs of projects that have global benefits, the LCD Fund and the SCCF fund the additional cost of adaptation measures that are not required to include global benefits. The LCD Fund funds projects that address immediate needs as identified in NAPAs. The SCCF funds projects in priority areas of intervention with a longer-term approach and strategy. She noted that the top priority area of the SCCF is adaptation, followed by technology transfer.

40. In the general discussions that followed, participants highlighted why innovative finance is needed, and what types of capacity-building initiatives are needed for financing. Further clarifications were provided by Ms. Biagini with regard to how the GEF defines and measures “global benefits.”

#### **2. Lessons learned and possible synergy with ongoing activities**

41. Mr. Markus Lehmann, Convention on Biological Diversity (CBD) stressed that, under the CBD, access to genetic resources can be granted in exchange for access to, and transfer of, technology that makes use of those genetic resources. He noted that the CBD programme of work includes elements relating to technology assessments, information systems, enabling environments and capacity-building and enhancement.<sup>7</sup> Mr. Lehmann noted that transfer of technology in the CBD includes technology protected by intellectual property rights and must be implemented in accordance with international law. He said that some technologies are addressing both biodiversity and climate change challenges. Examples include technology for conservation and sustainable use such as resilience of ecosystems, and adaptive capacity and technology that makes use of genetic resources such as crops with higher resistance against extreme climate events. He said there are opportunities for sharing experiences and good practices and cooperating to minimize trade-offs, for example for coastline protection and management technologies that can have positive or negative effects on biodiversity.

42. Mr. Ian Noble, World Bank, said the World Bank is concerned about climate change because the poor will face the greatest challenges from its consequences. He stressed that two billion people in developing countries were affected by climate-related disasters in the 1990s, and 2 per cent of World Bank funds are diverted to disaster relief. Mr. Noble said that although climate change is a minor factor in the Bank’s development decision-making processes, it is becoming more relevant to project planning, and climate variability is already a major impediment to development. Mr. Noble noted that funds for mitigation and adaptation to climate change are limited and must be used effectively. He presented a

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<sup>7</sup> These themes are similar to those included in the technology transfer framework under the UNFCCC and they are an example of synergy in designing targeted processes for fostering transfer of technology.

screening tool, under development by the World Bank, that allows one to find out what climate vulnerabilities should be addressed in a specific project.

43. Mr. Taka Hiraishi, member of the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) and of the EGTT, presented an overview of the work of CGE relevant to vulnerability and adaptation. He summarized extracts from national communications of non-Annex I Parties on the subject of vulnerability and adaptation. He also highlighted results and recommendations from a hands-on training workshop, held in Maputo, Mozambique, from 18 to 22 April 2005. Mr. Hiraishi said 40 hours of training were provided for 55 participants, during which modelling software and tools for vulnerability and adaptation assessments were used.

#### **D. Endogenous technologies for adaptation to climate change**

44. Mr. Mozaharul Alam, Bangladesh Centre for Advanced Studies, presented an overview of Endogenous technologies for adaptation to climate change in Bangladesh. Noting that hazards in Bangladesh include floods, storm surges, droughts, and increasing salinity, he gave examples of technologies existing in Bangladesh to reduce risk. On floods and storm surges, he noted structural measures such as multipurpose cyclone centres, and non-structural measures such as subsurface food and seed storage. On wetlands, he mentioned a floating agriculture technique for growing vegetables on floating rafts, called *baira*, traditionally practiced in southern districts but recently introduced in other wetland areas through environment and development projects. He enumerated coping strategies, such as polyculture, rainwater harvesting, migration, and afforestation. He said a main lesson was that endogenous technology for adaptation is context-specific, and that challenges include the need to understand communities and ecosystems and the functionality of these technologies under the additional stress of climate change.

45. Mr. Paul Desanker, Chair of the LDC Expert Group (LEG) spoke about technologies for adaptation in NAPAs. He gave an overview of the NAPA process, and provided examples of adaptation projects identified by NAPAs and associated applicable technology, including improving yields through irrigation and changes in crops or tree types. He noted that some initial examples of project results emerging from NAPAs are early warning systems, seasonal forecasts, agricultural technology, geographic information systems and remote sensing analysis, and integrated modelling and planning. Mr. Desanker mentioned that the most critical constraint is likely to be funding. He mentioned plans for an online database of adaptation options to share local knowledge and endogenous adaptation techniques.

