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

Compilation and synthesis of initial national communications

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

Note by the secretariat*

Addendum

Measures contributing to addressing climate change

Summary

This document contains information on measures contributing to addressing climate change with a focus on ways to abate greenhouse gas (GHG) emissions and enhance removals by sinks. The sectors covered are energy (supply and demand), agriculture, land-use change and forestry, and waste management. This document also highlights the needs and constraints of Parties not included in Annex I to the Convention relating to the assessment and implementation of activities meant to abate and sequester GHGs. There are many such initiatives and activities. The majority of those reported by Parties were in the energy, agriculture, land-use change and forestry, and waste management sectors. Many of the measures that are being considered or have already been implemented deliver multiple benefits for development, the environment and the global climate system.

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

CONTENTS

	<i>Paragraphs</i>	<i>Page</i>
I. INTRODUCTION.....	1	3
II. REPORTING ISSUES	2–10	3
III. OVERVIEW OF INFORMATION.....	11–53	4
A. National circumstances that influenced choice of measures ..	11–22	4
B. Sectoral synthesis.....	23–52	5
C. Estimation of emission reduction.....	53	12
IV. PROJECT PROPOSALS SUBMITTED IN ACCORDANCE WITH ARTICLE 12, PARAGRAPH 4, OF THE CONVENTION.....	54–65	13
A. Sectoral analysis of the projects.....	57	13
B. Regional distribution/analysis of the project proposals.....	58–65	13
V. NEEDS AND CONSTRAINTS.....	66–68	16
VI. CONCLUSIONS.....	69–73	17

Annex

List of Parties covered in the sixth compilation and synthesis	19
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I. Introduction

1. The guidelines for the preparation of initial national communications by Parties not included in Annex I to the Convention (non-Annex I Parties), contained in the annex to decision 10/CP.2,¹ require that Parties seek to include, as appropriate, programmes containing measures the Parties believe contribute to addressing climate change and its adverse impacts, including the abatement of increases in greenhouse gas (GHG) emissions and enhancement of removals by sinks.

II. Reporting issues

2. Almost all the Parties that submitted their initial national communications up to 1 April 2005 included a chapter on the measures aimed at addressing climate change. Those Parties that did not include a chapter on these measures provided lists of possible options in other chapters.

3. The scope and level of detail of reports varied depending on national circumstances and how Parties decided to implement decision 10/CP.2. In many cases, when the measures were identified, their status of implementation was not clear. Many Parties indicated that assessments of their measures are at an early stage and that the development of more detailed recommendations would require consultation with, and input from, stakeholders in the public and private sectors, as well as the development of appropriate policy and legal measures. The assessment of measures also varied across sectors and across Parties.

4. In addition to elaborating on the measures, many Parties provided information on their proposed projects submitted under Article 12, paragraph 4, of the Convention.

5. Some Parties (e.g. Botswana, Ethiopia, Nicaragua, Saint Lucia, Sudan, Tunisia) reported on methods used to project the level of future emissions using business-as-usual and one or two abatement or sequestration scenarios. For the energy sector, the common variables used to develop scenarios were population growth, demand, and gross domestic product (GDP). In some instances emission projections were made for various years. However, as mentioned in chapter III, many Parties based their selection of measures on expert judgement and national development programmes.

6. In assessing and identifying the measures and options for abating and sequestering GHGs, some Parties used expert judgement, and others applied computer-aided tools. In most cases when Parties used expert judgement, they based their assessments on the information in their GHG inventories, economic growth patterns and national sustainable development plans. Furthermore, Parties mentioned that they would select approaches based on a holistic evaluation of the options, taking into account life cycle assessments and the impact of implementing these options.

7. In the energy sector, the common tools used for analysis included Long-range Energy Alternative Planning (LEAP) system, Energy and Power Evaluation Program (ENPEP), Market Allocation Macroeconomic (MARKAL) model, Services, Transport, Industry, and Residential Energy (STAIR) model, energy technology optimization (ETO), Modèle de demande en énergie pour l'Europe – Sud (MEDEE-S), Energy Flow and Optimization Model – Environment (EFOM-ENV), Wien Automatic System Planning (WASP) package, and the Greenhouse Gas Costing Model (GACMO).

8. Several Parties (e.g. Argentina, Bolivia, Ghana, Honduras, Republic of Moldova, Turkmenistan) described the methodological aspects of the assessment of measures in the waste sector. In cases when this assessment was done, some Parties used linear regression tools, and others reported the use of methodologies that reflected source categories of the Intergovernmental Panel on Climate Change (IPCC)

¹ FCCC/CP/1996/15/Add.1.

1995 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the IPCC Guidelines).

9. In general, Parties provided limited information on the methodologies used in the land-use change and forestry (LUCF) sector. A few Parties used the Comprehensive Mitigation Assessment Process (COMAP) model and others used cost-benefit analysis. A number of Parties reported difficulties in quantifying the reduction potential of identified measures. A few provided estimates of the time period over which the estimated carbon uptake would occur through afforestation, reforestation, forest protection and woodland creation.

10. The majority of activities that were reported in the initial national communications were in the energy, agriculture, LUCF, and waste management sectors.

III. Overview of information

A. National circumstances that influenced choice of measures

11. Choice of measures was influenced by key national circumstances relating to population, the economy, energy, industry, transport, agriculture and forestry.

12. It is recognized that population distribution patterns have important implications for, among other things, ownership of cars or other powered vehicles, occupancy of private houses and demand for energy, and therefore affect the emissions from transport and housing. The total population of Parties covered in this report was over 4.5 billion. It varied widely between Parties, from less than 3,000 in Niue to about 1.2 billion in China. The population growth in the past decade in most of the Parties was about 1.5 per cent annually on average, but was higher in a number of countries. In some countries the population density is quite high. India, for example, reported a population density of 324 persons/km² in 2001. There has also been a rapid increase in urbanization in most non-Annex I Parties. Brazil reported that 81.2 per cent of its population is living in cities, and India reported that 36 per cent of its people lived in urban areas in 2000, and that urbanization continues to grow.

