



UNITED
NATIONS



**Framework Convention
on Climate Change**

Distr.
GENERAL

FCCC/CP/2007/4/Add.1
19 November 2007

Original: ENGLISH

CONFERENCE OF THE PARTIES
Thirteenth session
Bali, 3–14 December 2007

Item 4 of the provisional agenda
Report of the co-facilitators of the dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention

Report on the dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention

Note by the co-facilitators*

Addendum

Summary

The Conference of the Parties (COP), by decision 1/CP.11, resolved to engage in a dialogue, without prejudice to any future negotiations, commitments, process, framework or mandate under the Convention, to exchange experiences and analyse strategic approaches for long-term cooperative action to address climate change.

In response to this request by the COP, the secretariat organized four workshops under the dialogue in 2006 and 2007. The dialogue was facilitated by two co-facilitators, Mr. Howard Bamsey (Australia) and Ms. Sandea De Wet (South Africa).

The COP requested the co-facilitators to report on the dialogue and on the information and diversity of views presented by Parties to the twelfth and thirteenth sessions of the COP. This document is the second part of the final report of the co-facilitators on the discussions in the dialogue. It contains information regarding the organization of the workshops and descriptions of the information and diversity of views presented during the dialogue. It also contains information provided by participants on overarching and cross-cutting issues.

* This document was submitted late because there was insufficient time to finalize it between the fourth workshop under the Dialogue and the documents submission deadline.

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I. Introduction

1. The report on the dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention (the Dialogue) consists of two parts. The first part (FCCC/CP/2007/4) contains the observations of the co-facilitators of the Dialogue on the discussion on building blocks and approaches and how they might be integrated to form an effective global response to climate change. It also includes comments on options for Parties in considering how to proceed with their deliberations beyond the thirteenth session of the Conference of the Parties (COP).

2. This document presents the second part of the report. It contains information regarding the organization of workshops convened under the Dialogue and a descriptive account of the information provided and the views expressed. This had by necessity to be done in an abridged and simplified manner and best efforts have been made to do this in a balanced way. Views recorded are intended to be as expressed by presenters, participants and observers. Fuller insights can be gained by consulting Dialogue working papers, electronic versions of presentations and web-casts of the actual exchange.¹ No attempt has been made to synthesise issues or provide observations on interrelationships among them.

3. The document is structured according to the four themes of the Dialogue, that is:

- (a) Advancing development goals in a sustainable way;
- (b) Addressing action on adaptation;
- (c) Realizing the full potential of technology;
- (d) Realizing the full potential of market-based opportunities.

4. Other information presented in this document includes views from Parties on overarching and cross-cutting issues, such as on the economics of climate change and finance issues.

II. Organization of workshops under the dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention

5. At its eleventh session, the COP decided that the Dialogue would be conducted under its guidance and would take place in up to four workshops, open to all Parties, to be organized by the secretariat (decision 1/CP.11). In response to this mandate, the secretariat organized four workshops during 2006 and 2007. The timing, place and theme of each workshop are outlined in the table below.

6. All Dialogue workshops were attended by representatives from Parties and observer organizations. At the first one, participants had an initial discussion on the four themes of the Dialogue mentioned in paragraph 2 above and initiated analysis of strategic approaches to address climate change. At the second and third workshops, the discussions focused on concrete actions on the four Dialogue themes, as well as on effective and appropriate national and international responses to climate change. The fourth workshop provided an opportunity for an exchange of views on the building blocks of an effective response to climate change, overarching and cross-cutting issues, including financing, and on proposals for further actions, activities and approaches.

¹ <<http://unfccc.int/meetings/dialogue/items/3668.php>>.

Timing, place and themes of the four workshops under the dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention

Timing, place	Themes
First workshop (15–16 May 2006, Bonn, Germany)	<p>(a) Exchange of experiences and analysis of strategic approaches for long-term cooperative action to address climate change in the four thematic areas:</p> <ul style="list-style-type: none"> - Advancing development goals in a sustainable way - Addressing action on adaptation - Realizing the full potential of technology - Realizing the full potential of market-based opportunities <p>(b) Exchange of views, information and ideas on actions, activities and approaches that would:</p> <ul style="list-style-type: none"> - Enable Parties to continue to develop effective and appropriate national and international responses to climate change - Promote research, development and deployment of, as well as investment in, cleaner technologies and infrastructure - Support, and provide the enabling conditions for, voluntary actions by developing countries to mitigate and adapt to climate change - Promote access by developing countries to cleaner and climate-friendly technologies and technologies for adaptation through the creation of enabling environments, concrete actions and programme
Second workshop (15–16 November 2006, Nairobi, Kenya)	<p>(a) Advancing development goals in a sustainable way</p> <p>(b) Realizing the full potential of market-based opportunities</p> <p>(c) Concrete actions that would:</p> <ul style="list-style-type: none"> - Enable Parties to continue to develop effective and appropriate national and international responses to climate change - Support, and provide the enabling conditions for, further actions to address climate change in the context of sustainable development - Capture the full potential of market-based opportunities
Third workshop (16–17 May 2007, Bonn, Germany)	<p>(a) Addressing action on adaptation</p> <p>(b) Realizing the full potential of technology</p> <p>(c) Concrete actions that would:</p> <ul style="list-style-type: none"> - Support and enable countries, in particular developing countries, to manage and adapt to climate change - Promote research, development and deployment of, as well as investment in, cleaner technologies and infrastructure - Promote access by developing countries to cleaner and climate-friendly technologies and technologies for adaptation
Fourth workshop (27–29 August 2007, Vienna, Austria)	<p>(a) Overarching and cross-cutting issues, including financing</p> <p>(b) Proposals for further actions, activities and approaches</p>

7. Some participants provided their views and ideas in writing and the secretariat made them available as working papers. A total of 37 working papers were made available. Government experts and representatives of businesses, observer non-governmental organizations (NGOs), United Nations bodies and initiatives outside the UNFCCC process were given the opportunity to share their views and experiences through presentations and targeted interventions. The agendas of the workshops, notes by the co-facilitators of the Dialogue, working papers with views of Parties, presentations delivered during each workshop and other relevant information are available from the UNFCCC website.

8. The COP had agreed that the Dialogue would be informed by the best available scientific, technical, social and economic information. In fulfilment of this mandate, targeted presentations were arranged. Specifically, the findings of the Stern Review on the economics of climate change² and key findings of the working group contributions to the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change were presented during the second and third workshop, respectively.

9. The Dialogue offered a unique opportunity for building confidence among governments through an informal and open exchange of experiences unconstrained by any formal negotiating process. Its informal nature provided the setting for exciting, interesting and open discussions, which covered a broad range of issues that need to be addressed as strategic approaches to climate change are developed.

10. All participants provided high-quality information and contributed actively to the discussions. Governments followed up on various ideas presented during the Dialogue by developing their thinking further through submissions and presentations. The business and NGO communities took a very keen interest in the Dialogue process and prepared thoughtful inputs.

III. Advancing development goals in a sustainable way

11. Several participants stated that climate change is already happening and its impacts are visible all around the world. It was mentioned that the Arctic region is being affected by climate change and an increased rate of melting of the Greenland ice cap is currently being observed. Others referred to Africa, which is already suffering from climate variability and change resulting in dwindling food resources, water stress and negative implications for hydropower generation, acceleration of desertification, negative implications for tourism and national parks, deterioration of human health owing to increased cases of malaria and HIV/AIDS, and increasing conflicts over resources. One participant indicated that the combined effects of increased drought and climate change could remobilize the Kalahari dune fields and transform that system into a mobile, wind-blown state, with serious consequences for local livelihoods. Participants from several small island developing States (SIDS) outlined some of the challenges associated with increasing intensity of hurricanes and more frequent droughts as well as sea level rise, which has forced, in some cases, the relocation of communities and villages.

12. There is a strong realization that climate change undermines sustainable development in various parts of the world. Development was identified by all participants as an overriding priority and as the point of departure for any future response to climate change. It was recognized that for climate change action to be effective it needs to be addressed in the context of sustainable development, giving priority to synergetic actions that could yield benefits both in the long term and in the short term as well as on a local and a global scale. In this context, it was pointed out that implementation of mitigation and adaptation activities needs to be fully consistent with efforts to pursue development aspirations and with sustainable growth paths. Technology and market-based opportunities could help decouple economic development and emission growth. Two examples of challenges and opportunities in responding to climate change and addressing sustainable development objectives in developing countries are given in box 1.

