



UNITED  
NATIONS



**Framework Convention  
on Climate Change**

Distr.  
GENERAL

FCCC/SBI/2005/18/Add.4  
25 October 2005

Original: ENGLISH

**SUBSIDIARY BODY FOR IMPLEMENTATION**

Twenty-third session

Montreal, 28 November to 6 December 2005

Item 4 (b) of the provisional agenda

National communications from Parties not included in Annex I to the Convention

Compilation and synthesis of initial national communications

**Sixth compilation and synthesis of initial national communications from  
Parties not included in Annex I to the Convention**

Note by the secretariat\*

Addendum

**Research and systematic observation**

*Summary*

This document compiles and summarizes information on various research projects and systematic observation initiatives relating to climate change that are ongoing or under development by Parties not included in Annex I to the Convention. These activities increase Parties' understanding of the possible impacts of climate change and prepare Parties for developing sound climate change strategies. The document also describes the institutional setting in which national research is conducted and collaboration with international and regional bodies.

\* This document is submitted after the due date because all the necessary information was not available on time.

CONTENTS

	<i>Paragraphs</i>	<i>Page</i>
I. INTRODUCTION.....	1-3	3
II. REPORTING .....	4-5	3
III. OVERVIEW OF INFORMATION.....	6-44	3
A. Institutional arrangements.....	6-11	3
B. Research.....	12-19	4
C. Systematic observation .....	20-31	5
D. National research initiatives.....	32	7
E. Involvement in international and regional research efforts ....	33-44	8
IV. RESEARCH NEEDS .....	45-47	9
V. SUMMARY .....	48-50	11

Annex

National networks of observation stations contributing to systematic observation .....	13
--	----

## I. Introduction

1. The guidelines for the preparation of initial national communications by Parties not included in Annex I to the Convention (non-Annex I Parties) annexed to decision 10/CP.2<sup>1</sup> request Parties to seek to include information on research and systematic observation as well as policy options for adequate monitoring systems and response strategies for climate change impacts on terrestrial and marine ecosystems. Almost all Parties that have submitted their initial national communication as of 1 April 2005 provided information on research and systematic observation relating to climate change impacts, vulnerability assessment and adaptation options, and measures for addressing greenhouse gas (GHG) emissions (mitigation). The level of detail of reporting varied considerably, in most cases depending on the comprehensiveness of Parties' activities in these areas.

2. For some Parties, reporting was minimal and confined to institutional strengthening for research and systematic observation, or to research conducted on climate change that is carried out with international and/or bilateral support, as well as to the needs that countries have in pursuing specific aspects of research in broad or specific areas.

3. In general, Parties followed the guidelines. Most Parties provided a chapter dealing with research and systematic observation that included a general description of steps taken. Others covered the subject in general terms under other sections of the national communication.

## II. Reporting

4. Most Parties reported on their research activities in general, as requested in the guidelines. Some Parties also provided a detailed breakdown of research initiatives and results of research studies into climate change impacts, adaptation and mitigation.

5. Research initiatives that were reported fell into the following categories: issues relating to scientific aspects of the atmosphere, climate, hydrology, and meteorology, including modelling of climate processes; climate change impacts and adaptation; climate change mitigation; and ongoing or planned research programmes covering economic sectors, such as agriculture, health, forestry, waste, coastal zones and water resources. Most of the research activities reported as ongoing or planned were linked to vulnerability and adaptation assessments and mitigation activities, such as energy conservation, efficiency and related technologies.

## III. Overview of information

### A. Institutional arrangements

6. Most Parties noted the involvement of several governmental bodies, agencies and research institutes in systematic observation. They provided information on, and identified agencies responsible for, institutional arrangements to facilitate research, through the ministries of environment and physical planning, national offices of meteorology (Dominican Republic, United Republic of Tanzania), national councils and specialized centres (Brazil, China, Gambia, India, Nigeria, Pakistan), and universities (India, Nepal, South Africa, United Republic of Tanzania). India reported that many government ministries, and several autonomous institutions and non-governmental organizations (NGOs) are engaged in research relating to climate change. In countries such as Gambia, for example, it was reported that there is no single body responsible for directing research, although the Ministry of Agriculture and the National Agriculture Research Board direct research, and the National Agricultural Research Institute is responsible for conducting research.