46. Mr. Moussa Sanon, Burkina Faso, presented a case study on transfer of technology and capacity-building for coping with climate variability.<sup>8</sup> He noted that experts focused their work on cotton and cattle ranching, carried out guided discussions with stakeholders, and highlighted the importance of restoring and improving soil fertility, increasing collection of rainwater, strengthening capacities with field demonstrations, and improving irrigation efficiency. Mr. Sanon said the case study launched a workshop to foster effective stakeholder participation, information-sharing and awareness-raising. He concluded that successful technology transfer projects need to involve stakeholders from the beginning of a project, elaborate inventories on techniques and constraints, apply a variety of technologies rather than isolated ones, and strengthen capacities.

47. In the following discussions, participants highlighted the complexity of managing an integrated assessment that combines numerous elements and that endogenous technologies are context-specific and difficult to introduce successfully in other countries.

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<sup>8</sup> This case study, although belonging to this session, was presented during the last day of the seminar.

### **E. Working group discussions**

48. Two working groups were set up to share and discuss ideas to address the lessons learned from the seminar, information needs and processes, and ways forward on technologies for adaptation. The working groups were chaired by Mr. Elmer Holt (United States of America) and Mr. Rawleston Moore (Barbados). Below is a set of questions prepared to guide the discussions of the working groups:

- (a) What were the key lessons you received from this seminar? Were your expectations met?
- (b) Would access to information on country experiences with technologies for adaptation be useful? If so, in what form should this information be presented, and what support is necessary to be able to utilize this information?
- (c) How might the outcomes from assessments relating to technologies for adaptation be structured to enhance their prospects for financing? What steps might be taken to help facilitate a market-based supply of technologies for adaptation?
- (d) What synergy within the Convention and other multilateral environmental agreements might be pursued to enhance the work on technologies for adaptation?
- (e) SBSTA is developing a five-year structured programme of work built around the following issues: methodologies, data and modelling; vulnerability assessments; adaptation planning, measures and actions; and integration into sustainable development. Given these four themes, what messages coming from this seminar would you deem important that might be considered for inclusion in this programme of work on adaptation?

49. Among the many lessons learned from the seminar, participants mentioned the importance of synergy and the value of sharing country experiences, awareness of the tools available for evaluating technologies for adaptation, and the role of technologies for adaptation in different sectors, such as water and health. In general, participants expressed their good impression that the seminar generated valuable information that could form good basis for future work of the SBSTA in this area. Hence, their expectations were met.

50. The working groups emphasized that TNAs play a crucial role in identifying the needs for technologies for adaptation, and that technology transfer should be integrated into overall national development goals. They also acknowledged that many such technologies exist at local levels and that financing remains one of the main issues for enhancing their deployment.

51. The groups highlighted the role of information dissemination as a means for promoting the deployment and diffusion of technologies for adaptation. They stressed the importance of increasing awareness and involvement of all stakeholders and provided concrete suggestions for consideration in the programme of work on adaptation. Highlights from discussions and presentations during all sessions and two working group discussions are summarized in the following section.

### **F. Highlights from plenary and working group discussions**

#### **1. Needs for technologies for adaptation and TNA studies**

52. The preliminary analysis showed that information from TNAs is already available<sup>9</sup> and that several countries have developed capacity to identify their needs for technologies. Most of the TNA

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<sup>9</sup> Some 22 reports are already available on TT:CLEAR and another 8 are expected to be completed by the end of 2005.

studies completed to date addressed the needs for mitigation technologies, and only a few addressed the needs for technologies for adaptation and their integration in the suitable development goals.

53. The following issues relating to conducting TNAs were highlighted:
- (a) Main difficulties relate to the cross-sectoral nature of these technologies, identification of vulnerable sectors and adaptation options, lack of information on available technological options that can be adjusted to national circumstances, and the strong emphasis on soft technologies. Other difficulties are limited response from stakeholders, inadequate capacity and limited resources available for conducting these studies
  - (b) At present, non-Annex I Parties are submitting the reports of their TNAs to the secretariat on a voluntary basis. Future technology needs will be reported by non-Annex I Parties in their second national communications and an appropriate reporting format may be needed
  - (c) The UNDP handbook needs to be updated to include more information on vulnerability assessment, as identification of needs and transfer of technologies for adaptation is a part of the general intervention in the vulnerable sectors. The handbook needs to take a broader approach to assessment that addresses all the issues of adapting to impacts of climate change. The APF could be another useful approach for selecting adaptation projects at country level
  - (d) The implementation of TNAs results (plan of action) remains a challenge. Activities that would support this implementation include: the collaboration between TNAs and NAPA activities to implement climate change measures; simplifying ways to access funding within the GEF; and innovative financing and guidance on developing project proposals for technologies for adaptation.<sup>10</sup>