13. Most Parties noted that their economies were originally structured on natural resources, with mining and agriculture as the mainstay of GDP. Other sectors, such as services and tourism, have been growing and have been recognized as key areas for opportunity and economic growth. They also present potential co-benefits for GHG abatement.

14. Most Parties that reported belonged to the low-income group, with GDP per capita in some cases less than USD 500 (in 1995 prices adjusted for purchasing power parity). There were very few Parties that could be classified as middle income with GDP per capita of USD 15,000–20,000 (for example Bahamas and Malta). A majority of the Parties mentioned that their service sectors contributed 40 per cent or more to their total GDP. In a few Parties, the industrial sector contributed substantially to GDP, for example 72 per cent in the Republic of Korea, 48 per cent in China, 32 per cent in Malaysia, 28 per cent in Algeria and 25 per cent in Ghana and South Africa.

15. Most of the reporting Parties provided information on the evolution of their economies, including developments relating to globalization, deregulation, privatization and currency convertibility. Some Parties indicated a decline in the energy intensity of production. Biomass and fossil fuels remain the main forms of energy used in non-Annex I Parties. Consumption of energy, and its associated emissions, continue to grow to meet development needs. The growth of electricity demand will constitute a challenge for many countries in the coming decades.

16. Many Parties presented estimated reserves of fossil fuels and/or non-fossil-fuel energy sources. South Africa, for example, reported that coal currently provides more than 90 per cent of the energy for

its electricity generation and is expected to dominate power generation until 2040. South Africa has about 60 billion tonnes of coal reserves, which is sufficient to meet this demand. India reported that it has reserves of 221 billion tonnes of coal and indicated that coal would be the mainstay for commercial energy for the foreseeable future.

17. Many reporting Parties mentioned that they rely heavily on fossil fuel imports to meet their energy needs, in addition to using their indigenous energy sources, such as biomass. Some Parties, however, are net exporters of fossil fuels, with the value of these exports ranging from 20 to 67 per cent of the country's total exports.

18. Cleaner fossil fuels, such as natural gas, are favoured because of their advantages in dealing with concerns about environmental issues and GHG emissions. Many Parties provided information on alternative energy resources and mentioned that these include photovoltaic, solar thermal, wind, hydroelectric, geothermal, oil shale, and biomass energy. Some Parties reported substantial hydroelectric power generation in their countries.

19. Most Parties stressed that agriculture is considered to be a development priority, with a view to ensuring food security and to increasing its contribution to the GDP. Agriculture's share of GDP ranged from 0.8 per cent for the Federated States of Micronesia to 56.4 per cent for the Lao People's Democratic Republic. Agricultural area as a percentage of total land area also varied widely, ranging from 0.6 per cent for Jordan to 82 per cent for Turkmenistan.

20. The relative contribution of emissions from industrial processes to total GHG emissions is generally low in non-Annex I Parties, but it is expected to grow in response to demand for industrial materials. Many non-Annex I Parties are developing rapidly. The most important industry in terms of emissions is cement manufacture. Apart from energy efficiency or fuel-switch projects, most of the GHG abatement projects in the cement sector involve replacement of a portion of the clinker with mineral by-products or residues, which results in a substantial reduction of emissions.

21. Several Parties identified certain trends in the transport sector including the increase in road transport at the expense of both commuter and freight railway use and maritime transport. The use of higher payload commercial vehicles was also identified. Problems relating to efficiency in the transport sector included the lack of organized transport systems in most cities, in addition to an ageing car fleet. Transport is considered a major sector that will contribute to the growth of GHG emissions.

22. The current global assessment of the potential of forests and other biological mitigation options is in the order of 100 Gt C (cumulative) by 2050, equivalent to about 10 to 20 per cent of projected fossil fuel emissions during that period.² Many non-Annex I Parties have developed master plans and programmes in the forestry sector, mostly to reverse a trend of deforestation (Argentina, Colombia, Costa Rica, Ghana, Indonesia, Lesotho, Mauritius, Mexico, Morocco, Peru, Philippines, Republic of Korea, Senegal, Seychelles, Thailand, Tunisia, Uganda). Costa Rica succeeded in turning its forests from being a source of emissions to being a sink of carbon in 1995; the rate of deforestation has decreased and the rate of forest regeneration has increased since 1990 and is expected to continue to grow up to 2015.