---

<sup>1</sup> FCCC/CP/1996/15/Add.1.

7. Some Parties indicated that research activities are coordinated by their national meteorological services, and others indicated that climate change research is included under other environmental and energy-related activities or in the context of international or regional initiatives.
8. Many countries reported that their ministries responsible for the environment, energy and agriculture conduct sector-specific research on GHG inventories, vulnerability, and the ozone layer. Some countries (Argentina, Brazil, China, India, South Africa, Trinidad and Tobago) reported the active participation of universities in research, and the establishment of special groups working on climate change. Research activities as part of regional networks were also enumerated; examples are the Botswana Global Change Research Committee affiliated with the International Geosphere–Biosphere Programme (IGBP), the Caribbean Foresters Society, the Caribbean Community, and the Organisation of East Caribbean States/National Resources Management Unit project for the Caribbean.
9. Several Parties reported on plans and programmes that have the objective of developing scientific information on climate and on GHG emissions and of strengthening the capacity of institutions to address the scientific aspects of climate change. Notable plans include “Brazil Advances” within the Program of Climatic Change of the Brazilian Federal Government’s Multi-year Plan (2000–2003). Brazil is also developing scientific capacity to enhance cooperation and disseminate information on present and future global changes in Latin America in collaboration with the Inter-American Institute for Global Change Research.
10. Three Parties (Bolivia, Ecuador, Peru) also reported on their collaboration with the French Institute for Research and Development in a regional project called the Andean Glacier Monitoring Program, which entails an analysis of the effects of global climate change on glaciers in South America.
11. The Central African Republic, Comoros, Gabon, Guinea and Madagascar noted their need to set up an institutional framework for undertaking studies on climate change. These countries also have yet to set up a network of measuring stations, and institutions and/or programmes for specific research.

## **B. Research**

12. Most Parties addressed domestic and international research activities and identified priority areas for national climate change research. Many Parties reported that they have special national research plans and long-term strategies in different areas of climate change research.
13. Research activities identified by Parties included notable national initiatives as well as participation in international efforts in global research programmes relating to climate change. Some Parties highlighted the need to enhance research on agricultural practices and species resistant to climate change and to promote carbon monitoring in forestry management (Honduras) and livestock production (United Republic of Tanzania). Most Parties recommended further research on the impacts of climate change on agriculture and forestry, studies on the technical and economic feasibility of desalination of sea water and underground aquifers, studies on the effect of temperature increase on health, and support of scientific and applied research on human development vis-à-vis mitigation. Parties also called for more research on indigenous vegetation and animal diversity (Bhutan, Botswana, Namibia, Nepal, Mali, Mongolia, South Africa), the use of drought-resistant high-value crops (Cook Islands, Dominica, Ecuador, Ethiopia, Gabon, Guyana, Mauritania, Morocco, Nigeria, Niue), fisheries (Dominican Republic, Fiji, Jamaica, Kiribati, Tonga, Tuvalu), and health, including malaria, (Bangladesh, Gambia, Kenya, South Africa, Sudan, United Republic of Tanzania).
14. Research on mitigation included research on new energy sources and renewable energy, energy efficiency, and GHG abatement technologies. In Brazil, research is a component of several mitigation programmes for conservation of energy and development of new renewable energy sources. The most relevant included technology development for power generation using sugar cane as an energy source,

the project Gerahelio that looks at defining the most appropriate solar technology and size of solar power plants, and the project Pro-biodiesel for the development and approval of specifications of a new fuel for Brazil. Technology development for the use of new energy sources, studies on vulnerability and adaptation, development of forecasting models, emission factors and activity data in different sectors, monitoring of GHG emissions, information systems on GHGs, and development of studies on mitigation options for addressing climate change were noted by many Parties as ongoing research into mitigation.

15. Many Parties identified emission factors and activity data in the energy sectors, industry, use of solvents, agriculture, land-use change and forestry and waste treatment as key areas of research to improve the quality of data and the methods and procedures for emissions inventories.

16. Many Parties reported specific scientific research on the effect of the El Niño Southern Oscillation (ENSO) on their countries' climate, and the need to conduct detailed studies of the impact of climate change on vulnerable sectors using the Intergovernmental Panel on Climate Change (IPCC) scenarios of climate change.

