6 September 2002

ENGLISH/RUSSIAN ONLY

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE
Seventeenth session
New Delhi, 23–29 October 2002
Item 8 of the provisional agenda

RESEARCH AND SYSTEMATIC OBSERVATION

Third Assessment Report of the Intergovernmental Panel on Climate Change: Views on priority areas of research and questions for the scientific community relevant to the Convention

Submissions from Parties

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its sixteenth session, under the agenda item on the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC), noted the robust findings, the key uncertainties and priorities for future research and systematic observation reported in the TAR. It also noted that possible items for consideration by the scientific community could be, inter alia, assessment of the effects of the implementation of the Kyoto Protocol, quantification and reduction of uncertainty, climate sensitivity and improved climate and economic modelling (FCCC/SBSTA/2002/6, para. 15 (d)–(i)).

2. The SBSTA invited Parties to submit, by 20 August 2002, their views for compilation into a miscellaneous document on priority areas of research and questions for the scientific community relevant to the Convention, as referred to in the paragraph above (FCCC/SBSTA/2002/6, para. 15 (h)). A synthesis of those submissions is contained in document FCCC/SBSTA/2002/INF.17.

3. The secretariat has received 14 submissions. In accordance with the procedure for miscellaneous documents, these submissions are attached and reproduced* in the language in which they were received and without formal editing.

* These submissions have been electronically imported in order to make them available on electronic systems, including the World Wide Web. The secretariat has made every effort to ensure the correct reproduction of the texts as submitted.

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PAPER NO. 1: AUSTRALIA

THIRD ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE –Priority areas of research and questions for the scientific community relevant to the Convention [Reference Document FCCC/SBSTA/2002/CRP.3/Rev.1]

The 16th session of the Subsidiary Body for Scientific and Technological Advice invited Parties to submit their views for compilation into a miscellaneous document on priority areas of research and questions for the scientific community relevant to the Convention as referred to in subparagraph 4(a) of Document FCCC/SBSTA/2002/CRP.3/Rev.1. Australia welcomes the opportunity to submit its views on priority areas of research and questions for the scientific community.

1. Research Priorities

Australia considers that state-of-the-art research into all scientific and technological aspects of climate change is essential to underpin sound climate policy, and to ensure that decision-makers have the best possible scientific basis for development of effective climate change response strategies. However, it is also important to ensure that in determining the focus of scientific research that this is not done in too prescriptive a manner. Research can range across the spectrum from research activities initiated or targeted in response to specific policy priorities to so-called 'blue sky' research, which is where much of the truly innovative science originates.

The IPCC TAR is an essential guide to informing the SBSTA on the current state of understanding on climate science and on the past and possible future impacts of changes in climate and options for responding to those changes, including through development of adaptation and/or mitigation strategies. Through an exhaustive and rigorous intergovernmental process, the IPCC has drawn on the best experts in the scientific and technological communities and delivered a comprehensive and authoritative assessment to guide the work of the Convention. The TAR identifies a number of areas in which all the stakeholders (all those involved in drafting, reviewing and approving the report) consider there to be a need for further work, to fill gaps in understanding and to remove or at least further diminish the documented uncertainties.

Australia in a previous submission on the TAR (FCCC/SBSTA/2002/Misc.5) put forward its initial views on the implications of the information contained in the TAR and future actions by the SBSTA and other bodies. Australia recognised that the TAR provided clarity on the extent and nature of uncertainties remaining on climate change knowledge and highlighted the need for further and more targeted research to help reduce uncertainties in key areas and strengthen quantitative conclusions. Australia also recognised the need to address remaining gaps in information and understanding and to improve the ability to detect, attribute causes of and understand climate change.

It is, however, important to recall that the TAR also presents robust findings including new and stronger evidence of climate change. Uncertainties have been more clearly articulated and in many cases reduced, and confidence levels have increased in many areas. One of the most significant conclusions of the TAR is that emissions from all regions will have to move to a lower trajectory at some point to achieve stabilisation of global greenhouse gas concentrations. The TAR also identifies many opportunities that already exist to reduce near term-emissions, including substantial low-cost mitigation opportunities. In short, the TAR provides the impetus for concerted global action on climate change.

Based on the TAR, with further consideration by policymakers of their special needs and in consultation with the scientific community, Australia considers that the priority areas for research include:

Monitoring and observed climate

- improved systematic and sustained monitoring of climate
    - including climate variables and indicators such as temperature, rainfall, ocean circulation/overturning, snowfall, riverflow, flowering times, species distribution)
- further historical reconstruction and analysis of climate variables and indicators to enable detection of trends and rates of change, for verifying and attributing future change and to allow benchmarking to assess effectiveness of mitigation strategies

Climate system modelling and processes

- improved understanding of the climate system, e.g. the oceans role, sources and sinks of greenhouse gases
- improved understanding of feedbacks in the climate system, eg. radiation, cloud processes, aerosols, water vapour, terrestrial carbon dynamics
- improved methods of detection and attribution of climate change at global and regional scales
- development and assessment of alternative approaches to understanding and projecting the regional impacts of climate change, in a risk assessment framework using the full range of available climate models
- improved projections of climate change, climate variability and extremes, at both global and regional scales, including probabilities where possible

Climate change impacts

- improved understanding of the thresholds that might produce sudden or irreversible change and the potential impacts of such changes, eg. weakening or cessation of the thermohaline circulation of the ocean and its impacts on climate and human systems
- integrated assessment of regional impacts across various industries, activities, societies and ecosystems, including socio-economic outcomes
- special attention to the effects of long time scales and inertia in the climate system, and indeed also in the socio-economic system, which affects the urgency and time scales of adaptation and mitigation actions

Adaptation and Mitigation

- improved understanding of both short-term and long-term mitigation and adaptation options that maximise achievement of sustainable development
- assessment of relative effectiveness of different mitigation and adaptation responses
- region-specific studies of integrated adaptation and mitigation options which identify opportunities and barriers within a risk assessment framework and considering cost-benefit analyses

- development of frameworks for taking into account uncertainty, and socio-economic and environmental risk in policy making related to climate change – this requires quantification of the risk associated with various impacts

- further analysis of likely emissions pathways, and associated economic, social and environmental implications. An important aspect of this would be to assess the costs and benefits of mitigation options, timeliness, projected impacts and necessary adaptation measures for various mitigation scenarios

- assessment of how best to enhance innovation in greenhouse gas abatement technologies

- expanded focus on methodological issues in relation to emissions reporting, especially for carbon sequestration measures relating to forests, agricultural lands and other terrestrial ecosystems.

An important part of the research agenda includes developing the scientific basis for policies to achieve the ultimate objective of the UNFCCC, as expressed in Article 2. The TAR provides useful information to the Parties that is relevant to the long-term stabilisation of greenhouse gases in this context. A future focus for research could therefore build on the work of the TAR in meeting the objective of the Convention through further examination of the impacts of differing stabilisation levels, the capacity for adaptation to respond to these impacts, including explicit analysis of any irreversible impacts. Further analysis of abatement pathways, including timing of a portfolio of mitigation actions required to reach particular stabilisation levels would also be useful.

2. SBSTA Consideration of Research

Standing SBSTA Agenda Item on Research and Systematic Observation

As discussed at SBSTA16 in the context of the consultations both on the Third Assessment Report and on collaboration with the Global Climate Observing System (GCOS), Australia reaffirms the importance of maintaining an ongoing focus on these issues, as encapsulated in Article 5, through a standing agenda item of SBSTA. This will facilitate close collaboration between research and monitoring communities required to develop sustained climate observations. This will also facilitate the ongoing consideration of research priorities through a two-way communications process between the research community and the SBSTA. The principal reporting and feedback role on research issues should continue to be with the IPCC (as follows), just as GCOS fulfils that function for the monitoring community.

Interface between SBSTA and the research community

The IPCC should continue to be the main conduit of research findings into the SBSTA, both in terms of assessment of those findings and in terms of feedback to the research programs on the priority research needs of the Convention bodies. The IPCC, through its assessment function, is uniquely placed to inform the SBSTA on the progress of research and to advise the SBSTA on the consensus scientific views regarding the relative importance and/or validity of specific scientific findings, within an intergovernmental assessment framework.

Periodic briefings on Research Activities

In order to inform the SBSTA on progress on research issues of relevance to the Convention, the IPCC may also coordinate and facilitate periodic briefings on particular research findings by various representatives of relevant research programmes, such as the World Climate Research Programme (WCRP) and the International Geosphere Biosphere Programme (IGBP) – similar to the event planned for SBSTA 17. These should largely be held as informal events and could provide an opportunity for

question and answer sessions. They could be used as a basis for highlighting particular research outcomes and also for discussions on more general items such as the determination of research priorities. The principal advisory role, however, should continue to lie with the IPCC in accordance with its intergovernmental assessment function.

Australia proposes that a representative of the IPCC be invited to convene the informal SBSTA 17 discussion on research priorities.

3. Integration of climate science concepts

Australia is a strong supporter of an integrated approach to consideration of the policy responses to climate change. However, integration encompasses many different scales and concepts. Within the context of climate change science and the climate policy community served by the science, it might be considered to refer to:

(a) The cross-cutting issues that need to be addressed to ensure that the assessment process applies standard rules and methodologies to its approach across all relevant disciplines and codes, such as encapsulated by the different Working Groups of the IPCC – for example, estimation of confidence levels and treatment of uncertainties;

(b) A unified approach to many of the underlying concepts across the various disciplines of the IPCC – an ability to contrast and compare the results of the different Working Groups, such as in relation to adaptation and mitigation strategies; use of standard, or at least traceable, assumptions in diverse modelling studies; an ability to measure the impact of different strategies against different assumptions such as changes in atmospheric concentration levels. Policymakers are required to make decisions based on a balanced assessment of all relevant factors – science can either present a range of individual scientific findings (assessed or otherwise) and ask the policymakers to do the integrating, or the scientific community can do the integrating itself. In order to retain maximum scientific integrity, the latter is preferable. As the principal suppliers of scientific assessment to the SBSTA, the IPCC will have to adopt a much more unified approach to presenting its assessments. Integration at this level largely falls to the IPCC and is a function of the approach taken by the IPCC to coordinating the work of the various Working Groups.