13. For developing countries, particularly the smallest, least developed and most vulnerable, concrete and effective international cooperation (especially on key development goals, such as food security and access to energy) is needed to realize their sustainable development objectives. Some participants stated that concerted efforts at the international policy level should involve closer cooperation between international organizations and United Nations bodies and conventions, including, for example, the three Rio Conventions (the UNFCCC, the Convention on Biological Diversity and the

² Stern N. 2007. *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.

United Nations Convention to Combat Desertification). Several participants called for the enhancement of bilateral cooperation and initiatives, including public–private partnerships, to ensure that financial resources become available to those countries that need them most.

14. Various approaches to achieving sustainable development were suggested, including developing a work programme on sustainable development; promoting the development and implementation of sustainable development policies and measures (SD-PAMs); integrating sustainable lifestyle and consumption patterns; focusing on actions with multiple benefits, such as energy security, pollution abatement, economic development and poverty reduction; and developing educational programmes on sustainable development and climate change.

Box 1. Responding to climate change and addressing sustainable development objectives in developing countries: the examples of China and Grenada

Some of the key challenges that China is facing include significant temperature differences between seasons and between different regions within the country; increasing economic losses caused by weather-related extreme events; large population and high employment pressure; low level of economic development; and a coal-dominated energy mix. China's efforts to mitigate climate change include: formulating and implementing a sustainable development strategy; adopting a series of policies and measures favourable to climate change mitigation; improving energy efficiency and energy conservation; developing low carbon energy and renewable energy; improving the country's energy structure; and carrying out reforestation programmes.

One of the principles guiding China's policies and measures in climate change mitigation was addressing climate change within the framework of sustainable development. The main targets of sustainable development in China for the eleventh Five-Year Plan are: an energy intensity drop by around 20 per cent; a drop in emissions from all main pollutants by 10 per cent; and an increase in forest coverage of 20 per cent. China is planning the promotion of key energy conservation projects and making efforts in other areas, including the development of hydropower together with ecological protection; the promotion of nuclear power; the optimization of thermal power; the promotion of coal-bed methane utilization; the promotion of bio-energy; the development and use of wind, solar, geothermal and tidal power, the control of greenhouse gas (GHG) emissions from the agriculture sector; and the strengthening of carbon sinks.

Grenada is one of the smallest countries of the world. It has a high poverty rate, a high dependence on tourism and agriculture and high external debt. Its economy is highly susceptible to external shocks, such as the 11 September 2001 terrorist attacks, which led to a decline in tourism, or extreme weather events such as Hurricane Ivan in 2004.

Grenada is vulnerable to the impacts of climate change, including increases in the frequency of hurricanes, sea level rise, higher temperatures affecting crop yields, rain-fed water supply shortages in the dry season and more incidences of dengue fever. Recent impact studies have shown that a rise in sea level of 1 m would result in damaging or destroying 80 per cent of Grenada's main tourism infrastructure. A retreat of infrastructure is not an option for Grenada since its relief consists of a very narrow coastal plain and steep slopes.

GHG emissions from Grenada are low; nevertheless the country has assumed responsibility for reducing these emissions. Implementation of national efforts has been slow, however, because of the lack of necessary resources. Grenada is too small to attract clean development mechanism projects, there is limited access to alternative financing and there are difficulties in obtaining the necessary technologies. Grenada has received support from many countries to help alleviate the impacts of Hurricane Ivan, although more pledges have been made than actual contributions.

A. Sustainable development policies and measures

15. A proposal was put forward by South Africa³ regarding the implementation of SD-PAMs that would effectively capture the potential of reducing greenhouse gas (GHG) emissions in developing countries. In the context of multilateral negotiations under the Convention, SD-PAMs would result in greater recognition of action taken by developing countries.

16. SD-PAMs would build on existing commitments of developing countries under the Convention, particularly those under Article 4.1 (b), which requires all Parties to formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all GHGs. They would also be consistent with Article 10 of the Protocol, which reaffirms existing Convention commitments and aims to advance the implementation of these commitments in order to achieve sustainable development.

17. According to the proposal, SD-PAMs would aim at stimulating action on climate change in developing countries and would fit into a general approach of initiating action and then correcting course based on lessons learned and experience gained. A key incentive for developing countries would be the co-benefit of more sustainable local development. Changing development paths is a meaningful contribution to mitigating climate change and SD-PAMs can be an important element in a transition to an equitable and adequate climate regime. However, on their own, SD-PAMs will not be enough to solve the climate challenge and would need to be implemented together with other strategic approaches.

18. Implementing SD-PAMs in the context of the Convention would require several issues to be addressed. These would include: defining what would qualify as an SD-PAM under the UNFCCC; designing an appropriate process to pledge SD-PAMs (for example, through a list of countries in an annex or a register of pledged policies and programmes); developing methodologies to quantify both local sustainable development benefits and global synergetic co-benefits; establishing appropriate metric(s) to compare the climate co-benefits of SD-PAMs with those of other approaches; and developing accounting, reporting and review procedures or mechanisms.

19. Successful implementation of SD-PAMs depends on the availability of domestic and international funding from both climate and non-climate related sources. Given that SD-PAMs would promote local development, it would be expected that domestic investment be mobilized. At the same time, developing countries would be eligible for access to funding from international sources for adaptation and mitigation. Efforts at the national level would need to ensure the involvement of a broad range of stakeholders in the development and implementation of SD-PAMs.

B. Reducing emissions from deforestation

20. Reducing emissions from deforestation (a significant contributor to GHG emissions according to the AR4) was frequently cited as an area of particular importance to an effective response to climate change. This issue is currently being addressed under the UNFCCC process,⁴ where the discussions have focused on options for establishing an arrangement, under the Convention, to provide positive incentives to developing countries in order to reduce emissions from deforestation. Such incentives could include

³ See Dialogue working paper 18 (2006) at <<http://unfccc.int/meetings/dialogue/items/3759.php>>.

⁴ Reducing emissions from deforestation in developing countries was introduced into the agenda of the Conference of the Parties at its eleventh session at the request of Papua New Guinea and Costa Rica. This request was also supported by eight other Parties.

the provision of new and additional financial resources, technology transfer and means for capacity-building and enhancement of endogenous capacities.

21. During the Dialogue, Brazil presented a proposal on this issue.⁵ Its main objective is the development of an arrangement under the UNFCCC process aimed at providing positive incentives for the voluntary reduction of emissions from deforestation in developing countries in relation to a national reference emission rate. Such a reference rate would be established (and periodically updated) taking into account average rates of deforestation during a specific time period and considering a mean carbon stock in biomass per unit area and for specific biome or vegetation type.

22. This system of positive incentives would be based on a transparent, consistent and science-based methodology. Developed countries, taking into account their obligations under the Convention, would provide new and additional resources to developing countries, which, in turn, would be required to demonstrate real emissions reductions.

IV. Addressing action on adaptation

23. Adaptation to the adverse impacts of climate change emerged as a key priority in the global efforts to address climate change. Referring to findings of the AR4, several participants supported the view that, irrespective of global mitigation efforts, adaptation to climate change is, and will continue to be in the future, important for all countries. Developing countries are particularly vulnerable, especially the least developed countries (LDCs) and SIDS. At the same time, these are the countries that have contributed the least to the problem. For the most vulnerable communities, climate change impacts pose a direct threat to survival, either through the devastating effects of sudden onset events on human settlements and infrastructure or through longer-term impacts on sectors essential for their livelihood. Such sectors typically include coastal zones, water resources, agriculture and food security, and human health.

24. Although some adaptation measures are already being put in place to address current and expected changes, several participants stated that there is a host of risks that will require further adaptation planning and measures. It was recognized that adaptive capacity varies across and within societies and countries and substantial limits and barriers to adaptation still remain, even in developed countries, as exemplified by the European heat wave of 2003. Some participants warned that a focus on mitigation and burden sharing might distract from the effort to adapt, which is of critical importance to most LDCs. One participant advocated that action to address both mitigation and adaptation might have a lower net effect than separate policies in each area.

25. Several participants expressed the view that rigorous assessment and prioritization of adaptation needs could help to close the knowledge gap on the needs associated with adaptation and to avoid maladaptation. Such assessment could help countries to develop both their information base and the policies and tools necessary for identifying the sectors most affected and the appropriate national or even sub-national adaptation actions. Participants highlighted that traditional knowledge can complement scientific sources of knowledge and can be integrated and used more broadly in vulnerability and adaptation assessments. Although some uncertainties associated with the modelling and assessment process remain, most participants stressed that sufficient information is available for the immediate initiation of concrete action on adaptation.