17. The application of regional climate models was reported by many Parties. For example, Brazil reported the use of the ETA weather forecasting models of the National Centers for Environmental Prediction in the United States of America, which is a model configured to run in South America, to make seasonal climate predictions. This initiative is part of a project "Extended Range Simulations over South America" using the ETA/CPTEC model of Center for Weather Forecasts and Climate Studies, Brazil. India reported atmospheric and climatic research that focuses on developing customized general circulation models (GCMs) and regional circulation models for South Asia.

18. Several countries reported conducting studies on glaciology (Brazil, China, Nepal, South Africa). Brazil is doing this under the umbrella of the Antarctica Treaty for the development of scientific research, and South Africa presented details of its work at its Antarctic Base–Sanap.

19. Other research areas reported by many Parties included the impacts of extreme weather events and the intrusion of sea water into freshwater lenses (Kiribati, Nauru, Tonga, Tuvalu), human health (Kyrgyzstan), river flows (Namibia), glacier shearing movements, carbon management, forest inventories, mosquito control and malaria (South Africa), vulnerability to diseases and the effect of heat stress (Tajikistan), and meteorological studies and emissions reduction strategies (The former Yugoslav Republic of Macedonia).

### **C. Systematic observation**

20. All reporting Parties described their national programmes on meteorological, atmospheric, oceanographic and terrestrial observations of the climate system. The annex to this document lists the national networks of observation stations relating to systematic observation. In most countries, the meteorological agency is responsible for undertaking and coordinating these observations.

21. Armenia, Gambia, Guyana, India, Namibia, The former Yugoslav Republic of Macedonia and Viet Nam were among the many Parties that reported having undertaken meteorological observation since the late 1880s, including collecting, processing and disseminating data and information on meteorology and hydrology. Gambia reported a meteorological network of 15 synoptic stations, 44 rainfall stations and 18 crop-monitoring stations for observation of crop phenology. Namibia operates 300 active rainfall stations and 6 synoptic weather stations, and The former Yugoslav Republic of Macedonia has 270 meteorological stations, 110 hydrological stations and 115 ground stations. South Africa operates 20 fully equipped weather offices including on Antarctica.

22. Armenia counts on a network of as many as 45 meteorological stations, 3 climatic stations, and 70 meteorological, 105 river and 7 lake observation sites. The United Republic of Tanzania's network

consists of 24 full meteorological stations, 8 atmospheric chemistry, 13 agro-meteorological, and 110 climate stations and about 1,400 rainfall stations. Viet Nam operates 167 meteorological surface stations, 253 hydrological stations and hundreds of other specialized stations.

23. Although several countries did not provide details of their observation stations, all Parties have synoptic, climatic, meteorological, sea-level, rainfall and hydrological monitoring stations. Others have specific observation systems for avalanches and lakes (such as Argentina, Armenia, Bolivia, Brazil, Chile, China, Kyrgyzstan, Nepal and Peru). Viet Nam operates one ground atmospheric monitoring station that belongs to the World Meteorological Organization (WMO) Basic Pollution Monitoring Network. In Costa Rica, the Instituto Costarricense de Electricidad keeps track of climate parameters in areas close to hydropower, geothermal and wind projects in the country.

24. China reported on the establishment a large national network for comprehensive observation of the atmosphere. It has 143 reference climate stations, 530 basic weather stations and 1,736 ordinary weather stations. China has also set up an integrated marine observation and monitoring system comprising stations for ocean observation, voluntary observation vessels, a nationwide network for ocean tide testing, seashore ice-monitoring radar and “China Haijian” airplanes for observation. China has a developed terrestrial observation system consisting of a network that collects data on hydrological systems, ice and snow, ecological systems, agrometeorology and environmental protection. However, it was noted that the network has not been integrated to produce continuous observations of all parameters.

25. India reported that many of its data and research and observation centres have been established over the past century for climate-dependent sectors, such as agriculture, forestry and hydrology and that these have been coupled with the recent introduction of satellites and other modern observation platforms, such as automated weather systems and ground-based remote-sensing. India was one of the few countries to report on a long-term strategy to build up a self-reliant climate databank. The country reported that it possesses a “vast weather observational network” and is involved in regular data collection and databank management.