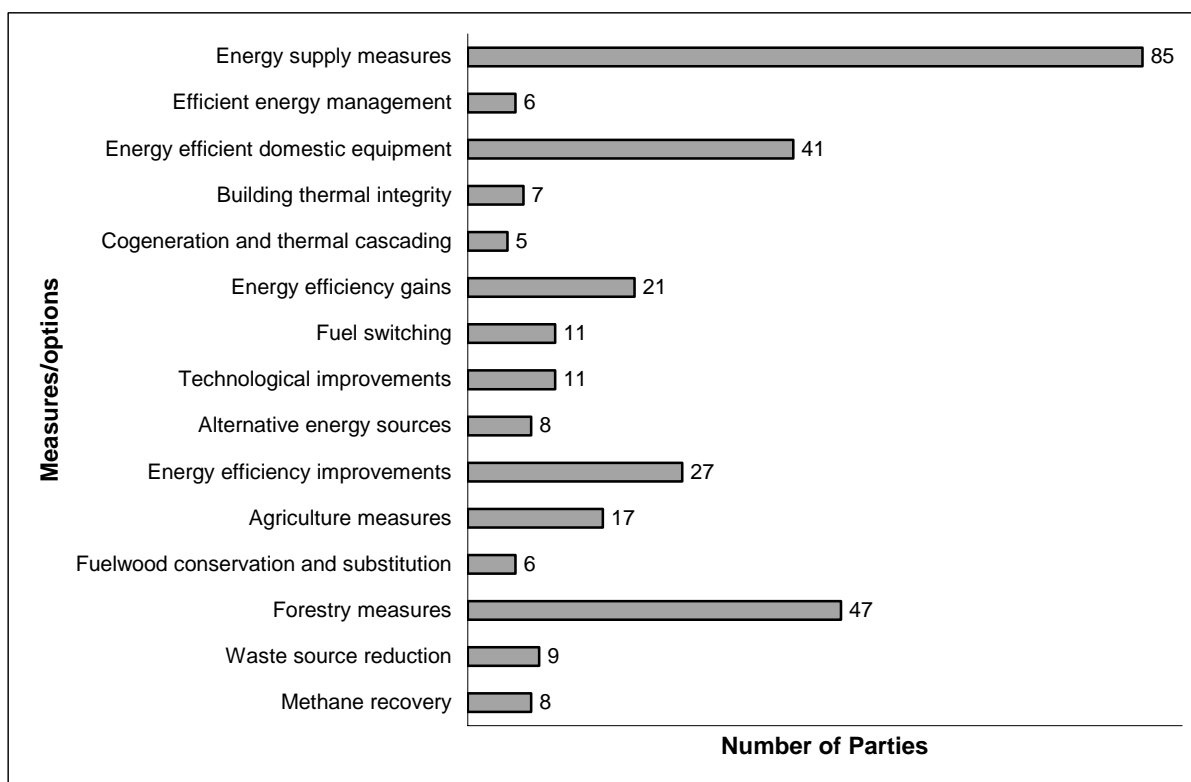
B. Sectoral synthesis

23. Seventy initial national communications indicated that the energy sector was the largest source of GHG emissions; for 45 Parties it was the agriculture sector and for six the waste sector. Agriculture was the second largest emitter for most Parties, followed by the industrial processes and the waste sectors.

² *Climate Change 2001: Mitigation. Summary for policymakers and Technical Summary of the Working Group III Report.* Part of the WG III contribution of the Third Assessment Report of the IPCC. United Nations Environment Programme–World Meteorological Organization.

Sequestration of carbon dioxide (CO₂) emissions by the LUCF sector in most Parties offset the GHG emissions originating from this sector. Roughly half of the reporting Parties also identified measures to limit emissions and enhance removals by sinks in the LUCF sector. About a third of reporting Parties also reported on measures to abate GHG emissions in the agriculture and waste sectors. Figure 1 illustrates the numbers of Parties that reported measures in the various sectors and the names of the Parties are indicated in table 4.

Figure 1. Number of Parties that reported measures in the various sectors



1. Energy

24. Measures in energy supply included energy efficiency and conservation, increasing transformation efficiency, modernization of thermoelectric utilities, fuel switching, electricity imports, reduction of losses in transmission and distribution, development of plans to promote rural electrification and use of renewable energy sources. On the demand side, Parties identified various types of measures, ranging from regulatory to educational, and promotion of information, in the transport, residential, commercial and industrial subsectors.

25. Table 1 shows the measures most commonly reported in the energy sector, with regional detail. Nearly half of reporting Parties (52 of the 122) are implementing, or are considering the implementation of, small hydropower applications in order to increase their energy supply to meet their pressing needs for power. This interest is spread fairly evenly across regions. The same number of Parties (52) is also considering alternative fuels in the transport subsector, with the greatest interest coming from Latin America. Many Parties have measures in place that encourage the switching from solid cooking fuels, such as biomass and coal, to cleaner alternative fuels, such as kerosene, liquefied petroleum gas (LPG), natural gas and biogas. They believe that these measures will result in reduction of growth of GHG emissions.

Table 1. Regional distribution of common measures (implemented and/or planned)

Region	Construction of small hydropower dams	Switching to cleaner cooking fuels	Combined heating and power	Alternative fuel for transport	Improved transport infrastructure	Efficient lighting	Making buildings energy efficient
Africa (43 Parties)	23	24	3	14	11	17	12
Asia and the Pacific (41 Parties)	15	9	6	14	8	13	18
Latin America and the Caribbean (31 Parties)	10	4	7	19	8	19	10
Other (7 Parties)	4	0	2	1	5	3	2
Total (of 122 Parties)	52	37	18	48	32	52	42

26. As a result of planned responses to sustainable development, many Parties achieved large emission reductions or avoidance. India, for example, reported that various planned responses have helped it to integrate the national development policies aimed at climate change. Carbon dioxide emissions saved over the past decade by promoting renewable energy and energy conservation initiatives are estimated to amount to more than 330 Mt with another 40 Mt coming from population policies. These initiatives and additional investments have altered India's emissions trajectory since the early 1990s, making national development more climate friendly. China's tenth five-year Energy Development Plan (2001) gives priority to hydropower, optimization of thermal power, development of the electricity grid and increased use of nuclear power.

Energy supply

27. Regarding energy supply, Parties mentioned several options, including ensuring an optimal overall mix of energy sources. About half of the Parties considered switching to cleaner fuels, such as low-sulphur fuels and LPG, from coal. South Africa signed agreements with the Government of Mozambique and the chemicals group, Sasol, to pipe gas from the Pande and Temane gas fields to the Sasol Secunda plant by 2004. China will complete a 4,000-km pipeline by 2005 to transport 12 billion m³ of gas annually to the east of the country, and this gas will largely replace coal and biomass usage. In India, 34 million new LPG connections have been implemented in an effort to increase the availability of this relatively clean energy source. Other Parties described projects for capturing coal-bed methane for combustion. Further, as part of their economic restructuring, a number of Parties, including China and Republic of Korea, reported their intention to close down some of their coal mines. From 1996 to 2000, China also closed down many coal-fired power plants that were producing less than 50 MW of power.

28. More than a half of the Parties stressed the development and promotion of renewable energy sources. For many Parties the most important renewable option is the extension of their hydropower programmes, mainly through additional small-scale hydro projects. Parties are also considering other forms of renewable energy, such as solar, geothermal, wind, biofuels and related technologies. A few Parties with suitable soils and climatic conditions for growing sugar cane are considering further investment in bagasse production (Brazil, Cuba, Mauritius and others). In Brazil, ethanol has proven to be a reliable fuel for cars. It has a higher octane rating than gasoline and contains no sulphur, and so does not deactivate catalytic converters. Also, it has a lower vapour pressure than gasoline, which results in less emission through evaporation (see box 1).

