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**NATIONAL COMMUNICATIONS FROM PARTIES NOT INCLUDED IN ANNEX I
TO THE CONVENTION**

**CONSIDERATION OF THE FIFTH COMPILATION AND SYNTHESIS OF INITIAL
NATIONAL COMMUNICATIONS**

Fifth compilation and synthesis of initial national communications

Note by the secretariat

Summary

This compilation and synthesis of information contained in initial national communications from 16 Parties not included in Annex I to the Convention submitted to the secretariat between 1 June 2002 and 1 April 2003 contains information on the following: national circumstances; sustainable development and the integration of climate change concerns into medium- and long-term planning; inventories of anthropogenic emissions and removals by sinks of greenhouse gases; measures contributing to addressing climate change; research and systematic observation; climate change impacts and response strategies; education, training and public awareness; and financial and technical needs and constraints.

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I. INTRODUCTION

1. Articles 4, paragraph 1, and 12, paragraph 1, of the Convention, require all Parties to the Convention to communicate information to the Conference of the Parties (COP). Article 12, paragraph 5, specifies that each Party not included in Annex I to the Convention (non-Annex I Party) shall make its initial communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources in accordance with Article 4, paragraph 3. Parties that are least developed countries (LDCs) may make their initial communication at their discretion.

2. Four compilation and synthesis reports covering 83 initial national communications of non-Annex I Parties have been produced by the secretariat in response to various decisions of the COP. The COP, by its decision 2/CP.8, requested the secretariat to prepare the fifth compilation and synthesis report of initial national communications from these Parties, based on submissions received from such Parties between 1 June 2002 and 1 April 2003, and to make that report available to the Subsidiary Body for Implementation (SBI) at its nineteenth session.

3. The fifth compilation and synthesis report of initial national communications from 16 non-Annex I Parties (Albania, Bangladesh, Belize, Benin, Cambodia, Djibouti, Eritrea, Guinea, Iran, Kenya, Kyrgyzstan, Mauritania, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia, Uganda) includes information on efforts made by these Parties to implement the Convention, compiled in accordance with the "Guidelines for the preparation of initial communications by Parties not included in Annex I to the Convention" (FCCC/CP/1996/15/Add.1, decision 10/CP.2, annex), referred to throughout this report as the UNFCCC guidelines. It also contains information on other issues raised by these Parties.

4. The secretariat noted that Parties provided information with different levels of detail under the various chapters, using headings and subheadings of the UNFCCC guidelines. Parties provided information using the UNFCCC guidelines but presented it in such a manner as to highlight and demonstrate their national circumstances, their vulnerability to the adverse effects of climate change and the efforts they have made or proposed to address climate change nationally or regionally.

5. The adoption by the COP of revised guidelines for national communications, annexed to decision 17/CP.8, is expected to result in more detailed information being provided by non-Annex I Parties in their national communications. Parties may wish to bear this in mind when reviewing this report and reflect on how information presented in accordance with the revised guidelines is to be compiled, synthesized, analysed and presented.

II. NATIONAL CIRCUMSTANCES

6. Information on national circumstances is useful for understanding a country's vulnerability, and its capacity and options for adapting to the adverse effects of climate change, as well as its options for addressing its greenhouse gas (GHG) emissions within the broader context of sustainable development.

A. Reporting issues

7. All reporting Parties provided information on national circumstances in a separate chapter of their national communications. Further information on national circumstances relating to their national GHG inventories, vulnerability and mitigation was provided in other chapters.

8. More than 80 per cent of the Parties used a table, based on table I of the UNFCCC guidelines, to provide an overview of key socio-economic data such as population size, gross domestic product (GDP) and literacy rate. Parties adjusted this standard table and the data contained therein to suit their national

circumstances and it proved to be a useful tool for contrasting indicators. However, it was often not possible to get a complete data set for the same indicator and year covering all reporting Parties.

9. The Convention recognizes the common but differentiated responsibilities, as well as the specific needs and special situations, of several groups of countries. In examining national circumstances to determine if any special circumstances exist, reference is made to the ranking of Parties in the 2003 Human Development Index (HDI)¹ prepared by the United Nations Development Programme (UNDP) and to the inclusion of some Parties in the list of LDCs prepared by the United Nations Commission on Trade and Development (UNCTAD).

B. Overview on national circumstances

10. The 16 Parties whose national communications are covered in this report are diverse in many ways, such as location, population size, land areas and level of development. As quoted in the UNDP *Human Development Report 2003*, the HDI classified nine of the reporting Parties (Albania, Bangladesh, Belize, Cambodia, Iran, Kyrgyzstan, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia) in the medium human development category and seven (Benin, Djibouti, Eritrea, Guinea, Kenya, Mauritania, Uganda) in the low human development category. Six Parties (Benin, Cambodia,² Djibouti, Eritrea, Guinea, Mauritania) are classified as LDCs by UNCTAD.

11. The 16 Parties have a total population of about 280 million people; national populations range from about 250,000 (Belize) to more than 120 million (Bangladesh). The land area of the smallest Party (Belize) is less than 23,000 km² and of the largest, Iran, is a little more than 1.6 million km².

12. The level of socio-economic development differs among the reporting Parties. For most of the reporting Parties, agriculture is the most important economic sector in terms of employment, and its contribution to GDP, to exports and/or to subsistence of the population.

Physical geography

13. All reporting Parties presented information on the physical geography of their territories. The description of physical and natural characteristics, such as geomorphology, hydrology, biodiversity, ecosystems, coastal zones and soils, set the background for the assessment of climate change issues in the countries and helped, for example, to assess a country's specific vulnerability to climate change and climate variability, and its adaptation options.

14. Information presented on climatic variables, such as rainfall, temperature, humidity, solar radiation and wind is essential to understanding the local climate and weather situation. Many Parties highlighted specific aspects of their climatic circumstances including exposure to **extreme weather events**. For example, six Parties (Bangladesh, Djibouti, Eritrea, Iran, Kenya, Uganda) reported on the effects of the El-Niño Southern Oscillation phenomenon; 13 Parties (Albania, Bangladesh, Benin, Cambodia, Djibouti, Eritrea, Guinea, Iran, Kenya, Mauritania, Namibia, Tajikistan, Uganda) on droughts; 10 Parties (Albania, Bangladesh, Benin, Cambodia, Djibouti, Eritrea, Iran, Kenya, Kyrgyzstan, Tajikistan) on flooding; and two Parties (Bangladesh, Belize) on severe tropical cyclones. Territories of

¹ The human development index is based on three development indicators: a long and healthy life, as measured by life-expectancy at birth; knowledge, as measured by the adult literacy rate (two thirds weight) and the combined primary, secondary and tertiary education gross enrollment ratio (one third weight); and a decent standard of living, as measured by gross domestic product per capita (purchasing power parity in US dollars).

² Cambodia is classified by UNDP as in the medium human development category and by UNCTAD as an LDC.

nine Parties (Benin, Djibouti, Eritrea, Iran, Kenya, Kyrgyzstan, Mauritania, Namibia, Tajikistan) contain arid and semi-arid regions; Mauritania and Namibia include parts of the Sahara or Namib deserts.

15. All Parties except Bangladesh reported that their territories contained mountainous regions. Eleven Parties (Albania, Bangladesh, Belize, Benin, Djibouti, Eritrea, Guinea, Iran, Kenya, Mauritania, Namibia) have low-lying coastal areas. Four Parties (Kyrgyzstan, Tajikistan, The former Yugoslav Republic of Macedonia, Uganda) are landlocked countries and one Party (The former Yugoslav Republic of Macedonia) highlighted the fact that it is a transit country.

16. All Parties provided information on forested areas, and 13 quantified the sizes of their forests. The total reported area of forests in these Parties is close to 250,000 km². The largest reported forest area in one country (Cambodia) is a little more than 100,000 km². Almost all Parties stressed that deforestation was an important issue in their countries.

Economic circumstances

17. All Parties included information on their economic circumstances. Nearly all Parties reported on the main challenges for their economy. Five Parties (Djibouti, Iran, Kenya, Mauritania, Uganda) highlighted poverty as a main challenge, and four Parties (Albania, Cambodia, Kyrgyzstan, The former Yugoslav Republic of Macedonia) reported on the challenge of transition from a state-controlled towards a market-oriented economy. Parties reported on their economic structure in different ways. Some Parties provided aggregated information on the contribution of agriculture, mining and energy to GDP. Others included mining in the aggregated figures in the secondary sector, but did not specify its contribution. Moreover, Parties did not all give the same information for the same years.

Primary economic sector (agriculture, mining, energy)

18. The primary sector and the mainstay for most of the 16 national economies is **agriculture**. As well as its contribution to GDP, factors that contribute to making agriculture a priority for nearly all of the reporting Parties include its importance for employment, subsistence of their populations and agriculture-based industry. In only one Party (Djibouti) does agriculture play a minor role. Four Parties (Eritrea, Kenya, Namibia, Uganda) reported that subsistence agriculture was their main form of agricultural activity. Most Parties reported on fisheries and their countries' livestock.

19. For six Parties (Guinea, Kyrgyzstan, Mauritania, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia), **mining** was an important contributor to the primary sector.

20. All reporting Parties provided information on the **energy** sector and most provided information on the more important sources of energy used in their countries. Iran reported that it was highly dependent on fossil fuels and that their export made a large contribution to its GDP.

Secondary economic sector (manufacturing industry)

21. All Parties provided information on their manufacturing industry, which formed part of the secondary sector in their national economies. In eight Parties (Albania, Bangladesh, Belize, Benin, Eritrea, Guinea, Kenya, Uganda), the manufacturing industry is dominated by the **processing of agricultural products** including food, beverages, textiles and leather goods. Iran and The former Yugoslav Republic of Macedonia have developed important metallurgical and chemical industries, as well as agriculture-based industries.

Tertiary economic sector (services)

22. All Parties provided information on their tertiary sector, which provides an important contribution to GDP. For five Parties (Belize, Benin, Djibouti, Eritrea, Kenya), this sector's share of GDP was at least 50 per cent. Most Parties provided information on the major forms of **transport** used in their countries. Generally, the road network (paved and unpaved) is more extensive than water transport and railways, but a few Parties highlighted the central role of water transport: Bangladesh and Cambodia highlighted the importance of rivers for transport purposes; Djibouti stressed the importance of its sea port; and Uganda emphasized that lake Victoria is a central part of its transport system.

23. For some Parties (Belize, Kenya, Namibia, The former Yugoslav Republic of Macedonia, Uganda) **tourism** is an important sector, and others (Albania, Cambodia, Djibouti, Eritrea, Tajikistan) indicated that they had some or a high potential for the development of a tourism sector.

Energy consumption and use

24. Almost all Parties reported on the important sources of energy used in their countries. Fossil fuels (oil products, coal and natural gas) and biomass were reported as the dominant sources of fuel for energy production, domestic uses and in industry. Hydropower is the major source of renewable energy, and several Parties reported on the potential for further expansion of renewable resources.

25. In some Parties (Albania, Bangladesh, Belize, Djibouti, Iran, Mauritania, The former Yugoslav Republic of Macedonia) fossil fuels are the most important fuels for primary energy consumption. For several Parties (Benin, Cambodia, Eritrea, Guinea, Kenya, Uganda), biomass (mainly fuel wood) was most important, and for a few Parties (Kyrgyzstan, Namibia) hydropower was the main source.

26. Most Parties provided information on the trend in total energy consumption and/or production and/or trends in the energy mix of production. Information provided for the most recent reporting years shows an increase in energy consumption in Belize, Djibouti, Eritrea, Iran, Kenya and Uganda, a decrease in Kyrgyzstan and Tajikistan and constant levels in Albania and The former Yugoslav Republic of Macedonia. Most Parties indicated their potential for further exploitation of renewable energy resources, including solar energy and hydropower.

Social and demographic circumstances

27. In the description of their social and demographic circumstances, all Parties presented a population profile, including information on poverty levels, literacy rates, human health and education and/or research.

28. Several Parties reported on the number of their people living in **absolute poverty**, which ranged from zero in The former Yugoslav Republic of Macedonia to 56 per cent in Mauritania, with Bangladesh, Cambodia, Kenya, Kyrgyzstan, Mauritania, Uganda reporting a share of more than 30 per cent. The reported **literacy rate** varied from 31 per cent in Guinea to 99 per cent in Kyrgyzstan; three Parties (Bangladesh, Djibouti, Guinea) reported a rate below 40 per cent, and four (Albania, Kyrgyzstan, Tajikistan, The former Yugoslav Republic of Macedonia) a rate above 80 per cent. The **urban population** ranged from less than 20 per cent of the total in Bangladesh, Cambodia and Uganda to more than 80 per cent in Djibouti, with an average of less than 40 per cent.

Economic impact assessment of "response measures"

29. One Party (Iran) reported in detail on the possible impacts on its economy of the implementation of policies and measures by Annex B countries in meeting their emissions reduction targets under the

Kyoto Protocol. These impacts were estimated using the general equilibrium model MS–MRT (Multi Sector–Multi Region Trade Model) and supported by information from the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (TAR). Four scenarios were run: “business-as-usual”; Kyoto Protocol with “no flexible mechanisms” and no tax adjustment; Kyoto Protocol with “no flexible mechanisms” and with tax adjustment; and Kyoto Protocol with flexible mechanisms and no tax adjustment. The model was also used to estimate the possible adverse consequences on trade interactions between Annex B and non-Annex B countries. Economic impacts were estimated for each scenario for the period 2000 to 2030. Impacts on the Iranian economy under these four scenarios ranged from a potential loss of US\$ 6.3 billion to a potential gain of US\$ 1.6 billion (at 1995 prices) by 2030.