26. Teams of national researchers from several Parties are participating in international efforts in global observing systems relating to climate change, through collaboration and cooperation with regional and international organizations. These programmes include the Global Climate Observing System (GCOS), and the Global Ocean Observing System (GOOS). Several Parties mentioned technical cooperation with neighbouring countries (Argentina, Brazil, China, Guinea, India, South Africa).

27. Several Parties provided a breakdown of research initiatives in the Global Atmosphere Surveillance programmes in regions such as Latin America and the Caribbean and Africa. Others reported that they are establishing national and regional databases on meteorology and the environment. Where research centres exist, studies concentrate on climatology and climate change. The National Meteorological Database in Chile is reported to store climate information and have a comprehensive database dating back to 1950. Other Parties reported on their research databases that are used for local and regional climate studies, studies on climate prediction using statistical methods and monitoring meteorological variables associated with the ENSO, and conducting research in the area of atmospheric science.

28. Most Parties reported on their participation in the observing and monitoring programme of the Comité permanent inter États de lutte contre la sécheresse au Sahel (CILSS), which is a programme established in 1975 to monitor agricultural, hydrological and meteorological phenomena within the CILSS member States.

29. Several Parties highlighted that the main problems affecting the operation of their observing networks are lack of equipment, funding and trained personnel. A need was expressed for equipment for

monitoring GHG and climate. Parties mentioned that these types of equipment are generally expensive and, for this reason, the information used in their ongoing climate change studies is obtained from Europe, the United States and Canada.

30. Other Parties reported the lack of an integrated coordinated and standard approach in the present arrangements for collection, storing, quality control and dispersion of climate observation data. It was also mentioned that there is a limited number of weather parameters monitored in short time series and that more data are needed for non-standard data processing. Some Parties, including China, reported problems with meteorological observation where stations are distributed unevenly across the country.

31. Parties also reported that work to standardize airborne observation needs to increase, given that current airborne observation systems are still basic and that insufficient atmospheric trace gas observations are being made. The need for improvement of observation equipment and methods was also identified by many Parties.

#### **D. National research initiatives**

32. Research initiatives led by non-Annex I Parties that were reported in the initial national communications included the following:

- (a) In Brazil there is the Large-Scale Biosphere–Atmosphere Experiment in Amazonia focused on the protection of the tropical forest of Brazil and which is also engaged in the development of regional climate change models. Another programme, a pilot initiative, aims to stem deforestation in Brazil and contributes to the development of regional climate change models. This study is financed with resources from the World Bank, the European Union, and the Governments of the Netherlands and Brazil
- (b) Cuba is developing research programmes on climate variability and change, air pollution and atmospheric chemistry, and terrestrial ecosystems and biodiversity. In the framework of the “Branch Programs” on sciences and technology, there are two additional research programmes relating to climate change: one on the environment and sustainable development and the other on analysis of climate change and weather and climate prediction and the social and economic implications
- (c) India reported a pilot project to create an India-wide network on forecasting ocean movements and changes due to climate change
- (d) South Africa is conducting research on renewable energy and energy efficiency, energy demand and energy efficiency standards/guidelines for office buildings and low-cost housing, a biomass initiative for rural areas, and clean development projects in the energy sector. South Africa has also prepared a provisional carbon map for the country which illustrates the organic value of the soil to estimate possible carbon sequestration and accumulation under different cultivation practices and different ground cover
- (e) The Southern African Regional Science Initiative was initiated in 1999 to study the link between GHG emissions from natural and anthropogenic sources, as well as the emissions from transport mechanisms for the region and the impact of emissions on the environment. The study will use measurements taken by remote-sensing from aircraft, complemented by ground-based measurements of land surface characteristics and atmospheric characteristics
- (f) Gambia is working on the production of short-cycle higher-yielding manioc varieties

- (g) Indonesia is conducting research on fast-growing, high-quality forests, and on logging practices that will prevent further losses of species that enrich diversity of their tropical rainforests.

#### **E. Involvement in international and regional research efforts**

33. Several Parties provided information on their participation in many international research initiatives on climate. These include participation in the Global Energy and Water Cycle Experiment, the Climatic Predictability and Variability Initiative, Stratospheric Processes and their Role in Climate, and the Arctic Climate System Study.