(c) An integrated approach to the development of response strategies, drawing on the information of the IPCC assessments in a risk assessment framework which enables and weighing up of the relative risks and costs, in economic, social and environmental terms, of different choices and the development of a package of response strategies. For example, the TAR highlights the inter-relationship between adaptation and mitigation and indicates a mixture of both measures needs to be applied in order to respond effectively to climate change. A corollary of this is that the SBSTA should begin to explore policy frameworks that take into account these synergies.

The ability of the policy community to use IPCC assessments most effectively depends on the adoption of a unified approach, as per (b). This would complement and improve the ability of the Synthesis Report, to bring together information on the cross-cutting issues.

In this submission we have identified specific research priorities and have raised views about how information from the research community is used by the SBSTA. We have also put forward some ideas regarding integration and how the IPCC might approach the Fourth Assessment Report. We look forward to the opportunity to consider the views of Parties on the TAR and expanding on our views in a future submission.

PAPER NO. 2: AZERBAIJAN

It is possible to prepare an assistance program for preparation the regional climate scenarios. To the Global Climate Network must be jointed one station of Major Caucasus.

PAPER NO. 3: BOLIVIA

SUBMISSION BY THE GOVERNMENT OF BOLIVIA ON PRIORITY AREAS OF RESEARCH AND QUESTIONS FOR THE SCIENTIFIC COMMUNITY RELEVANT TO THE CONVENTION

As requested by document FCCC/SBSTA/2002/CRP.3/Rev.1 para. 8 the Government of Bolivia submit the following recommendations and comments.

The Government of Bolivia agreed that more efforts are needed to enhance the confidence of climate modelling and support SBSTA notation that enhanced interaction is needed with international research programs and SBSTA on the scientific question.

Furthermore the Government of Bolivia support current SBSTA efforts to get mayor understanding about the effects of implementation of the Kyoto Protocol upon the climate system.

The Government of Bolivia consider the Kyoto Protocol as the only available political tool to reduce effectively Greenhouse Gases Concentrations in the Atmosphere. The Government of Bolivia further note that after nine years of UNFCCC implementation, still not sufficient scientific confidence exist about the levels of greenhouse gas concentration stabilization in the atmosphere that would prevent dangerous anthropogenic interference with the climate system. If such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner as defined in article 2 of the Convention the clarification of this levels shall be considered as a first priority of international research.

With this regards the Government of Bolivia considers that increased attention should be given to show the feasibility of further measures to achieve further reduction targets in coming commitments periods to let the emissions curve converge at precautionary levels and what kind of measures are needed to reach such levels.

The Government of Bolivia also support the conclusions proposed by the Chair of SBSTA on research activities, and the need to enhance research and systematic observation in developing countries.

Bolivia defined three mayor priority areas of research and capacity building in systematic observation where cooperation with developed Parties is needed:

1) Increasing the accuracy of Global Circulation Models and developing Regional Circulation Models for South America to understand in deep temperature and precipitation changes;
2) Increasing understanding and monitoring of climate variability in non-coastal areas;
3) Developing indicators and systematic observation of climate change impacts and vulnerability.

1) Increasing the accuracy of Global Circulation Models and developing Regional Circulation Models for South America to understand in deep temperature and precipitation changes

The government of Bolivia recognize the need to increasing the accuracy of Global Circulation Models and developing Regional Circulation Models to understand in deep temperature and precipitation changes.

Current Global Circulation Models lack an sufficient accuracy to understand which are the changes in Temperature and Precipitation in regions with complex Physiographies like mountain chains.

Regional Circulation Models with enhanced spatial resolution can fill this gaps and provide a basis for vulnerability and adaptation studies to understand vulnerability and adaptation in different sectors and regions.

The government of Bolivia support the initiatives to develop Regional Circulation Models and urge SBSTA to put special attention to develop climate models for mountain ecosystems. In the context of international cooperation SBSTA should put special attention to develop Regional Circulation Models for the whole Andes Region.

2) Increasing understanding and monitoring of climate variability in non-coastal areas

Non-coastal areas are also prompted to be impacted by climate change and climate variability events and the intensification and distortion of regional and global hydrological cycle.

Countries without coastal areas need to enhance drastically systematic observations of precipitation and temperature patterns and build capacities for El Niño – La Niña forecasting and monitoring.

The Government of Bolivia recognize the difficulties to differentiate climate change effects on climate variability events, even the intensification of positives anomalies related with “el Niño” since the 80´s show strong correlation with the intensification and disruption of the global hydrological cycle.

The Government of Bolivia further recognize and urge the international community to provide the necessary help to create systematic observation capacities within the regions that can be shared among countries following the principle of equity.

We urge the international community to recognize that some countries are more vulnerable to climate events because they depend on forecasting and research done in other countries with enhanced systematic observation capacities.

3) Developing indicators and systematic observation of climate change impacts and vulnerability.

The Government of Bolivia further support SBSTA initiative to enhance interaction with international research programmes on the scientific question as noted in para. 4(a) of the document.

The Government of Bolivia urge the international scientific community to enhance systematic observations on mountain regions, in particular to understand regional hydrology, ecology and land use patterns in mountain regions.

The Government of Bolivia further request the international research community to enhance cooperation with developing countries to observe carbon cycle in Forest and develop indicators to monitor the causality of deforestation.

PAPER NO. 4: CANADA

CANADA'S VIEWS ON PRIORITY AREAS OF RESEARCH AND QUESTIONS FOR THE SCIENTIFIC COMMUNITY RELEVANT TO THE CONVENTION (FCCC/SBSTA/2002.CRP.3/REV.1, PARA 8)

Canada welcomes the opportunity to share our views on a process in the SBSTA to identify priority areas of research and questions for the scientific community.

Canada fully supports the Intergovernmental Panel on Climate Change (IPCC) as the authoritative body on the assessment of climate change science. In addition to providing a wealth of new information related to climate change science, impacts, adaptation and mitigation, the IPCC Third Assessment Report (TAR) identifies a number of areas where further research and information would contribute to reduce any remaining uncertainty.

The Parties to the Convention have a role to play in identifying information needed to assist Parties to implement decisions and to support possible future decisions of the Conference of the Parties, and communicating these needs to the IPCC, as well as stakeholders, civil society and national and international research agencies. The findings of the TAR provide Parties a useful basis to consider future research priorities and prepare questions for the scientific community.

However, as Canada suggested in deliberations on the TAR at SBSTA16, for such an exercise to be most meaningful it should follow from, and not precede, the appropriate review and use of the new information in the TAR. An exercise to identify information gaps and priorities relevant to the Convention before, or in disconnect with, the appropriate review and use of the new information in the TAR is in our view premature.

A Process to Identify Information Needs:

The SBSTA16 conclusions related to the TAR are a promising first step towards establishing a process to review and make use of the new information in the TAR. In Canada's view, any additional information needs of the Convention will be a natural outcome of the associated deliberations, decisions and upcoming submissions (as requested in FCCC/SBSTA/2002/CRP.3/Rev.1) on the TAR, namely:

- the aspects of the TAR that could help facilitate further consideration of the agenda items of the COP and its subsidiary bodies;

- possible new work elements for the SBSTA based on information in the TAR relevant to the scientific, technical and socio-economic aspects of impacts of and vulnerability and adaptation to climate change;

- possible new work elements for the SBSTA based on information in the TAR relevant to the scientific, technical and socio-economic aspects of mitigation;

- how to make use of relevant information in the TAR to develop a better understanding of the scientific, technical and socio-economic aspects of Article 2 and cross-cutting issues, including the relationship between adaptation and mitigation.

As Parties gain experience with implementation of the Convention and its Kyoto Protocol, they should share information about any problems that they encounter. The TAR is a useful tool to help Parties assess

their country level information needs by assisting to define and identify where specific needs, options and priorities lie.

It may be useful for Parties to share information on any experience with methods or processes to identify and prioritize information needs, and determine how to best fill the gaps. For example, Canada is currently undertaking a process to identify its climate change response information needs and associated research priorities as part of establishing a Canadian Climate Change Research Agenda. Although inevitably the needs of Parties will vary, the process taken to identify needs may be useful and have application for other Parties.

There should be a permanent agenda item for the exchange of information between the Convention and international research agencies, as there is for GCOS. It is important for Parties to learn how international research is stimulated, coordinated and funded. Learning about the agencies' programmes will allow for better appreciation of the research effort that underlies the IPCC Assessment Reports, and allow for the Convention's needs for further scientific and technical inputs to be communicated to research organizations. Dissemination of IPCC Assessment Report conclusions and communication of information needs relevant to the Convention to civil society, stakeholders and national research agencies should be a key aspect of Parties' implementation of Article 6. The SBSTA should also consider what it can itself do to help close information gaps, such as generating key information needed by incorporating it into reporting requirements.

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The foremost priority of the FCCC is to facilitate action, namely adaptation and mitigation, to address climate change. The key focus of the SBSTA's work should be the assessment of the scientific information provided by the IPCC and how it can improve implementation of decisions related to the Convention and Protocol, and help to identify further areas of priority in pursuit of our common objective (Article 2).

In a previous submission on the subject (FCCC/SBSTA/2002/MISC.5) Canada offered its preliminary views on how the new information in the TAR could contribute to enhancing existing decisions and possible future SBSTA work.

Canada suggested that in the case of existing decisions, primarily the Marrakech Accords which represent the actions that will be taken by Parties in the first commitment period, the TAR provides considerable new information relevant to their implementation. In some cases the existing methodologies, policy frameworks and guidelines may need to be refined to take into account this new information. For instance, given the additional insight provided by the TAR on adaptation, the existing methodologies might need to be improved in order to help Parties to better identify priorities.

The TAR also identifies further action that is necessary to reach stabilization but is not covered by present decisions and for which new methodologies and policy frameworks need to be established. For instance, the TAR clearly points out that, despite the availability of many low cost options to adapt and mitigate, a number of factors influence Parties capacity to implement these measures. The SBSTA should assess the factors influencing adaptive and mitigative capacity to identify constraints, barriers, and opportunities to enhance all Parties' capacities to take on response measures. The TAR also points to the fact that a portfolio of both adaptation and mitigation measures will prove to be the most effective response to climate change, and the SBSTA should begin to explore policy frameworks that take into account these synergies.

Although understanding will improve as research moves forward, there is sufficient information for the SBSTA to begin to explore methods and tools to make use of the wealth of information in the TAR. Likewise, further information will reduce uncertainties, but information will never be complete and the SBSTA should assist Parties with methods and tools for risk assessment and risk management and for dealing with uncertainties in decision making.