III. SUSTAINABLE DEVELOPMENT AND THE INTEGRATION OF CLIMATE CHANGE CONCERNS INTO MEDIUM- AND LONG-TERM PLANNING

30. The sustainable development concept was embraced by all reporting Parties. Eight of them (Albania, Bangladesh, Belize, Cambodia, Iran, Kenya, Namibia, Uganda) provided information on sustainable development and devoted a section to it, or gave brief descriptions of their national development, environmental or sustainable development plans or initiatives. Another three (Eritrea, Djibouti, Kyrgyzstan) presented information on concrete activities or priorities to be addressed under Agenda 21 relating to the protection of the environment, water resources, flora and fauna, and soils. Six Parties (Albania, Belize, Cambodia, Djibouti, Guinea, Kyrgyzstan) reported actions towards implementing the UNFCCC and some of them reported initiatives to create committees on sustainable development and/or global change. Four Parties (Djibouti, Guinea, Iran, Kyrgyzstan) indicated that climate change planning would be taken into account in future social, economic and environmental considerations in accordance with national development priorities.

31. All of these Parties reported, with different degrees of detail, on strategies to achieve sustainable development objectives. Poverty reduction was identified as the development priority of several reporting Parties, and other development priorities included agro-technology and research, coastal zone management, protection of biodiversity, disaster warning and preparedness, pollution control, sustainable use of natural resources, energy and transport strategy, land-use policies, and the protection of forestry, fisheries and wildlife. All Parties recognized the need to ensure an integrated approach in dealing with environmental, social and economic development issues.

32. Most Parties referred to the incorporation of socio-economic concerns into their environmental plans to achieve sustainable development, each according to its own needs and priorities. Cambodia’s socio-economic plans were designed to promote sustainable economic growth as well as social and cultural development. Eritrea’s strategy included investment in rural infrastructure, and development of agriculture and fisheries. Uganda highlighted its plans to modernize its agricultural base.

33. All Parties referred to the need to introduce climate change concerns to all areas of national planning. Seven Parties (Albania, Bangladesh, Eritrea, Kenya, Namibia, Tajikistan, Uganda) referred to the need to strengthen national coordination between sectors to ensure a consistent climate change policy.

34. Several Parties (Albania, Bangladesh, Belize, Cambodia, Eritrea, Namibia, Tajikistan) described their national plans and policy frameworks to coordinate and facilitate the implementation of the Convention. Six Parties (Albania, Bangladesh, Eritrea, Kenya, Namibia, Uganda) reported the need to improve capacity for developing a framework for activities dedicated exclusively to climate change. Iran has prepared a national action plan to address the main thematic issues relating to climate change.

35. Five Parties (Albania, Bangladesh, Cambodia, Eritrea, Namibia) stressed the need to improve capacity to identify national priorities and develop sectoral strategies and measures. Areas that need improvement include formulating mitigation, adaptation and response strategies, training in basic environmental concepts and economics of climate change projects, and energy data development. Training for policy makers and planners was also seen to be important.

36. Most Parties reported on the creation or the existence of specific institutional arrangements and frameworks to manage climate change activities. Many Parties have established national climate change committees that function as coordinating or advisory bodies on national policies. Some Parties (Iran, Kyrgyzstan, Mauritania) provided information on institution-strengthening initiatives essential for the effective implementation of climate change activities. Most of these institutions are inter-ministerial committees or inter-agency bodies, a reflection of the interdisciplinary approach being taken to address climate change concerns. Two Parties provided information on specific coordination activities – the integration of databases (Mauritania) and the development of information and networking (Iran).

37. All Parties stressed the importance of coordinating climate change activities. Three Parties (Eritrea, Kenya, Namibia) referred to specific needs, such as strengthening the networking of information and acquiring equipment and information technology. In the context of identifying the needs of the national climate change offices, two Parties (Eritrea, Namibia) indicated that capacities need to be strengthened in the development of databases and networking for improved policy development on climate change.

38. Seven Parties (Albania, Bangladesh, Eritrea, Kenya, Namibia, Tajikistan, Uganda) referred to the importance of stakeholders' involvement in national climate change activities, and to the need to address the lack of awareness among many of the stakeholders through education, training and public awareness. Three Parties (Guinea, Iran, Mauritania) provided information on the relevance of effective participation of non-governmental organizations (NGOs), the private sector, academia and local community-based organizations, in the development of climate policy and for ensuring continuity of climate change activities.

39. Five Parties (Albania, Bangladesh, Belize, Cambodia, Kenya) referred to relevant legislation and how this would contribute to supporting sustainable development and climate change objectives. Information was provided on existing and planned environmental legislation in the areas of natural resources protection, atmospheric air protection, wildlife preservation, national biodiversity, disaster management, forestry and energy industry.

IV. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS BY SINKS OF GREENHOUSE GASES

40. In accordance with Articles 4, paragraph 1 (a), and 12, paragraph 1 (a), of the Convention, Parties provided information on their national inventory of anthropogenic emissions by sources and removal by sinks of GHGs not controlled by the Montreal Protocol. This section of the report covers inventory information and methodological and analytical issues and problems identified by the 16 reporting Parties.

A. Methodological issues

41. All Parties followed the UNFCCC guidelines and, with the exception of Uganda, took into account the conclusions of the Subsidiary Body for Scientific and Technological Advice (SBSTA), at its fourth session, which encouraged Parties to apply the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (FCCC/SBSTA/1996/20, paras. 30 (b) and 31).

Methods

42. All Parties followed the IPCC Guidelines³ in compiling their national GHG inventories. Fifteen of them used the Revised 1996 IPCC Guidelines, and one (Uganda) used the 1995 IPCC Guidelines. All Parties estimated emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Most Parties provided emission estimates for all the GHG precursors.⁴ However, Namibia provided estimates for only carbon monoxide (CO) and nitrogen oxides (NO_x); Bangladesh and The former Yugoslav Republic of Macedonia did not provide estimates of these gases; two Parties (Kyrgyzstan, Mauritania) provided estimates of hydrofluorocarbons (HFCs); only Tajikistan provided estimates of perfluorocarbons (PFCs); two Parties (Iran, Kyrgyzstan) provided estimates of sulphur hexafluoride (SF₆); and eight Parties (Benin, Belize, Cambodia, Guinea, Iran, Kyrgyzstan, Mauritania, Tajikistan) reported estimates of sulphur dioxide (SO₂) emissions.

43. Two Parties also indicated that they had developed their own methodologies. Albania mentioned the estimation of CO₂ absorption by fruit trees, and of CO₂ emissions from small industrial boilers and from the burning of fuel wood in household stoves; Kyrgyzstan reported on national methodologies and coefficients for technological processes not reflected in the IPCC Guidelines, such as the production of stibium and mercury, core-mould casting, re-fusion of cast iron and non-ferrous metals, glass production, blasting operations, and a specific approach for calculating emissions in the case of natural fires occurring in mountains.

44. All Parties applied both reference and sectoral approaches, with the exception of Bangladesh, Cambodia, Iran and Kyrgyzstan which applied only the sectoral approach. Six Parties (Albania, Benin, Belize, Eritrea, Namibia, The former Yugoslav Republic of Macedonia) compared the two approaches and reported observed differences, which ranged from 0.2 per cent (The former Yugoslav Republic of Macedonia) to 8.0 per cent (Eritrea).

45. Estimates of emissions from international aviation and/or marine bunker fuels were reported by five Parties (Albania, Kyrgyzstan, Mauritania, Namibia, Uganda) and all of them except Kyrgyzstan provided a breakdown into marine and aviation bunkers. In conformity with the IPCC Guidelines, these emissions were not included in the national total, but were reported separately.

46. Six Parties (Albania, Bangladesh, Belize, Cambodia, Kenya, Namibia) reported problems relating to limitations of the current IPCC methodologies for estimation of emissions in some sectors. The major concerns were the availability, quality and lack of the disaggregated data required to apply the IPCC methodology (see table 1). Some country-specific problems encountered were: the inappropriateness of most default emission factors; the difficulty of obtaining activity data in a suitable format; the inappropriate forest classification; the need to adjust the methodology for rice cultivation; the need to identify other potential sinks of CO₂ such as coffee, tea, coconuts and cashew nuts; and the fact that the present IPCC methodology does not consider the amount of carbon sequestered in the underground biomass.

47. The IPCC Guidelines request Parties to make efforts to report the estimated range of uncertainty in their emission estimates, where appropriate. Nine of the Parties reported uncertainties; one (Kyrgyzstan) provided the information quantitatively; three (Benin, Iran, Kenya) provided the

³ "IPCC Guidelines" refers to both the *1995 IPCC Guidelines for National Greenhouse Gas Inventories* and the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

⁴ Precursors are atmospheric compounds which affect greenhouse gas or aerosol concentrations by taking part in physical or chemical processes regulating the production or destruction rates. The precursors on which Parties have provided information are carbon monoxide (CO), nitrogen oxides (NO_x), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and sulphur dioxide (SO₂).

information qualitatively; and five (Albania, Cambodia, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia) reported both qualitatively and quantitatively. The sectors covered in estimating the range of uncertainty were often energy, land-use change and forestry (LUCF), agriculture and waste.

Activity data

48. Most Parties identified the source of the activity data used for the emission estimates of the different sectors and source categories, even though this information is not explicitly requested by the UNFCCC guidelines. Parties indicated that activity data were obtained from various national sources, such as ministries, municipalities and agencies, or from industrial facilities. Namibia and The former Yugoslav Republic of Macedonia also reported using expert judgement when data were not available.

49. Most Parties identified the lack of activity data as a major constraint for estimating emissions of some source categories in at least one sector, usually the energy and LUCF sectors and, to a lesser extent, the agriculture, industrial processes and waste sectors. For the LUCF sector, six Parties (Albania, Bangladesh, Guinea, Iran, Kenya, Namibia) reported that activity data were not available in a form suitable for compiling the national GHG inventory in accordance with the IPCC Guidelines, and three Parties (Benin, Iran, Kenya) reported difficulties in obtaining activity data in the necessary time series, as requested by the IPCC methodology. Data on land use and forest cover were often out of date. Kenya reported difficulties with obtaining data on trends and rates of land-use change.

50. Five Parties reported that some important activity data are either not available or are not accessible due to inadequate national data collection and/or management systems. Three of these Parties (Albania, Cambodia, Kenya) reported generally on the issue, and two (Bangladesh, Tajikistan) elaborated on their needs, which related mainly to the energy and waste sectors and often arose from a lack of institutional capacity for the collection, archiving and management of data for preparing the inventory and standardization of activity data.

51. For the energy sector, nine Parties (Albania, Bangladesh, Benin, Belize, Cambodia, Eritrea, Namibia, Tajikistan, Uganda) reported lack of activity data, generally, or specifically for household biomass consumption, the transport and industrial subsectors, and international bunker fuels. Benin mentioned the uncertainty of data on final consumption of oil products due to illegal imports from an oil producing neighbouring country.

52. For the industrial processes sector, six Parties (Eritrea, Iran, Kenya, Kyrgyzstan, Namibia, Tajikistan) faced problems in collecting activity data. Kyrgyzstan reported that the great variety of food products and the absence of standard emission factors for all type of products lead to an aggregation into groups of products; Tajikistan indicated problems relating to the lack of monitoring of emissions in the industrial sector.

Emission factors

53. The IPCC Guidelines encourage the development and use of local emission factors that suit national circumstances. However, most Parties used IPCC default methods; only three developed their own methodologies – Albania for fuel wood combustion in household stoves, Namibia for methane emissions from enteric fermentation in cattle, and Bangladesh for modifying many default values and emission factors. Kenya used EMEP/CORINAIR⁵ emission factors for calculating emissions in the industrial processes sector.

⁵ EMEP: cooperative programme for monitoring and evaluation of long-range transmission of air pollutants in Europe; CORINAIR: CORE INventory of AIR emissions (a European project).

54. Most Parties reported that the default emission factors provided by the IPCC Guidelines often did not reflect national circumstances well, so their use in inventory calculation led to uncertainties in the estimates. IPCC default emission factors were specifically reported to be inappropriate for the agriculture and waste sectors mainly and, to a lesser extent, for energy.

Reporting tables

55. Four Parties (Djibouti, Kyrgyzstan, Namibia, Tajikistan) used the IPCC summary tables⁶ and eight Parties (Benin, Belize, Cambodia, Eritrea, Guinea, Iran, Kenya, Uganda) used tables with a similar format. Three Parties (Albania, Bangladesh, The former Yugoslav Republic of Macedonia) did not use the IPCC summary tables or a similar format, and Mauritania did not provide a summary table.

56. All Parties included sectors or source categories of the IPCC other than those explicitly required by table II of the UNFCCC guidelines (see table 2). In some cases it was not clear whether source categories had not been reported because they were not relevant for the country or had not been estimated for other reasons. Two Parties (Albania, Bangladesh) used table II of the UNFCCC guidelines and The former Yugoslav Republic of Macedonia adopted a modified format of that table.