34. In addition to the participation of many Parties in GCOS and GOOS, there are specific regional initiatives such as the Pilot Network for Research on the Tropical Atlantic – Pirata, in Brazil, which is an international system to gather atmospheric and oceanic data, and involves scientists from Brazil, France and the United States. This network supports the current GOOS stations in Latin America. Mention was made of Brazil's Center for Weather Forecasts and Climate Studies – CPTEC/INPE, which is equipped with a supercomputer with a capacity to use numeric models for the simulation of weather and climate.

35. Some Parties listed their work with the IPCC. Many Parties (e.g. Argentina, Brazil, Chile, China, Gambia, India, South Africa) noted that the results of their research on climate science, impacts, adaptation and mitigation contributed to work developed by the IPCC and that they will continue to take an active part in the relevant activities of the IPCC, and strengthen international cooperation and information exchange. These countries also said they are involved with the IPCC to gain a better understanding of the current situation and future prospects of climate change.

36. In addition to their involvement in global research programmes relating to climate change, including GCOS and GOOS, many Parties reported on their cooperation in activities conducted by the WMO, on international global atmospheric chemistry, past global changes and global changes in terrestrial ecosystems.

37. Gambia reported on its involvement with the United Nations Environment Programme (UNEP) Collaborating Centre on Energy and Environment at Risø, Denmark, and several countries in Africa (including Gambia and United Republic of Tanzania) reported their involvement in the Energy for Development Research Centre of the University of Cape Town, South Africa, on capacity-building in analytical tools for estimating and comparing costs and benefits of adaptation projects in Africa. South Africa also reported on its work with the World Health Organization on malaria control, with the United Nations Development Programme (UNDP) on capacity-building, and with Germany through its Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) on a solar cooker for rural areas.

38. Nigeria reported its involvement in World Weather Watch of the WMO and GCOS, and the Ocean and Coastal Areas Programme Activity Centre of UNEP, and several other Parties in Africa reported on their active cooperation and collaboration with the African Centre of Meteorological Applications for Development, based in Niger, and the Nairobi-based Drought Monitoring Centre.

39. Several Parties are participating in diverse international research initiatives, for example, with the Inter-American Institute for Global Change Research, the Global Climate Research Program and the IGBP, in studies on modelling emissions of carbon dioxide (CO<sub>2</sub>) from transport and from forest fires in Amazonia, and in research in glaciology under the Antarctic programme – PROANTAR. The Large-Scale Biosphere–Atmosphere Experiment in Amazonia is an international project to expand understanding of the climatological, ecological, biogeochemical and hydrological functions of the Amazonian region.



40. Some Parties collaborate with Parties included in Annex I to the Convention (Annex I Parties) through their national institutes where environmental studies on vulnerability and adaptation assessment are conducted. One example is the National Environmental Commission of Chile which, together with the Swedish Meteorological and Hydrological Institute, is working on a project aimed at developing its institutional ability to manage problems involving the atmospheric dispersion of substances.

41. The French Institute for Research and Development and research institutions in Bolivia, Ecuador and Peru are conducting an "Andean Glacier Monitoring Program: A Tool to Analyze Global Climate Change in South America".

42. Caribbean countries reported their involvement in an ongoing study on the potential use of photovoltaic technology to produce electricity. Initial investigation has also been conducted into the feasibility of using wind energy to produce electricity. A solar stills project for schools is being conducted in conjunction with the Centre for Research Management and Environmental Studies at the University of the West Indies. The university is also investigating ocean thermal energy conversion possibilities in Barbados. Several Parties in the Caribbean are researching climate change and related issues under the Caribbean Planning for Adaptation to Global Climate Change project in Guyana. Others are involved in research activities as part of regional networks such as the Global Change Research Committee affiliated with the IGBP.

43. Several Parties reported their involvement in the UNEP Country Working Groups for Climate Change Vulnerability and Adaptation Assessment on Water Resources, Agriculture and Coastal Zone as well as with the Global Change System for Analysis, Research and Training – START to develop regional networks for collaboration between scientists and institutions to carry out research on regional aspects of global change, evaluate its causes and impacts and provide information relevant to policy makers.

44. China is cooperating with many actors on studies on climate change research. Among these are the World Bank, the Asian Development Bank, UNDP, the Global Environment Facility and Annex I Parties such as Canada, Germany, Italy, Norway, Switzerland, United Kingdom of Great Britain and Northern Ireland, and the United States. China reported that in the future it will improve and further develop the national and regional network for systematic climate observation on the basis of extensive international cooperation with these and other organizations and Parties.