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Canada also suggested possible areas where further information might be most useful. Priority should be given to improved climate and socio-economic models that reflect more detailed regional and local features. More research is needed to understand the vulnerabilities, impact of and adaptation to Arctic climate changes. There is also a need for improved modeling approaches that focus specifically on development drivers and possibilities for alternative development paths in non-Annex I countries.

The TAR suggests that decisions on what constitutes critical GHG levels will be intricately linked with further monitoring and research on: detecting, attributing, and projecting climate change and the impacts of climate change; the vulnerabilities of natural and human systems and the adaptive and mitigative capacities of communities from the local to global scale; and the effectiveness of adaptation and mitigation options. International research agencies should be encouraged to focus attention on the conclusions of the TAR on further research and information needs.

There are undoubtedly a number of scientific and technical uncertainties to the climate change response which further research by the scientific community would reduce, i.e. with respect to the projected magnitude and rate of climate changes under different emissions scenarios; a better understanding of the role of the carbon cycle and biological carbon storage building on the work of the IPCC Special Report on Land-use, Land-use Change and Forestry; the synergies and trade-offs among land use, land-use change, adaptation, mitigation and vulnerability issues; further examination of the relationship between adaptation and mitigation , including how timing of emission reductions affects the optimal balance of adaptation and mitigation; the effectiveness of measures; the potential for non-C02 greenhouse gas reductions; and more information (both monetary and non-monetary) about ancillary benefits and the costs of damages. Further assessment of the technological potential for different emissions reduction pathways, in both the short term and long term and on both a detailed regional and sub-regional basis, would reduce uncertainties with regards to what options are open and what they will cost.

Nevertheless, the SBSTA has had only a very preliminary exchange of views, and further discussion is necessary to come to a collective view and to send a collective message with respect to the needs of the Convention to the scientific community, including the IPCC as it embarks on its Fourth Assessment Report. Canada looks forward to participating fully, through future submissions, future deliberations in the SBSTA, and future decisions to identify further methodological work and information necessary.

Terms of Reference for the Side Event with the Scientific Community

The upcoming interactive session between Parties to the Convention, the IPCC and the scientific community should seek to:

- Clarify the roles and mandates of the UNFCCC, the IPCC and the scientific community/international research agencies;

- Communicate the current status of the main areas of work/focus of the UNFCCC;

- Provide an opportunity for discussion with the IPCC of new information in the TAR relevant to the main areas of work of the Convention with the aim to assist Parties in their consideration of the TAR and upcoming submissions on the subject;

- Provide an opportunity for discussion with the international research agencies as to their work programmes and how the agencies determine their priorities;

- provide the Parties to the Convention and the scientific community opportunity to discuss possible strategies to strengthen cooperation within the international research community, strategies to promote and encourage Parties to invest in research and training of scientists at home, and a strategy for communication of Convention information needs and priorities to the IPCC and the scientific community.

Overall, the session should provide an exchange of information to support the SBSTA's aim to make recommendations to CoP8 and CoP9 on a work program and process to make use of the TAR to further progress towards addressing the ultimate objective of the Convention and how to deal with remaining challenges presented to the policy-maker.

PAPER NO. 5: CHINA

A SUBMISSION ON KEY SCIENTIFIC QUESTIONS AND PRIORITY AREAS OF RESEARCH BY THE CHINESE GOVERNMENT

The Sixteenth session of the SBSTA invites governments of Parties to submit, by 20 August 2002, their views on priority areas of research and questions for the scientific community relevant to the Convention. According to the requirement, China provides the following comments on key scientific questions and priority areas of research for the basic climate change science.

Key scientific questions

China considers that IPCC TAR has provided an assessment of new scientific information for policymakers. However, many key scientific questions still remain to be solved due to the complicated responses of the earth climate system to natural and anthropogenic forcing. Uncertainties are obviously large in the following basic scientific questions:

Facts and causes of the past climate change

Key scientific questions to be tackled include: what changes have happened to the global and regional temperatures, the rate of precipitation and extreme weather or climate events over the last 100 or 1000 years or for an even longer period? How about the changes in solar radiations, volcanic aerosol, tropospheric aerosols and land use/cover during the corresponding periods? What are the causes for the observed changes in major elements of climate? And how could we detect the anthropogenic global and regional changes of climate in case of the remarkable and multi-scale natural climate changes?

The TAR concludes that there is new and stronger evidence that human-induced increase in atmospheric CO2 concentration is the main cause for the observed changes in the climate over the past 50 years. We should realize, however, that this conclusion is tentative and might be subject to major modification. Presently, we still don't know the exact position of today's climate in the past 1000 years or longer time due to proxy problems of data and its coverage. So it is necessary for further research. Problems still exist because urbanization effects on terrestrial records might have not been removed completely from the current temperature series. The disparity between surface and aloft temperatures in the last 20-30 year should also be explained more rationally. It should be pointed out that the scientists lack reliable time series data of long-term solar radiation, natural and anthropogenic aerosols for investigating the causes of climate change. The ability of climate models to simulate the low-frequency climate change is considered to be low at present, and their role in studying climate change detection and attribution will be enhanced only if they are significantly improved.

Key processes and feedbacks in climate system

There are many important questions in this respect which accurate answers should be given: what are the magnitudes and rates of terrestrial and ocean carbon emissions and sequestration? How to accurately estimate the future change in concentration of the atmospheric greenhouse gases? What is the sensitivity of climate system to varied forcing including greenhouse gases? What is the mechanism for the documented rapid climate changes in the past time?

Our understanding of these questions is limited, and much work is needed in observation and research in the future. Efforts should be given to the processes of bio-geo-chemical cycles of the key earth elements including carbon, the response and feedback of clouds and moisture to climate change, the interactions among ecosystems, cryosphere and climate change, and the palaeo-processes relevant to the understanding of modern climate change. Only if substantial progress be made in these areas, could we be more confident to estimate the sensitivity of the earth climate system.

Climate models and the prediction of the future climate trend

The scientific questions which need to be studied and assessed include: how to reduce the error bars for predicted future concentration of atmospheric greenhouse gases and for the radiation magnitudes of the gases and aerosols? How to test and improve the ability of hierarchy of climate models? And how to use these models to predict the global and regional climate change probably induced by the increased concentration of atmospheric carbon dioxide and other trace gases, and to depict the confidence or uncertainty especially for the prediction of regional details?

The climate models in use today couldn't simulate with satisfaction the current regional precipitation and extreme weather events, and the palaeo-climate changes. Even for the surface temperature changes, models usually output radically different results for the same region. Large uncertainty is obvious in estimating the radiation forcing of the main species of greenhouse gases and aerosols, particularly in estimating the indirect effect of aerosols. The role played by black carbon from continents should also be further investigated.

Priority areas of research and assessment

China suggests that the following aspects should be emphasized in future research and assessments.

Detection and attribution of natural and anthropogenic changes

Efforts are needed to improve the observation of climate system, both in current time and in the distant past. For climate change during the instrumental period, more attention should be given to the effects of urbanization and land use on global and regional temperature. Marine data set needs to be improved. The improvement of climate model and development of methodology is needed in order to distinguish the anthropogenic change from natural variability on different time and spatial scales, especially to confirm the key elements which induce the climate change during last 100 years

Climate sensitivity and the projection of atmospheric CO2 concentration

In order to significantly improve our understanding of present and future climate changes, scientific community has to pay more attention to the study of processes and feedbacks within climate system. Special efforts should be given to: The establishment of a believable emission scenarios of greenhouse gases and aerosol. Effects of marine biological, physical and chemical processes on atmospheric CO2 concentration; Impacts of land use/land cover change and terrestrial ecosystem change on global carbon cycle; The response and feedback of cloud, moisture and mineral aerosol to climate change; Palaeo-climate dynamics on time scales of decade to millennia.

Development, test and projection of climate models

More sophisticated climate system models and regional climate models should be developed. Comparison of different models and palaeo-climate modeling should be encouraged for evaluating the models' performance and for modifying the models. Models' ability to simulate the extreme weather events and abrupt climate change should be increased, and estimation of possibilities of their occurrence could be made. The modeling prediction of possible change in the future and its uncertainty should be described scientifically.

Estimation of effectiveness of the Kyoto Protocol implementation

The Convention prescribes that the developed countries will firstly take action to reduce the emission of greenhouse gases. So it is an urgent task for IPCC to assess the effectiveness of the implementation of Kyoto Protocol to globe climate change in the future.

PAPER NO. 6: COLOMBIA

COLOMBIAN VIEWS ON PRIORITY AREAS OF RESEARCH AND QUESTIONS FOR THE SCIENTIFIC COMMUNITY RELEVANT TO THE CONVENTION

In response to the invitation made by SBSTA 16 in document FCCC/SBSTA/2002/CRP.3/Rev.1, Colombia welcomes the opportunity to submit its views on priority areas of research and questions for the scientific community relevant to the Convention. In this regard, we consider the following to be priority areas of research:

1) Vulnerability assessment and differential climate change impacts

As a key step to improve local adaptation capabilities to respond to the adverse effects of climate change, we consider it a priority for the scientific community to further study the vulnerability of **regional ecosystems** to the projected alterations linked with global climate change.

a) Future research could focus on certain regional ecosystems that have not been the object of extensive studies. Such is the case of mountain ecosystems and high plateaus, in particular the Andean *paramo*, not commonly perceived as being highly vulnerable to climate change.

   Given that local data is scarce and predictions inaccurate, research is needed in order to:
   (i) Gather observations to better understand the pressures these ecosystems are undergoing due to associated climate change effects
   (ii) Provide quantitative information on the response of these systems to climate change additional to the existing qualitative data – continue research on ecosystem biology to better predict possible responses

b) With regards to coastal zones and marine ecosystems (which have been studied in more detail) partial data at local scale on natural and anthropogenic threats needs to be completed. Detailed cartography and unified coastal lines need to be developed at a local/regional scale, as well as studies on local coastal and delta geomorphology.

   Specifically, further knowledge is required at a local dimension with regards to:
   (i) Current state of aquifers in the Caribbean and Pacific coastal zones
   (ii) Evaluation and measurement of saline intrusion
   (iii) Land use change as a result of flooding and saline intrusion
   (iv) Coastal erosion and accretion processes – location, historical changes, magnitude, causes and possible consequences
   (v) Effects of sea level rise (flooding, erosion and saline intrusion) on natural resource use

2) Further research is needed regarding local strategies aimed at creating greater resilience to face potential climate-related harm. These strategies must take into account poverty and inequality issues, governance factors and effective territorial planning options that address climate change. In this regard, the scientific community could help guide policymakers on the effects of and links between territorial planning and adaptive capacities.