## 2. Identification and evaluation of technologies for adaptation to climate change

54. The range and dimensions of technologies for adaptation that can be considered are very large. There are many examples of technologies that can be used to collect data, provide information and increase awareness for coastal adaptation to climate change, to plan and design adaptation strategies, to implement adaptation strategies and to monitor and evaluate their performance. Although many examples of technologies were presented and discussed at the seminar for a range of vulnerable sectors and systems, including water supply, agriculture, human health, and coastal zones, it is difficult to provide an all-inclusive lists of technologies for all relevant sectors.

55. The case studies presented at the seminar showed that many local technologies for adaptation to climate change are available in developing countries and that some of them were independently adopted or introduced.<sup>11</sup> The issue is therefore how to promote their deployment and diffusion and, in many cases, it relates to the limitation of financial resources. Consideration should be given also to new technologies for adaptation and to their adoption and implementation based on local experiences and circumstances.

56. The evaluation of technologies for adaptation to climate change includes an integrated assessment that combines numerous elements and has cross-sectoral implications. For example, on

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<sup>10</sup> This guidance may address issues relating to incorporating adaptation concerns in the project's cost-benefit analysis and mainstreaming adaptation projects in the national development agenda.

<sup>11</sup> For example water resources management and agriculture technologies that were introduced in West Africa after the 1972 drought.

climate change and human health, links exists between water storage and diseases and between malnutrition and the spread of diseases relating to climate change, such as those caused by drought and loss of agricultural land. These links highlighted the need for technology to identify the diseases at early stage, and prevent their spread.

57. Regional cooperation and transfer of technologies for adaptation to climate change is, at the moment, limited as endogenous technologies are context-specific. Successful deployment of these technologies in other countries will depend on good understanding of communities and ecosystems and of the functionality of these technologies under the climate conditions in those countries.

58. Much important work was done to develop tools for identification and evaluation of soft and hard technologies for adaptation. Several simplified tools exist that can be used for identifying, selecting and to some extent evaluating technologies for adaptation.<sup>12</sup> The capabilities of these tools should be explored further, the countries' experiences on their utilization should be reviewed and a greater awareness of the tools is needed.

59. It was noted that a broad approach to adaptation should be taken by addressing the transfer of technologies for adapting to climate change as well as technologies to reduce the impact of response measures.

60. Adaptation to climate change involves more than merely the application of a particular technology. Adaptation is an ongoing and reiterative process that includes information development, awareness raising, planning, design, implementation and monitoring. Reducing vulnerability requires not only having access to technology, but also having the mechanisms, expertise and other resources that are needed to make the technology useable and sustainable.

### 3. Financing the transfer of technologies for adaptation to climate change

61. Both conventional and innovative options for financing the transfer of adaptation technology should be explored. On conventional options the GEF funds (SPA, LDC Fund, SCCF and Adaptation Fund) provide opportunities for accessing financial resources that could be used for deployment, diffusion and transfer of technologies for adaptation, including initiatives on capacity-building, partnerships and information sharing. Focused efforts are needed to take projects, eventually identified in TNAs, to implementation through these financial opportunities. And based on these experiences as well as on special needs of groups of countries such as SIDS and LDCs, further guidance could be provided to the GEF on funding technologies for adaptation.

62. Parties have explored several innovative options for financing transfer of mitigation technologies that aim to catalyze important financial actors and provide greater overall flexibility for the private sector to invest in environmentally sustainable technologies.<sup>13</sup> Comparable options have still to emerge for the technologies for adaptation where potential technology transfer is associated with insufficient incentive regimes, increased risks, and high transaction costs. Whereas the private sector could be attracted by strong interest from governments in technologies identified in TNAs and NAPAs, to enhance the prospects for financing these technologies there would be a need:

- (a) To define basic objectives for innovative financing for transferring technologies for adaptation: the underlying motivation for these objectives could be to help countries enhance their resilience to climate change by helping businesses and the public sector invest in risk-reducing strategies that capture commercial opportunities;

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<sup>12</sup> The World Bank presented such a screening tool that will be freely available on the World Bank web site when completed.

<sup>13</sup> FCCC/SBSTA/2004/11.