26. There was strong recognition that adaptation does not happen in isolation and needs to be considered within the broader context of sustainable development. Discussions on how responses to adverse impacts of climate change could best be integrated with national sustainable development plans

⁵ See Dialogue working paper 21 (2006) at <<http://unfccc.int/meetings/dialogue/items/3759.php>>.

pointed to policy priorities such as poverty alleviation, national security, education, health, water resources and food security. It was stated that, at the national level, governments would need to provide enabling environments to ensure that all stakeholders are involved, through participatory approaches in adaptation planning and implementation, and that development policies are formulated with due consideration of climate change. Examples of adaptation activities that can reduce vulnerabilities to climate change and increase resilience include indirect efforts such as the conservation of mangroves and corals, and the reduction of non-climatic stresses such as land based pollution.

27. The integration process could be accomplished through different approaches. For example, some participants favoured a holistic approach, in which adaptation is part of a wider development process, while others saw benefits in pursuing stand-alone adaptation if, for example, sectoral adaptation strategies were to be adopted.

Box 2. Links between mitigation and adaptation based on findings in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Effective climate policy aimed at reducing the risks of climate change to natural and human systems involves a portfolio of diverse adaptation and mitigation actions. Even the most stringent mitigation efforts cannot prevent impacts of climate change being felt in the next few decades, which makes adaptation unavoidable. However, without mitigation, a level of climate change is likely to be reached that makes adaptation impossible for some natural systems, while for most human systems it would involve high social and economic costs.

Creating synergies between adaptation and mitigation can increase the cost-effectiveness of actions and make them more attractive to stakeholders, including potential funding agencies. Analysis of the inter-relationships between adaptation and mitigation may reveal ways to promote the effective implementation of adaptation and mitigation actions together. Opportunities for synergies are greater in some sectors (e.g. agriculture and forestry, buildings and urban infrastructure) than others (e.g. coastal systems, energy and health).

It is not yet possible to answer the question of whether investment in adaptation would buy time for mitigation. Specific adaptation and mitigation options operate on different spatial, temporal and institutional scales and involve different actors with different interests, beliefs, value systems and property rights. Deciding on an ‘optimal mix’ of adaptation and mitigation would require the careful consideration of potential impacts on the welfare of people around the world.

People’s capacities to adapt and to mitigate are driven by similar factors. Enhancing the capacity of a society to respond through the pursuit of sustainable development is one way of promoting both adaptation and mitigation. This would facilitate the effective implementation of both options, as well as their mainstreaming into sectoral planning and development.

28. Some participants were of the view that currently there are no arrangements that offer incentives or credits for activities exclusively dedicated to adaptation to climate change or disincentives for maladaptation, in contrast to existing regulatory and fiscal incentives for mitigation. Concerns were expressed regarding the insufficiency of resources available to support adaptation activities. Several participants mentioned specifically the three sources of funding currently available that are operated through the Global Environment Facility (GEF): the GEF Trust Fund and its strategic priority “Piloting an Operational Approach to Adaptation”; the Special Climate Change Fund; and the Least Developed Countries Fund.

29. It was broadly recognized that there is little experience in using market-based mechanisms to promote adaptation. Some participants referred to the Adaptation Fund under the Kyoto Protocol as an

example of an instrument relating to carbon finance and expressed the view that, for the first commitment period, it is not likely that the fund will result in the implementation of many adaptation projects.

Box 3. Addressing action on adaptation: perspectives of three developing countries

India has adopted policy decisions that enhance the adaptive capacity of the most vulnerable sectors and population groups in the country. These efforts, however, are primarily driven by the objectives of promoting sustainable livelihoods and alleviating poverty rather than adapting to climate change. The overriding concern of providing food for over 1 billion people and concern about the adverse climatic conditions that could have catastrophic impacts on food security mean that agriculture is the number one priority sector for India. Other areas of concern include water resources; coastal regions; health and sanitation; forestry; and disaster risk management.

Seven major components of adaptation have been identified: crop improvement and research; drought-proofing and flood control; health improvement and prevention of disease; risk financing; disaster management; forest conservation; and poverty alleviation and livelihood preservation. Under each of these components a number of schemes have been identified for adaptation purposes. Based on its data, India has concluded that even though considerable resources from the national budget are spent on adaptation, new resources are necessary to implement all necessary measures. New resources could come from the carbon market. Diversion of official development assistance (ODA) is not an option since development is seen as the best form of adaptation.

Despite current efforts in **South Africa**, adaptation has not been successfully integrated in national planning and practices. To increase awareness of adaptation and to support implementation, South Africa proposed the creation of an Adaptation Committee of Experts under the Convention.

According to South Africa, a new conceptual framework for adaptation is needed. Such a framework would include two types of adaptation – resilience (bounce back) and acclimation (adjusting to the changing environment) – which have different timescales and costs. Successful support for adaptation actions would require additional financial resources, including financing of Stage III activities, i.e. measures to facilitate adequate adaptation, including insurance, through the Global Environment Facility (GEF), and innovative sources, such as market-based mechanisms, introducing a levy to joint implementation and emissions trading; voluntary contributions to Adaptation Fund; Air Travel Adaptation Levy; or insurance-based incentives.

The vulnerability of **China** to climate change is partly due to the fact that the majority of its population and economic infrastructure located along its 18,000 km-long coastline or its rivers and lakes. Over the last few years, communities have suffered increasingly from flooding and droughts, which have resulted in losses of billions of United States Dollars to Gross National Product.

According to China, adaptation pilot projects could be undertaken until international adaptation policy emerges, which could be funded through multilateral funds such as the funds of the GEF, the Adaptation Fund or even bilateral ODA. Experience thus far has shown the necessity of practical research, experiments on impacts on key sectors and pilot studies on integrating climate impacts into long-term development planning. China emphasized that capacity-building for adaptation is a prerequisite of taking further adaptation actions and called for assistance to be provided by developed countries.

30. Several participants, while recognizing the importance of national action, called for international and regional cooperation on adaptation. They expressed the view that such cooperation could enhance the availability of funding, human resources, expertise and scientific and technical support. Examples of cooperative programmes between developed and developing countries that were mentioned during the Dialogue include a pilot study on integrating adaptation into a long-term development plan in Ningxia Province (cooperation between China and the United Kingdom of Great Britain and Northern Ireland), and adaptation activities in the areas of agriculture and water resources through the Iberoamerican Programme of Evaluation of Impacts, Vulnerability and Adaptation to Climate Change (PIACC), which is part of the Iberoamerican Network for Climate Change Offices (RIOCC).

31. Some participants referred to the efforts of international and intergovernmental organizations, which are increasingly undertaking work on climate change impacts, vulnerability and adaptation. These activities vary considerably in scope and magnitude; some focus entirely on the issues relating to vulnerability and adaptation, whereas others include these issues as a component of a broader effort. In terms of magnitude, some are programmes that include several major multi-country initiatives in various regions of the world. Some participants mentioned specific initiatives such as the National Communications Support Programme of the GEF, UNDP and UNEP and the World Bank project on mainstreaming adaptation to climate change in the Caribbean region, which provide support for multiple countries.

32. It was often mentioned that international support for adaptation in developing countries is almost exclusively provided through voluntary funding, whether through bilateral or multilateral channels. It was stated that, according to the AR4, future climate change impacts will result in a need for adaptation funding of a much higher level compared with current levels of voluntary funding. It was emphasized that achieving sustainability, sufficiency and predictability of both national and international long-term support for adaptation action is the main challenge in implementing adaptation measures in the future.

33. Some participants advocated that additional support be provided through insurance, reinsurance and other risk-sharing mechanisms. Access to insurance, however, varies around the world. It was proposed that, in the future, insurance-based funding need not be based on traditional insurance, but could be developed through innovative mechanisms and other financial instruments. Furthermore, public-private partnerships could augment the involvement of private insurance related instruments in any future adaptation regime. However, one participant warned that although insurance schemes can trigger adaptation measures, there is a need to ensure that they do not trigger maladaptation.