57. Three Parties (Benin, Djibouti, Namibia) provided all the relevant IPCC worksheets,⁵ which give detailed calculations of GHG emissions as well as numerical information on aggregate emission factors and activity data for inventories using the IPCC default methods. Kenya and Mauritania provided some of the IPCC worksheets and the other Parties did not provide any worksheet. The provision of these worksheets contributes substantially to the transparency of the inventories.

58. The degree of completeness (see table 2) in reporting on IPCC sectors and subsectors was high. Only one Party (Mauritania) did not report on emissions of at least one GHG from agricultural soils. All Parties reported on CO₂ emissions from the LUCF sector. Seven Parties used the notation keys indicated in the IPCC Guidelines.

B. Presentation of results

59. Table 3 summarizes inventory data provided by most Parties on aggregate emissions and removals provided for 1990 and 1994. Benin and Mauritania provided data only for 1995. The analysis provided in this section of the report is based on 1994 inventory data, and 1995 in the case of Benin and Mauritania. Estimates provided by Parties have, where necessary, been converted into CO₂ equivalents using 1995 IPCC global warming potentials (GWPs) in order to facilitate comparison among Parties' data. Such a presentation shows, for example, the relative contributions of the different GHGs and the different sectors to a Party's total GHG emissions. In fact, 12 Parties (Albania, Benin, Belize, Cambodia, Djibouti, Eritrea, Guinea, Iran, Kyrgyzstan, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia) used the GWPs to estimate the relative contribution of each individual GHG or sector to their aggregate GHG emissions, although this is not required by the UNFCCC guidelines.

60. For some Parties, different emission estimates for the same sector or source categories were indicated in different places or tables in the communication. Some Parties changed the format of the IPCC summary tables.

⁶ The summary tables and worksheets are automatically generated when using the IPCC software. See *Greenhouse Gas Inventory Software for the Workbook of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories – Instruction Manual*.

Emissions by sources and removals by sinks

61. Most reporting Parties were net emitters of GHGs, whereas six (Benin, Cambodia, Djibouti, Guinea, Kenya, Namibia) were net GHG sinks due to the generally relatively large CO₂ removals reported in the LUCF sector. When considering CO₂ only, seven Parties (Belize, Cambodia, Djibouti, Eritrea, Guinea, Kenya, Namibia) showed that removals by sinks in LUCF exceeded their total CO₂ emissions.⁷

Aggregate GHG emissions expressed in terms of CO₂ equivalent⁸

62. In terms of total GHG emissions expressed as CO₂ equivalent, CO₂ was the primary GHG for five Parties (Albania, Iran, Kyrgyzstan, Tajikistan, The former Yugoslav Republic of Macedonia). For Eritrea, N₂O was the main contributor to aggregate GHG emissions. For other Parties, CH₄ was the most important contributor.

63. The energy sector was the largest source of GHG emissions for seven Parties (Albania, Djibouti, Eritrea, Iran, Kyrgyzstan, Tajikistan, The former Yugoslav Republic of Macedonia); for seven others (Bangladesh, Benin, Cambodia, Kenya, Mauritania, Namibia, Uganda), it was the agriculture sector; and for the remaining two (Belize, Guinea) it was the waste sector. Energy and agriculture were also the second largest emitters for almost all Parties. In most Parties, removals by LUCF offset GHG emissions from this sector; the exceptions were Albania, Bangladesh, Eritrea, Iran and Uganda.

64. The level of emissions varied widely among reporting Parties. Eight Parties have aggregate GHG emissions (excluding LUCF) lower than 10,000 Gg CO₂ equivalent, and seven Parties⁹ have emissions lower than 50,000 Gg CO₂ equivalent. In contrast, one Party (Iran) had aggregate emissions totalling more than 385,000 Gg CO₂ equivalent (see table 3).

Emissions of main greenhouse gases (CO₂, CH₄ and N₂O)

65. *Carbon dioxide.* Fuel combustion in the energy sector accounted for the largest share of CO₂ emissions for all Parties, ranging from 82 per cent (Iran) to 100 per cent (Djibouti) of total CO₂ emissions. Within the fuel combustion sector, transport was the largest source of emissions for seven Parties (Benin, Belize, Cambodia, Eritrea, Kyrgyzstan, Namibia, Uganda), ranging from 36 to 74 per cent, followed by small combustion, which ranked first for four Parties (Djibouti, Iran, Mauritania, Tajikistan). On average, transport accounted for 39 per cent of CO₂ emissions from fuel combustion. Carbon dioxide emissions from international bunker fuels were reported by five Parties (Albania, Kyrgyzstan, Mauritania, Namibia, Uganda) and were equivalent to between 0.2 per cent (Kyrgyzstan) and 15 per cent (Uganda) of total CO₂ emissions from fuel combustion. The LUCF sector as a whole constituted a net sink of CO₂ for 11 Parties (Benin, Belize, Cambodia, Djibouti, Guinea, Kenya, Kyrgyzstan, Mauritania, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia). For six Parties (Benin, Djibouti, Guinea, Kenya, Namibia, The former Yugoslav Republic of Macedonia), emissions from the forest and grassland conversion subsector exceeded in absolute value the total net

⁷ In view of the different role of the land-use change and forestry sector in the different Parties – in some, this sector offsets total emissions, and in others it is a large source of emissions – and the request by the IPCC Guidelines to provide estimates of net emissions or removals in the different source categories of this sector, the term “total CO₂ emissions” in this document denotes the sum of CO₂ emissions from all sectors except land-use change and forestry. This enables the data to be presented in a consistent and comparable manner.

⁸ Aggregate GHG emission estimates given in this document are the sum of total CO₂, CH₄ and N₂O emissions converted to CO₂ equivalent using IPCC 1995 GWPs.

⁹ Uganda reconsidered the data it submitted within its initial national communication and provided a revised GHG inventory summary table.

emissions or removals. For four Parties (Albania, Bangladesh, Eritrea, Iran), the largest emissions in the LUCF sector were from changes in forest and other woody biomass stocks. For 12 Parties, however, this subsector constituted the main removal by sinks. The removal by sinks in the subsector of abandonment of managed land was not larger than that from changes in forest and other woody biomass stocks for any Party.

66. *Methane.* Agriculture was the largest source of CH₄ emissions, ranging from 45 to 98 per cent of total CH₄ emissions for 12 reporting Parties. Fugitive fuel emissions were the most important CH₄ source for two Parties (Iran, The former Yugoslav Republic of Macedonia), accounting for 47 and 58 per cent of total methane emissions, respectively. For Belize, the waste sector was the primary source of CH₄ emissions, with 96 per cent. In the agriculture sector, livestock was the most important subsector for 13 Parties. Rice cultivation or other agricultural activities were the largest source for other Parties.

67. *Nitrous oxide.* Agriculture was the most important source of N₂O emissions for 11 Parties, ranging from 52 per cent (Kyrgyzstan) to 100 per cent (Tajikistan). For the other Parties, fuel combustion was the largest source for only two Parties (Eritrea, Kenya) at 100 per cent; the LUCF sector was the most important source of N₂O for two others, with values ranging from 79 per cent (Guinea) to 84 per cent (Djibouti), and the waste sector constituted the most important source of N₂O for Mauritania at 80 per cent.

C. Current trends

68. Although the UNFCCC guidelines request inventory data for either 1990 or 1994, three Parties (Kyrgyzstan, Tajikistan, The former Yugoslav Republic of Macedonia) provided a GHG inventory for both years. This allowed a preliminary analysis to be made of the trends of GHG emissions in these countries. Eleven Parties (Albania, Bangladesh, Belize, Cambodia, Djibouti, Eritrea, Guinea, Iran, Kenya, Namibia, Uganda) provided a GHG inventory for 1994 only; Benin and Mauritania provided a GHG inventory for 1995; Tajikistan and The former Yugoslav Republic of Macedonia provided annual GHG inventories for 1990 to 1998; and Kyrgyzstan provided such information for 1990 to 2000.

69. Total CO₂ emissions (excluding LUCF) decreased over the period 1990–1994: by 10 per cent in The former Yugoslav Republic of Macedonia, by 50 per cent in Kyrgyzstan, and by 64 per cent in Tajikistan. When the LUCF sector was included in total CO₂ emissions, the decrease in total CO₂ emissions in these Parties was slightly larger (13, 51 and 71 per cent, respectively) but the differences were not significant.

70. Carbon dioxide emissions from fuel combustion were lower in 1994 than in 1990 for these three Parties. The largest decrease was reported by Tajikistan (71 per cent); decreases reported by The former Yugoslav Republic of Macedonia and Kyrgyzstan were 9 and 50 per cent, respectively. Between 1990 and 1994, CH₄ emissions decreased (by 2 to 43 per cent) and total N₂O emissions also decreased (by 3 per cent for The former Yugoslav Republic of Macedonia, 53 per cent for Tajikistan and 80 per cent for Kyrgyzstan).

V. MEASURES CONTRIBUTING TO ADDRESSING CLIMATE CHANGE

71. All reporting Parties provided information on programmes incorporating measures that could address climate change by limiting the increase in GHG emissions and enhancing removals by sinks. Mitigation measures covering various time periods have been undertaken, and others are being implemented or planned in the energy, agriculture, forestry and waste management sectors.

72. The five Parties (Albania, Cambodia, Guinea, Iran, The former Yugoslav Republic of Macedonia) that developed baseline and mitigation scenarios used such indicators as projections of GDP,

demographic parameters, land use, legal frameworks and pricing policies, value added, cost parameters and exchange rates, energy demand and job creation. In most cases, Parties based the selection of their priority mitigation options on expert assessment of their national sustainable development plans. These five Parties also used models to obtain cost estimates for the mitigation options. Djibouti undertook a cost-benefit analysis of the use of geothermal energy. Other Parties used expert judgement to provide rough estimates of mitigation costs. Most Parties did not provide information on assumptions and constraints used in estimating the growth of emissions.

73. Most Parties have experienced or are likely to experience difficulties in implementing mitigation measures. Almost all Parties mentioned the need for finance, appropriate technology, capacity-building, information, public awareness and institutional capacity. The prohibitive costs of equipment, and in some cases political, cultural and social constraints, have also hindered implementation of mitigation measures. Several Parties provided lists of mitigation projects. Others stated that they will develop these projects during phase II of the Global Environment Facility (GEF) enabling activity programme.

A. Energy

74. All Parties reported on measures to limit GHG emissions in the supply and demand sides of the energy sector. Measures included energy conservation, fuel switching, reduction of electricity transmission and distribution losses, increase in efficiency of thermal electricity generation and usage, use of renewable energy, application of market prices, removal of subsidies, and improvement in energy pricing policies. These measures were either implemented or earmarked to be implemented in a number of energy supply and end-user subsectors including the industrial, residential, commercial and transport subsectors.

75. Measures reported for the various subsectors were:

(a) Industrial: the introduction of efficient heavy fuel for oil fired boilers in industries, efficient coal fired boilers for industrial consumers, efficient electrical motors, and efficient lighting in industrial buildings;

(b) Residential: the introduction of thermo insulation of households, efficient refrigerators, efficient lighting, thermostats for electric boilers, prepaid meters for household consumers, and solar water heating system in households;

(c) Transport: repair of existing roads and construction of new ones (Eritrea, Kenya, Uganda); increasing share of public transport for passengers and goods (Albania, Eritrea, The former Yugoslav Republic of Macedonia, Uganda); introduction of non-motorized modes of transport (Albania, Bangladesh, Cambodia, Kenya); introduction of a carbon tax system (Albania, The former Yugoslav Republic of Macedonia); increasing taxes on second hand cars (Albania); conducting public awareness campaigns (Albania, Cambodia, Iran, Kenya, Namibia); and educating drivers.

76. Parties used different methodologies to estimate their mitigation potentials. Albania used the GACMO¹⁰ to develop its GHG baseline scenario, and the LEAP¹¹ model for the abatement scenarios. Guinea, Cambodia and Iran also used the LEAP model to develop their abatement options. The former Yugoslav Republic of Macedonia used the WASP¹² model to estimate its emissions derived from the generation of electricity. Bangladesh, Benin and Djibouti assessed their abatement potentials using various national studies.

¹⁰ Greenhouse Gas Abatement Costing Model.

¹¹ Long-range Energy Alternative Planning system.

¹² Wien Automatic System Planning package.

77. Bangladesh based its selection of priority mitigation options on the results of ALGAS¹³ project, whereas Albania, Djibouti, Guinea, Iran and Mauritania stated that they based their selection on business-as-usual socio-economic development programmes and mitigation scenarios. Benin stated that residential and transport sectors were chosen because they are the biggest consumers of traditional and conventional energy. Tajikistan based its selection on the view that it is strategic to protect the environment and to rationally use natural resources. In The former Yugoslav Republic of Macedonia, the selection of priority options was based on future economic and population growth.

78. Table 4 contains information reported by Parties on the estimates of emission reductions that may be achieved, with different time horizons, by undertaking mitigation measures. Most of the programmes are likely to be undertaken in the energy sector.

79. Several Parties provided estimates of costs associated with the introduction of mitigation measures. Djibouti estimated that it would need a total of US\$ 88,530,000 to undertake its mitigation measures. Guinea stated that the introduction of liquefied petroleum gas (LPG) would cost US\$ 99,500,000 (equivalent to 199 billion Guinea Francs). Kyrgyzstan estimated a figure of US\$ 778 million, and Mauritania a figure of US\$ 54 million. Iran and The former Yugoslav Republic of Macedonia also provided a number of estimates for various activities. Many Parties did not provide any funding estimates for their mitigation measures.