- (b) To provide guidance on how to deal with technologies for adaptation to climate change as opposed to technologies to address climate vulnerability, in order to meet Convention and financing criteria;
- (c) To better quantify adaptation costs and integrate them into development plans: capture broader benefits of adaptation actions by considering the adaptation opportunity costs<sup>14</sup> in cost–benefit analysis for adaptation projects; and develop methodologies and indicators to measure success;
- (d) To maximize the use of resources by making projects marketable and by a better coordination between the priorities and policies of the international funding and implementing agencies and countries' needs;
- (e) To consider financing the technology within the sustainable development and adaptation context.

63. The engagement of the insurance industry is essential as risk insurance could be a passive option for financing these technologies that redistributes the risks between different actors. Issues to be addressed relating to this option include: how to quantify the risk factors of climate change and take them into account in decision-making; how to consider, in addition to property losses, the more important issue of human losses in developing and developed countries;<sup>15</sup> and how to promote strategic partnerships with professional organizations in this field. The public sector involvement is also important, particularly in areas of extreme high risk. Two workshops on insurance have been conducted under the Convention, and issues raised there are relevant in this context.<sup>16</sup>

64. The dialogue with the financial community and other private sector representatives on issues relating to funding technologies for adaptation should continue at the follow-up workshop on innovative options for financing technology transfer to be held in Bonn, Germany, in October 2005.

65. Much attention has been focused in recent years on the barriers facing the transfer of mitigation technologies that can be integrated in sustainable development strategies. These include limited financing, limited institutional capacity, legal complexity, and the need for community involvement. Each of these applies to some extent to technologies for adaptation. In addition, the transfer of these technologies faces other barriers that include additional institutional complexity associated with an expanded stakeholder community and the present limited funding opportunities.

#### 4. Access to information on technologies for adaptation and a raising awareness

66. A successful transfer of technologies for adaptation depends on: access to reliable, up-to-date and useful information on technologies available in Annex I countries as well as endogenous technologies; efficient information sharing between all stakeholders; and the capacity of developing countries to use this information.

67. Measures that may contribute to information dissemination include: sharing information on countries' experiences about success stories and maladaptation; post-evaluation on the effectiveness of technologies for adaptation and how they improved resilience to climate change; and development of a common template to facilitate gathering of standardized information on various technologies for adaptation and enhance south–south information sharing on endogenous technologies.

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<sup>14</sup> What we stand to lose if we do not act in a preventative manner, i.e. cost of inaction or business as usual.

<sup>15</sup> It was noted that that human losses in disasters would decrease as a result of better early warning and evacuation systems.

<sup>16</sup> FCCC/SBI/2003/11.

68. A compendium/guide on technologies for adaptation may be necessary to further promote dissemination of information on these technologies. The compendium/guide could include, in addition to a list of technologies, background information on the development of these technologies, experience in their application, and best practices. Once available, the compendium could be distributed widely in hard copy, on CD-ROM and on the Internet.

69. The organization of a technology fair was suggested as another important platform for dissemination information on technologies for adaptation, where the private sector could be invited to demonstrate new technologies and meet country representatives.

70. Additional outreach efforts are needed to increase awareness with business, decision makers and society on climate change issues relating to technologies for adaptation. Information dissemination should target particularly farmers and local communities (e.g., information on identification and assessment of appropriate technology to enhance their capacity to capture and use endogenous technologies), the media and politicians.

#### 5. Synergy within the Convention and other MEAs

71. The ongoing cooperation and information sharing between the expert groups established under the Convention has proven to be very useful and should be strengthened. Concrete actions identified at the seminar include: promoting synergy between the work programmes of the groups; holding coordination meetings of the chairs of three expert groups (EGTT, CGE and LEG); and inviting representatives of the other groups to workshops and seminar organized by the EGTT. Possible areas for collaboration include work relating to TNAs and NAPAs and to TT:CLEAR and the database on local coping strategies.

72. The programme of work on adaptation is another important activity that should take advantage of work done on technologies for adaptation to climate change. This programme should avoid developing a completely parallel process to address issues relating to these technologies. The EGTT could contribute directly to the programme of work on adaptation in the area of technologies for adaptation and in related subject areas. The following areas of work on technologies for adaptation were identified for possible consideration by the programme of work on adaptation:

- (a) Promoting awareness raising and information sharing on transfer of technologies for adaptation and know-how and on technology cooperation initiatives that are vital for successful design and implementation of adaptation projects and programmes
- (b) Encouraging research and development of technologies for adaptation, including on their long-term goals and costs
- (c) Promoting deployment and diffusion of endogenous technologies that are already available in many developing countries
- (d) Further understanding the cross-cutting nature of mitigation and adaptation technologies and to what extent they can be considered as complementary activities<sup>17</sup>
- (e) Ensuring that efforts aimed at addressing technologies for adaptation contribute to meeting sustainable development objectives
- (f) Conventional and innovative financing of development, deployment, diffusion and transfer of technologies for adaptation, including capacity-building related activities.