34. The role of technology and the mechanisms that ensure sectors and communities can access it was identified as a key issue by a number of participants. It was argued that existing adaptation technologies, including early warning systems, have proven to be effective in reducing vulnerability to weather-related hazards. Relying on existing technologies would, to some extent, contribute to successful adaptation by assisting sectors and communities in coping with climate variability. Some participants, however, mentioned that using existing technologies alone would not be sufficient and that the development of new ones would be necessary.

35. Supporting countries (especially developing ones) in meeting their adaptation needs and sustainable development goals will require additional efforts in capacity-building. Capacity-building activities mentioned during the Dialogue include: creation of national and regional networks and communities of practitioners; dissemination and application of assessment tools at the national and regional levels; and ongoing training programmes. Some participants outlined the need for new institutional arrangements to facilitate information exchange, planning, implementation and monitoring of adaptation. It was suggested that implementation of capacity-building activities would involve relevant United Nations bodies, international organizations and other stakeholders.

36. Another element that was mentioned as having the potential to enhance adaptation efforts is the systematic sharing of information on, knowledge of and experience in adaptation. This could facilitate the identification of good practices and the transfer of knowledge across communities. Such efforts could also help to identify opportunities for regional collaboration in the assessment of vulnerability and adaptation as well as in activities to reduce vulnerability. Several participants expressed the view that the Nairobi work programme on impacts, vulnerability and adaptation to climate change could serve as a means towards such transfer of knowledge.

V. Realizing the full potential of technology

37. The deployment, diffusion and transfer of existing climate-friendly technologies as well as the development of new and more efficient technologies were identified as key parameters for the evolution of less carbon-intensive economies.

38. Several participants referred to the findings of the AR4 and the work of the International Energy Agency (IEA) on energy technologies (see box 4), which address a wide range of technologies and their mitigation potential for all economic sectors and for different regions. Examples of technological solutions for the reduction of GHG emissions that were mentioned during the Dialogue include: improved efficiency in the generation and distribution of electricity; fuel switching; renewable energy technologies; carbon capture and storage (CCS); cleaner vehicles and engines; more efficient lightning and electrical equipment; improvements in the insulation and ventilation of buildings.

Box 4. Energy technology perspectives of the International Energy Agency

According to the International Energy Agency (IEA), most of the world's energy needs are directly connected with material production (e.g. aluminium, steel, chemical feedstock, cement and paper) and emission reductions are mainly associated with efficiency improvements in the power generation and end-use energy sectors.

The present policies that would result in technological solutions in the energy sector are not sufficient to create a sustainable energy future. A portfolio of cleaner and more efficient technologies will be required in the future and, in this respect, collaboration between developing and developed countries will be essential. According to IEA:

- (a) End-use energy efficiency is a top priority given that improved energy efficiency on a global scale could result in a reduction of about 15,000 MtCO₂ by 2050. About 45 per cent of the potential reduction lies in the end-use energy efficiency sector, using technologies that are commercially available today. Implementation of cost-effective measures such as information dissemination and labelling for household appliances would need to be explored further;
- (b) By 2050 more than 5,000 TWh of electricity globally could be produced by coal plants equipped with carbon capture and storage (CCS) and thus there is an urgent need for more research and development on CCS, as well as for full-scale CCS demonstration plants. Power generation from renewable energy sources could quadruple by 2050 (compared with current levels) and nuclear energy could gain a more important role in countries, where it is acceptable;
- (c) Urgent action is required in the transportation sector, which is projected to continue to grow over the next 30–40 years. This would include reconsidering the role of biofuels in the global energy mix and the introduction of policies and regulations in order to improve efficiency of road vehicles through, for example, more use of plug-in hybrid cars and electric vehicles.

39. Some participants mentioned that, given the importance of coal to the global energy system, strong financial support is needed for clean coal technology projects, including through additional investments from the private sector. Current funding programmes provide support for: reducing emissions from energy supply, energy end use and infrastructure; CCS projects; measuring and monitoring emissions; and bolstering scientific research. Hydrogen fuel initiatives have led to a series of demonstration projects. Some participants referred to their biofuel initiatives, which include production of ethanol from agricultural products such as corn in the United States of America and sugar cane in Brazil.

40. It was broadly recognized, however, that none of the above-mentioned technologies alone could provide all of the emission reductions needed to achieve stabilization of GHGs in the atmosphere. Instead, a portfolio of mitigation technological solutions and measures will be required. Some of these technologies are currently on the market and have significant mitigation potential in the short- and medium-term, while others are at a demonstration stage. In addition, over the next 30–40 years, new technologies are expected to become available and to contribute to addressing the climate change challenge.

41. Energy efficiency and renewable energy technologies as well as adaptation technologies were recognized as key for both adaptation and mitigation, for sustainable development and for self-sufficiency of economies. It was also highlighted that using existing clean technologies can result in ancillary benefits such as improvements in energy access and security, in human health and employment and in air quality.

42. One sector that was specifically mentioned is the building sector, which currently accounts for a large portion of direct and indirect global GHG emissions. Efficient technologies in this sector cover a broad range of technological solutions, including insulated windows, walls, roofs and floors, and efficient electrical appliances. Policies that can be effective in driving investment in such technologies include improved building codes for new construction and energy efficiency portfolio standards.

43. During the Dialogue, some SIDS mentioned that they have decided to become 100 per cent reliable on renewable energy provided that their partners and financial institutions make available the necessary funding. Participants from many LDCs expressed the view that more efforts are needed to fulfil their technological needs, including widespread use of available endogenous technologies that could be used immediately. For example, many such countries are already using innovative, locally produced biofuels such as coconut and palm oil. It is thought that there would be substantial value in using endogenous technology to drive small-scale mitigation projects that could be accepted under the clean development mechanism (CDM).

44. Several participants from developing countries stated that increasing demand for energy combined with limited financial resources and low technological capacity would result in development paths in which GHG emissions increase sharply. Many developing countries are currently expanding their infrastructure with low-efficiency technologies. For other developing countries, especially the more industrialized ones, there is the risk of their economic development following a high carbon path owing to the relatively high costs of low carbon technologies. Avoiding any such 'locking-in' effects would be particularly important for energy intensive sectors such as power generation, heating and cooling, industrial production and transportation.

45. Some participants referred to the current efforts under the UNFCCC on development and transfer of technology, making specific references to the work of the Expert Group on Technology Transfer (EGTT). The Co-Chair of the EGTT provided summary information on the work of the EGTT, which aims to facilitate and advance technology transfer activities under the Convention (see box 5).

46. There were different views on what has happened so far on technology transfer. Several participants expressed the view that despite the fact that technology transfer has been discussed within the UNFCCC process for more than 10 years, there has been limited progress on the ground. It was argued that although some developing countries have increased their capacity to deploy or purchase new technology and that technology transfer is already taking place, other developing countries, especially those in Africa, have not so far seen tangible results.

Box 5. Current efforts on technology cooperation under the UNFCCC process

Action on technology cooperation under the UNFCCC has been guided by the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention, which was adopted as part of the Marrakesh Accords (decision 4/CP.7). This framework includes a set of technology transfer activities, grouped under five thematic areas: technology needs and needs assessments; technology information; enabling environments; capacity-building; and mechanisms for technology transfer. The Expert Group on Technology Transfer (EGTT) was established with the objectives of facilitating and advancing technology transfer activities under the Convention and of implementing this framework.

Over the last five years, the EGTT, in collaboration with the Global Environment Facility, the United Nations Development Programme, the United Nations Environment Programme, the Climate Technology Initiative and other international organizations, has carried out actions to implement this framework. The activities of the EGTT have focused on identification of prioritized technology needs of developing countries; enabling environments for technology transfer through the active engagement of public and private sector; promoting innovative options for financing technology transfer; and improving the current knowledge and understanding of technologies for adaptation and assessing their potential and limitations. The EGTT has also explored the role of loans, tax incentives, other financial and fiscal instruments and the issue of intellectual property rights. Other activities include the publication of a practitioner's guide for development of project proposals, information on technologies on adaptation and good practices in conducting technology needs assessments.

47. Some participants noted that technology transfer is not straightforward. They mentioned, for example, that simply transferring blueprints of a given technology is not sufficient, or in some cases even appropriate. Other participants emphasized the need not only to identify specific technology requirements of developing countries but also to focus on those technologies that suit national circumstances, so that they can actually be applied in the country, including by local communities.