Box 1. Reduction of greenhouse gases through the use of ethanol in Brazil

The production cycle of ethanol includes the photosynthesis process that allows the sugar cane to absorb the same amount of carbon dioxide as is released in the burning of alcohol and bagasse. However, GHG emissions are generated in sugar cane production (because of the use of the fertilizers and burning at harvest) and in transporting the crop from the field to the plant. The net reduction in CO₂ emissions is in the order of 2.46 t CO₂ equivalent per m³ of ethanol consumed.

The CO₂ emissions avoided as a result of substituting ethanol for gasoline in Brazil corresponded to an average reduction of 4 Mt C/year in the 1980s and 6.2 Mt C/year in the 1990s. The CO₂ reduction achieved in the period 1975–2000 amounted to 110 Mt C.

29. Many Parties have already exploited hydropower potential. By 2000, China had constructed 40,000 rural hydropower stations with an installed capacity of 24.8 GW and was generating about 80 million MWh of electricity per year. In 2000, the use of renewable energy in China led to the avoidance of more than 33 million tonnes of coal combustion.
30. In Costa Rica, 92 per cent of power needs are generated by renewable energy sources, and the potential is not yet fully utilized. Geothermal potential amounts to 990 MW and wind potential to 600 MW. Colombia has hydropower potential amounting to 25,000 MW and potential from other renewables amounting to 1,200 MW. In 2000, 88 per cent of Brazil's electricity was generated from hydropower. Brazil has also constructed 205 small hydropower stations generating 865 MW of power and 40 other stations are being constructed to generate an additional 504.9 MW. Eighty-two others have been authorized and, if built, will generate 1,323 MW of power.
31. In the past, nuclear power has been promoted for energy security. A number of Parties now plan to introduce nuclear power, in part due to the need to save fossil fuels. Iran, for example, is planning to generate 10–20 per cent of its electrical energy from nuclear power by 2005, resulting in an estimated potential 3 per cent reduction in Iran's total carbon dioxide emissions. In South Africa, nuclear power is the second largest source of electricity, accounting for 6.8 per cent of the country's electricity generation capacity and 3 per cent of the primary energy supply. In 2000, the installed capacity of nuclear power in China was 2.1 GW, with a further 6.6 GW under construction.
32. A number of Parties, including Brazil, China, India and South Africa, indicated that they have abundant coal reserves, and will continue to use coal in the medium term (i.e. to 2030). As far as technologically and economically possible, they intend to use high-efficiency technologies for power production from coal, including supercritical steam technology, integrated coal gasification combined cycle and fluidized bed technology.
33. Reducing flaring of gases was identified as a key measure to reduce emissions from a number of activities, including from oil and coal production (China, Iran, Nigeria and others). Iran plans to reduce emissions by 175,270 kt CO₂ equivalent by reducing flaring and by introducing new technologies that would capture the gases.
34. Combined heating and power (CHP) is being promoted in a number of Parties (Botswana, China, Mexico, Republic of Korea, Thailand and others). It has substantial potential to reduce emissions in non-Annex I Parties. China increased the share of CHP in the energy supply sector by 11 per cent annually between 1995 and 2000.

Energy demand

Transport

35. Nearly two thirds of the reporting Parties identified measures in the transport subsector. Parties' attention to this subsector follows from the fact that transport is often one of the fastest growing sources of GHGs, especially in large urban areas where it is affecting urban air quality and creating noise and congestion problems. As a result of the subsector's direct influence on human health and well-being, measures that address transport emissions are often desirable from an environmental sustainability perspective, and also lead to lower GHG emissions. Reported measures target both new and improved technologies, such as introduction of electric or compressed natural gas vehicles, encouragement of early adoption of hybrid vehicles, introduction of vehicle emission standards, passenger and freight vehicle efficiency standards, and measures focused on mode switching and other behaviours affecting transport. This includes discouragement of the use of private vehicles, improvement of the public transport system, including the development of road transport master plans, adoption of legal measures to limit the importation of used and/or reconditioned vehicles and improvement of road infrastructure, as well as modernization of locomotives and switching from diesel to electric traction on railways, and using river transport systems where possible.

36. Other measures in this subsector focused on improving availability, efficiency and emission performance of public modes of transport, and included consideration of the integration of urban planning, transport and environmental policies, speed reductions, fuel economy ratings, rationalizing of urban and inter-urban transport, education and awareness raising on transport issues, and regular vehicle inspection to improve fuel efficiency. Some Parties referred to tax policies (e.g. carbon tax system), the restructuring of relevant institutions, encouragement of the use of hydrogen-based fuels, and the introduction of small-engine-capacity cars that consume less energy.

37. Several Parties, including Brazil and India, have carried out research on the use of hydrogen as a fuel. Hydrogen-fuelled buses are more environmentally friendly than diesel buses. Brazil began implementing a project on hydrogen fuel cell buses in 1994. The intention is to manufacture these buses on a large scale in the future. Also, some countries have converted vehicles from gasoline and diesel to compressed natural gas (Ecuador, Iran, Peru, Thailand and others). For example, in New Delhi, India, 84,000 public vehicles were converted in 2002 and the Government announced an auto fuel policy that will also abate GHGs.

38. Some Parties noted that currently there is limited scope for substitution of non-petroleum fuels in the transport sector. In these Parties, changing consumer behaviour was envisaged as a way to reduce fuel consumption from transport and reduce emissions. This could be complemented by studies to evaluate the energy demand and supply in the subsector with a view to facilitating the formulation of policies and strategies for achieving sustainable transport.