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<sup>17</sup> Some participants said synergies between mitigation and adaptation are important, while others said that coordination rather than synergies were important.

73. Although the theme of the programme of work on adaptation on adaptation planning, measures and actions is the main place to address technologies for adaptation, technology components could be considered and actions could be identified also in its other main themes. Different options are considered for addressing adaptation issues in the programme of work on adaptation such as by vulnerable sectors (e.g., agriculture, water, human, health) or by major hazards (e.g., droughts, floods). In this connection, it was noted that a sectoral approach was used already for identifying and evaluating technologies for adaptation to climate change.

74. Outside the Convention process, collaboration should be pursued with relevant work of other MEAs. To this end activities discussed included: inviting representatives from other conventions to take part in adaptation discussions; identifying areas or fields where maximum synergy can be achieved; exploring ways to cooperate in respect of the technological requirements of the various related conventions; and addressing structural barriers to promote synergies.

75. Three actions were identified to facilitate bringing the various facets of technology transfer for adaptation together into a coherent strategy by collaboration with ongoing efforts:

- (a) A **systematic synthesis** of the types of technology for adaptation priorities emerging from numerous initiatives, projects, and/or strategies already proposed or in effect and which can meet multiple objectives, including climate adaptation, would be helpful in structuring an approach for matching funding with projects that are able to satisfy multiple objectives
- (b) **Networking**: it would be helpful for networks to be established to facilitate a structured exchange of information regarding various initiatives. The pilot network of technology centres could enhance communication across the various MEAs and development assistance programmes, and could help to facilitate the emergence of key lessons, insights and complementarities
- (c) **Innovative financing**: as has been the case with mitigation, it will be necessary to explore innovative financing mechanisms that can promote, facilitate and support increased investment in technologies for adaptation.

#### IV. Issues for further consideration

76. From the discussions during the seminar plenary sessions and the working groups, and the final round-table discussion, several issues emerged for further consideration and are presented below, without any order of priority:

- (a) **Technology needs assessments**: TNA remains an essential component of the work on technology transfer that reflects the concept of a country driven approach to this process. As identification of needs is a continuous process, actions to strengthen the support provided for conducting TNAs and to enhance reporting of their outcomes could be considered
- (b) **Technical paper on technologies for adaptation**: the secretariat background paper prepared for the seminar could serve as a useful starting point for a more comprehensive technical paper on the development and transfer of environmentally sound technologies for adaptation to climate change. This paper, in addressing specific elements for technologies for adaptation, could build upon the previous technical papers of the secretariat on adaptation technologies, technology information, enabling environments and capacity-building, and the forthcoming paper on innovative financing

- (c) **Technologies for adaptation:** further work is needed to address issues relating to cross-sectoral implications of these technologies, to how to deal with these technologies as opposed to technologies to address climate vulnerability, and to how to strengthen the work on specific activities for these technologies such as information development, awareness raising, planning, design, implementation and monitoring
- (d) **Endogenous technologies for adaptation:** it was noted that many local technologies for adaptation to climate change are available in developing countries. The issue is therefore on how to promote their deployment and diffusion and, in many cases, this relates to the scarcity of financial resources
- (e) **Financing:** further work is needed to enhance the prospects for financing these technologies, including on better defining and preparing adaptation projects and on engaging the insurance industry. These aspects could be addressed at the follow-up workshop on innovative options for financing technology transfer
- (f) A **compendium/guide** on technologies for adaptation may be necessary to further promote dissemination of information on these technologies.<sup>18</sup> Additional outreach efforts are needed to increase awareness and reach all stakeholders, including farmers and local communities
- (g) **Links with other processes:** The EGTT could contribute directly to the programme of work on adaptation in the area of technologies for adaptation and in related subject areas. Possible areas of work on technologies for adaptation should be further discussed
- (h) **Mitigation and adaptation:** further understanding of the cross-cutting nature of mitigation and adaptation technologies and to what extent they can be considered as complementary activities is recommended.

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<sup>18</sup> Most participants agreed that information on adaptation technologies is useful, but some questioned the need for a compendium/guide.