48. Differences in the characteristics of various technological solutions call for the identification of particular barriers associated with their penetration of the market (including shortage of financing, lack of social acceptance, insufficient infrastructure, need for capacity-building, intellectual property rights (IPRs) and "protectionism"), and for the development of approaches and implementation of actions that ensure a higher market share for desired technologies.

49. The most frequently mentioned barriers to diffusion and transfer of available technologies, particularly in developing countries, are economic, institutional, information and awareness barriers. International cooperation on regulation, labelling, product standards and public procurement was cited as a tool for encouraging the diffusion of available technologies and promoting energy efficiency, while also strengthening incentives to innovate, improve transparency and promote international trade. On awareness, examples were given of national initiatives, including online software applications that perform technical and financial assessments of projects that aim to increase energy efficiency of households, home appliances and industrial equipment.

50. Incentives will be needed for demonstrating or deploying technologies that will be available over the next 20–30 years, while the availability of new technologies will be determined by investment in research and development (R&D). Specifically for the latter, some participants suggested that public funds and other measures, such as R&D tax credits, could stimulate R&D of technologies that are generally a long way from penetrating the market. It was also mentioned that R&D would need to have a local dimension to ensure that technological solutions will work locally.

51. It was often suggested that IPRs and trade policy have a potential role in realizing the full potential of technologies. In this context, efforts could be made to explore how policy on these two areas can promote the diffusion and transfer of cleaner technologies. Protection of IPRs has been identified as a potential barrier to the transfer of climate-friendly technologies. In contrast, at the national level, lack of protection of IPRs could discourage the diffusion of those technologies. It was recognized that while protection of IPRs is a key requisite for investment in R&D, joint R&D efforts could allow for broader ownership of the developed technologies.

52. The creation of a level playing field was seen as key to mobilizing financial support from the private sector. It was suggested that the UNFCCC process could act as catalyst and provide a framework within which the private and public sectors would be engaged. In this regard, governments in developed and developing countries would have a crucial role in facilitating the development, deployment, diffusion and transfer of technologies through both national and international initiatives.

Box 6. Business perspectives on realizing the full potential of technology

According to the World Business Council for Sustainable Development, decarbonizing the economic growth will be challenging for all countries. The level of effort necessary is large given the need for: more energy efficiency measures; higher penetration of renewable energy sources; faster commercialization of carbon capture and storage; higher efficiency vehicles; and greater use of alternative fuels. The development of new technologies and the rapid deployment of new and existing technologies would need to take into account financial considerations, availability of natural resources, security of supply and environmental concerns. Clean development partnerships and programmes should be established to demonstrate performance of technologies.

The cement industry in Australia is reducing its GHG emissions by using fly ash and slag in the cement production process. Other efforts include participation in the Asia-Pacific Partnership on Clean Development and Climate. Major impediments to emission reduction in the cement industry (particularly in Australia) include an engineering skills shortage and a lack of specialist manufacturing capacity.

The General Electric Company (GE) Ecomagination Initiative aims to develop green products and services. GE expects increased revenues from Ecomagination products, increased investment in R&D (for example on advanced battery technology, waste gasification and advanced photovoltaics) and GHG emission reductions through technology upgrades. GE is focusing its environmental work on four main areas: efficiency; decarbonization of power; decarbonization of fuels; and forests and agriculture. The research work focuses on residential and commercial buildings, reduced vehicle use, efficient vehicles, efficient coal plants, renewable energy sources, CO₂ capture; and alternative fuels.

According to Rio Tinto, carbon capture and storage can be implemented successfully in the coal industry on a global scale and can contribute to sustainable development. In this regard, a policy framework to encourage deployment of coal technologies could be based on an integrated low emission technology strategy that may include a comprehensive suite of policies that would address barriers for energy technologies.

53. Several proposals were made to speed up the process of transfer of environmentally sound technologies to developing countries in the short to medium term, including: agreement under the UNFCCC process on an improved technology development and transfer framework; establishment of a well-resourced technology transfer body; establishment of funds (e.g. a multilateral technology cooperation fund or a venture capital fund); development of a framework for international cooperation, joint R&D and development and targeted capacity-building for developing countries. It was also suggested that, in the long term, a market-based technology transfer and development protocol could be put in place in order to ensure the provision of financial incentives and rewards for investors from the public and private sectors.

54. Regulatory frameworks that incorporate different approaches, such as using policy tools, mobilizing international financial support and promoting information sharing, could be established in order to create the necessary enabling conditions. Such frameworks would need to take into consideration national parameters and circumstances, including building human and institutional capacity, the capacity to absorb technology, receptiveness of the market and the existence (or lack) of infrastructure.

55. The deployment of emerging technologies, which are either in a demonstration phase or are not ready for rapid deployment, could be impeded by high capital costs, lack of competitiveness, trade barriers and undefined property rights. Some participants supported the view that private sector investment, both foreign and domestic, is and will probably remain the primary means of technology deployment and diffusion. Private flows could be directed towards lower GHG technologies through the use of incentives such as capital allowances and depreciation schemes, taxation credits, certificates and tariffs, and GHG reduction incentives. Public funds could be used effectively to leverage large private investments and to create a financial multiplier.

56. Several participants noted that addressing the climate change challenge in the longer term will require continuous improvement in technology through innovation. Given the long time required for R&D for some technologies, more investment in R&D is necessary to ensure their timely availability. While funding at the international level will be an important means of stimulating the deployment of technologies, there are other alternatives such as technology-sharing agreements and partnerships between governments and the private sector to mobilize private expertise and investment, and to provide support for demonstration projects, for the dissemination of best practices and for technologies that require further field testing. Some participants mentioned the Asia-Pacific Partnership on Clean Development and Climate as an example of a partnership that facilitates private sector and government partnership in the development of a low carbon economy.

57. It was often mentioned that ensuring availability of trained personnel is a challenge for most developing countries. Given the fast pace in the development of technology, developing countries in the future will need a large number of researchers, traders, technicians and operators in order to help them realize the full potential of technology.

VI. Realizing the full potential of market-based opportunities

58. Market-based approaches, including the recently established carbon markets and the Kyoto mechanisms, were recognized as tools that provide incentives and stimulate global action to address climate change. Several participants suggested that there is a gap between what is needed and what can be achieved with the existing international financing instruments under the UNFCCC process and the existing funding mechanisms. They also suggested that existing incentives should be scaled up in order to ensure that the necessary global shift to cleaner energy systems takes place. It was also noted that in

order to achieve sustainable development the full potential of technology must be realized, which, in turn, is reliant on realizing the full potential of market-based opportunities.

59. Since their introduction over the last 10 years, carbon markets have been growing continuously. It was pointed out that in 2006 the value of the global carbon market was over USD 30 billion. Volumes of traded allowances in regional emissions trading systems, for example the European Union emissions trading scheme, increased significantly in 2006 compared to previous years, while the market value of all CDM projects in 2006 was estimated at USD 5 billion. To put these numbers into perspective, it was noted that governments, over the last 14 years, have been able to finance USD 3.3 billion with an additional leverage of USD 14.3 billion for climate change related projects under the GEF.

60. Although the discussions during the Dialogue focused on the carbon markets, it was recognized that there exists a variety of market-based opportunities, including sectoral approaches; incentive-based approaches; fiscal and financial instruments and incentives; voluntary programmes; information programmes; standards and benchmarks for specific key industries and sectors; and sustainable development policies and measures. In order to make full use of these opportunities, all market participants in all countries need to be actively engaged, through, for example, public-private partnerships. As regards capacity-building, it was suggested that international finance institutions such as the World Bank might play an important role.

61. The recent increase in interest in CDM projects led to extensive discussions on the implementation and lessons learned from the operation of the CDM thus far. Several participants expressed the view that the CDM has demonstrated the usefulness of market mechanisms. It was recognized that CDM projects have contributed to sustainable development in developing countries and, to some extent, to technology transfer, despite the fact that the CDM was not specifically designed for this purpose. At the same time, there were calls for the improvement of the CDM by strengthening it and reducing transaction costs without compromising the environmental integrity of projects.

62. Since the CDM has only recently been put into action, it was observed that it might not be prudent to introduce amendments or radical changes to it at this point in time. Instead, it was proposed that efforts be made to extend its use and to facilitate access to it for countries in Africa and Latin America and the SIDS by, for example, reducing barriers for small and medium-sized companies. This would be particularly important for improving the geographical distribution of CDM projects, given that only 2 per cent of current projects are located in Africa.