#### **IV. Research needs**

45. Parties indicated a need for more research in several areas to allow them to monitor the localized effects of climate variability and climate change. They also expressed a need for research into developing a sustainable socio-economic system. Many Parties, including Brazil, China, Gambia and India, mentioned that limited national budgets, inadequate financing, and limited technical support and human capacity are constraints to further research. It was also reported that inadequate financial support has resulted in a depletion of stocks of instruments and equipment as well as a restriction in the expansion of existing networks to increase their coverage.

46. Many Parties also reported that one of their priorities is strengthening the capacity of institutions involved in the collection, processing and maintenance of data and information relating to such areas as meteorology, hydrology and climatology. Some Parties (Djibouti, Guinea, Iran, The former Yugoslav Republic of Macedonia, Uganda) provided information on specific scientific research needs on climate, climate change and the effect of climate change on important economic sectors, on how to manage the waste sector and on the technical and economic feasibility of desalination of sea water, and on the use of aquifers in relation to the assessment of water resources. Research to improve scientific knowledge in

the forest sector and in-depth study of coastal zones was also reported as important. Specific areas of research need highlighted by select Parties are presented in box 1.

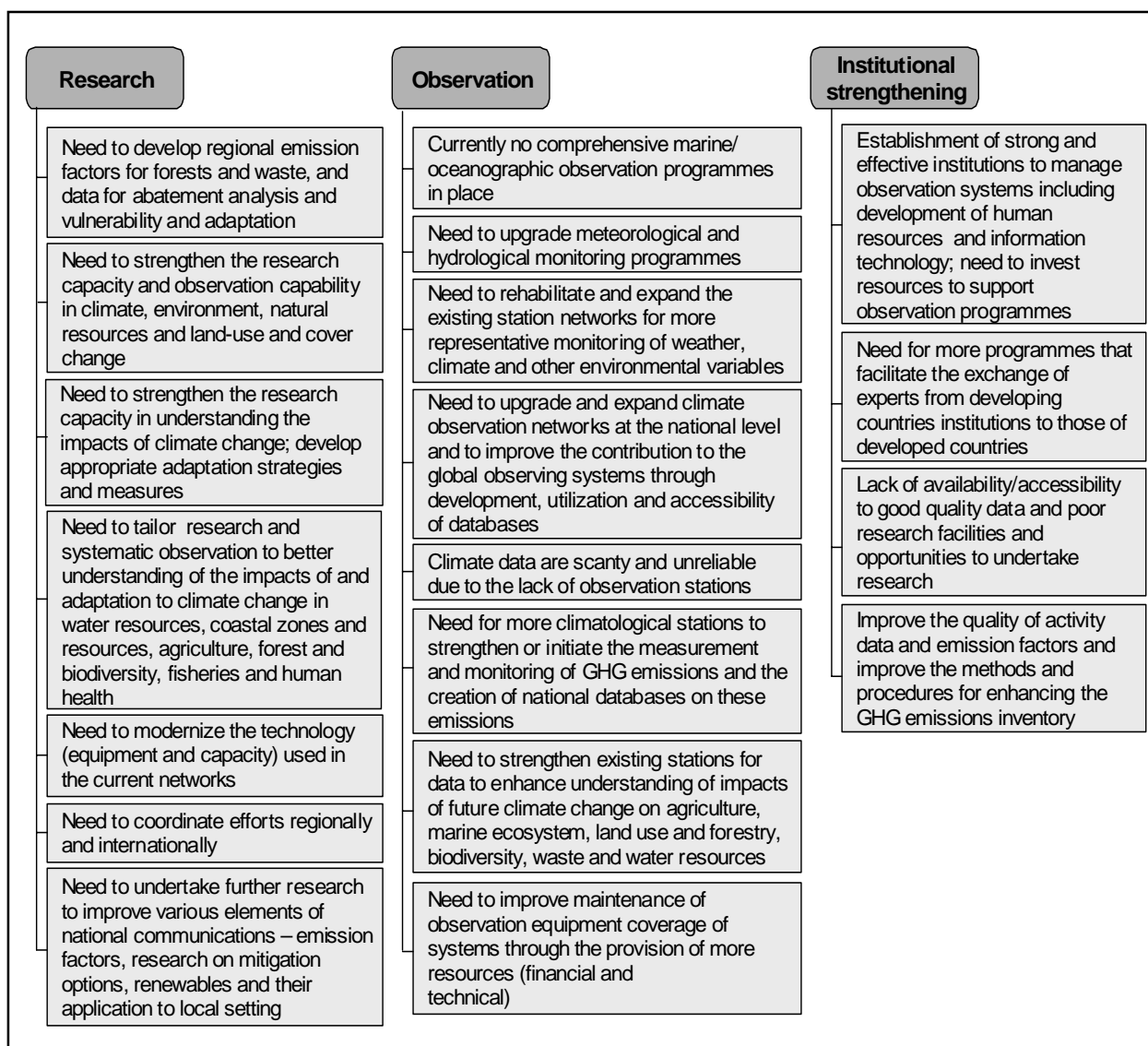
**Box 1: Specific areas of research need highlighted by some non-Annex I Parties**