Industry

39. Although the level of industrialization is still low in most non-Annex I Parties, it is expected to grow. Therefore GHG emissions from this subsector will grow. Some Parties identified plans to modernize industrial processes and equipment. Efforts are being made to introduce improvements in cement and steel production to ensure that these processes are ecologically and environmentally friendly. Some Parties have developed policies for cleaner industrial production. Some have set stringent energy intensity targets and energy conservation plans for different branches of industry. China, for example, has implemented a number of incentive policies in support of energy conservation projects, including interest payment rebates, differential interest rates, revoking of import taxes, reduction of income tax of enterprises and accelerated depreciation. Since 1990, the Government of China has closed down some

large enterprises that were using antiquated technologies and/or were highly inefficient consumers of energy and materials.

40. Some Parties are proposing the introduction of efficient fuel for boilers in industry, efficient coal-fired boilers, efficient electrical motors, and efficient lighting in industrial buildings.

Residential/commercial

41. More than a half of the Parties identified several measures in the residential and commercial subsectors. Some of the options were the introduction of thermo-insulation of households, efficient refrigerators, efficient lighting, thermostats for electric boilers, prepaid meters for household consumers, solar water heating systems in households, improved air conditioning systems, implementation of demand-side management programmes, promotion of fuel switching, and use of renewable energy.

42. According to the information reported on this subsector, the efficient lighting option has high potential for cost-effectively abating GHGs, and many Parties are currently implementing improved lighting practices by replacing incandescent light bulbs with compact fluorescent types. During 1996–1998, China implemented the Green Lighting Program and 267 million high-efficiency products were marketed. It was estimated that 17.2 million MWh of electricity was saved.

2. Agriculture

43. Many Parties reported that agriculture is the second largest source of emissions after the energy sector. The options reported for reducing emissions included measures to reduce methane emissions in rice cultivation, such as through improved farm management practices, changes in traditional farming practices, reduction of the area under rice cultivation, shift to shorter-duration rice varieties, crop rotation, diversification and intensification of crops, increase in area under directly seeded rice, provision of training and dissemination of information on mitigating methane emissions from rice paddies, improved water management through soil aeration and periodic drainage of paddy fields, adoption of intermittent irrigation systems, incorporation of pre-fermented farm residues in organic matter amendment, and the use of chemical compounds to inhibit the production of methane.

44. Measures to reduce GHG emissions in livestock-related operations included improvement in cattle management practices, optimization of livestock populations, improvement of livestock production through diet, use of nutrient supplement urea-molasses-mineral blocks, supplementing poor quality roughage with legumes and/or low-cost agricultural by-products, chemical treatment of low-quality roughage, expansion of pasture and forage conservation for dry-season feeding, confined animal management, manure management, improvement of collection, use and storage of organic waste, including wastes from animal husbandry complexes, use of biodigesters, and use of animal waste for energy production.

45. A range of other measures clearly delivers sustainable development as well as GHG benefits. Options identified by Parties to reduce N₂O and NO_x emissions included appropriate and rational use of fertilizers, substitution of organic and biological fertilizers for mineral fertilizers, use of ammonium sulphate fertilizers instead of urea, use of a combination of phosphogypsum (hydrated calcium sulphate) and urea, use of composted rice straw instead of fresh rice straw, introduction of changes in irrigation, enhanced use of organic fertilizers and bio-organic technologies, and promoting research, production and use of organic products.

46. Some Parties also identified as options for limiting emissions from agriculture the promotion of land-use planning, encouragement of integrated farming, promotion of low-tillage or no-tillage agriculture, banning of sugar cane burning prior to harvest, post-harvest management (including the avoidance of burning of farm waste), ploughing of vegetative waste into the soil, management and

administration of grasslands and changes in the use and handling of crop residues. These measures have the double advantage of increasing long-term crop productivity and enhancing uptake of CO₂ from the atmosphere or abating CO₂ emissions.

Table 2. Measures to abate the increase of greenhouse gases in the agricultural sector in select Parties

Party	Share of emissions from agriculture (% of country's total emissions)	Practices
Bangladesh	61	Improved management of livestock manures Improved rice production practices
Botswana	54	Zero tillage Cattle feeding to reduce overgrazing
Cambodia	80	To reduce methane emissions from the agriculture sector
Chad	91	Reduced savannah burning Improved diet of cattle through grazing land management
El Salvador	49	Post-harvest management to avoid the burning of wastes and to preserve soils
Ethiopia	81	Increased livestock productivity through improved nutrition and strategic supplementation Use of conservation tillage to sequester carbon in agricultural soils
Haiti	79	Introduction of a new variety of rice that cause less CH ₄ emissions Rational use of fertilizers
India	28	Improved water and crop management Efficient application of synthetic fertilizers
Mauritania	68	Improved water and fertilizer management
Uganda	88	Reduced animal populations; creating paddocks to reduce soil degradation; improved management of rangelands

3. Land-use change and forestry

47. More than two thirds of the Parties identified measures relating to the enhancement of removals of GHGs by sinks. The range of reported measures, both planned and implemented, included the preservation of existing forest cover, afforestation, reforestation, programmes for the development of commercial plantations, agroforestry, prevention and control of forest fires, control of diseases and pests, control of damage due to acid rain, woodland creation, promotion of low-impact logging, improvement of timber utilization, and conversion of low productivity lands into grasslands and rangelands. Other measures identified by Parties included the planting of high-biomass crops, such as sugar cane, soil and watershed conservation, rehabilitation of wetlands, forest research, forest management, bans on bush burning during land clearing and the promotion of fast-growing tree species, review of current forest and land management policies, forestry legislation, forestry administration plans and tax incentives for encouraging reforestation, and sand dune stabilization. Some Parties reported measures in reforestation of mountain regions, plains and microbasins.

48. Some Parties proposed measures that included the establishment of development funds and public awareness and training programmes, protection of and vigilance over protected areas, sustainable management of protected areas, sustainable management of fragile ecosystems and native forests, development of forestry–livestock and agroforestry systems, and provision of alternative livelihoods for communities protecting/conserving forests.