3) Vulnerability, climate change and agriculture

Not withstanding the fact that agriculture is a multifactored system, investigation efforts should strive for greater linkage between climatic and socioeconomic scenarios to determine the vulnerability of

agricultural zones and sectors to climate change, in terms of: Gross Domestic Product, employment prospects, chemical substance use, exports and imports, market opportunities, among others.

Specifically, research regarding agriculture and vulnerability could focus on:

a) Evaluating information regarding minimum and optimal climatic conditions for the development of agricultural crops such as: temperatures, rainfall, solar radiation, water needs, among others

b) Defining and identifying strategic crops and agricultural areas most negatively affected by climate change impacts

c) Specific studies on the expected changes in geographical distribution and productivity of the main crops already identified in the TAR (maize, wheat, rice) as well as others, possibly due to climate change effects and increased climate variability

d) Links between indirect effects of climate change, such as reduction in cultivated areas, and peasant migration phenomena

e) Scarcity of freshwater resources due to climate change and possible rise in production costs

f) Research on crop improvement in order to yield harvest more tolerant to drought and more resistant to plagues and diseases, as well as having shorter cultivation cycles that allow greater flexibility in conditions of climate change

4) Correlation between climate change, extreme weather phenomena and increased climate vulnerability

The links between climate change, extreme weather phenomena and increased climate vulnerability should be further studied, especially at the regional level, in order to fully understand the range of impacts associated to climate change and the inertia that characterizes it.

One concrete request would deal with research regarding possible increases in storms, river and delta flooding and other natural phenomenon due to sea live rise.

5) Reduction of uncertainties in projected changes linked to global climate change

There is a need for higher levels of certainty regarding the frequency, intensity, occurrence, distribution and impacts of expected climate change-related alterations.

A specific task could be the promotion of modelling activities aimed at improving predictions on the magnitude of sea level rise, the probabilities of its occurrence, and the actual rate of the rise.

6) Probable adverse effects of response measures under the Kyoto Protocol on fossil fuel exports

a) Quantification of such adverse effects in terms of Gross Domestic Product, employment prospects, exports and imports, market opportunities, among others

b) Effects of possible oil supply failure (in the mid to long term) on projected emissions scenarios and climate change predictions

7) Migration responses to climate change

Climate change may potentially lead to emigration in highly vulnerable areas. The scientific community relevant to the Convention should therefore take the issue of environmental refugees into account as an additional pressure on societies and regions less vulnerable to climate change

PAPER NO. 7: DENMARK ON BEHALF OF THE EUROPEAN COMMUNITY AND ITS MEMBER STATES AND OF BULGARIA, CROATIA, CZECH REPUBLIC, HUNGARY, LITHUANIA, POLAND, SLOVAKIA AND SLOVENIA

Third Assessment Report of the Intergovernmental Panel on Climate Change.

Views on priority areas of research and questions for the scientific community relevant to the Convention.

Denmark, on behalf of the European Community and its Member States and Bulgaria, Croatia, Czech Republic, Hungary, Lithuania, Poland, Slovakia and Slovenia, hereby submit views on priority areas of research and questions for the scientific community relevant to the Convention.

The EU welcomes the conclusions of SBSTA at its sixteenth session, contained in document FCCC/SBSTA/CRP.3 Rev.1, and the invitation to submit views on various parts of the conclusions, as input to the further consideration by SBSTA of these issues at the 17th, 18th and subsequent sessions.

SBSTA Conclusions

The conclusions of SBSTA 16 identified in paragraph 4 research and systematic observations as one of three preliminary areas of scientific, technological and socio-economic matters, which could be considered regularly by the SBSTA, taking into account other relevant agenda items. The EU supports that the SBSTA undertake regular consideration of research and systematic observations, and that ways should be found to secure an improved and more continuous interaction with the research community, in the future work of SBSTA.

Article 5 of the Convention covers both research and systematic observation, but so far SBSTA has only considered systematic observations through the Global Climate Observing System (GCOS) under the heading of co-operation with International Bodies and there has been no in-depth consideration of research requirements. The EU would therefore suggest that a new agenda item on Article 5: Research and Systematic Observations should be introduced and that GCOS should be considered under this item as well as new items on research.

The EU considers the steps already taken, such as the workshop to consider the IPCC Third Assessment Report (TAR), the discussions in the SBSTA 16 on the TAR, the decision to invite representatives from IPCC and relevant international research organisations to an exchange of views at SBSTA 17, the invitation to Parties to submit views on the issues covered in the SBSTA 16 conclusions on the TAR, as well as on the aspects of TAR that could help facilitate further consideration of the agenda items of the COP and its subsidiary bodies, to be the initiation of a valuable process in direction of strengthening the link between science and policy making.

The EU further notes that SBSTA, by article 9 of the Convention, is explicitly created to deal with this link in several ways, specified in article 9.2 a-e.

Priorities for International Research

The EU believes that as part of the ongoing consideration of the IPCC 3rd Assessment Report, better linkage should be made between the work of the Convention and the international research programmes such as the WCRP, IGBP and IHDP as agreed in paragraph 7 of the SBSTA16 conclusions. Indeed, paragraph 7 proposes the first main activity of the SBSTA with respect to international research. It is an

excellent opportunity in our view for the SBSTA to bring to the attention of the international research programmes the recommendations of the IPCC for further research.

The EU proposes that the secretariat requests the representatives of the international research programmes to provide a comparison of their planned research activities with the research recommendations of the IPCC, as stated in the TAR synthesis report, in the Summaries for Policy Makers and the Technical Summaries of the three IPCC working groups, as well as in the individual Working Group reports, and also how their planned research activities relate to the questions which the IPCC addressed in the TAR Synthesis Report. The EU notes that many of the recommendations in the TAR involve basic scientific activities, which are already included in the international research programmes. Without pre-judging the outcome of the process the EU would draw attention to the following key areas where it believes there may be gaps in the international research activities with respect to the needs of the Convention. It suggests that these could be:

- Reducing the uncertainty in the sensitivity of the climate system to greenhouse gases and other forcings.
- Improving the quantification of the anthropogenic component of observed changes in climate, and improving the estimates of possible natural influences and natural variability.
- Improvements in modelling regional and subregional climate change, for integrated assessment of impacts, vulnerability and adaptation, including the size and frequency of extreme events (storms, floods, droughts, etc).
- Assessment of global and regional impacts and risks associated with various greenhouse gas stabilisation levels and pathways. This should also include better estimates of thresholds and probabilities for abrupt, or irreversible events, and assessment of the risk of the possible amplification (or amelioration) of anthropogenic climate change.
- Assessment of the economic, environmental and social costs and benefits associated with different stabilisation levels and pathways and the technological scenarios associated with each, including improved understanding of factors affecting inertia to change and learning processes.
- Research on methodologies, technologies, timing and costs of adaptation.
- Assessing integrated approaches to adaptation and mitigation in the framework of strategies for sustainable development.
- Assessing how regional/national development strategies can simultaneously meet development priorities and address climate change.
- Assessments of the constraints and opportunities for adoption of low GHG emitting technologies.

The above research activities should be seen in the context of the policy relevant questions addressed by the IPCC in the Synthesis Report of the TAR. In the view of the EU the IPCC will need to revisit these questions in its 4th Assessment Report and so they are very relevant to the research agenda over the next 5 years.

The questions of the TAR Synthesis Report are highly relevant to policy makers but very often involve cross cutting and interdisciplinary issues. The IPCC notes that “the challenge to IHDP, IGBP and WCRP is to build an international programme of earth system science, driven by a common mission and common questions, employing visionary and creative scientific approaches and based on an ever closer collaboration across disciplines, research themes, programmes, nations and regions”. The EU suggests that these programmes should include key policy-relevant scientific areas, which need to be addressed by Parties to the Convention.

The consideration of future research needs will be an on going process and the EU recommends that the SBSTA asks the Secretariat to continue to liase with the international research programmes and to report to the SBSTA on the outcome of the dialogue

An important matter raised in paragraph 4a was the need to enhance research and observational activities in developing countries and to encourage further

the co-operation between developed and developing countries in this area. The EU would like to note that the START programme of the IGBP exists to help enhance research activities and to provide training for scientists from developing countries. The EU would welcome a report by the IGBP on this programme to SBSTA.

The EU would further be interested to hear from the international programmes what other work they are undertaking to encourage capacity building in science within developing countries and would ask that they report on this under this agenda item at SBSTA 17.

The European Commission under its Fifth Framework Programme (FP5) is supporting all important research aspects related to climate change, from better understanding of the carbon cycle to detection, prediction and impacts of climate change. Under the priority "Global Change and Ecosystems" of the Sixth Framework Programme (2002-2006) climate related research will be strengthened and the programme will be open to the developing countries. Research will be carried out in close collaboration with international programmes and contribute to the objectives of IPCC.

As regard to timing it is important to recall that the IPCC's Fourth Assessment Report is scheduled to be completed in 2007. This means that for new research to be reflected in the 4th Assessment and to assist policy making under the Convention, research results should be available no later than 2005. Thus the research community need to review their plans and activities with some urgency if they are to be of value to the needs of the Convention. Parties also need to consider the implications for their domestic research programmes in the same time frame. The EU proposes that the international programmes report back on their response to any requests agreed at SBSTA 17 by SBSTA 18.

National Programmes and Communication

The EU recalls that Annex I Parties have reported their research activities under their 3rd national communications. The EU considers that it would be useful if the secretariat could review how far the National Programmes address the issues raised above and report to SBSTA.

The EU notes that to facilitate science based policy making, broad dissemination of the results of climate change research, to policy makers, to other scientists, to the private sector and to the public, should receive adequate attention, as a priority matter for both the science and the policy community, and for the work of the Convention on article 6. In this respect,

the EU stresses the importance of relevant sections in the work programme being prepared on Article 6 and especially its paragraph 9(f).

Conclusions

Regarding key research issues, the EU has already made its views known in the submission "Third Assessment Report of the Intergovernmental Panel on Climate Change", which is reproduced in FCCC/SBSTA/2002/misc 5. It would underline the importance of further work on assessing the parameters required to address the ultimate objective of the Convention, improving the assessment of the anthropogenic component of climate change and reducing the uncertainty in the sensitivity of the climate system to increasing greenhouse gas concentrations. It would also encourage cross cutting work to look at the question of stabilisation, which it will discuss in more detail in its next submission.