- **Barbados:** further research and analysis in the area of vulnerability (the Party noted that there are no regional models to aid in vulnerability analysis in the Caribbean)
  - **Brazil:** measurement of sea levels over a longer time horizon, with the aim of studying the impacts of sea-level rise (in Brazil the collection of information is not adequate due to the high cost of obtaining and storing data. Information from private institutions is not always available)
  - **China:** improvement in airborne observations
  - **Comoros:** vulnerability indices, emission factors, water resources, coastal zones and oceanography
  - **Dominican Republic:** requires support for the development of an integrated surveillance system as part of a national network or system for the prediction of epidemics or the determination of the behaviour of diseases outside their endemic environment
  - **Gambia:** replacement and upgrading of conventional equipment to digital equipment to provide continuous recording of meteorological, hydrological and climatological elements
  - **Grenada:** development of research in flood control technologies, water availability, agriculture, human health, alternative energy resources, and systematic monitoring and observation systems, e.g. monitoring sea-level rise
  - **Honduras:** enhanced research on agricultural practices and species resistant to climate change and promotion of carbon monitoring in forestry areas
  - **India:** integrated research efforts to focus on climate change issues relevant to the Asia region
  - **Nigeria:** early warning systems to enable disaster preparedness
  - **Pakistan:** development of a meso-scale atmospheric model and a regional hydrological model for the upper Indus basin
  - **Sudan:** appropriate programmes for vulnerability indices, emission factors, water resources, research gaps and needs relating to impact of climate change on water resources
  - **Tonga:** the effects of extreme weather events and the intrusion of sea water into freshwater lenses
  - **United Republic of Tanzania:** additional research to identify the possible health implications associated with climate change
  - **Viet Nam:** more research to ensure the timely forecast and warning of natural disasters
  - **Yemen:** needs international support for conducting systematic observation of all relevant variables to climate change.
- Several Parties highlighted the need for sectoral research in vulnerability and adaptation vis-à-vis freshwater resources, and strengthening monitoring programmes that will facilitate: (a) collection of baseline data; (b) studies to quantify the response of surface run-off to rainfall; (c) development of flood maps for all coastal and other vulnerable areas.
  - Many Parties expressed a need for applied research to identify and transfer appropriate technologies to increase crop productivity, and to conduct investigations of the use of drought-resistant or salt-resistant crop varieties, international cooperation to study possible sources of pest introduction, and methods of biological or chemical control for pests in several regions.
  - Several Parties reported the need to rehabilitate and expand the existing station networks for more representative monitoring of weather, climate and other environmental variables.

47. Most Parties reported on their needs in priority sectors such as agriculture, water resources, fisheries and coastal zones. Almost all reporting Parties mentioned the need for capacity-building in the use of sophisticated sectoral impact models and integrated models. Several countries reported their involvement in vulnerability studies through the United States Country Studies Program, in sectors such as agriculture, coastal zones and water resources and called for similar types of studies in the future. A

compilation of needs reported by non-Annex I Parties on research and systematic observation is presented in figure 1.