63. Establishing consistent, coherent and long-term policies and setting a long-term price signal were considered necessary to provide certainty for the private sector and enhance the rate of investment made in mitigation. Flexibility in policy development is needed to accommodate new scientific evidence and correct any unintended consequences of past efforts. In the long term, countries could explore further voluntary approaches and stimulate R&D and capacity-building, particularly in developing countries.

64. Some participants expressed concerns regarding market distortions and competitiveness of industrial sectors in countries that have introduced market mechanisms as opposed to countries that have not adopted such measures. For one group of countries, this appears to be one key challenge as they place their industries under a competitive burden. Noting that levels of energy efficiency among countries around the world vary, one participant stressed the importance of adopting appropriate national emissions levels or caps in order to avoid market distortions.

65. It was recognized that new financial resources and a flexible set of incentives are needed in order to facilitate building new markets for the benefit of all. Participants called for the continuation of the CDM after 2012. Further development of global carbon markets could help mobilize the financial resources needed for a global response to climate change.

66. Several participants stated that market-based approaches are not the only solution to climate change and suggested that there is a limit to what can be achieved through their use. In this regard, it was noted that there is scope for government action as well as a broader perspective including incentive-based approaches and use of information tools. Some participants suggested that voluntary commitments are not adequate and that the success of market-based approaches hinges on agreement on deep reduction commitments that are consistent with the latest scientific findings (for example those in the AR4).

67. Existing mechanisms under the Kyoto Protocol need not be the only points of engagement for developing countries. Some participants suggested that there is scope for extending the market-based approaches in order to facilitate the contribution by developing countries to global mitigation efforts. Examples mentioned for additional market activities include participation of developing countries in renewable energy trading, SD-PAMs and activities to reduce emissions from deforestation. Some participants supported the view that future market-based approaches will need to address sustainable development in developing countries and should not be seen only as a compliance mechanism for developed countries. It was also suggested that care should be exercised so that their further development will not exacerbate the economic imbalance between categories of developing countries. In order to meet the needs of vulnerable countries in managing the impacts of climate change, it was proposed that dedicated and creative methods of funding be considered, including a share of proceeds from auctioning of carbon emission allowances in emissions trading schemes.

68. A business organization representing 140 corporations from developed and developing countries expressed the view that in order to realize the full potential of market-based opportunities, a clear global consensus for GHG reductions post 2012 would be necessary. It suggested that allowing all emitters in all jurisdictions to access market mechanisms (e.g. emissions trading, CDM, joint implementation and/or the successors to these mechanisms) for compliance with GHG reduction goals would ensure a level playing field, avoid distortions in competitiveness and enhance cooperation. A common global price for carbon may be achieved by either explicitly linking different schemes or implicitly linking them via full acceptance of common currency units (such as certified emission reductions and emission reduction units).

Box 7. Industry perspectives on market-based opportunities

According to the EDF Group, an integrated energy utility business, energy efficiency and demand-side management should be improved, low-carbon and carbon-free technologies need to be deployed, and research and development on promising technologies, including carbon sequestration technologies, should be accelerated as part of the efforts to address climate change. The Group has managed to reduce its emissions per kWh rate through the use of nuclear energy and hydropower, and it has increased its investments in wind farm projects. The Group's projects in various developing countries, including Mali, Morocco, Senegal and South Africa, promote the concept of decentralized service companies.

Eskom, a South African electricity utility, uses primarily coal for electricity production. Balancing one of the cheapest electricity production processes with climate change concerns has been challenging. In this regard, references were made to various technological options, including supercritical and ultra-supercritical power plants. Another challenge is the fact that South Africa produces more than half of Africa's electricity and its economy is growing continuously. Africa's share of world power consumption is still small and the total number of people without electricity will reduce only slightly over the coming decades. According to Eskom, in order to allow for collaborating nations to share the benefits of energy diversification and access, it would be necessary to develop African power grids and use Africa's energy for Africa's development. Enhancing developmental priorities would require engaging markets in innovative ways in order to increase capital and technology flows.

VII. Overarching and cross-cutting issues

A. Shared vision and long-term goals

69. It was broadly recognized during the Dialogue that climate change is a global challenge and that an effective response calls for a global effort. Several participants expressed the view that discussions on a future response to climate change need to be guided by a shared vision and should aim to fulfil long-term goals under the Convention. In this regard, there were several references to the ultimate objective of the Convention, including interventions on what is meant by “dangerous anthropogenic interference”, and the principles of the Convention.

70. Repeated references were made to the fact that consideration of long-term goals would need to be based on the latest scientific information, including the projected increase in global mean surface temperature in the AR4. Some participants proposed a maximum 2°C increase in global mean temperature over the twenty-first century. Such a proposal would imply that global emissions need to peak within the next two decades and then be reduced by about 50 per cent by 2050, which would require considerable effort. However, the SIDS indicated that even a 2°C target would be unacceptably high and stated their view that global warming has already reached a dangerous level. Other participants warned against in-depth discussions on temperature limits and proposed that other alternatives (e.g. energy intensity targets) deserve consideration.

Box 8. International climate efforts beyond 2012

The Pew Centre climate dialogue at Pocantico: Twenty-five senior policymakers from 15 countries participated in their personal capacity in offline discussions on options for advancing the international climate effort beyond 2012. The group as a whole believed that there was a case for action because:

- (a) There is a clear scientific justification for stronger action now and over the coming decades;
- (b) There is a strong economic rationale for acting now to reduce emissions and develop new technologies;
- (c) Delaying action could increase long-term costs and undermine economic growth.

According to participants of the Pocantico dialogue, climate change should be met with a global response. There was consensus that the UNFCCC established a foundation, and fundamental guiding principles, for a global approach. There was also consensus about the need to: engage major economies; provide flexibility for different national strategies and circumstances; integrate climate and development; couple near-term action and long-term focus; and address adaptation needs. The participants of the Pocantico dialogue agreed on possible elements for a future framework, including targets and trading; sectoral approaches; policy-based approaches; technology cooperation; adaptation; and aspirational long-term goals.

Center for Clean Air Policy (CCAP) Dialogue on Future International Actions to Address Global Climate Change: The dialogue brings together senior climate negotiators from 15 developed and 15 developing countries and a limited number of companies for informal, off-the-record discussions on mitigation and adaptation options for a possible post-2012 international framework for climate policy. One area of work for this dialogue is exploring a sectoral approach to creating incentives to reduce greenhouse gas emissions post-2012 by targeting key sectors in key countries through energy-intensity benchmarks and by allowing sales of net emissions reductions beyond voluntary pledges.

According to CCAP, in order to encourage developing countries to take on more aggressive no-lose targets, industrialized countries, international financial institutions and export credit agencies could provide a package of technology finance and assistance incentives designed to encourage demonstration of more expensive innovative technologies such as integrated gasification combined cycle technology and carbon capture and storage.

71. Participants linked the principle of common but differentiated responsibilities with issues discussed during the Dialogue. Many of them outlined how this important principle could be put into practice, when contributions of countries to long-term cooperative action are determined. The diversity of views on how this principle should guide the effort was great. It was repeatedly mentioned that developed countries should continue to take the lead in reducing GHG emissions and should make more efforts in fulfilling their responsibilities under the Convention that are related to providing financial support and technology in order to help developing countries fulfil their commitments.

72. Other related issues discussed were associated with enhanced action by developing countries in the context of global efforts to address climate change. Some participants from developing countries gave information on mitigation activities currently being implemented in the context of sustainable development efforts. Others indicated willingness to assume responsibility for reducing emissions and to participate in future global mitigation efforts. Some participants proposed the engagement of all major emitters in any future action. Others proposed the establishment of new mechanisms to provide incentives for voluntary emissions reductions by developing countries.

B. Economics of climate change

73. The findings of the Stern Review on the economics of climate change were presented to the Dialogue.⁶ This review assesses a wide range of evidence on the impacts of climate change and on the associated economic costs of adaptation and mitigation. The information presented leads to the conclusion that benefits of strong, efficient and early action far outweigh the economic costs of not acting. Some of the key messages from the Stern Review are listed in box 9.

74. Using the results from economic models, it is estimated that if countries do not act soon, the overall costs and risks of climate change will be equivalent to losing at least 5 per cent of global gross domestic product (GDP) each year, now and forever. If a wider range of risks and impacts is taken into account, estimates of damage could rise to 20 per cent of GDP or more. In contrast, the costs of action – reducing GHG emissions to avoid the worst impacts of climate change – can be limited to around 1 per cent of global GDP each year.