49. A number of Parties also identified options which included revision of prices for timber trees, effective enforcement of a ban on chainsaw operations, sustainable supply of fuels, comparative studies on carbon sequestration potentials, establishment and extension of seed banks for the reproduction of local plant species, control of forest fires, reclamation of coastal lands, enforcement of existing regulations, control of outbreaks of invasive insect species, establishment of a legal framework for long-term management of forests, establishment of forest inventories, legislation on the types of activities to be authorized within forests, implementation of programmes and plans to develop territorial management, introduction of an environment services tax, and replacement of wooden poles by steel fencing.

4. Waste management

50. Parties reported in varying degrees of detail on measures, some planned and some already implemented, to limit emissions in the waste management sector. The reported measures included integrated waste management, waste minimization at the production, distribution, consumption and disposal stages, waste recycling, improvements in organic waste collection, utilization and storage systems, including wastes of animal husbandry complexes, composting, use of sanitary landfills, waste-water treatment, capacity-building for operation and maintenance of waste-water treatment plants and rehabilitation of waste-water treatment plants, recovery of methane from landfills and waste-water treatment plants, waste utilization for energy production, waste incineration, and the development of regulations to control urban industrial pollution. Many Parties mentioned the implementation of national environmental management strategies, education programmes and studies on appropriate packaging materials, introduction of legal instruments, promotion of the private management of sewers, regulation and monitoring of agricultural and industrial waste, organization and improvement of systems of waste accounting, and the implementation of non-polluting technologies. Other Parties reported the use of biogas from landfills to generate electricity.

51. Other measures mentioned were the changing of landfill processes from anaerobic to semi-aerobic collecting, sorting and processing of waste, introduction of modern biotechnologies of waste processing, and strengthening of control and reduction in the amount of organic substances stored in landfill sites.

52. Some Parties mentioned the completion of studies leading to the preparation of recommendations and the formulation of national action plans for the safe handling of solid waste. Many Parties indicated that they were proceeding with implementation of measures in this sector.

C. Estimation of emission reduction

53. Some Parties included an assessment of the impacts of measures on GHG emissions. Although this assessment is not required by the guidelines, a few Parties provided comprehensive analyses covering the major sources of GHG emissions and the action plans that integrate all the measures in a consistent way. The Parties that provided estimates of projected emission reductions used various time horizons ranging from 2005 to 2050. Table 3 contains examples of projected emission reductions reported by Parties for various emission sources, and table 4 examples of measures that have been implemented, or are being planned, by non-Annex I Parties.

Table 3. Projected^a greenhouse gas reduction in select non-Annex I Parties

Party	Examples of reductions
Albania	10 million tonnes CO ₂ equivalent by 2020 from various sources
Algeria	19 to 47 million tonnes CO ₂ equivalent by 2020 from the energy sector depending on the scenarios 3.4 million tonnes CO ₂ resulting from sink enhancement projects
Brazil	110 millions tonnes CO ₂ by 2020 from energy sector
Costa Rica	82.3 million tonnes CO ₂ from AIJ (activities implemented jointly) projects. Period of project varied, from 10 to 40 years
India	1 160 million tonnes CO ₂ over the period 2002–2010 from various sources
Peru	30 million tonnes CO ₂ equivalent by 2020 from the energy sector
Thailand	57 million tonnes CO ₂ equivalent by 2020 from the energy sector
Tunisia	14 million tonnes CO ₂ equivalent by 2020 from energy sector

^a Parties did not provide the base year in relation to these reductions. However, the inventory data have 1990 and 1994 as base years.

IV. Project proposals submitted in accordance with Article 12, paragraph 4, of the Convention

54. Article 12, paragraph 4, of the Convention states that developing country Parties may propose projects for financing, including specific technologies, materials, equipment, techniques or practices that would be needed to implement such projects, together with, if possible, an estimate of removals of GHGs and an estimate of the consequent benefits. In line with this Article, the Conference of the Parties, by its decision 12/CP.4, paragraph 7 (d), requested the secretariat to compile and make available to Parties a list of projects submitted by non-Annex I Parties.

55. As at 15 March 2005, 469 project proposals had been submitted to the secretariat and were compiled in document FCCC/SBI/2005/INF.2.

56. Most of the project proposals did not include all the information mentioned in Article 12, paragraph 4, of the Convention. Some Parties provided only one line of the concept they intended to develop into a project. Nevertheless, these concepts provide an indication of the areas of national interest for development of abatement and sequestration projects.

A. Sectoral analysis of the projects

57. The database containing the project proposals is organized in accordance with emission source categories proposed in a 1996 IPCC technical paper entitled *Technologies, Policies and Measures for Mitigating Climate Change*, namely energy supply; residential, commercial and institutional buildings; transport; industrial; agriculture; forest; and solid waste and waste-water disposal. Figure 2 below shows the distribution of the project proposals by emission sector.

B. Regional distribution/analysis of the project proposals

58. In this section, a regional distribution analysis of the proposals is attempted with a view to identifying project preferences of the different regions as reported by the Parties. Figure 3 shows the distribution of project proposals by geographic region.

Table 4. Examples of measures that have been implemented, or are being planned, by non-Annex I Parties