Finally the EU notes that although further research is needed to reduce uncertainties and to better quantify various aspects of climate change, the basic scientific propositions on climate change are robust and imply that urgent actions are required to address the growing levels of greenhouse gases in the atmosphere. Research is required to improve our assessment of the risks of climate change and the policies required to manage such risks.

PAPER NO. 8: JAPAN

JAPAN'S VIEWS ON PRIORITY AREAS OF RESEARCH AND QUESTIONS FOR THE SCIENTIFIC COMMUNITY RELEVANT TO THE CONVENTION (FCCC/SBSTA/2002/CRP.3/REV.1, PARA 8)

Japan welcomes the opportunity to submit its views on priority areas of research and questions for the scientific community.

IPCC TAR contains much information that is useful for the future work of COP and SBs. Also, it contains important recommendations for further action to address remaining gaps in information and understanding. We believe that this set of information should be used in various ways to support the work of COP and SBSTA on further strengthening their efforts to address the issue of climate change. Therefore, SBSTA should make the best use of the information contained in the TAR for the existing agenda items, and it should also establish a permanent agenda item to ensure linkage between the work of UNFCCC and that of the scientific community.

Japan believes that climate change issue should be tackled with the participation of all countries, and be based on the latest scientific knowledge and a long-term perspective. The TAR provides much useful information for this purpose. We need to consider how we can best use the TAR in pursuing this goal. In Japan's submission in March 2002 we presented our preliminary views on this issue and we will address it further in our submission that will be presented by the end of January 2003.

We must plan and implement measures to address climate change using the best available scientific knowledge at each stage. While full consideration should be given as to how to use existing scientific knowledge, we also need to provide our views on priorities and questions to the scientific community so that limited resources are best utilized for research that meet the needs of policy makers.

It is Japan's view that the following subjects are those to which the scientific community should give priority in their research and assessments.

1. Promotion of systematic observation

(a) Reversing the decline of observational networks

The international community should support countries' efforts, particularly those of developing countries, to remedy deficiencies in their monitoring systems. Climate change studies require accurate, long-term, consistent and reliable data from national observational networks. New technologies are emerging for the integration of various data from different sources, including satellites, using assimilation methods. There is a strong need to encourage wider use of these technologies as new, cost-effective solutions to satisfy observational needs for climate change studies.

Global observing systems have an important role in the maintenance and improvement of observational networks. There is a strong need to support the efforts of these global observing systems such as GAW, WWW/GOS, GOOS, GTOS and GCOS.

(b) Observational foundation for climate studies

Integrated global observations

Since climate change is a global phenomenon, observations for climate studies must be organised on a global scale. In this effort, satellite data should be used effectively to cover areas where ground systems do not exist. At the same time, it is extremely important to integrate satellite-based observing systems with ground-based networks, so that satellite data can be verified using ground-based observational data.

Since Earth observation on a global scale exceeds the capacity of a single government or international organization, international strategic planning of observations is essential to avoid duplication and to fill gaps in observational networks. To achieve this, it is necessary to strengthen the cooperation and coordination among global observing systems and research programmes for integrated global observations. At the same time, relevant international organizations, especially the United Nations specialized agencies, should jointly plan and implement a strategy for integrated global observations to monitor the Earth's atmosphere. In this regard, the Integrated Global Observing Strategy (IGOS) Partnership has an essential role to facilitate the implementation of the integrated global observations. Governments and relevant international partner organizations should support efforts to achieve global observations which aim to satisfy IGOS requirements. As an important partner of the IGOS Partnership, GCOS should submit to SBSTA for further review reports on the progress of the IGOS activities.

Data and information systems

Priority should be given to the improvement of the coordination among numerous different data providers for the generation of accurate, long-term and consistent data. Therefore, it is required to promote initiatives for the following actions through international cooperation:

i. establish interchange format and quality control method for the international compatibility of observational data;

ii. establish data archiving system for improved compilation of data;

iii. promote the common use of the data archives and networks that store and access data;

iv. develop information system and services for active exchange of data obtained.

(c) Observation of the spatial distribution of greenhouse gases and aerosols

Strengthening systematic observation is essential for identifying the occurrence of climate change and improving the accuracy of climate models. In particular, it is important to observe the carbon cycle, including sequestrations and emissions of CO2 by terrestrial ecosystems and oceans. It is also important to observe GHGs, as well as other climate forcing agents such as aerosols and clouds, and changes in precipitation patterns.

Besides observation of the carbon cycle, it is imperative to observe the global water cycle. Since water vapor is the largest forcing agent, the water cycle and global warming greatly affect each other. Changes in the water cycle also induce changes in precipitation patterns and extreme weather events.

2. Further development of climate models and reduction of scientific uncertainties

State-of-the art global climate models still have some inconsistency in simulating the mean climate and its variability. To reduce uncertainties in projections, it is essential to identify what causes the inconsistency and to improve the model simulations.

(a) The future design of measures to tackle climate change must be based on more reliable projections of the future climate system. Research on the following subjects is of great importance for improving climate models and enabling us to make more reliable projections.

- effects of aerosols and clouds on the dynamics as well as the thermodynamics of the climate system
- effects of climate forcing agents other than aerosols and clouds
- change and feedback in the carbon cycle in terrestrial ecosystems and oceans
- changes in precipitation patterns and extreme events induced by water cycle variations through climate change

(b) The impact of climate change varies from region to region. It is necessary to develop methods to obtain climate change projections with smaller geographical scales. It should be recognized that further improvement of global to regional scale projections is indispensable for downscaling.

(c) Further research is needed on the inertia of climate change, including possible large-scale and long-term changes in polar regions.

(d) Further research is needed on large-scale, high impact, non-linear and potentially abrupt changes in physical and biological systems, including changes in the thermohaline circulation of the oceans.

(e) A mechanism should be developed to ensure that the outcome of research on climate models can be used as quickly as possible for research on the effects of climate change.

(f) Intensive and comprehensive research is needed to understand the global carbon cycle, including observation and synthesis of terrestrial and oceanic carbon sources and sinks, data assimilation into models, and integration of the biophysical and human dimensions.

3. Further research on emission scenarios

(a) Difference in emission scenarios as well as uncertainties in climate models arises in the wide range in climate change projections. Although it is scientifically impossible to predict the accurate future ways of development in the world, it is necessary to improve individual scenarios as well as consider the probability of the scenarios by enhancing consistency among sectors and regions.

(b) It is also necessary to project the future emissions of groups of countries such as developed countries, countries that are undergoing the process of transition to a market economy and developing countries in each scenario.

(c) The existing scenarios mainly focus on emissions from energy sectors and CO2 emissions. The other scenarios such as those focusing on land use change should be further improved.

4. Further research on existing impacts, prediction of future impacts and possibility of adaptation

(a) In order to monitor the impacts of climate change which have already appeared in various areas, the following research activities are necessary.

- development of monitoring methodologies and establishment of monitoring systems using those methodologies and international networks

- inter alia, establishment of monitoring systems in small island countries and other vulnerable developing counties

(b) The prediction of future impacts of projected climate change should be improved by focusing on the following issues.

- prediction of regional impacts with smaller geographical scales

- environmental and socio-economic impacts associated with changes in precipitation patterns and extreme events such as floods, droughts, tropical cyclones and ENSO

- comprehensive risk assessment of climate change impacts including quantitative inter-sectoral risk comparison and integration of various risks

- prediction of climate change impacts according to different development scenarios

(c) Potential and costs of adaptation measures should be further examined region by region.

5. Further research on mitigation measures

(a) Potentials, barriers and costs of mitigation measures should be examined in terms of emission scenario, region, country and sector.

(b) Effects (including ancillary benefits) of mitigation measures and their implication with sustainable development should be further examined.

(c) The further investigation should be made for opportunities of individual technologies and measures to mitigate climate change. Such technologies and measures should include (i) mitigation and prevention technologies such as separation, recovery, sequestration and utilization of carbon and green house gases, (ii) renewable and alternative energy technologies, resources and products, as well as energy efficiency measures and technologies, and (iii) green house gas sinks.

(d) Policy assessment should be made including the effects of the implementation of the Kyoto Protocol in the first commitment period, in conjunction with climate change impact assessment, to find outeffective integrated mitigation and adaptation measures. Emission-climate-impact integrated models could be a useful tool for such assessment.

6. Improving scientific knowledge related to the ultimate objective of the Convention

As described in the TAR the decision on the ultimate objective of the convention requires value judgment. On the other hand, the best scientific knowledge should be provided for the policy decision. Although a lot of new information was compiled in the TAR, further improvement of scientific knowledge is needed. In this regard the research on the subjects described above from 1 to 5 as well as integrated research activities which bridge emission scenario, climate model, impact analysis and response measures are important. They will provide scientific knowledge for better decision making on the ultimate objective of the Convention. Nevertheless, we should recognize that a set of scientific information enabling the complete quantification of the ultimate objective may not be obtained in the near future. Therefore, practical approaches to address climate change under certain level of uncertainty should also be explored.

7. Facilitation of climate change research in and participation of developing countries

Although developing countries are thought to be most vulnerable to climate change, far less scientific information is available in developing countries. Therefore, a comprehensive assessment is required to identify current status, gaps, needs and possible measures relating to scientific knowledge on climate change and its impacts and response opportunities in developing countries.

The scientific community such as WCRP, IGBP, IHDP and IPCC has facilitated developing country participation in climate change research, but we have not seen satisfactory results so far. Their participation is of utmost importance for the improvement of monitoring, prediction of regional climate change impacts and investigation of mitigation and adaptation measures of each country and region.

From this point of view enhanced participation in the above-mentioned scientific programmes and assessments as well as capacity building through regional global research networks such as APN, IAI and ENRICH should be promoted.

PAPER NO. 9: MYANMAR

VIEW ON PRIORITY AREAS OF RESEARCH AND QUESTIONS FOR THE SCIENTIFIC COMMUNITY RELEVANT TO THE CONVENTION

The SBSTA should also note that the conventional instruments for basic elements in the least developed nations need to be replaced by new ones to yield consistent reliable data. Thus the climate change assessment may prove realistic pictures in the years to come.