80. Parties used different time horizons to estimate their changes in emissions. Bangladesh, Iran and Mauritania used 2010; Guinea used 2015 with yearly targets of emission reductions with the introduction of LPG, biogas and photovoltaics; Albania, Bangladesh and Kyrgyzstan used 2020; and Djibouti and The former Yugoslav Republic of Macedonia used 2030.

81. Identified measures in the area of renewable energy included the use of hydropower, solar, geothermal, wind, wave, tidal and biofuel, and nuclear energy. Many Parties reported the increased use or efficiency of hydropower electricity. Eight Parties (Albania, Cambodia, Djibouti, Eritrea Kenya, Iran, Kyrgyzstan, Tajikistan) reported on measures to use wind energy. Most Parties indicated the potential to use solar power. Guinea, Namibia and Mauritania reported measures to use photovoltaics. Djibouti and Kenya are planning to use geothermal power.

B. Agriculture

82. Many Parties reported measures in agriculture which included options to reduce CH₄ emissions and/or to reduce N₂O and NO_x emissions. Identified measures included improvement of feed quality, improvement of breeds and fertility, and reduction of pollution by nutrients (Albania, Bangladesh, Kenya, Mauritania, The former Yugoslav Republic of Macedonia); livestock and manure management (Iran); and the use of manure to produce biogas and fertilizers. None of the reporting Parties elaborated on the methodology used to estimate the mitigation potential of the planned or implemented measures or on the use of models and analytical tools.

83. Iran and Mauritania provided information on the estimated cost of GHG reduction in the agricultural sector. Mauritania estimated that in order to complete four ongoing projects and to implement six new projects to reduce emissions in this sector, it will need US\$ 240 million before 2010. Iran will need US\$ 131,381,750 in the period 2000–2010 to fund its efforts in the agricultural sector.

84. None of the reporting Parties provided information on assumptions and constraints in estimating the growth of emissions, but most mentioned constraints to implementation of the measures as being political, financial, social, and lack of legislation, economic instruments and advanced technologies.

¹³ Asia Least-Cost Greenhouse Abatement Strategy

C. Land-use change and forestry

85. All Parties reported measures in the LUCF sector: reforestation of mountainous regions, plains and micro basins (Albania, Bangladesh, Belize, Cambodia, Djibouti, Kenya, Tajikistan); preservation and rational management of forests, reforestation and regeneration of forests (Mauritania); development of commercial plantations and agroforestry (Albania, Bangladesh, Belize, Cambodia, Guinea, Kenya, The former Yugoslav Republic of Macedonia); afforestation and forest rehabilitation, controlling forest utilization and other wood resources and introducing other fuels as alternatives to wood (Iran); and rehabilitation of existing forests and planting new forests (Albania, Bangladesh, Belize, Cambodia, Kenya, Kyrgyzstan). The former Yugoslav Republic of Macedonia reported that its forest cover varies and that methods used to calculate the projected emissions were not well developed.

86. A few Parties described the methodology used to estimate the mitigation potential of the planned measures. Djibouti and Kenya used cost-benefit analysis and Cambodia and Guinea used the COMAP¹⁴ model. Reported criteria used to select priority abatement options included national development programmes (Cambodia, Djibouti, Guinea, Iran, Mauritania) and mitigation scenarios (Iran).

87. Several Parties stated that mitigation measures are yet to be implemented. Projected emission reductions from 2010 to 2030 were provided by Albania, Djibouti, Kenya and The former Yugoslav Republic of Macedonia. Guinea reported that the projected emissions were based on assumptions of forest area planted over the next five years. Kenya assumed a planting rate of 6,000 ha per year, but stated that the actual annual planted area of forests is estimated to be less than 3,000 ha per year.

88. Several Parties included estimates of the emission reductions associated with the reported measures, which varied from 346 to 5,384 Gg CO₂ equivalent. Some Parties stated how much they would need to implement the mitigation measures: Djibouti, US\$ 4,395,000; Guinea, US\$ 14 million; Kyrgyzstan, US\$ 272 million; and Mauritania, US\$ 39 million.

89. Some Parties identified constraints to the implementation of the measures: Cambodia lacked enforcement in its sector; Djibouti needs capacity-building, legislation, awareness campaigns, information, institutional capacity-building and finance; Guinea lacked the strategy that would encourage local growers to take over the land infrastructure and to exploit the plantation sustainably; Kenya experiences poor survival rate of new plantations, attributed to poor tending techniques, poor timing of tree planting, inadequate protection and occasional low rainfall in some years; and Kyrgyzstan lacked legislation, economic instruments, advanced technologies and finance.

D. Waste management

90. All Parties, except Cambodia, Guinea and Eritrea, reported measures in the waste management sector. Reported measures to limit emissions included reduction of CH₄ emissions through its recovery and ultimate use for energy production (Djibouti); treatment of solid and liquid waste (Mauritania); recycling, composting and waste management, and changing the landfill process from anaerobic to semi-aerobic (Iran); and collecting, sorting and processing the waste, introduction of modern bio-technologies of waste processing and strengthening of control (Kyrgyzstan). Albania considered the following options: construction of new sanitary landfill sites and use of the gas generated; construction of a new municipal solid waste incinerator with energy utilization; reduction in the amount of organic substances stored in landfill sites; and construction of new sewerage systems with waste-water treatment plants. Kenya gave a brief description of legal measures that are intended to enhance waste management in general, as well as various waste management activities, including waste collection. Tajikistan stated

¹⁴ Comprehensive Mitigation Assessment Process.

that waste recycling could reduce CH₄ emissions by 30 to 40 per cent by 2015. Apart from Albania, no other Party described the methodology used to estimate the mitigation potential of the identified measures. Furthermore, none of the reporting Parties indicated that it used models.

91. Several Parties based the selection of their priority options on socio-economic scenarios and population growth. These Parties included estimates of the emission reductions associated with the reported measures, and three of them (Djibouti, Kyrgyzstan, Mauritania) showed costs of implementing the measures, which ranged from US\$ 1.6 to US\$ 24.6 million. Only Djibouti indicated that it had experimented with waste composting and that encouraging results were obtained in 1995/1996.

92. Several Parties attempted to provide emission projections with various time horizons. Albania used 2010 and 2020; Djibouti used 2035 with steps of five years; Iran used 2005 and 2010; Mauritania used 2010 with steps of one year; and The former Yugoslav Republic of Macedonia used 2020.

93. Constraints to implementation of the measures were cited as: lack of active participation of the general population in observing sanitary and environmental norms (Mauritania); lack of human resources to undertake measures (Mauritania, The former Yugoslav Republic of Macedonia, Uganda); and lack of capacity-building, legislation, awareness, information and finance (Albania, Djibouti, Kyrgyzstan, The former Yugoslav Republic of Macedonia, Uganda).

E. Projects for GHG emissions reduction and enhancement of removals by sinks

94. Nine Parties (Bangladesh, Benin, Cambodia, Djibouti, Guinea, Iran, Kenya, Kyrgyzstan, Mauritania) included a list of projects or activities aimed at reducing GHG emissions and enhancing removals by sinks, and elaborated on the costs of implementing these projects. These are posted on the secretariat web site (<http://www.unfccc.int/resource/webdocs/2003/05.pdf>). Three Parties (Djibouti, Guinea, Mauritania) also described project concepts, and gave descriptions of the environmental and social benefits accruing from the projects.

VI. RESEARCH AND SYSTEMATIC OBSERVATION

95. Almost all Parties provided information on research and systematic observation relating to climate change impacts, vulnerability assessment and adaptation options, and measures for addressing GHG emissions (mitigation). Ongoing or planned research programmes cover climate change, agriculture, forestry, waste, mitigation, coastal zones and water resources. Most of the research activities reported as ongoing or planned are linked to vulnerability and adaptation assessments and mitigation activities, such as energy conservation, efficiency and related technologies.

A. Research

96. Research activities identified by Parties included: studies on improvement of scientific knowledge in the forestry sector; assessment of the impact of the waste sector on the environment; experiments on composting; studies on the technical and economic feasibility of desalination of sea water and underground aquifers; in-depth study of coastal zones; strengthening of research programmes on treatment of brackish water; determination of methods for water management and use in agriculture; and breeding programmes and studies on nutrition regimes for livestock. Research on mitigation covered energy efficiency, environmentally sound energy systems, development and implementation of new energy- and resource-saving technologies, GHG abatement technologies, modern means of GHG emission capture and instruments for GHG measurements, and waste processing. Table 5 lists areas of ongoing or planned research on climate change impacts, vulnerability assessment and adaptation options.

97. 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. Guinea noted its need to set up an institutional framework for undertaking studies on climate change. For Djibouti, research on how to manage its waste sector and on the technical and economic feasibility of desalination of sea water and use of its aquifers is important for the assessment of its water resources. Research to improve scientific knowledge in the forests sector and in-depth study of its coastal zone is also important. Iran and The former Yugoslav Republic of Macedonia feel a need to improve the quality of activity data and emission factors and to improve the methods and procedures for enhancing the emissions inventory.

98. Iran reported specific scientific research on the effect of the El-Niño Southern Oscillation on the country's climate, and that it would conduct a detailed study of the impact of climate change on vulnerable sectors using the IPCC scenarios of climate change. Kyrgyzstan reported studies on the effect of temperature increase on health.

99. Other areas which require further research work include LUCF (Cambodia), river flows (Namibia), glacier shearing movements, carbon management, forest inventories, mosquito control, vulnerability to diseases and the effect of heat stress (Tajikistan), and further meteorological studies and emissions reduction strategies (The former Yugoslav Republic of Macedonia). Uganda is undertaking research on the impacts of El-Niño, GHG inventory, temperature and rainfall variability and trends, hydrological studies, vulnerability and adaptation assessment and policy implications of climate change.

100. Only four Parties (Cambodia, Eritrea, The former Yugoslav Republic of Macedonia, Uganda) provided information on institutional arrangements to facilitate research. In The former Yugoslav Republic of Macedonia much of the research work is coordinated through the Ministry of Environment and Physical Planning; in Uganda, the Ugandan National Council for Science and Technology oversees research in these areas.

B. Systematic observation

101. All reporting Parties described their national programmes on meteorological, atmospheric, oceanographic and terrestrial observations of the climate system. Table 6 lists the national networks of observation stations relating to systematic observation.

102. Kyrgyzstan, which has been undertaking systematic observation since the 1930s, reported on one upper air station, three avalanche stations, eight combined hydrological, one lake observatory and 75 hydrological stations. Mauritania identified 12 meteorological stations. Namibia has made climate observations since 1892 and now operates 300 active rainfall stations and six synoptic weather stations. Uganda has seven synoptic stations, and six hydrological, five agrometeorological, 10 other climatic, 112 rainfall, one upper air and one radar stations. Tajikistan has 58 hydrometeorological and 126 hydrological stations. The former Yugoslav Republic of Macedonia has been involved in meteorological observations since 1891 and now has 270 meteorological observation stations (with 16 main stations), plus 110 hydrological and 115 groundwater stations. Although other Parties did not provide details of their observation stations, they all have synoptic, climatic, meteorological, sea-level, rainfall and hydrological monitoring stations.

103. Many Parties reported on their involvement in global observing systems, through cooperation and collaboration with regional and international organizations. Guinea mentioned technical cooperation with neighbouring countries, and Iran, Kyrgyzstan and Uganda reported cooperation with the World Meteorological Organization (WMO). Four Parties (Iran, Tajikistan, The former Yugoslav Republic of Macedonia, Uganda) are participating in global observing systems such as the Global Ocean Observing

System (Iran), the Global Climate Observing System (Tajikistan) and the Global Telecommunications System (Uganda). Other Parties cooperate with regional and international organizations such as UNDP, the United Nations Environment Programme (UNEP), and the IPCC on global observing systems.

104. The needs and priorities for systematic observation identified by Guinea, Iran and Kyrgyzstan related to a lack of observation stations and the need for upgrading and expansion of existing networks at the national level. Satisfying these needs will make an effective contribution to the global atmospheric monitoring system by contributing to the development, use and accessibility of databases. Belize does not have a comprehensive marine/oceanographic observation programme and its hydrological and meteorological monitoring programme would need to be upgraded.

105. Several Parties (Eritrea, Guinea, Iran, Kyrgyzstan, Mauritania, Tajikistan, The former Yugoslav Republic of Macedonia, Uganda) saw the need to establish strong and effective institutions to manage national observation systems, rehabilitate, modernize and extend the coverage of observation networks, and develop, use and access databases. Problems, difficulties and constraints relating to systematic observation include lack of basic infrastructure for systematic observation (Cambodia), lack of financial and human resources to maintain and/or upgrade the existing observation systems (Tajikistan, The former Yugoslav Republic of Macedonia), and inadequate geographical coverage of the climatological and hydrological stations (Uganda). Table 7 lists the difficulties encountered or requirements to be met to enable improved reporting of systematic observation. Tajikistan further elaborated its need for agrometeorological observations to assess agricultural crop production, upper air quality, hydrological and environmental monitoring, solar radiation and behaviour of avalanches under various environmental conditions.