75. Investment choices in the next 10–20 years will have a profound effect on climate in the second half of this century and in the next. Actions taken now and over the coming decades could create risks of major disruption to economic and social activity, on a scale similar to those associated with the great wars and the economic depression of the first half of the twentieth century. Reversing these changes later would be a difficult or even impossible task.

76. The review also concludes that tackling a global challenge such as climate change requires an international response that would need to be based on a shared vision of long-term goals and agreement on frameworks that will accelerate action over the next decade. Such response would need to build on mutually reinforcing approaches at national, regional and international levels. According to the review, three elements of policy are required for an effective global response: pricing of carbon, implemented through tax, trading or regulation; policy to support innovation and the deployment of low carbon technologies; and removal of barriers to energy efficiency. Key elements of future international frameworks could include:

⁶ See Dialogue working paper 20 (2006) and 20/Add.1 (2006) at <http://unfccc.int/meetings/dialogue/items/3759.php>.

- (a) Emissions trading: expanding and linking the growing number of emissions trading schemes would be a powerful way to promote cost-effective reductions in emissions and to bring forward action in developing countries;
- (b) Technology cooperation: informal coordination as well as formal agreements can boost the effectiveness of investments in innovation around the world. Globally, support for energy R&D should at least double and support for the deployment of new low carbon technologies should increase up to fivefold. International cooperation on product standards is a powerful way to boost energy efficiency;
- (c) Action to reduce deforestation: curbing deforestation is a highly cost-effective way to reduce emissions. Large-scale international pilot programmes to explore the best ways to do this could get under way quickly;
- (d) Adaptation: the poorest countries are most vulnerable to climate change. It is essential that climate change be fully integrated into development policy and that rich countries establish the necessary resources for funding adaptation activities. International funding should also support improved regional information on climate change impacts, and applied research for developing adaptation options.

77. Providing the necessary investment framework for clean energy and development has been recognized as a key activity for addressing climate change. The World Bank, in response to requests by governments, has considered different investment options taking into account that clean energy could also address other related issues such as:

- (a) Pollution problems at the household level;
- (b) Environmental impacts at the local, national and regional level, including urban air pollution and regional acid deposition;
- (c) Global environmental impacts of GHG emissions from the production of energy, including impacts on agricultural productivity, water resources, human health, human settlements and ecological systems.

78. The work of the World Bank was based on the following three focus areas or pillars (for more explanation, see box 10):

- (a) Energy for development and access for the poor: the role of energy in economic growth and poverty reduction;
- (b) Policies and financial requirements to support a transition to a low carbon economy;
- (c) Investments to reduce vulnerability to climate variability and climate risk, especially for the poor, who suffer the most from this problem.

79. Current policies and investment are not sufficient to address the energy needs of all countries. Electricity supply needs are estimated at USD 165 billion per year (including USD 35 billion for electricity access for the poor); current private and public sector resources provide about half of that (USD 80 billion per year). It was proposed that the World Bank could start working with countries in order to identify their energy needs. The intention of the World Bank is to spur technology change through various measures including GEF demonstration projects, bringing the private sector in and using its own guarantee mechanism.

Box 9. Key messages from the Stern Review on the economics of climate change

The costs of stabilizing the climate are significant but manageable; delay would be dangerous and much more costly:

- (a) The risks of the worst impacts of climate change can be substantially reduced if greenhouse gas (GHG) levels in the atmosphere can be stabilized between 450 and 550 ppm carbon dioxide (CO₂) eq. Stabilization in this range would require emissions to be at least 25 per cent below current levels by 2050, and perhaps much more;
- (b) Ultimately, stabilization – at whatever level – requires that annual emissions be brought down to more than 80 per cent below current levels. This is a major challenge, but sustained long-term action can achieve it at costs that are low in comparison with the risks of inaction. Estimates of the annual costs of achieving stabilization between 500 and 550 ppm CO₂ eq are around 1 per cent of global gross domestic product, if countries start taking strong action now;
- (c) Costs could be even lower than that if there are major gains in efficiency or if the strong co-benefits, for example from reduced air pollution, are measured. Costs will be higher if innovation in low-carbon technologies is slower than expected or if policymakers fail to make the most of economic instruments that allow emissions to be reduced in the most cost-efficient way.

Action on climate change is required across all countries, and it need not cap the aspirations for growth of developing and developed countries:

- (a) The costs of taking action are not evenly distributed across sectors or around the world. Even if the developed countries take on responsibilities for absolute cuts in emissions of 60–80 per cent by 2050, developing countries would need to take significant action too. But developing countries should not be required to bear the full costs of this action alone. Carbon markets are already beginning to deliver flows of finance to support low-carbon development, including through the clean development mechanism. A transformation of these flows is now required to support action on the scale required;
- (b) Action on climate change will also create significant business opportunities as new markets are created in low-carbon energy technologies and other low-carbon goods and services. These markets could grow to be worth hundreds of billions of United States dollars each year, and employment in these sectors will expand accordingly;
- (c) The world does not need to choose between averting climate change and promoting growth and development. Changes in energy technologies and in the structure of economies have created opportunities to decouple growth from GHG emissions. Indeed, ignoring climate change will eventually damage economic growth;
- (d) Tackling climate change is the pro-growth strategy for the longer term, and it can be done in a way that does not cap the aspirations for growth of all countries.

A range of options exists to cut emissions; strong, deliberate policy action is required to motivate their take-up:

- (a) Emissions can be cut through increased energy efficiency, changes in demand and adoption of clean power, heat and transport technologies. The power sector around the world would need to be at least 60 per cent decarbonized by 2050 for atmospheric concentrations to stabilize at or below 550 ppm CO₂ eq, and deep emissions cuts will also be required in the transport sector;
- (b) Even with extensive expansion of the use of renewable energy and other low-carbon energy sources, fossil fuels could still make up over half of global energy supply in 2050. Coal will continue to be important in the energy mix around the world, including in fast-growing economies. Extensive carbon capture and storage will be necessary to allow the continued use of fossil fuels without damage to the atmosphere;
- (c) Further reductions can be achieved in non-energy sectors, such as industrial processes, agriculture and forestry (particularly addressing deforestation).

80. A review undertaken by the World Bank of existing financial instruments available from international financial institutions (IFIs) indicates that one of the challenges is ensuring an adequate energy sector policy and regulatory framework to enable these financial instruments to bridge the financial gap. By stretching current instruments and removing constraints, it may be possible to increase the involvement of the private sector and to mobilize an additional USD 11 billion per year (approximately) from the private sector, IFIs, donors and export credit agencies. Increased concessional funding will be needed for electricity access in sub-Saharan Africa by doubling the current level of investment to USD 4 billion per year from the current level of USD 2 billion per year. Regarding funding for adaptation, the view was expressed that the funds flowing through the primary financial instruments available (official development assistance, GEF special funds for adaptation and the Adaptation Fund) needed to be substantially increased.

Box 10. World Bank Investment Framework on Clean Energy and Development

Pillar 1: Energy for development and access for the poor. Energy options for middle income countries include the following: better governance for better utilities; increase trade to decrease cost; private sector participation to decrease cost; ensure financial health of the sector to enable prudent investments; decrease financing gap through reforms, increased international financing institutions and private funding; better technology to decrease the impacts of air and water pollution, end-use efficiency; and demand management. Energy investment options for low-income countries include: additional generation capacity (including through regional projects); scaled-up programmes of household electrification (grid and off-grid); access to clean cooking, heating and lighting fuels (through sustainable forest management and improved cooking stoves); energy services to schools and clinics; modern illumination packages for households without electricity. Emphasis is placed on implementing an action plan for energy access for the poor in sub-Saharan Africa, stating that energy has an important role in economic growth and poverty alleviation and that the access problem is most acute in sub-Saharan Africa and South Asia.

Pillar 2: Policies and financial requirements to support a transition to a low-carbon economy. The costs of decreasing greenhouse gas emissions could be reduced through international trading and by adopting a multi-gas/multi-sector strategy, hence reducing financing needs. Taking into account that technologies are currently, or will soon be, commercially available for a transition to a low-carbon economy, such a transition required annual incremental investments of tens of billions of United States dollars in the energy sector, particularly in power generation. Although existing instruments could be strengthened and scaled up for greater impact on the development of markets for energy efficient and renewable energy technologies, there are, nonetheless, problems of scale of existing facilities such as the Global Environment Facility, and problems of carbon market continuity post 2012. A viable carbon market is needed for a long-term stable global framework, with differentiated responsibilities. This could stimulate the carbon market with a flow of funds to developing countries of tens of billions of United States dollars per year.