PAPER NO. 10: NEW ZEALAND

PRIORITY AREAS OF RESEARCH AND QUESTIONS FOR THE SCIENTIFIC COMMUNITY RELEVANT TO THE CONVENTION

Submission by New Zealand
(as invited by FCCC/SBSTA/2002.CRP.3/Rev.1 para 8)

Overview

New Zealand welcomes the opportunity to share its views on priority areas of research and scientific questions for the scientific community relevant to the Convention, as invited by SBSTA16 (FCCC/SBSTA/2002.CRP.3/Rev.1 para 8).

New Zealand considers it crucial that decision-making processes of SBSTA and Parties to the Convention are informed by policy-relevant scientific information. Communication of information needs by the Parties to relevant science bodies forms an important step to increase the collective knowledge on the science of climate change, its impacts, vulnerability and adaptation options, and opportunities and costs to mitigate greenhouse gas emissions.

At the same time, New Zealand considers it important that SBSTA embark on a process that reviews and, where appropriate, acts upon scientific advice received from the scientific community. In particular, New Zealand considers it an important step to identify the findings of the IPCC Third Assessment Report (TAR) that are directly relevant to agenda items of SBSTA and SBI, and to work towards agreement on consequent recommendations to the Parties to the Convention.

New Zealand also wishes to point out that the IPCC will shortly embark on scoping of its Fourth Assessment Report. To ensure that this report will meet the needs of the Parties, the IPCC will require a comprehensive list of relevant questions that Parties wish the scientific community to address. For scientific information to be relevant to the ultimate objective of the Convention, the scope of these questions needs to be wider than research and systematic observations, but needs to include information on the scientific, technical and socio-economic aspects of impacts of, and adaptation to climate change, and mitigation (FCCC/SBSTA/2002.CRP.3/Rev.1 para 4b/c).

SBSTA17 therefore should consider inviting Parties, by 31 January 2003, to submit comprehensive questions specifically for the IPCC to consider in its Fourth Assessment Report. Together with consideration of the information contained in the TAR that is relevant to agenda items of COP and its subsidiary bodies (FCCC/SBSTA/2002.CRP.3/Rev.1 para 9), SBSTA18 would then be able to consider the lessons learnt from the TAR, and recommend a set of questions to the Parties to the Convention to be submitted to the IPCC.

The Parties to the Convention will also require additional specific scientific information to guide the discussions on future mitigation commitments. These negotiations will begin formally in 2005, and any request from COP and its subsidiary bodies will require urgent attention by the Parties for the scientific community to be able to respond to such a request.

Priority areas of research and questions for the scientific community

The TAR has shown that there are several robust findings with regard to the existence of climate change, a substantial contribution of human activities to observed climate change, a high likelihood of climate changes during the 21st century occurring more rapidly than at any time during the past 10,000 years, and

a persistence of anthropogenic perturbation of the climate system for several more centuries at a minimum. Concerns resulting from those changes justify, in New Zealand's view, global collective action and considerable effort towards reducing greenhouse gas emissions. The inevitability of some degree of climate change also implies that adaptation is a necessity for all countries.

The efforts of the Parties to decide on the degree and balance between mitigation and adaptation, and global distribution of efforts and responsibilities, would be helped by the following scientific information and assessments:

- reduction of uncertainty of the climate sensitivity factor;
- improvement in regional and local climate change projections and their uncertainties, and better understanding and communication of model differences leading to various projections;
- reduction of uncertainty in predictions of changes in the frequency and intensity of extreme events and their regional variations;
- better identification of thresholds for low-probability, high-impact large-scale events, which would assist determining levels of greenhouse gas concentrations that may be deemed non-dangerous compared to natural pressures on resources;
- development of comprehensive risk management approaches to dealing with uncertainty, incorporating:
    - probability distributions for climate sensitivity
    - thresholds for damages in ecological and socio-economic sectors, and the relevance of rate-of-change versus absolute change
    - financial and non-market appraisals of adaptation strategies
    - methodologies for determining possible thresholds and decision points in the evolution of emission pathways in developing and developed countries, with the goal of better understanding drivers and probability distributions of emission scenarios used in the scientific literature
    - treatment and communication of subjective and objective uncertainties
    - consistent treatment and communication of the concepts of probability, uncertainty, impact, and risk, in climate change assessments;
- improved links between responses to climate change impacts and "normal" sustainable management and use of natural resources, and methodologies to quantify costs, co-benefits and synergies of adaptation measures;
- methodological frameworks for defining and assessing economic, social and environmental mitigative and adaptive capacity of nations and regions and identify cross-cutting issues (synergies and barriers);
- improvements in bottom-up and top-down assessments of mitigation costs and barriers to implementation, and consistent treatment of ancillary benefits and negative cost options, revenue recycling, and transaction costs.

New Zealand notes that in addition to specific research, an ongoing internationally coordinated programme of systematic observations is vital, so that scientists can address these research questions and test predictions of changes and impacts, and monitor the effects of mitigation activities. We welcome the ongoing SBSTA consideration of the Global Climate Observing System (FCCC/SBSTA/2002.CRP.3/ Rev.1 para 4a), and the importance SBSTA places on enhancing research and observation activities in developing countries and collaboration between developed and developing countries.

With regard to the needs of the Convention to work towards future mitigation commitments, New Zealand sees an urgent need for SBSTA to request the scientific community to provide additional information on:

- peer review of current and future scientific work undertaken by SBSTA to determine current, previous and future contributions of nations and regions to anthropogenic climate change, including sensitivities to assumptions and required data (such as the proposal by Brazil);
- assessment of options to determine future mitigation commitments by all Parties on the basis of historical and/or current greenhouse gas emissions, and absorptions by sinks, on the basis of, inter alia, regional, national, per capita, per GDP, or per unit energy net emissions, with regard to:
    - data requirements
    - data availability
    - feasibility of projections
    - measurement frameworks for mitigative and adaptive capacity.

A framework for identifying further information needs and relating findings in the TAR to agenda items of the COP and its subsidiary bodies

The overarching goal of the Convention is to facilitate action that will prevent dangerous anthropogenic interference with the climate system. Adequate responses include both mitigation and adaptation. The task of SBSTA is to identify relevant scientific information to guide Parties in making decisions and define priorities for action.

The TAR has produced a number of robust scientific findings that are relevant to this task. The SBSTA16 conclusions are a promising first step to review and make use of the relevant information through an on-going dialogue with the scientific community, beginning with an event at SBSTA17. New Zealand welcomes this further opportunity and believes this session should be used to:

- clarify the requirements and roles of SBSTA, the IPCC, and the scientific community represented by WCRP, IGBP and IHDP
- give the scientific community opportunity to further explore information needs and priorities of the Parties and the policy relevance of scientific information
- agree on timelines for the exchange of questions and information relevant to processes of SBSTA and the Convention, and the IPCC.

To continue this promising exchange of views and information, New Zealand would like to see a permanent agenda item for the exchange of scientific information and policy-relevant information needs between the Convention and relevant scientific bodies and agencies. The SBSTA should also consider whether it can assist the science community by structuring reporting requirements such as to maximise the availability and transparency of scientific data required by the scientific community.

New Zealand wishes to emphasise that, in addition to an increased engagement with the scientific community, the SBSTA has to make a dedicated effort to evaluate the scientific information already available since the publication of the TAR with regard to its relevance for agenda items and the ultimate objective of the Convention. The work by the scientific community, and their ability and willingness to focus research areas on policy-relevant subjects, depends on the ability and willingness of Parties to take existing information into account.

PAPER NO. 11: NORWAY

VIEWS ON PRIORITY AREAS OF RESEARCH AND QUESTIONS FOR THE SCIENTIFIC COMMUNITY RELEVANT TO THE CONVENTION

In relation to the agenda item on the Third Assessment Report (TAR) of the IPCC

The SBSTA at its sixteenth session requested Parties to provide submissions by 20 August 2002 with views on priority areas of research and questions for the scientific community relevant to the Convention, under the agenda item on the IPCC's Third Assessment Report (TAR). We are pleased to submit Norwegian views on this issue.

Each of the three volumes of the TAR contains a list of further work that the IPCC considers needed for narrowing gaps between current knowledge and policymaking needs. These lists, together with the submissions from Parties on this issue would be useful guidance to the governments when they make plans for their countries' research activities. We would expect that the issue would be further discussed within the SBSTA with a view to provide guidance to the IPCC on issues to be addressed in their Fourth Assessment Report.

Robust findings and key uncertainties

The key findings from the second IPCC assessment report, SAR, provided a technical and scientific basis for the development of the Kyoto Protocol. The TAR confirms and strengthens these conclusions, and states that there is now stronger evidence for a human influence on the global climate. Question 9 of the Synthesis Report focuses on robust findings and key uncertainties regarding attribution of climate change and model projections. In the report, a robust finding is defined as one that holds under a variety of approaches, methods, models and assumptions and one that is expected to be relatively unaffected by uncertainties. For example, one robust finding is that to stabilise the atmospheric CO_2 concentration at certain levels, global CO_2 emissions would eventually need to decline to a very small fraction of current emissions. This is true for all the studied levels (450, 650 and 1000 ppm).

In our view, the TAR and the Synthesis Report with their robust findings provide sufficient scientific and technical basis for initiating the process of establishing new and stronger reduction commitments for the period after 2012. The SBSTA and the COP should start this process as soon as possible.

Key uncertainties are defined as those, which, if reduced, may lead to new and robust findings in relation to the questions of the Synthesis Report. In the following we focus on some areas where we believe the scientific community should make a special effort to reduce uncertainties. Our research priorities are: assessing ways to achieve the ultimate objective of the Convention, analysing mitigation options and barriers, adaptation, as well as climate extremes, regional changes and large-scale abrupt and long-term changes. In addition to the mentioned research priorities, we see a need for improving climate related systematic observations world-wide.

Research priorities

<u>Ultimate objective of the Convention</u>

It is Norway's view that research, which may assist Parties in achieving the ultimate objective of the Convention should be a high priority of the SBSTA. We see a need to decide on specific stabilisation targets for greenhouse gases in the atmosphere and develop possible paths towards this ultimate objective. The SBSTA should start assessing different stabilisation scenarios and the climatic impacts

associated with them for the different regions of the world. It would be advantageous if these regional impacts could be quantified as detailed as possible. Information on different time frames of reductions required in order to obtain these stabilisation levels, and under what conditions, should be made available. Analyses of costs and benefits of the mitigation efforts needed would be important input in such a process.