**Figure 1. Research and systematic observation: needs of non-Annex I Parties**



## V. Summary

48. Research and systematic observation and modelling procedures used for assessments by non-Annex I Parties have been evolving over the past few years. Many Parties noted that data observed and collected for some climate variables are adequate for making a general predication of weather trends. The involvement of national institutions in regional and international research and observation initiatives permits Parties to have a basic understanding of the causes of climate change. These initiatives also serve as an important basis for integrated assessments of climate change impacts, which enable Parties, on the basis of future climate scenarios, to propose adaptation and GHG abatement options.

49. Some Parties noted advances in research on climate processes, climate modelling and prediction, including detailed assessments of the likely contribution of human activities. Research on climate

change impacts and vulnerability was, in most cases, related to research on adaptation to climate change. Ongoing studies on adaptation included those on important sectors, such as agriculture, water resources, health, and coastal zones and settlements. Research networking and collaborative efforts in the areas of glacier monitoring, climate studies in Antarctica, and regional databases for monitored environmental parameters are important developments for many Parties.

50. Although some Parties have reported that research and observation procedures and activities have been evolving, and others reported large investments in scientific infrastructure, it is worth noting that collaborative efforts among groups and across regions need to be encouraged further. In addition, new programmes that bring together research groups to solve common problems on climate change issues at the national, regional and international levels need to be identified. The compilation of more reliable and sufficient data for adequate evaluation of the effects of GHG emissions in the national context continues to be an urgent need.

Annex

**National networks of observation stations contributing to systematic observation**

<b>Party</b>	<b>Meteorological stations</b>	<b>Climate stations</b>	<b>Synoptic stations</b>	<b>Rain gauges</b>	<b>Hydrological stations (lake, river, etc.)</b>	<b>Oceanographic stations<sup>a</sup></b>	<b>Upper-air observing stations</b>	<b>Lightning detectors</b>	<b>Seismic stations</b>	<b>Aeronautical stations</b>	<b>Radar stations</b>	<b>Satellite stations</b>	<b>GHG monitoring stations</b>	<b>Other stations not specified</b>
Argentina													X	X
Armenia	X	X			X									
Azerbaijan	X				X	X								
Bahrain	X													
Bhutan	X													
Bolivia	X				X									
Brazil	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cameroon	X													
Chile						X								X
China	X	X	X	X	X		X	X	X		X	X	X	X
Comoros	X			X										
Cook Islands			X			X	X				X			X
Costa Rica	X	X				X								
Côte d'Ivoire	X											X		
Democratic People's Republic of Korea	X	X	X	X		X	X	X	X	X		X	X	X
Democratic Republic of the Congo	X			X										
Dominican Republic	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ecuador	X	X		X	X	X						X		
Gabon	X													
Gambia	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Georgia	X										X			
Ghana	X		X	X	X	X				X	X			
Grenada	X	X		X	X	X								
India	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Israel	X												X	X
Jamaica	X	X	X	X	X	X	X			X	X			
Kazakhstan		X												X
Kyrgyzstan	X				X		X							

Party	Meteorological stations	Climate stations	Synoptic stations	Rain gauges	Hydrological stations (lake, river, etc.)	Oceanographic stations <sup>a</sup>	Upper-air observing stations	Lightning detectors	Seismic stations	Aeronautical stations	Radar stations	Satellite stations	GHG monitoring stations	Other stations not specified
Lesotho	X	X	X											X
Malawi	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mali	X			X	X							X		
Marshall Islands		X				X								
Mauritius	X					X				X		X		X
Mexico														X
Namibia			X	X										
Nauru						X								
Niger	X			X	X									
Nigeria	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Philippines	X		X				X						X	X
Republic of Korea	X	X	X			X	X	X	X	X	X	X	X	X
Saint Vincent and the Grenadines		X				X								
Sri Lanka	X													
Tajikistan	X				X									
Thailand	X													
The former Yugoslav Republic of Macedonia	X		X		X									
Tuvalu						X								
Uganda	X	X	X	X		X	X	X	X	X	X	X	X	X
United Republic of Tanzania		X	X	X	X	X	X	X	X	X		X	X	X
Uruguay														
Uzbekistan	X				X	X						X		
Viet Nam	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Zambia	X		X	X	X	X	X	X	X	X	X	X	X	X
Zimbabwe	X	X		X	X						X	X		

<sup>a</sup> Due to the diverse terminology used by reporting Parties, the current usage of the term oceanographic stations includes marine stations and tide gauges.