Pillar 3: Investments to reduce vulnerability to climate variability and climate risk. Poor countries are disproportionately affected by climate variability. An estimated 300 million people per year in developing countries are affected by climate-related disasters (droughts, floods and wind storms) and this number is increasing. Failure to adapt to changing climate risks would threaten progress in development and the Millennium Development Goals. Tens of billions of United States dollars per year of official development assistance and concessional finance investments were exposed to climate risks and at least USD 1 billion per year was needed to climate-proof the development portfolio of the World Bank. Regarding the exposure of private sector investment, responses by the private sector were constrained by a lack of information on the nature of the risks and adaptation options as well as insufficient risk-spreading mechanisms such as insurance.

C. Investment and finance flows

81. At the closing of the second Dialogue workshop, Parties requested the secretariat to provide, before the fourth workshop, an analysis of existing and planned investment flows and finance schemes relevant to the development of an effective international response to climate change.⁷ The work on this request was completed in August 2007 and the input to the Dialogue was made available in the form of a working paper.⁸

82. The analysis and assessment of investment and finance flows was carried out for a time horizon until 2030. Worldwide mitigation and adaptation requirements were based on different scenarios of social and economic development. To the extent possible, existing work was used, including information from the AR4, the IEA, the Stern Review and other published literature. As such, the results of the analysis were dependent on the assumptions of the scenarios used. The results of the analysis are indicative of the incremental financial resources needed and of the investment flows changes necessary until 2030. The key findings of the analysis are as follows:

- (a) Mitigation measures needed to return global GHG emissions to current levels in 2030 require an increase in global investment and financial flows of USD 200–210 billion in 2030. Major reductions in emissions would come from increased energy efficiency (the most promising means to reduce GHG emissions in the short term); shifts in energy supply from fossil fuels to renewable energy, nuclear energy and hydropower; and large-scale deployment of CCS;
- (b) For adaptation, additional investment and financial flows needed in 2030 amount to several tens of billions of United States dollars. These expenditures, while large in absolute terms, are expected to result in the avoidance of climate change impacts of appreciably larger magnitude.

83. The amounts mentioned above are significantly higher than the amount of funding currently available under the Convention and its Kyoto Protocol, but are relatively small in relation to the estimated global GDP (0.3–0.5 per cent) and global investments (1.1–1.7 per cent) in 2030. The private sector is expected to bear the largest share of the global investment effort (86 per cent of total investment).

84. Particular attention needs to be paid to the circumstances of developing countries, given that most of the cost-effective opportunities for reducing emissions will occur here and that they are particularly vulnerable to climate change impacts. Investment flows to developing countries are estimated at about 46 per cent of the total needed in 2030 resulting in emissions reductions in developing countries that correspond to about 68 per cent of global emission reductions.

85. In considering means to enhance investment and financial flows to address climate change in the future, it is important to focus on the role of private sector investment as it constitutes the largest share of global investment and financial flows (86 per cent). Although ODA funds amount to less than 1 per cent of investment globally, ODA represents a larger share of the total investment in some countries such as in LDCs (6 per cent) and plays an important role in catalysing investment in activities addressing climate change.

⁷ The COP, at its twelfth session, acting on a proposal by its President, also endorsed the request to the secretariat (see FCCC/CP/2006/5, paragraph 62).

⁸ See Dialogue working paper 8 (2007) at <<http://unfccc.int/meetings/dialogue/items/4048.php>>.

86. Carbon markets, which already play an important role in shifting private investment flows, would have to be significantly expanded to address needs for additional investment and financial flows. National policies can assist in shifting investments and financial flows made by private and public investors into more climate-friendly alternatives and optimize the use of available funds by spreading the risk across private and public investors. Additional external funding for climate change mitigation and adaptation will be needed, particularly for sectors in developing countries that depend on government investment and financial flows.

87. If the funding available under the financial mechanism of the Convention remains at its current level and continues to rely mainly on voluntary contributions, it will not be sufficient to address the estimated future financial flows for mitigation and adaptation. Several other options for generating additional funds have been suggested. Some of these options could generate revenues commensurate with the additional needs.

88. Implementation of mitigation and adaptation actions relies on the availability of financial resources and enabling investment conditions. With appropriate policies and/or incentives, a substantial proportion of the additional investment and financial flows needed could be provided by the currently available sources. However, enhancement of investment and financial flows would require a strategic application of available resources to improve the effectiveness of the response. In this regard, it may be appropriate to consider possible combinations of the following:

- (a) Further implementation of commitments under the Convention by Parties included in Annex II to the Convention to provide financial assistance to developing countries;
- (b) Expansion of carbon markets through increased commitments that increase demand and possible additional mechanisms to increase supply;
- (c) Identification of options for scaling up additional and predictable financial flows from new sources;
- (d) International coordination of policies to encourage private investment and domestic government investment in mitigation and adaptation measures such as energy efficiency standards for internationally traded appliances or standards for climate resilient infrastructure.

89. Several participants expressed the view that enhancing implementation of the Convention by developing countries depends on the provision of financial assistance by developed countries. They also supported the view that although the private sector plays, and will continue to play in the future, a key role in providing such assistance, it is not the only solution to bridging the gap between what is currently available and what will be needed in the future in terms of investment and finance flows. Policies and incentives are needed in order to direct private investment in the areas where it would be most needed. Public funding will play an important role, particularly to areas where the private sector may be reluctant to commit resources. In this regard, public funding could be used to promote capacity-building, adaptation and R&D for new technologies.

90. Some participants argued that, action should begin now before long-term investment in high GHG emitting technologies is 'locked in' thus increasing the future costs of reducing emissions. National policies such as promotion of energy efficiency standards are considered useful tools that can play an important role in improving investment and financial flows. It was felt that it is important to identify means to promote such policies and to increase international coordination in order to enhance their effectiveness.

91. Several participants mentioned that the carbon markets are examples of how investment and financial flows can be mobilized for mitigation activities. Others expressed the view that the design of any future markets should not compromise the environmental integrity of any future efforts to reduce GHG emissions.

Box 11. Expert and business reactions to the outcomes of the investment and financial flows work of the secretariat

- (a) The main impediments to private sector investment include: the incremental cost of technologies; behavioural barriers even when investment makes economic sense; needs for a long-term policy framework for carbon markets that provides clarity to the private investors; and need for adequate regulatory environment at the national level.
- (b) The intergovernmental process can stimulate and enhance opportunities for investments by playing a bridging role in decreasing the incremental cost of technology, mitigating the risks for investors and ensuring that governments take the necessary commitment for a larger market. Market-based mechanisms can achieve cost-effective reductions and contribute to the development of developing countries. New institutions need to be created for the task at hand, especially to help with the maintenance of a stable carbon price needed to support the level of investment needed. Initiatives at the national level are also important to complement efforts at intergovernmental level.
- (c) New products could be created to assist in financing losses due to climate change impacts, such as catastrophe bonds and micro-insurance. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is a good example of a public-private partnership between insurances companies, governments in the Caribbean region and the World Bank, as it enables capital to flow quickly to the countries affected by a natural disaster.
- (d) If adaptation needs are not taken into account, development goals will be harder to achieve. Official development assistance and concessional financing could play a more important role in building a conducive environment for private investment in adaptation.

92. Some ideas for new sources of funds include: fixing an international carbon price; placing a tax on emissions from Parties included in Annex I to the Convention (Annex I Parties) in order to fund adaptation activities under the Convention, complementary to the Adaptation Fund under the Kyoto Protocol; a new financing mechanism for promoting access to clean energy; debt swaps for renewable energy; and new instruments to leverage financing outside the Convention process.

93. Some participants called for a better understanding of synergies between investment and financial flows for mitigation and for adaptation, and for further consideration of adaptation needs. They recommended that the cost of damages due to the adverse impacts of climate change be taken into account when considering investment and financial flows for adaptation. Also with regard to adaptation, participants noted that although adaptation costs are linked to development, they are not always only development costs. It was suggested that climate-proofing of investments should not be promoted as the only solution for financing adaptation. Finally, some participants suggested that the role of the UNFCCC process in terms of catalysing further investment and financial flows should be further considered.