VII. CLIMATE CHANGE IMPACTS, ADAPTATION MEASURES AND RESPONSE STRATEGIES

A. Climate change impacts and vulnerability

106. All Parties provided information on their vulnerability to, and impacts of, climate change in a dedicated section or chapter of their national communication. All Parties indicated that they are already experiencing stresses from climate extremes, such as droughts and floods, and pointed out that these may be exacerbated with future climate change. Mauritania provided information dispersed throughout its national communication.

107. Parties provided information on methods and approaches used in their assessments, on sectors studied, on specific needs and priorities for financial and technical support, and on institutional arrangements and networking. All Parties have undertaken assessments of the main socio-economic sectors and some reported on the uncertainties, problems and constraints encountered while undertaking their assessments.

Methods and approaches used

108. A wide range of models as well as expert judgement were used in the analysis of impacts in various sectors (see table 8). The models were either process-based or integrated for sectors such as agriculture and food security, biodiversity, coastal zones, energy, fisheries, forests, human health, marine and terrestrial ecosystems, tourism and water resources. Information provided by Parties on the current and future vulnerabilities of the sectors depended on the national circumstances and on the relative importance of these sectors in their economy. Albania, Iran and The former Yugoslav Republic of Macedonia used the *IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations*, and Djibouti used the *UNEP Handbook on Assessing Vulnerability and Adaptation to Climate Change*

(UNEP Handbook); Guinea used both for assessing climate change impacts and adaptation. Mauritania used projections and numerical simulations for the assessment.

109. All Parties reported on the application of the outputs of various general circulation models (GCMs) for generating climate change scenarios. Eight Parties (Albania, Benin, Djibouti, Guinea, Iran, Kyrgyzstan, Mauritania, The former Yugoslav Republic of Macedonia) used the MAGICC–SCENGEN¹⁵ model for generating regional climate change scenarios based on GCM outputs. The time horizons generally covered are 2050 and 2100. In addition, Mauritania used an incremental scenario for population increase, and Kyrgyzstan adopted an analogue scenario up to the year 2100. Other techniques used included expert judgement, statistical analysis, surveys and modelling.

110. Nine Parties (Albania, Bangladesh, Belize, Djibouti, Eritrea, Guinea, Mauritania, Namibia, The former Yugoslav Republic of Macedonia) used projections of sea-level rise for different time horizons up to 2100. Some scenarios used were derived from MAGICC–SCENGEN at both low and high sensitivities. Other Parties used statistical methods and expert judgement to project future changes in temperature and rainfall.

111. Eight Parties (Belize, Cambodia, Djibouti, Eritrea, Guinea, Iran, Tajikistan, Uganda) also had problems in applying the *IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations*. Difficulties related to suitability of methods and tools, lack of national capacity to apply these methods and tools, and lack of the reliable data and financial resources required to undertake these assessments. For example, Eritrea indicated that due to variations in topography, the model outputs could not be interpreted with high confidence, and Guinea mentioned that the low resolution and the differing results provided by the GCM outputs (for example, some models tend to underestimate temperature and precipitation) make it difficult to analyse climate change impacts for various sectors.

112. Several process-based models were used to analyse climate change impacts on various sectors. These included hydrological models for surface water (Djibouti, Iran), DSSAT¹⁶ for agriculture (Belize, Eritrea), SPUR2¹⁷ for rangelands and livestock, biome model for ecosystems (The former Yugoslav Republic of Macedonia), CERES-Maize¹⁵ for agriculture and the Holdridge¹⁸ classifications for forests (Uganda).

Agriculture and food security

113. Most Parties assessed vulnerability of, and reported on, climate change impacts in the agriculture sector. Generally, the results presented for this sector were more detailed and extensive than those for the others, but the level of detail and depth of the presentation of the methods and results were still very varied. Belize, Cambodia, Djibouti, Guinea and Mauritania reported possible losses of agricultural land as a consequence of sea-level rise through inundation and salination.

¹⁵ Model for the Assessment of Greenhouse Gas-Induced Climate Change (MAGICC) and SCENGEN is a global and regional Climate Change Scenario Generator (MAGICC–SCENGEN).

¹⁶ Decision Support System for Agrotechnology Transfer (DSSAT) is a software system that integrates crop growth models (CERES-Wheat, CERES-Maize, CERES-Rice, etc.) with crop, weather and soil data and estimates potential changes in crop yields and water use. It is provided to countries within the United States Country Studies Program and the GEF support programme.

¹⁷ The SPUR2 suite of models simulates the effects of climate change on grassland ecosystems and cattle production. The package includes sub-models for plant growth, hydrology/soils, animal production and grasshopper infestation.

¹⁸ Holdridge Model/Holdridge Life Zones Classification. This model relates the distribution of major ecosystems (“life zones”) to the climate variables of biotemperature, mean precipitation, and the ratio of potential evapotranspiration to precipitation (PET ratio).

114. Various crops, including wheat, maize, rice, cotton, vegetables, millet, barley, sorghum and potatoes, were assessed under a variety of climate change scenarios. The results are not comparable across the countries because of the diversity of assessment methods and approaches used by Parties. Parties reported both positive and negative changes in crop yields and livestock production, although decreases predominated. Possible decreases ranged from 17 to 60 per cent; levels of increase were not reported.

115. Possible adverse and positive effects of climate change on agriculture included lower soil moisture, greater infestation by weeds and pests and the higher incidence of diseases. Kyrgyzstan expects an increase in crop production resulting from the longer growing season and higher temperatures.

116. Assessments of livestock were variable, but all Parties anticipate a decline in livestock production as a result of a decrease in pasture areas or productivity of existing pastures. Kyrgyzstan mentioned loss of animal weight due to heat stress, Guinea expects climate change to affect livestock numbers, and three Parties (Djibouti, Iran, Kyrgyzstan) presented the results of impact assessments for livestock productivity.

Coastal zones and marine ecosystems

117. Seven Parties (Bangladesh, Belize, Cambodia, Djibouti, Guinea, Iran, Mauritania) reported on the assessment of climate change impacts on their coastal zones. Coastal vulnerability was usually assessed by analysing the potential impacts of specified levels of sea-level rise on coastal zone infrastructure and marine ecosystems. Other likely impacts of sea-level rise include loss of infrastructure, disruption to marine ecosystems and serious physical and socio-economic problems. Iran reported on possible climate change impacts on coastal zones and ecosystems of the inland Caspian sea. Belize indicated that about 6 per cent of its coastal area would be inundated from sea-level rise, which would also threaten the supply of potable water to its population.

118. The presentation of results varied from qualitative considerations (Iran, Mauritania) to detailed quantitative analysis including tables and maps (Djibouti, Mauritania), illustrating expected land losses from inundation and erosion due to sea-level rise. Almost all Parties with coastlines reported on the potential adverse effects of salt water intrusion and storm surges on their coastal infrastructure and ecosystems. Djibouti stated that the loss of land due to sea-level rise will affect 60,000 to 130,000 people and cause loss of infrastructure and of coastal biodiversity. Guinea reported that sea-level rise would cause: inundation of rice fields (17 to 60 per cent by 2050 and 2100), lands and infrastructures leading to displacement of 30 per cent of coastal population (estimated at half a million people); submergence of rivulets and irrigation canals; loss and movement of mangroves; and negative effects on oyster farms. Iran reported that coastal erosion, inundation, salt water intrusion, and drop in sea level of Caspian sea will have serious consequences for the coastal system, including mass coral bleaching, and erosion of land and mangrove forests.

Water resources

119. Ten Parties (Albania, Belize, Djibouti, Eritrea, Guinea, Iran, Kyrgyzstan, Tajikistan, The former Yugoslav Republic of Macedonia, Uganda) provided information on the expected impacts of climate change on their water resources. Djibouti and Iran used local hydrological models for their assessments. Guinea estimated that flow in the main river course can drop by as much as 50 per cent. For five Parties (Belize, Djibouti, Guinea, Iran, Kyrgyzstan) climate change would have adverse impacts on their water resources, but Kyrgyzstan reported that its water supply would still be adequate for basic development scenarios.

120. Some of the impacts that climate change would have on water resources include water deficit, lower recharge of aquifers, reduction of level of aquifers, salt water intrusion, degradation of water quality, variation in the absolute amount and seasonal pattern of available water resources and lowered potential for rain-fed and irrigated agriculture. Albania reported that irrigation will not be affected much by 2020, but that by 2050 a reduction in the area of arable land is likely, although the area suitable for citrus cultivation may increase.

Human health

121. Eight Parties (Albania, Cambodia, Guinea, Iran, Kyrgyzstan, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia) reported on the effects of climate change on human health. Because of a lack of data and limited understanding of the relationships between health and climate, no models were run to assess impacts on particular diseases, and most Parties only presented qualitative assessments. While noting the uncertainties, all Parties found that an increase in temperature, variation of precipitation and air pollution would lead to a proliferation of diseases and increased risk to human health.

Terrestrial ecosystems and forests

122. Twelve Parties (Albania, Bangladesh, Belize, Cambodia, Djibouti, Eritrea, Guinea, Iran, Kyrgyzstan, Namibia, Tajikistan, The former Yugoslav Republic of Macedonia) presented information on the impact of climate change on terrestrial ecosystems, including forests and steppes, mangroves and rangelands. Impacts on forests and rangelands include changes in biomass or the suitability of the land for various uses under projected climate change, a general shift in species composition, with possible extinctions, and changes in vegetation types in warmer climates. Impacts were negative in all cases, with second order effects on the society and economy. Namibia pointed out that species changes and extinctions would affect its tourism industry.

123. Reported impacts on terrestrial ecosystems (including forests) included reduction of forest and steppes, loss of biodiversity as habitats changes, lower productivity of pastoral lands with reduction in the subsistence level of pastoral herders and destruction of mangroves (Djibouti); tree-bearing savannah deteriorating to arid savannahs, and dense forests of the Fouta region and elsewhere disappearing to give place to savannah with trees, and serious reduction of mangrove forests (Guinea); change in habitats and extinction of species affecting regeneration rate, lower production of forests, increased pests and diseases, higher soil erosion, loss of mangrove forests, reduction of forage production, degradation, soil erosion, fires, poor regeneration (Iran); expansion of desert and steppe belts, loss of invertebrates with specific habitats, changes of geographical distribution of some insects, possible altitudinal shift of forest species and loss of forest area (Kyrgyzstan).

Fisheries

124. Three Parties (Djibouti, Iran, Namibia) examined impacts on fisheries as a part of their impact assessment relating to climate change and sea-level rise. No common methodologies were used for this sector, and only qualitative projections were presented; second order effects were also analysed. The Parties indicated possible adverse effects on fisheries due to changes in temperature and loss of productive habitats for many species. Djibouti indicated changing fishing activities and lower incomes for fishermen. Iran also mentioned a negative effect of climate change on aquaculture.

Other sectors

125. Nine Parties (Albania, Bangladesh, Belize, Cambodia, Djibouti, Iran, Kyrgyzstan, Namibia, Uganda) presented their assessment of climate change impacts on marine biodiversity and the energy sector. Djibouti reported loss of coral diversity, destruction of mangrove forests, reduction of coastal fisheries, and loss of coastal species. Iran indicated that hydropower production will be affected. Kyrgyzstan reported that climate change will be favourable for hydroelectric engineering and that changes in the pattern of annual flow distribution may affect power stations and lead to a lower rate of production of these stations.

126. Iran further reported on the potential damage to, and destabilization of, offshore oil platforms and on-shore petrochemical units. It further reported on impacts in the waste sector, in terms of amount and management issues.

B. Adaptation measures and response strategies

127. All Parties provided information on adaptation options, strategies and measures relating to climate change impacts for a wide range of sectors. Table 9 presents adaptation options in the agriculture, water resources and coastal zone sectors of the 16 Parties. Many Parties stated the need to adopt adaptation measures to minimize the effects of climate change on the most important socio-economic sectors. Most Parties described adaptation activities in terms of future programmes and ongoing research, listing possible adaptation options and needs to combat adverse effects of climate change. None of the reporting Parties provided information on the implementation of adaptation measures.

128. Information reported on vulnerability and adaptation demonstrated some capacity to assess the impacts of climate change and, to a lesser extent, to evaluate potential adaptive responses. One of the most important constraints on the assessment of vulnerability and adaptation was the lack of capacities to conduct the type of vulnerability and adaptation assessments that would generate reliable results for incorporation into national development planning processes. The lack of data arises because of inadequacies in data collection and monitoring, and access to existing databases, and the lack of capacity to analyse, manipulate and improve quality assurance in some data sets.

129. All Parties identified adaptation as a major issue, but they presented only possible adaptation options without evaluating, prioritizing or costing them in their national communications. Many Parties expressed the need for more work on integrated assessments including socio-economic assessments, identification of adaptation options and costing implications.

Methods of assessing and analysing adaptation

130. Many reporting Parties did not provide a clear indication of the methods used in assessing and analysing adaptation options, strategies and measures. Most Parties used expert judgement and qualitative assessments based on the outputs of the GCMs and impact models. Therefore, most of the Parties either listed possible adaptation options or generally explored possible ways to adapt, or stated their needs for adaptation. In some countries, adaptation measures and strategies were initially identified based on the vulnerability assessment; in others, the measures were derived from various sectoral consultations, and from a review of existing policies and measures.

Results

131. Presentation of the results varied from quantitative descriptions of the measures, including their costs and benefits, to a listing of the options and/or needs to adapt. Parties reported on adaptation options in agriculture, water resources and coastal zones more extensively than in other sectors.