The TAR and the Scenario-report (SRES) contain information that would be helpful in the assessment. Further information will be available in the coming years, and close cooperation between the SBSTA and the IPCC is necessary.

Mitigation and adaptation

It is very important to continue the research on mitigation options and related costs and benefits. In this regard, analyses of barriers for implementation of the mitigation strategies as well as policy instruments are essential and should be given priority. Important research areas include options within the energy and transport sectors, where there are large potentials for reductions. Furthermore, “no regret” options (as defined in the TAR) as well as co-benefits of measures should be focused.

Research on adaptation strategies should also be highlighted, with regional and local focus. As described in the TAR, the projected impacts of extreme events might affect both natural systems, infrastructure and social aspects. Developed countries might be relatively well prepared with respect to technical adaptability, but more information is needed e.g. on effects on human well-being and health, as well as on the vulnerability of (marginalised) eco-systems, with a special focus on the situation in developing countries.

Climate extremes

The TAR indicates that the effects caused by extreme weather and climate events might be more severe than the results of the expected change in average conditions. There is still a lot of work to be done in relation to the predictability regarding the localisation, frequency and intensity of such events. Additional data gathering, modelling studies and simulation capacity are needed to achieve a better understanding of extreme events in terms of likelihood, frequency and spatial distribution. The TAR reveals that the gaps in knowledge might be particularly large for non-temperature extreme weather phenomena associated with precipitation, drying and wind. With regard to precipitation, we believe that both heavy rain- and snowfall, including the risk of avalanches and land slides, should be further studied. Research on climate extremes should be strengthened in general, to increase predictability and to find low-cost mitigation measures.

Regional changes

The TAR identifies gaps in knowledge regarding the simulation of regional impacts of climate change. This is the case for average weather conditions in general, and changes in extreme events in particular. In our view, further work should be done to improve the regional forecasts towards higher accuracy and finer spatial scale. These efforts should be co-ordinated with strengthened systematic observation – especially in the poorly mapped developing world.

Further work is also needed to improve the understanding of the potential consequences of climate change on a regional scale. These studies should focus on effects on both physical, biological and human systems, and should include the additional stress induced by other factors such as demographic shifts and land-use changes. This research is particularly needed for developing regions, indigenous communities and marginalised unique ecosystems. This work should also deal with the current and short-term regional effects of climate change. Areas of interest could for example be the possible role of climate change and recent extreme weather events, and the effects from such events on resources, demography and political stability.

Large-scale abrupt changes

The prospect of surprises due to the non-linear nature of the climate system is dealt with in the TAR. Advances in knowledge are needed to better understand the physical mechanisms, likelihood, magnitude, time scale and reversibility associated with such phenomena. Areas of focus could be studies of the thermohaline circulation, effects due to changes in ice sheets and carbon cycle feedbacks in the terrestrial biosphere and release of greenhouse gases from permafrost regions and hydrates.

Long-term changes

In relation to projected climate changes, the TAR correctly focuses primarily on changes in 2100. We would welcome further research related to longer term climatic changes. From the TAR we know that some impacts of current emissions of greenhouse gases may be too slow to become apparent and some could be irreversible if emissions and related climate changes are not limited in both rate and magnitude before associated thresholds are crossed (i.e. inertia). Thus we see the need for further research on this, including the possible thresholds and their levels.

Systematic observations

In the TAR it is stated that there is a particular need for additional systematic and sustained observations, modelling and process studies, and that a serious concern is the decline of observational networks. We agree with the IPCC that there is an urgent need to strengthen the effort with regard to systematic observations. At SBSTA 16, the Global Climate Observing System (GCOS) secretariat reported on its activities and on development of the global observing systems for climate. In this context we would like to express our appreciation of the work of the GCOS secretariat, and we especially look forward to the second report on adequacy of the climate observing system, which was initiated last year. The report will be elaborated in collaboration with the UNFCCC, and a major part will consist of country information on systematic observation from the Parties' third National Communications. In our view, the SBSTA should support and contribute to this process, with the aim to raise consciousness on the importance of systematic climate observations. We do appreciate the fact that research and systematic observations will be on the SBSTA agenda on a regular basis from now on (according to conclusions adopted at SBSTA 16). In this regard we would like to suggest that the SBSTA should develop a strategy to establish stable funding of these monitoring activities through international channels, which would secure sustained climate observations globally.

PAPER NO. 12: RUSSIAN FEDERATION

Informal Translation

SUBMISSION ON PRIORITY AREAS OF RESEARCH AND QUESTIONS TO SCIENTIFIC COMMUNITY RELEVANT TO CONSIDERATION OF THE THIRD ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Russian Federation highly estimates efforts of international scientific community for preparation of the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC). TAR covers problems of reduction and stabilisation of the levels of greenhouse gas emissions in line with the main objective of United Nations Framework Convention on Climate Change (UNFCCC, Article 2), scientific, technical, and socio-economic aspects of vulnerability and adaptation to climate change, and organisation of systematic research and observation. It also provides analysis of possible project activities on climate change. Russian Federation supports consideration at SBSTA sessions of the above issues with participation of the IPCC and other relevant international scientific and research organisations. These activities will draw attention of policymakers in countries to the problem of climate change and rise their awareness on this issue.

Scientific research and systematic observations over climate system are key activities of the world community. They should be targeted at understanding core mechanism and direction of global transformations, reduction of uncertainties of estimates and elaboration of socially oriented and economically efficient measures to prevent climate changes.

Russian Federation believes that researches on levels of greenhouse gas atmospheric concentrations that may cause dangerous influence on climate system of the Earth is a priority condition for achieving the above tasks. TAR indicated their importance for reaching ultimate objective, principles and provisions of the Convention and justification of commitments, policies, and measures on reduction greenhouse gas emissions that were taken by the Annex I Parties in accordance with Kyoto Protocol. The SBSTA also noted a need for more scientific research on greenhouse gas atmospheric concentration and forcing agents, which can influence the climate system (paragraph 4 (a), document FCCC/SBSTA/2002/CRP.3/Rev.1).

Russian Federation proposes to prepare a Technical Paper on permissible levels of greenhouse gas atmospheric concentrations and other forcing agents that do not cause dangerous interference with the climate system. The Technical Paper should summarize the latest scientific knowledge of the dynamics of greenhouse gasses and aerosol accumulation and interaction in the atmosphere, together with their transformation and impact on global climate. It is proposed to request the IPCC to prepare this Technical Paper by the end of the year 2003. The first steps on preparation of this Technical Paper have been already undertaken: more than 30 experts participated in preparation of the Scoping Paper for it. The Scoping Paper was sent to Governments for review, and 30 Governments provided their comments.

Российская Федерация

ПРЕДЛОЖЕНИЯ К ОПРЕДЕЛЕНИЮ ПРИОРИТЕТНЫХ НАПРАВЛЕНИЙ ИССЛЕДОВАНИЙ ВОПРОСОВ К НАУЧНОМУ СООБЩЕСТВУ В СВЯЗИ С РАССМОТРЕНИЕМ ТРЕТЬЕГО ОЦЕНОЧНОГО ДОКЛАДА МГЭИК

Российская Федерация высоко оценивает деятельность мирового научного сообщества по подготовке Третьего оценочного доклада МГЭИК. В Докладе отражены вопросы сокращения и стабилизации уровней парниковых газов в соответствии с главной целью Конвенции (Статья 2), научно-технические и социально-экономические аспекты уязвимости и адаптации, организация систематических исследований и наблюдений, а также выполнен анализ возможной проектной деятельности в области изменения климата. Российская Федерация поддерживает предложение об обсуждении указанных вопросов на сессиях Вспомогательного органа по консультированию по научным и техническим аспектам (ВОКНТА). РКИК с участием представителей МГЭИК и других международных, научных и исследовательских организаций. Эта деятельность позволит привлечь внимание к наблюдающимся изменениям климата лиц, ответственных за принятие политических решений в странах, и повысить их осведомленность в этой проблеме.

Научные исследования и систематические наблюдения за климатической системой являются ключевыми направлениями деятельности мирового сообщества. Они должны быть нацелены на понимание сути и направления происходящих изменений, снижение неопределенности оценок и обоснование социально ориентированных и экономически эффективных мер по предотвращению климатических изменений.

Российская Федерация считает, что развитие исследований уровней атмосферных концентраций парниковых газов, которые могут привести к опасному воздействию на климатическую систему Земли, является важнейшим условием решения поставленных задач. Их значимость для достижения главных целей, принципов и положений Конвенции, а также обоснования количественных обязательств, политики и мер по ограничению выбросов парниковых газов, принятых Сторонами Приложения I к Конвенции согласно Киотскому протоколу, подтверждена Третьим оценочным докладом МГЭИК. ВОКНТА также обращает внимание на необходимость дополнительных исследований атмосферных концентраций парниковых газов и других соединений, которые могут воздействовать на климатическую систему (пункт 4 (a), документ FCCC/SBSTA/2002/CRP.3/Rev.1).

Российская Федерация предлагает подготовить Технический доклад о допустимых уровнях атмосферных концентраций парниковых газов и других соединений, не позволяющих оказать опасное воздействие на климатическую систему, в котором обобщить современные научные знания о динамике накопления и взаимодействиях парниковых газов и аэрозолей в атмосфере, их превращениях и воздействии на климат нашей планеты. Подготовку Технического доклада предлагается поручить МГЭИК до конца 2003 г. Первые шаги в этом направлении сделаны – в подготовке макета Технического задания участвовало более 30 экспертов. Этот макет был разослан на рецензию Правительствам, и 30 Правительств прислали свои замечания.

PAPER NO. 13: UNITED STATES OF AMERICA

1.0 Introduction

The United States welcomes a discussion of research priorities for the scientific community of relevance to the deliberations of the U.N. Framework Convention on Climate Change.

As we noted in our interventions at SBSTA-16, we believe that the discussion at SBSTA-17 should be focused on key outstanding issues where the scientific and technical community can make progress over the coming years. SBSTA articulation of priorities in the context of the Convention's needs is likely to be a helpful reference for research-related institutions as they set own research priorities.

The United States does not consider that discussion at SBSTA-17 should result in questions posed for the purpose of framing the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The Third Assessment Report (TAR), which was issued last year, contains an up-to-date assessment of existing scientific information, and has identified robust findings and key uncertainties. Table SPM-3 on pages 31 and 32 of the TAR Synthesis Report identifies key uncertainties where further work by the scientific and technical community (as opposed to the IPCC, which is an assessment body) will be needed. At this stage, it is appropriate that the scientific and technical community work to address these uncertainties. Particular attention could be given to those areas in which substantial progress can be made in the period prior to the Fourth Assessment Report.