Sector	Party
Energy supply	
Efficient conversion of fossil fuels (rehabilitation of power plants, reduction of flaring, heat recovery, etc.)	BWA, MNG, GUY, LKA, SLV, ECU, ZAF, AZE, BRA, CHN, DZA, FSM, GRD, IND, KAZ, KGZ, KIR, SYC, TJK, TZA, UZB, ZAF
Switching to low-carbon fossil fuels (increase of natural gas share in energy consumption and utilization of associated gases, ethanol, etc.)	ECU, GHA, BWA, GUY, MRT, PER, SLV, KAZ, ALB, DJI, GIN, CHN, IND, HND, IRN
Switching to renewable energy sources (hydropower, solar, wind, geothermal, biomass, etc.)	DJI, GIN, ALB, UGA, KHM, KAZ, KGZ, TJK, UZB, EGY, ARM, CHN, IND, GRD, DOM, HND, MWI, TGO, CRI, ZWE, JOR, COM, NER, MDV, LAO, BDI, LKA, SDN, ECU, MLI, BRB, ATG, COL, PER, MSR, GMB, ETH, BWA, GEO, TCD, GHA, KEN, SLV, HTI, LBN, MRT, MNG, NIC
Residential, commercial and institutional buildings	
Introduction and improvement of energy-efficient cooking devices	ERI, BGD, KIR, LAO, GMB, ETH, BDI, MRT, ECU, NAM, SDN, HTI, BEN, CIV, NIC
Introduction of energy-efficient cooling devices	BGD, ERI, BGD
Introduction and implementation of efficient energy management	ERI, ALB, ARM, ECU, ZWE, SLV
Implementation of and introduction of energy-efficient lighting programmes	CHN, ERI, SYC, BDG, TJK, ALB, GRD, ZAF, MNG, ATG, NAM, BWA, ECU, LAO, ETH, LKA, COL, HND, CRI
Introduction of energy-efficient refrigerators	ERI, SYC, BDG, ALB
Improvement in buildings' thermal integrity, including through insulation, etc.	ERI, SYC, KHM, TJK, MNG, LBN, SDN
Industrial	
Cogeneration and thermal cascading	MAR, CHN, BRA, ZAF, COL
Energy efficiency gains	BRA, ZWE, SYC, CHN, IND, COL, LKA, JOR, KEN, PAK, SDN, MAR, BDI, LBN, GEO, SLV, ECU, ATG, BWA, MNG, SLV
Fuel switching	JOR, LBN, MAR, BRB, MDV, DJI, COL, ZAF, CHN, BRA, PER
Introducing new technologies and processes	JOR, BRB, SLV, CHN, ZAF, IDN
Process improvements	MNG, MAR, COM, CRI, ZWE
Transport	
Alternative energy sources	SLV, BRB, ETH, ECU, SYC, PER, DZA, SLV
Energy efficiency improvements	CIV, TGO, BRA, BEN, LKA, MDV, MAR, MLI, GHA, IND, CHN, ETH, MRT, KEN, EGY, BWA, SLV, PAK, NER, LAO, MNG, SDN, NAM, NGA, PER, CRI, DZA
Agriculture	
Improved management of ruminant animals	TCD, ECU, BDI, NIC, CRI, MRT
Increase carbon storage in agricultural soils	TCD, ZWE, ETH, SLV
Improve efficiency of use of nitrogen fertilizer	MRT, MLI, ECU, MWI, GUY, ETH, SLV
Forestry	
Conservation forests	COL, IND, PER, NIC, CHN, BRA, CRI, DOM, ZWE, ETH, NAM, SLV, GMB, GOE, COM, SDN, DJI, CAF, BDI, TCD, MRT, GHA, MLI
Production forestry/agroforestry	KEN, MAR, ECU, GHA, ECU, GHA, GMB, COL, PER, DOM, HND, ETH
Fuelwood conservation and substitution	CAF, TCD, MLI, MRT, SLV, BWA
Forest practices/goals	SDN, GEO, ECU, MRT, TCD, LKA, GHA, NIC, CRI, DOM, SLV, PER
Solid waste and waste water disposal	
Source reduction	CHN, MNG, DJI, LBN, TCD, GMB, KEN, CFA, ETH
Methane recovery	MDV, LBN, LKA, MAR, MRT, CRI, ETH, SLV

Note: See the annex for a list of Parties and their corresponding three-letter country codes.

Figure 2. Distribution of project proposals by sector

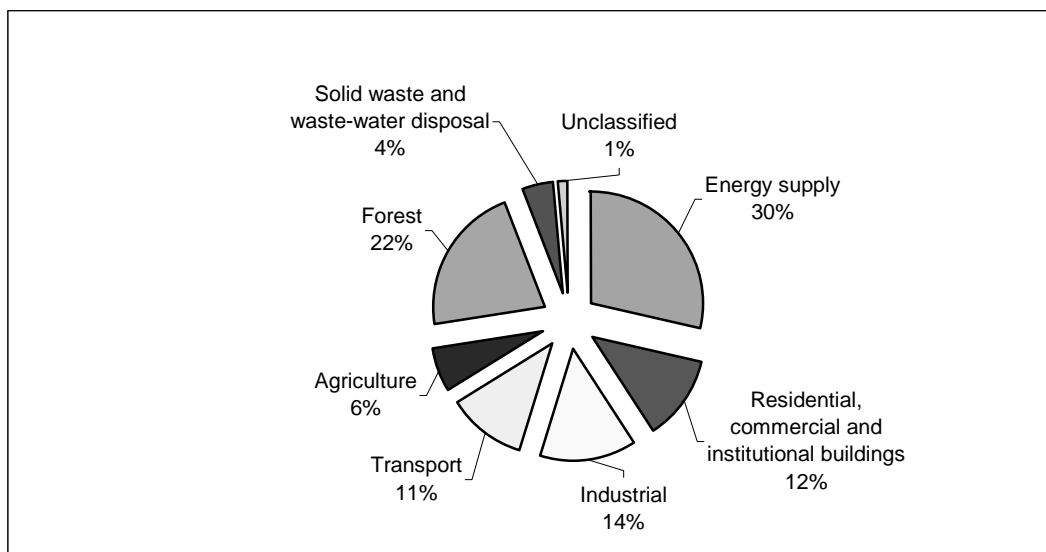
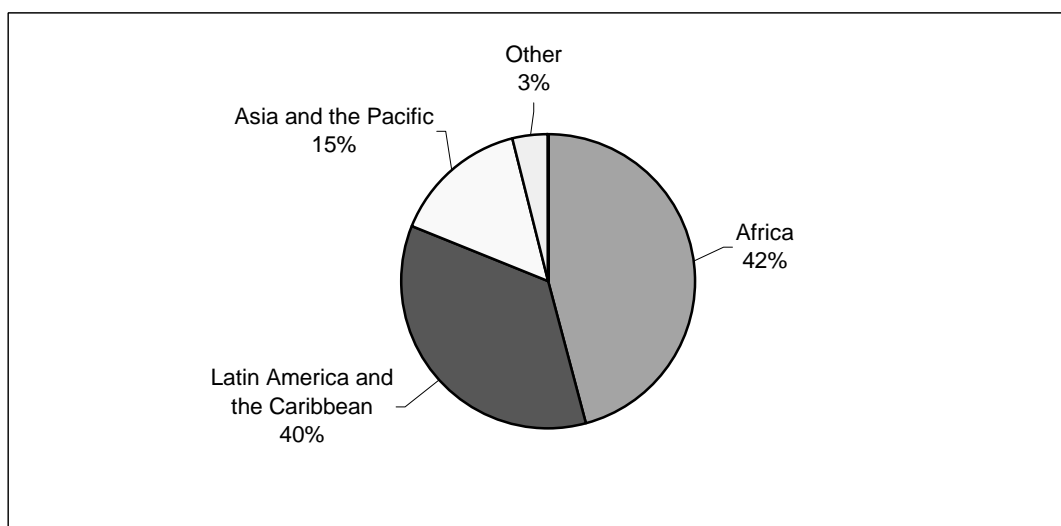