132. Five Parties (Bangladesh, Guinea, Iran, Kyrgyzstan, Mauritania) reported on adaptation possibilities in the agriculture sector; adaptation in this sector is particularly important in order to protect the food base. Parties focused on measures to counteract reduced crop yields, so that in most cases their adaptation options were designed to offset negative impacts of climate change. The options reported cover policy, technology and education. Among the measures most commonly mentioned by Parties were measures focusing on adapting management practices to new climates (e.g. shifts to alternative planting dates, changes in fertilizer application, changed plant density); measures relating to the use or development of new and more resistant crops; and the introduction of different irrigation practices and special soil treatment.

133. Five Parties (Bangladesh, Djibouti, Guinea, Iran, Mauritania) discussed adaptation in the water resource sector. Water management is seen as a key area for adaptation in the future and Parties described adaptation options that might reduce the vulnerability of water resources to climate change. Parties explored options for increasing domestic water supply through prospecting and extracting underground water, for increasing storage capacity by building reservoirs and dams, and for desalination of sea water. Djibouti also mentioned public awareness and participation as a means to adapt to reduced water resources.

134. Five Parties (Bangladesh, Djibouti, Guinea, Iran, Mauritania) discussed, in general terms, adaptation in coastal zones. Coastal adaptation options listed or analysed by Parties related to protection of coastal areas, particularly economically important ones, by constructing hard structures (seawalls or groynes), and/or by implementing soft measures (beach nourishment), to counteract coastal erosion. Accommodation measures, which imply adjusting to sea-level rise, included land-use changes, development of new planning and investment requirements, and more generally integrated coastal zone management. Djibouti mentioned studies of the coastal ecosystems as an important measure for planning adaptation.

135. Three Parties (Djibouti, Kyrgyzstan, Mauritania) considered adaptation options for forests and grasslands. Forest development and conservation were seen as important means to combat land degradation, preserve species and sequester carbon. Related adaptation measures included the protection and rehabilitation of forests and grasslands under stress and inappropriate use, and forest expansion, for example through plantations.

136. Several Parties discussed “cross-sectoral” measures that would enhance adaptive capacity. These included raising socio-economic living standards, improving the health care system, developing and implementing environmental legislation, integrating climate change concerns into national development plans and programmes, enhancing public awareness, and promoting sustainable development.

Stakeholder participation

137. Five Parties (Belize, Guinea, Namibia, The former Yugoslav Republic of Macedonia, Uganda) provided information on the involvement and participation of various stakeholders, including policy makers, in their vulnerability and adaptation assessment. Namibia reported that national workshops were held in collaboration with institutions responsible for other conventions such as the Convention on

Biological Diversity and the United Nations Convention to Combat Desertification. Uganda reported that it had engaged a wide range of stakeholders in its assessment work.

138. Other Parties (Belize, Guinea) used the national climate change committees to sensitize and heighten the awareness of the general public and decision makers to the effects of climate change, vulnerability and adaptation.

VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS

139. Parties treated education, training and public awareness together most of the time, but the details provided varied. All Parties provided some information on these topics either as a separate chapter in their national communications or as part of another chapter. For most Parties, the major education, training and public awareness activity related to the national communications process. Four Parties (Guinea, Kenya, Mauritania, Uganda) differentiated between ongoing, planned and proposed activities; others did not. Parties shared their concerns about the inadequacy of national programmes on education, training and public awareness relating to climate change for academic and research institutions, policy makers, practitioners in the media and industry, students and teachers in formal and non-formal education, non-governmental and community-based organizations, and the public at large.

140. Most Parties provided some information on the exchange of information and their involvement in the promotion of education, training and public awareness activities. Belize reported on information exchange that formed part of the regional Caribbean Planning for Adaptation to Climate Change (CPACC) project; Kenya presented information on the United States Country Studies Program (USCSP), a bilateral effort between the United States of America and Kenya. Several Parties identified their needs in this area, mainly involving the provision of financial resources. Two Parties (Albania, The former Yugoslav Republic of Macedonia) mentioned the request for additional resources from the GEF through its enabling activity phase II project.

141. Six Parties (Eritrea, Iran, Kyrgyzstan, Mauritania, Tajikistan, The former Yugoslav Republic of Macedonia) reported on public access to information. Access was largely provided through the national communications process that involved the hosting of workshops, and training activities in the context of national communications, GHG inventory and communications using the media, radio, television and videos. In almost all cases, it was difficult to distinguish between the ongoing activities and planned programmes.

A. Education

142. Ten Parties (Albania, Belize, Cambodia, Eritrea, Guinea, Iran, Kenya, Kyrgyzstan, Mauritania, The former Yugoslav Republic of Macedonia) recognize the need to incorporate climate change considerations into education and curriculum development at all levels (primary, secondary, and tertiary). Several gave some details on specific national and regional initiatives. Albania has made efforts to establish an environmental branch within its Polytechnic University with assistance provided through a European Union-sponsored initiative. In 2000, Belize inaugurated a post-graduate climate change programme, as part of a regional initiative at the University of the West Indies.

143. Targeted education courses and activities were described by other Parties in the fields of meteorology, physics, and geography and through various degree programmes focusing on the environment. Collaboration efforts in education, the involvement of the NGO community and cooperation with universities and other institutions were described in detail by several Parties (Eritrea, Kenya, Kyrgyzstan, The former Yugoslav Republic of Macedonia) and mentioned by others.

144. Four Parties (Guinea, Iran, Kyrgyzstan, Mauritania) provided information at various levels of detail on existing initiatives and future plans to incorporate climate change topics into formal education systems. Kyrgyzstan and Mauritania reported having used the expertise of local communities and collaborated with NGOs and universities in delivering lectures or courses on various aspects of climate change. Kyrgyzstan has prepared materials on publications by the IPCC and WMO, and on national communications of different countries, for libraries, in support of education programmes. Iran reported diffusion of documents on climate change as well as regional and national workshops targeting the public. Uganda has plans to integrate climate change issues into the education curriculum and cited, as the best approach, awareness raising of youth as a key component in its plans.

B. Training

145. Training facilitated by and through the national communications process was identified as the main means of capacity-building for Albania, Benin, Kenya, Guinea, Iran, Mauritania and The former Yugoslav Republic of Macedonia. But the information provided on training was presented in a non-systematic manner, making it difficult to distinguish between present actions and future needs. Two Parties (Guinea, Mauritania) identified the number of persons trained through workshops associated with the preparation of their national communications, and others indicated that UNITAR/CC:Train, USCSP and the National Communications Support Unit of UNDP provided training. Albania identified the UNFCCC and the workshops organized by it as having provided assistance in the process of preparing their national communications.

146. Guinea, Iran, Kenya, Kyrgyzstan, and Tajikistan provided information on the target groups for training. The groups targeted were linked directly to the national communications process and contained tertiary level professionals in government and academia who provided input to the national communications on GHG inventories, vulnerability and adaptation and mitigation. Training was mainly oriented towards government policy makers and national experts. Parties also mentioned that some training activities were aimed at specific sections of society such as the media, local communities, farmers and the business community. Djibouti mentioned capacity-building of experts and institutions on inventory, vulnerability and adaptation, mitigation, planning and implementation; Iran reported training of administrators, industrial managers, the public, school children, youth, teachers, and women-focused NGOs and community service organizations. Kyrgyzstan provided information on its national centres for post-graduate education (training) and the five workshops with wide community and NGO participation that provided information on the goals and tasks of the national communications project.

147. A few Parties (Eritrea, Iran, Kenya, Tajikistan, The former Yugoslav Republic of Macedonia) identified training needs in specific technical and policy issues relating to climate change and sustainable development. In Mauritania, more than 20 experts have been trained on inventory, vulnerability and adaptation, mitigation and preparation of national communication. Guinea organized three training sessions for 50 specialists on GHG inventory, 40 technicians, scientists and NGO members on vulnerability and adaptation, and 60 experts on mitigation. Iran acknowledged that three workshops have been organized by UNITAR/CC:Train for the preparation of the national communication.

148. No Party provided information on participation in, and/or organization of, regional and international exchange training programmes and workshops or on the ability of existing institutions to carry out research and training on climate change issues in order to satisfy the reporting requirements of the Convention. No Party reported directly on the improvement of understanding of local and regional climate change impacts. However, Kenya and Kyrgyzstan indicated their intention to continue further research in climate change. Kenya, in particular, indicated the intent of its Meteorological Department to collaborate with institutions in studies relating to climate variability and change.

C. Public awareness

149. Ten Parties (Belize, Djibouti, Eritrea, Guinea, Iran, Kenya, Kyrgyzstan, Mauritania, Tajikistan, The former Yugoslav Republic of Macedonia) provided some information, but no great detail, on public awareness efforts on climate change. They provided additional information on the focus and scope of activities, the content of materials needed, and on the means of communicating through existing and planned public awareness activities. Four Parties (Iran, Guinea, Kenya, Kyrgyzstan) recognized the importance of public awareness in the area of climate change and stressed the need to further enhance public awareness. Kyrgyzstan indicated that enhancing public awareness and knowledge of the climate change problem, its anthropogenic impacts and its adverse consequences, are of great importance to promoting measures and developing new governmental policies in that area.

150. Reported areas for public participation in addressing and responding to climate change and its effects are the introduction of new technologies such as composting or irrigation (Djibouti), sensitization of the majority of the population to climate change to help in addressing their negative behaviour that causes GHG emissions (Guinea), and separate collection of different kinds of waste (Kyrgyzstan). Mauritania has organized regional and national workshops to sensitize policy makers, planners, journalists and the public on climate change. Guinea claimed it is essential to inform and sensitize everybody, and Iran reported enhancement of public awareness programmes at local and national levels.

151. Some Parties also reported on special awareness campaigns for specific target groups such as local communities, parliamentarians, government and industry officials, researchers, students, actors, journalists, radio and TV animators. Various means of sharing information were described in existing and planned public awareness activities, including television, newspapers, round-table discussions, debates, libraries, web sites, demonstrations projects, workshops and documents.

152. The collaboration of NGOs in public awareness campaigns was also mentioned by all reporting Parties. The former Yugoslav Republic of Macedonia indicated that initial activities had been completed, and had generated suggestions for further activities, that would require funding. Seven Parties (Benin, Cambodia, Guinea, Kenya, Kyrgyzstan, Mauritania, The former Yugoslav Republic of Macedonia) reported on activities targeted at specific groups through special awareness campaigns, in some cases focused on general environmental awareness issues; at stakeholders, the media, government, industry, NGOs, parliamentarians; and in one case, at agricultural extension officers.

IX. FINANCIAL AND TECHNICAL NEEDS AND CONSTRAINTS

153. All Parties acknowledged having received financial and technical assistance from the GEF and its implementing agencies, and/or from other multilateral or bilateral programmes, for the preparation of their initial national communication, and indicated the need for further assistance.

A. General financial, technical and capacity-building needs and constraints

154. All Parties provided information on financial, technical and capacity-building needs and constraints relating to the preparation of their national communication and/or the implementation of the Convention. Reported needs related to lack of capacity for the preparation of GHG inventories, assessments of impacts and vulnerability to climate change, facilitation of adaptation to the adverse effects of climate change, and the identification and implementation of measures for addressing climate change. Most Parties highlighted specific areas, needs and constraints relating to education, training and public awareness that need particular attention for further development and support. Two Parties (Cambodia, Djibouti) indicated that they require extensive assistance in all areas of the national communication process.

B. National greenhouse gas inventories

155. Most Parties reported on constraints and/or needs with regard to preparing their national GHG inventories, in particular, to the availability, accessibility, management and/or quality of activity data. Almost all of them indicated that they had concerns relating to the appropriateness of default emission factors. Two Parties (Albania, Kyrgyzstan) expressed the need to adapt the IPCC GHG inventory methodologies to specific national circumstances. Five Parties (Albania, Cambodia, Djibouti, Kenya, Tajikistan) referred to the need to strengthen the capacity of institutions involved in the preparation of the GHG inventory, including the training of personnel.

C. Measures contributing to addressing climate change

156. Eight Parties (Albania, Cambodia, Djibouti, Iran, Kenya, Mauritania, Namibia, Tajikistan) reported on problems and/or the need for support relating to the identification, assessment and/or possible implementation of measures to address climate change. Reported problems include a lack of data and guidelines for quantitative analyses, a lack of models for specific sectors, insufficient training on available models, a lack of appropriate technologies and difficulties with technology transfer.

157. With regard to assistance to build capacity to formulate mitigation projects for funding, Djibouti identified insufficient human and institutional capacity and finance to prepare projects; Mauritania mentioned the priority for formulation and analysis of projects; and Iran reported the need to define and finance projects to benefit from the clean development mechanism and activity implemented jointly. Seven Parties (Benin, Djibouti, Guinea, Kenya, Kyrgyzstan, Mauritania, Namibia) proposed mitigation projects for funding in accordance with Article 12, paragraph 4, of the Convention.

D. Research and systematic observation

158. Most Parties reported on their needs relating to climate change research and systematic observation, in particular, their need to develop, extend and/or modernize national climate observation system to provide essential input to national efforts on vulnerability and adaptation assessments, and to develop models and tools for climate change research and analysis.

159. Parties indicated the need to enhance research through improved collection and management of data. Iran and Mauritania highlighted the importance of creating and/or strengthening research institutions that deal with climate change.