The United States offers below specific areas—climate change science (Section 2.0), impacts, adaptation and vulnerability (Section 3.0), and mitigation (Section 4.0)—we believe would be worthy of consideration in a discussion on research priorities with regards to climate change science, impacts, adaptation and vulnerability and mitigation given their relevance to Convention processes.

2.0 Climate Change Science

2.1 Climate Change Modeling

Reliance on models demands careful attention to their associated limitations and assumptions. In particular, great attention has been paid to global mean surface temperatures, even though some results are based solely on simple models that do not fully incorporate other major climate change variables (for example, those associated with the hydrological cycle). We also note that there remain significant uncertainties concerning the local and regional response of climatic phenomena. It is clear that more robust indicators that reflect regional and local climate change and variability have important policy implications and need to be developed. Focus on research and development of relevant tools and technologies by the scientific and technological community to reduce the uncertainties in these analyses and projections will be required.

2.2 Knowledge Base on Aerosols, Driving Forces and Feedback Loops

It would be particularly useful if the scientific and technical community could provide more information on the relative contributions to climate change of atmospheric forcing factors, as well as land cover and land use change. To improve and quantify confidence in future projections of climate change, uncertainties need to be reduced in at least three key areas:

(1) Human-induced factors such as atmospheric concentrations of greenhouse gases and aerosols, and land cover change;
(2) Natural factors, such as changes in solar radiation and aerosols; and

(3) Feedbacks within the climate system that determine the sensitivity of the climate system to changes in forcing.

The relative importance of carbon-based (black carbon) aerosols, sulfate-based aerosols, and carbon dioxide/other greenhouse gas emissions and tropospheric ozone in influencing climate requires further scientific attention as each is related to different control strategies. Additionally, more comprehensive measurements of greenhouse gases and aerosols would provide critical information about their local and regional source and sink strengths.

Feedbacks and interactions are critical to climate sensitivity, on both local and global scales. In the case of local feedbacks, understanding is currently limited, and a great deal of research is needed. This submission cannot cover the full range of research needs, but the United States wishes to note some examples, not in priority order:

(1) The relationship between both local and global forcing (including aerosols in particular) and responses in large and small-scale cloud systems;
(2) Global water cycles, including the inability of general circulation models to successfully represent water vapor transport (particularly in the equatorial regions) as well as Arctic ice and snow cover;
(3) Climate-ecosystem interactions, including dynamic vegetation and disturbance processes that reflect climate drivers;
(4) Land use/land cover influences on climate, and the coupling between other climatic variables and land use change; and
(5) The poor regional performance of current general circulation models, which severely restricts the examination of potential global change influences on key regional ecosystems and water sources such as bays, estuaries, snowpack, rainfall patterns, and inland watersheds.

2.3 Climate Observing System

A long-term global climate observing system that provides a more definitive observational foundation to evaluate decadal-to-century-scale variability and change remains critical to future projections of climate change. Such a system must include observations of key state variables such as temperature, precipitation, humidity, pressure, clouds, sea ice and snow cover, sea level, sea-surface and ocean temperatures, and soil moisture. Improved measurements of water vapor (particularly the vertical profile) and clouds are especially important. Forcing agents and their fluxes must also be observed and quantified, including for example aerosol, methane, and ozone abundances, and carbon fluxes. Comprehensive monitoring systems need to incorporate the following attributes:

(1) Development of “climate quality” data, with stable measurement methods, consistent exposures, good inter-comparison between data sets, and back- and forward-standardization of long-term data records;
(2) Provisions for high quality data assimilation methods, combined with efficient archiving and retrieval methods, to facilitate research, analysis, and forecasting applications;
(3) Creative capture of relevant information from the myriad of special research projects conducted throughout the world in recent decades to optimize the information available for scientific analysis and computer model evaluations of global change and climate change; and
(4) Development of new and complex observations and monitoring systems needed to analyze terrestrial and aquatic ecosystem variability.

It is also important that a comprehensive monitoring system have a strategy for integrated global observations, as called for in the IPCC TAR. The challenge is to develop one agreed, coherent observation plan for the atmosphere, ocean, and land that integrates space-based and in situ observations

across the three elements. SBSTA-16 urged Parties to give priority to the increasing contribution of new and emerging technologies, such as space-based systems. The Global Climate Observing System (GCOS), Global Ocean Observing System (GOOS), and Global Terrestrial Observing System (GTOS), together with the other Integrated Global Observing Strategy (IGOS) Partners, are working to develop international consensus on overall needs. GCOS has included a broader range of experts, including those from the IPCC, in preparation of the second "Report on the Adequacy of Observing Systems for Climate." SBSTA also stressed the importance of taking an integrated approach to this assessment, including the use of new and emerging methods of observation. Scientists need to develop increased expertise in using integrated datasets from satellites and in-situ instruments to develop new multi-faceted approaches relevant to help address significant scientific questions.

3.0 Impacts, Adaptation and Vulnerability

3.1 Reducing Uncertainties Regarding Potential Impacts

There is some evidence from both observational and modeling studies that recent climate changes have affected physical and biological systems, although factors such as land-use change, resource use and pollution also act on these systems, making attribution difficult. The TAR Working Group II report identified many outstanding uncertainties, including the reliability of local or regional details in projections of climate change. Reducing uncertainties will require extensive research and observational efforts.

Several key research issues that require attention are:

(1) The likelihood of changes in temperature, precipitation and other climate indicators at specific points in time and space (*i.e.*, provide likelihoods, as opposed to a range);
(2) The likelihood of impacts (by region, sector, etc.) of climate change at different points in time for a range of forcing scenarios especially as reflected in disturbance responses such as drought, flood, wildfire and pathogen epidemics;
(3) The potential changes in rates of climate change over the next few decades, as well as associated impacts and vulnerability; and
(4) Projected changes in the hydrological cycle in response to global and regional climate change.

3.2 Integrated Assessment of Alternatives

The United States believes that adaptive responses and amelioration of adverse effects of climate change are important areas for further investigation of potential responses evaluation of their effectiveness, and estimation of their costs. Further, the application of integrated assessment and decision analytical frameworks, which take into account economic, social, and biophysical data could allow for the prioritization of adaptive responses, as well as the relative emphasis on adaptation and mitigation.

4.0 Mitigation

4.1 Technological Change, Diffusion and Cost

Further discussion and review of least-cost pathways for meeting a particular stabilization goal are needed beyond those studies identified in Chapter 8 of the Working Group III TAR. These studies indicate that such pathways tend to depart gradually from the baseline in early years with more rapid reductions later on. This minimizes premature retirement of capital stock and permits sufficient time for the development and deployment of low-GHG emitting technologies.

Many of the differences between model projections of costs to address climate change stem from different assumptions regarding technological change. Certain aspects of technology diffusion, including the rates of change that are possible, remain poorly understood and merit further research and assessment, as well.

4.2 Alternative Mitigation Strategies

Further research and assessment are needed on the implications of different strategies with respect to CO_2 and non-CO_2 gases, as well as carbonaceous aerosols, and actions (*e.g.*, sequestration), on the nature, timing and cost of climate change mitigation. The potential of carbon capture, separation and sequestration technologies as well as associated environmental benefits and risks are sufficiently promising that they merit focused and systematic study. The time scales of forcing, responses, and costs associated with a range of different policy choices merit investigation with such an approach.

4.3 Integrated Analysis of Mitigation and Adaptation Options

The question of an economically efficient transition to a future that minimizes the economic and environmental consequences of climate change cannot be answered without simultaneous consideration of adaptation and mitigation. Developing the capacity to address climate change now and in the future will require substantial effort, institution building, and innovation. This should be a priority for the scientific and technical community. In this regard, a major concern is the inadequacy of decision models to capture both the benefits and costs associated with climate change and relevant mitigation strategies. The importance of a better assessment of accounting to reflect the full range of benefits and costs across sectors and the impacts on a nation's GDP, investment patterns, consumption levels, and jobs throughout the economy merit investigation.

4.4 Renewable Energy Resource Distribution

Past studies have characterized renewable energy technologies, but not their cost-effective geographic distribution. Information on the magnitude and distribution of renewable energy resources and technology distribution would facilitate country-specific development efforts on those technologies with the greatest potential to replace CO2-producing energy sources.

4.5 Biological Mitigation

It is also important to further explore biological mitigation, including:

(1) Conservation of existing pools of sequestered carbon;
(2) Augmentation of existing pools; and
(3) Substitution of biomass and other materials for fossil fuels.

Working Group III notes the importance of biological mitigation, and identifies questions about the uncertainty regarding the potential magnitude of biological mitigation and the lack of comparability between costs associated with various mitigation strategies. It is particularly important to address both the measurement of, and the costs and benefits associated with, preventing deforestation, especially in the tropics. As noted by Working Group III, improving the accuracy of global estimates of carbon emissions from deforestation remains an urgent and challenging task.

PAPER NO. 14: UZBEKISTAN

Uzbekistan counts that the priority areas of researches and questions for the scientific community relevant to the Convention and its Kyoto Protocol are identified fully and reflected enough in documents of the UNFCCC. We are satisfied that questions on development of researches and regional climate change assessments and scenarios included in the plans of forthcoming IPCC activities.

At the same time, Uzbekistan would like to underlines the importance of development of separate directions in the future report on researches and additional data for integrated assessment of climate change impact to sustainable development, as such as the water resources security and strengthening of degradation lands processes and also their interaction.

We consider that in further Fourth Assessment Report necessary will develop items related with methodologies on economic assessment of negative consequences of climate change and cost of mitigating measures, especially, for the countries with transition economy. The analysis and regional economic assessment of potential damage due no establishing of responsible measures is highly important, because there is break between the implementation of mitigation policy and scientific recommendations.

Uzbekistan, as the country not having the large financial opportunities, is very interested also in expansion of IPCC activities directed on development of the recommendations and economic assessments on comparative efficiency and cost of separate kinds of activity on GHG emission reduction, which could allow to choose by countries the most effective strategy of a mitigation and adaptation. Presently, very important items also are the economic analysis of expenses and benefits ratio in the most successful transfer of technology projects, the increasing of energy efficiency in technological processes and the use of renewed sources energy.

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