E. Climate change impacts, adaptation measures and response strategies

Climate change impacts and vulnerability

160. Ten Parties (Albania, Belize, Cambodia, Djibouti, Guinea, Iran, Kenya, Mauritania, Namibia, Tajikistan) reported on constraints relating to the assessment of vulnerability to climate change. The most frequently reported constraint was a lack of in-depth studies in various sectors including agriculture, biodiversity, forestry, health and tourism. Several Parties have encountered various problems and constraints affecting the completion of vulnerability assessments in preparing their initial national communications. The assessments were not very exhaustive and did not cover all sectors, mainly because of a lack of capacity, of good quality data, and of financial resources. Most assessments were qualitative, and used expert judgement instead of quantitative studies.

161. Six Parties (Albania, Belize, Guinea, Iran, Namibia, Tajikistan) highlighted the need to enhance the performance of models used for developing climate change scenarios so as to improve the results of vulnerability studies. Djibouti lacks data for studies on water resources, coastal zone and ecosystems.

Mauritania lacks reliable climatic data and needs to enhance research activities for better vulnerability assessments. Guinea and Iran reported insufficient data on the forestry sector; Iran also lacks basic coastline data.

Adaptation measures and response strategies

162. Eight Parties (Cambodia, Djibouti, Eritrea, Guinea, Iran, Kenya, Kyrgyzstan, Mauritania) reported on constraints with regard to identifying, evaluating or implementing measures to adapt to the adverse impacts of climate change, the most frequently reported being a lack of institutional capacity, including sufficiently trained personnel and financial resources. Two Parties (Eritrea, Kenya) highlighted the need to implement early warning systems for disasters relating to climate change.

163. Seven Parties (Benin, Djibouti, Guinea, Kenya, Kyrgyzstan, Mauritania, Namibia) included a list of adaptation projects for funding. Djibouti reported that finance is the major constraint for implementation of the proposed programme to facilitate adaptation; Mauritania reported that institutions responsible for implementing strategies and adaptation measures need to have sufficient human resources, materials, logistics and finance; and Guinea identified the need for training of resource persons and researchers so as to improve adaptation assessments.

F. Education, training and public awareness

164. All reporting Parties provided information on the need to enhance national programmes for formal and/or non-formal education, training and public awareness in all areas of climate change. But the information provided was very scanty and of a general nature, targeting the wide public for the most part. Guinea, however, stressed that it is essential to integrate more women and youngsters in the protection of the climate system. Most Parties emphasized the need to raise awareness and knowledge levels on climate change issues in all areas of society, including the media, schools, universities and other research institutions, the public and the private sector.

Table 1. Problems encountered and areas for further improvement in respect of activity data (AD), emission factors (EF) and methods (M) by Parties in the preparation of greenhouse gas (GHG) inventories

Party	Problems/ areas			Comments
	AD	EF	M	
Albania	X	X	X	<p>Problems: <i>Activity data:</i> Lack of activity data in general, and in particular for the energy sector, transport, biomass burned for energy use; lack of disaggregated activity data, and lack of consistency with the IPCC format (in particular, the IPCC LUCF classification does not suit local reality). <i>Emission factors:</i> Most emission factors do not reflect the situation of the country. Party developed local emission factors for CO₂ emissions from small industrial boilers, and emissions from burning of fuel wood in household stoves. <i>Methodology:</i> Slight deviations from IPCC methodologies, e.g. for the estimation of CO₂ absorption by fruit trees, and CO₂ emissions from small industrial boilers and from the burning of fuel wood in household stoves.</p> <p>Improvements: Financial support is needed to carry out special studies aiming at improving activity data. Activity data are very poor for cars, light and heavy duty trucks, buses and motorcycles, so Party proposes to carry out surveys. A survey is also needed on the traditional biomass burned for energy purposes. Need to establish a database on manure management.</p>
Bangladesh	X	X	X	<p>Problems: <i>Activity data:</i> Lack of data in the energy (international bunkers), LUCF and waste sectors. In the waste sector no proper records have been maintained. <i>Emission factors:</i> Many emission factors and default values have been re-fixed, based on expert judgment, to better reflect the specificities of the country. <i>Methodology:</i> The methodology for rice cultivation needs adjustment to fit the country's context.</p> <p>Improvements: <i>Activity data:</i> For LUCF, the forestry maps and inventories are to be prepared for each species with an interval of at least five years; detailed sample survey and monitoring needed to estimate growth rate of each species. <i>Emission factors:</i> Need to develop country-specific emission factors for agriculture, LUCF and waste sectors. <i>Methodology:</i> Need to develop CH₄ emission factors for rice fields under various conditions of inundation and agronomic practices.</p>
Belize	X	X	X	<p>Problems: <i>Activity data:</i> Information on industrial waste impossible to obtain; changes in stocks of petroleum products held across the country could not be assessed. <i>Emission factors:</i> Default values may not capture national characteristics effectively. <i>Methodology:</i> Methodology shows definite weaknesses when applied to the specific circumstances in any given country, particularly for assumptions and default values.</p> <p>Improvements: More local data are required to refine the rough estimate of the LUCF emissions.</p>
Benin	X	X		<p>Problems: The lack of <i>activity data</i> was mentioned for all sectors of the inventory; but especially for the energy and LUCF sectors. The use of default emission factors increased the uncertainty level of the emissions estimation, and the Party developed local emission factors in the waste sector for the open burning of waste at landfill sites, and waste incineration.</p>
Cambodia	X	X	X	<p>Problems: Lack of <i>activity data</i> in the energy, agriculture, LUCF and waste sectors; uncertainties still exist due to the current weak data management in most ministries. <i>Methodology:</i> In the agriculture sector, savannah burning is not appropriate to Cambodia; grassland burning done by the Parties is not covered by the IPCC methodology. Thus, Party used the definition adopted by the Philippines.</p> <p>Improvements: Training activities are required to enhance the capacity of the members of the National Technical Committee. Priority should be given to improving <i>activity data</i> and <i>emission factors</i>.</p>

Table 1. (continued)

Party	Problems/ areas			Comments
	A	E	M	
Djibouti	X	X		<p><u>Problems</u>: Lack of <i>activity data</i> for the energy, agriculture, LUCF and waste sectors; available activity data were unreliable.</p> <p><u>Improvements</u>: Need new studies in the energy, agriculture and LUCF sectors, and for institutional measures, collection of data, and capacity-building.</p>
Eritrea	X	X		<p><u>Problems</u>: Lack of <i>activity data</i> more limiting in the agricultural and LUCF sectors than in the energy and industrial processes sectors. Lack of country-specific <i>emission factors</i>.</p> <p><u>Improvements</u>: Development of <i>emission factors</i> and emission ratios, as well as the need to address the lack of <i>activity data</i> in some sectors (especially agriculture and LUCF).</p>
Guinea	X			<p><u>Problems</u>: Lack of <i>activity data</i> for the industrial processes, LUCF and waste sectors. The non-availability of data in the appropriate format mentioned in only a general way.</p>
Iran	X	X		<p><u>Problems</u>: Lack of <i>activity data</i> for the industrial processes and LUCF sectors; activity data (including time series) not available in a suitable format for the LUCF sector. The IPCC default <i>emission factors</i> show an upper limit, which led to an overestimation of emissions.</p> <p><u>Improvements</u>: Extensive work needed to improve the quality of <i>activity data</i> and develop local <i>emission factors</i>. Reliability of activity data and emission factors in the forestry sector should be verified and improved in the future.</p>
Kenya	X	X	X	<p><u>Problems</u>: Lack of <i>activity data</i> for the industrial processes (difficulty in obtaining information on many newly introduced industrial processes), agriculture and LUCF sectors; general non-availability of data in a suitable format for all sectors, particularly on trends and rates of land-use change). Lack of comprehensive data storage and management systems on an annual basis. Default <i>emission factors</i> adopted do not necessarily suit national circumstances. <i>Methodology</i>: IPCC Guidelines on LUCF could not incorporate land users' data collection methods that are thought important and practicable in areas outside designated forests. Also a need to identify other potential sinks of CO₂ that are excluded from the IPCC methodology, such as coffee, tea, coconuts and cashew nuts.</p> <p><u>Improvements</u>: <i>Activity data</i>: Need to harmonize land-use and forestry activities in order to facilitate data inventory. The county urgently needs a programme to collect and analyse data regularly, especially for the LUCF, agriculture and industrial processes sectors. Need to develop an information management system for archiving and updating inventory data. A project was developed to facilitate cooperation in data collection; to enhance national technical capacity to undertake data collection and GHG inventories; to obtain comprehensive activity data in the important socio-economic sectors; and to establish a data bank (duration: 24 months, budget: US\$ 300,000). <i>Emission factors</i>: Need to develop and use national/regional emission factors that suit national circumstances better than IPCC default emission factors. <i>Methodology</i>: Research will identify other potential sinks of CO₂ that are excluded from the IPCC methodology, such as coffee, tea, coconuts and cashew nuts.</p>

Table 1. (continued)

Party	Problems/ areas			Comments
	AD	EF	M	
Kyrgyzstan	X	X	X	<u>Problems:</u> <i>Activity data:</i> The great variety of food products and the absence of standard <i>emission factors</i> for all type of products lead to aggregation of products into groups. Due to smuggling of combustible/lubricating materials into the country, official statistics are not reliable. <i>Methodology:</i> Some technological processes were not reflected in the IPCC Guidelines.
Mauritania	X		X	<u>Problems:</u> Lack of <i>activity data</i> for the energy (variation of stocks of petroleum products), agriculture (use of fertilizers) and waste (solid waste disposal) sectors. <i>Methodology:</i> IPCC Guidelines on industrial processes do not address two sources of CO ₂ emissions: production of biscuits, and direct combustion of methane and ethane.
Namibia	X	X	X	<u>Problems:</u> Lack of <i>activity data</i> for the energy, industrial processes, agriculture, LUCF and waste sectors. Uncertainties surrounding appropriate <i>emission factors</i> in the energy and agriculture sectors. <i>Methodology</i> does not consider the amount of carbon sequestered in underground biomass. <u>Improvements:</u> Research should be directed to improve estimates of emissions or sinks resulting from LUCF, validate emission factors for enteric fermentation, improve estimates of emissions from the waste sector, and improve information on crop residue and savannah burning.
Tajikistan	X	X	X	<u>Problems:</u> Lack of <i>activity data</i> for the energy (energy balances have not been compiled for the past 11 years; consumption of natural gas for heating over the period 1990–92 was not considered due to the lack of data), industrial processes (exact volume of PFCs emitted could not be known precisely due to the lack of monitoring), agriculture, LUCF and waste sectors. Possible inaccuracy in <i>emission factors</i> for the agriculture and waste sectors. <i>Methodologies</i> not available in local languages. <u>Improvements:</u> <i>Activity data:</i> Need to improve the quality of activity data; the monitoring of PFCs emissions from the aluminium industry; and knowledge of specific emission processes (e.g. agricultural soils, forest and soil carbon dynamics, waste dumps, aluminium production). Also need to develop an energy database; conduct forest inventory and estimate carbon stocks; and enhance the statistical reporting system. Also need to develop local emission factors.
The former Yugoslav Republic of Macedonia		X		<u>Problems:</u> The appropriate <i>emission factor</i> for lignite was not provided by the IPCC. <u>Improvements:</u> <i>Activity data:</i> Party indicated its will to build a national emission inventory system, including register of sources and technologies. <i>Emission factors:</i> Party indicated that it will participate in a regional project aiming at improving the quality of GHG inventories. Party also intends to improve <i>methods</i> and procedures for improving the quality of GHG inventories.
Uganda	X			<u>Problems:</u> Lack of <i>data</i> , specifically on biomass for consumption as firewood and charcoal.

Table 2. Completeness of reporting according to table II of the UNFCCC guidelines

Greenhouse gas source and sink categories	CO ₂		CH ₄		N ₂ O	
	No. of reporting Parties	%	No. of reporting Parties	%	No. of reporting Parties	%
Total (net) national emissions	16	100	16	100	16	100
1. All energy	16	100	16	100	15	94
<i>Fuel combustion</i>						
Energy and transformation industries	15	94	11	69	10	63
Industry	13	81	9	56	9	56
Transport	15	94	13	81	13	81
Commercial/institutional	11	69	9	56	7	44
Residential	13	81	12	75	11	69
Other (please specify)	-	-	1	6	1	6
Biomass burned for energy	13	81	4	25	4	25
<i>Fugitive fuel emissions</i>						
Oil and natural gas systems	3	19	7	44	2	13
Coal mining	2	13	7	44	2	13
2. Industrial processes	15	94	4	25	6	38
3. Agriculture	2	12	16	100	16	100
<i>Enteric fermentation</i>	2	13	16	100	3	19
<i>Rice cultivation</i>	2	13	14	88	3	19
<i>Savannah burning</i>	1	6	9	56	7	44
<i>Other (please specify)</i>	1	6	9	56	9	56
Manure management	2	13	16	100	10	63
Agricultural soils	2	13	4	25	15	94
Field burning of agricultural residues	2	12	12	75	10	63
Other	-	-	-	-	-	-
4. Land-use change and forestry	16	100	13	81	13	81
<i>Changes in forest and other woody biomass stock</i>	16	100	2	13	2	13
<i>Forest and grassland conversion</i>	15	94	12	75	12	75
<i>Abandonment of managed lands</i>	10	63	1	6	1	6
5. Other sources as appropriate and to the extent possible (please specify)	8	50	16	100	11	69
CO ₂ emissions and removals from soils	6	38	2	13	2	13
Other (land-use change and forestry)	-	-	-	-	-	-
Waste	3	19	16	100	11	69
Solid waste disposal on land	2	13	16	100	2	13
Waste-water handling	2	13	11	69	9	56
Waste incineration	1	6	1	6	1	6
Other (waste)	-	-	1	6	2	13
International bunkers	6	38	3	19	3	19

Notes: Sectors and source categories not to be reported as "other" in table II of the UNFCCC guidelines are given in shaded cells. The values given in bold indicate that the percentage of reporting by non-Annex I Parties is equal to or higher than 80.

Table 3. Aggregate emissions and removals of CO₂, CH₄ and N₂O by major source/sink category, including and excluding land-use change and forestry (LUCF) (Gg CO₂ equivalent and percentage of total by Party)

	Energy		Industrial processes		Agriculture		Other		Total (excluding LUCF)	LUCF	Total (including LUCF)	Percentage of LUCF in total GHG
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	(Gg)	(Gg)	%
1990												
Kyrgyzstan	29 095.93	80.52	708.20	1.96	4 151.43	11.49	2 177.62	6.03	36 133.29	-825.46	35 307.83	-2.28
Tajikistan	18 787.40	79.28	1 565.10	6.60	3 167.70	13.37	155.40	0.66	23 698.20	-1 528.00	22 170.20	-6.45
The former Yugoslav Republic of Macedonia	10 595.52	68.64	1 633.31	10.58	2 025.44	13.12	1 181.90	7.66	15 436.17	-1 463.64	13 972.53	-9.48
Total	58 478.85	77.69	3 906.61	5.19	9 344.57	12.42	3 514.92	4.67	75 267.66	-3 817.10	71 450.56	-5.07
1994												
Albania	3 104.99	55.95	209.87	3.78	1 879.28	33.86	355.54	6.41	5 549.67	1 509.68	7 059.35	27.20
Bangladesh	15 210.01	33.12	1 281.48	2.79	28 122.39	61.23	1 312.29	2.86	45 925.39	7 837.97	53 763.36	17.07
Belize	606.85	9.36	0.29	0.00	270.37	4.17	5 607.06	86.47	6 484.58	-4 174.26	2 310.32	-64.37
Cambodia	1 881.11	12.98	49.85	0.34	10 559.05	72.85	2 000.64	13.80	14 493.75	-19 635.96	-5 142.21	-135.48
Djibouti	275.58	46.67	0.00	0.00	206.29	34.94	108.61	18.39	590.48	-678.55	-88.06	-114.91
Eritrea	2 677.70	64.74	32.34	0.78	1 371.20	33.15	53.97	1.30	4 135.84	1 676.30	5 812.14	40.53
Guinea	2 043.19	23.19	143.42	1.63	2 529.71	28.71	4 227.70	47.98	8 811.78	-21 482.97	-12 671.19	-243.80
Iran	321 355.86	83.34	25 474.85	6.61	30 303.79	7.86	8 460.87	2.19	385 595.37	31 416.66	417 012.03	8.15
Kenya	8 058.16	37.09	989.51	4.55	12 099.66	55.69	580.89	2.67	21 728.23	-28 262.22	-6 533.99	-130.07
Kyrgyzstan	14 494.07	79.65	228.42	1.26	2 354.73	12.94	1 120.47	6.16	18 197.69	-887.45	17 310.24	-4.88
Namibia	1 917.68	33.75	5.46	0.10	3 607.41	63.49	150.87	2.66	5 681.42	-5 715.60	-34.18	-100.60
Tajikistan	5 434.90	63.91	497.50	5.85	2 437.50	28.66	138.60	1.63	8 504.30	-2 048.00	6 456.30	-24.08
The former Yugoslav Republic of Macedonia	9 801.60	70.55	991.21	7.13	1 977.47	14.23	1 123.60	8.09	13 893.87	-1 735.58	12 158.29	-12.49
Uganda	4 962.22	11.61	43.50	0.10	37 503.51	87.76	225.09	0.53	42 734.32	8 122.65	50 856.97	19.01
Total	391 823.91	67.28	29 947.70	5.14	135 222.36	23.22	25 466.20	4.37	582 326.68	-34 057.32	548 269.36	-5.85
1995												
Benin	997.85	2.51	96.43	0.24	37 957.53	95.64	637.82	1.61	39 689.63	-47 865.42	-8 175.79	-120.60
Mauritania	1 153.69	26.64	2.43	0.06	2 944.38	68.00	229.36	5.30	4 329.87	-640.00	3 689.88	-14.78
Total	2 151.54	4.89	98.86	0.22	40 901.91	92.92	867.18	1.97	44 019.50	-48 505.42	-4 485.91	-110.19

Note: Uganda provided an updated version of its GHG inventory summary table, so the numbers in this table might not match the ones included in the original version submitted by the Party.

Table 4. Estimates of emission reductions from mitigation measures by sector reported by some Parties

Party	Sector/subsector	Estimates of emission reduction	
		(Gg CO₂ equivalent)	Time horizon
Albania	All sectors	7 000	2020
Bangladesh	Energy	68	Per year
Cambodia	Energy	59 650	2030
Djibouti	Energy supply	4 496	
Eritrea	Energy demand	45	Per year
Eritrea	Energy supply	21	Per year
Guinea	Energy demand	6 019	2010
Iran	Energy supply	330 627	2010
Iran	Agriculture	11 193	2010
Kyrgyzstan	Energy	610	2020
Kyrgyzstan	Forestry	1 336	2025
Mauritania	All sectors	10 932	2010

Table 5. Areas of ongoing or planned research reported on climate change impacts, vulnerability assessment and adaptation options

Adaptation and vulnerability areas	Socio-economic areas (tourism)	Environment	Biodiversity	Forestry	Agriculture	Livestock	Fisheries	Water resources	Coastal zones	Human health	Cross-cutting issues	Mitigation (energy, waste)
Climate change impacts/vulnerability assessments	Belize	Cambodia, Eritrea, Uganda	Belize, Eritrea	Belize, Cambodia, Djibouti, Eritrea, Namibia, Tajikistan	Belize, Djibouti, Guinea, Tajikistan	Guinea	Belize, Namibia	Belize, Djibouti, Eritrea, Guinea, Kyrgyzstan, Namibia	Belize, Djibouti, Guinea, Iran	Belize, Kyrgyzstan, Tajikistan	Djibouti, Eritrea, Guinea, Kyrgyzstan	Djibouti, Iran, Kyrgyzstan, Mauritania
Adaptation/mitigation options		Eritrea	Eritrea	Eritrea, Namibia, Tajikistan	Guinea, Tajikistan	Guinea	Namibia	Djibouti, Guinea, Namibia	Djibouti	Kyrgyzstan, Tajikistan	Eritrea	Djibouti

Table 6. National networks of observation stations relating to systematic observation

	Meteorological stations	Climate stations	Synoptic stations	Rain gauges	Hydrological stations (lake, river, etc.)	Upper-air observing stations	Radar stations
Kyrgyzstan	√				√	√	
Namibia			√	√			
Tajikistan	√				√		
The former Yugoslav Republic of Macedonia	√		√		√		
Uganda	√	√	√	√	√	√	√

Note: No Party indicated that it had national networks of oceanographic stations, lightning detectors, seismic stations, aeronautical stations, satellite stations, or GHG monitoring stations.

Table 7. Difficulties encountered or requirements to be met to enable improved reporting of systematic observation

Party	Difficulties encountered or needs to be met to improve reporting
Albania	Needs to develop regional emission factors for forests and waste, and data for abatement analysis and vulnerability and adaptation.
Bangladesh	Most research and systematic observation needs relate to better understanding of the impacts of and adaptation to climate change in water resources, coastal zones and resources, agriculture, forest and biodiversity, fisheries and human health.
Belize	Currently does not have comprehensive marine/oceanographic observation programmes and needs to upgrade its meteorological and hydrological monitoring programmes. Also needs to monitor water quality.
Benin	Needs to strengthen its research and observation capacity in order to improve understanding of impacts of climate change and to develop appropriate adaptation strategies and measures.
Cambodia	Needs to strengthen its research capacity and observation capability in climate, environment, natural resources and land-use and cover change.
Djibouti	Needs to improve scientific knowledge in forest sector and develop better understanding of impacts on coastal zones and resources.
Eritrea	Needs to establish strong and effective institutions to manage observation systems including development of human resources and information technology. Also needs to invest resources to support observation programmes.
Guinea	Needs to rehabilitate and extend the network of existing stations and observatories and to modernize equipment and strengthen its hydromet network on the coastal zone.
Iran	Needs to upgrade and expand its climate observation network at the national level and to improve its contribution to the global observing systems through development, utilization and accessibility of databases.
Kenya	Lack of availability/accessibility to good quality data and poor research facilities and opportunities to undertake research.
Kyrgyzstan	Needs to modernize the technology (equipment and capacity) used in its current network.
Mauritania	Climate data are scanty due to the lack of observation stations.
Namibia	Needs to undertake further research to improve various elements of national communications. Strengthen existing stations for data to enhance understanding of impacts of future climate change on agriculture, marine ecosystem, land use and forestry, biodiversity, waste and water.
Tajikistan	Needs to improve maintenance and will need more resources (financial and technical) for this purpose.
The former Yugoslav Republic of Macedonia	Needs to improve network coverage and to improve the collection, archiving and utilization of data.
Uganda	Needs more climatological stations and to strengthen existing climatological and hydrological stations, and better management of databases.

Table 8. Methods used by Parties to assess climate change impacts and vulnerability

Methods		Albania	Bangladesh	Belize	Benin	Cambodia	Djibouti	Eritrea	Guinea	Iran	Kenya	Kyrgyzstan	Mauritania	Namibia	Tajikistan	The former Yugoslav Republic of Macedonia	Uganda
Scenarios:	GCM equilibrium/transient	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	MAGICC-SCENGEN	√			√		√		√	√		√	√			√	
	Incremental/analogue	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Statistical							√		√					√		
	Socio-economic											√					
	IPCC SLR	√	√	√	√	√	√		√								
	SRES					√											
Agriculture:	DSSAT3 IBSNAT and CERES		√	√	√			√									
	Livestock: SPUR2															√	
	National models		√		√				√	√	√				√		√
	Qualitative	√		√			√	√	√	√	√			√		√	√
	SRES					√											
Water resources:	CLIRUN			√							√						
	National models	√	√					√		√	√	√			√		
	Qualitative	√		√	√						√			√		√	√
Coastal zones and marine ecosystems:	IPCC methodology	√	√	√	√	√	√	√	√		√						
	Qualitative			√	√		√		√	√	√		√				
Forests and terrestrial ecosystems:	Holdridge or Gap					√		√			√					√	√
	National methods	√	√	√		√				√		√				√	
	Qualitative	√	√	√			√		√	√	√	√	√	√	√		√
Human health:	Statistical							√		√		√			√		
	Qualitative	√	√					√	√	√	√	√	√	√	√	√	√
	SRES					√											
Other sectors:	Qualitative	√	√							√	√	√	√	√		√	√
	IPCC methods	√	√	√	√	√		√	√	√	√	√		√		√	√

Note: "Qualitative" means an approach that includes expert judgement.

Table 9. Adaptation options in the agriculture, water resources and coastal zones and marine ecosystems sectors

Option/sector	Albania	Bangladesh	Belize	Benin	Cambodia	Djibouti	Eritrea	Guinea	Iran	Kenya	Kyrgyzstan	Mauritania	Namibia	Tajikistan	The former Yugoslav Republic of Macedonia	Uganda
<i>Agriculture</i>																
Educational and outreach activities to change management practices to those suited to climate change		√	√	√			√		√	√			√	√		√
Switch to different cultivars	√	√								√	√		√		√	√
Improve and conserve soils	√	√	√		√				√	√	√		√		√	
Enhance irrigation efficiency and/or expand irrigation	√	√	√		√				√	√						√
Agriculture research and transfer of technology		√	√	√					√	√	√				√	√
Establish seed banks									√							
Develop new crops		√	√		√				√	√	√		√			√
Develop and introduce policy measures, including taxes, subsidies, facilitation of free market	√						√		√							
Develop early warning system and disaster preparedness	√	√	√	√			√							√		
Improve pest and disease forecast and control	√	√	√	√						√	√					√
<i>Water resources</i>																
Increase water supply, e.g. by using groundwater, building water storage reservoirs, improving or stabilizing watershed management, desalination		√	√	√		√	√		√	√	√			√		√
Decrease water demand, e.g. by increasing efficiency, reducing water losses, water recycling, changing irrigation practices		√	√	√					√		√		√	√		√
Develop and introduce flood and drought monitoring and control system.	√	√	√				√		√				√			
Reduce water pollution	√								√	√			√			
Improve or develop water management	√	√	√	√			√		√	√	√					
Alter system operating rules, e.g. pricing policies, legislation	√								√	√	√					
<i>Coastal zones and marine ecosystems</i>																
Develop integrated coastal zone management	√				√		√									
Develop planning/new investment requirements		√	√		√		√						√			
Protect, including building sea walls, and beach nourishment		√	√	√	√		√					√				
Retreat																
Research/monitor the coastal ecosystems		√	√				√						√			