Figure 3. Distribution of project proposals by geographic regions



1. Africa

59. In the energy supply sector, opportunities for partnerships between African Parties can be investigated in the areas of solar and biomass energy. In particular, 6 of the 27 African Parties proposed photovoltaic electrification projects in the domestic sector. Hydropower is another option that may be considered on a regional basis. In the residential, commercial and institutional buildings sector, 9 of 27 African Parties proposed projects targeting improved cooking technologies or techniques. Four Parties proposed projects targeting improved efficiency of lighting.

60. The majority of project proposals in the industrial sector target energy efficiency gains, in particular the improved efficiency of industrial boilers and furnaces. Nine of the 27 Parties submitted project proposals relating to the transport sector aiming at reducing vehicle energy intensity. Four of

these Parties specifically proposed the development of vehicle maintenance and inspection programmes. Five of these Parties also proposed projects that aim at removing energy conservation and efficiency barriers.

61. African Parties submitted 75 per cent of the project proposals in the agricultural sector. This is an indication of the importance of agriculture to this region. Fuelwood conservation and substitution is of high priority in the African forest sector. Seven of 27 African Parties (27 per cent) proposed 11 projects in this area (in addition to the projects targeting improved biomass cooking technologies). Thirteen African Parties proposed projects to reforest and afforest the land.

2. Asia and the Pacific

62. Parties from the Asia and the Pacific region proposed 14 renewable energy projects with various technology options. In the residential, commercial and institutional sector, three Parties (Lao People's Democratic Republic, Mongolia, Sri Lanka) each proposed a project targeting the improved energy efficiency of lighting. In the industrial sector, three Parties proposed projects aimed at identifying energy conservation measures and actions (energy efficiency gains).

3. Latin America and the Caribbean

63. Of the 16 Parties of the Latin America and the Caribbean region that made proposals, four proposed projects targeting a switch to low-carbon fossil fuels (natural gas in this case) in the energy supply sector. Four Parties proposed projects targeting the use of landfill/waste-water biogas for energy generation. Hydropower development is another area in which several Parties share common project priorities. Seven Parties in the region proposed projects targeting hydropower development. In the residential, commercial and institutional sector, energy-efficient lighting is of most interest in this region; six Parties in the region targeted this technology. In the industrial sector, three Parties proposed projects to substitute natural gas for conventional industrial fuels (fuel switching). Three Parties in the region proposed projects targeting the improved management of ruminant livestock.

64. Parties in this region proposed 50 per cent of all forest sector projects. More specifically, 15 Parties proposed projects for conservation forests and forestry/agroforestry production. Seven Parties proposed projects to slow deforestation and assist regeneration.

4. Other³

65. Georgia proposed 10 renewable energy projects targeting hydropower and geothermal energy sources.

V. Needs and constraints

66. Some Parties estimated the costs of undertaking the proposed measures, using various methodologies including cost-benefit analysis. Typical examples of the financial needs reported by Parties are given in box 2 below. See also FCCC/SBI/2005/INF.7 containing details of the experience of international funds and multilateral financial institutions relevant to the investment needs of developing countries in meeting their commitments under the Convention.

³ The "Other" region includes Albania, Armenia, Azerbaijan, Georgia, Malta, Republic of Moldova, and The former Yugoslav Republic of Macedonia.

Box 2. Examples of financial resources required by Parties

- Kazakhstan estimated it could reduce CO₂ emissions by 158 million tonnes between 2000 and 2020 at a cost of about USD 5 billion
- Djibouti estimated that it would need a total of USD 88 million to develop its geothermal and ocean energy
- Guinea stated that the introduction of liquefied petroleum gas would cost USD 100 million
- Ghana estimated that it would need USD 50–100 billion to develop its transport sector
- Iran will need USD 131 million in the period 2000–2010 to fund GHG abatement in the agriculture sector
- Jordan said it would need USD 200 million to provide modern fluid catalytic cracker technology in the industries
- Ecuador projected a cost of USD 128 million to reduce transmission and distribution losses in the energy sector
- Haiti said it would need USD 300 million to develop hydropower to replace diesel generators in urban centres

67. Many Parties pointed out that many of the measures and options have not been comprehensively assessed and that further assistance will be needed to conduct detailed cost-benefit analysis of these options, and to identify the relevant entities and social players on whom these costs and benefits will fall.

68. The following are examples of the constraints Parties identified in their national communications relating to the assessment of measures:

- (a) Difficulties in developing policies relevant to climate change abatement and sequestration, including a need for strengthening institutional capacity for the implementation of such policies
- (b) Lack of trained personnel for the analysis of demand-side management measures, plans and programmes
- (c) A lack of general education to improve public awareness and acceptance of new technologies and resource conservation opportunities
- (d) Lack of capital to invest in new technologies and inadequate opportunities to mobilize both private and public sector investment in new and renewable energy technologies, such as wind, solar, biomass, geothermal, and mini-hydropower
- (e) Lack of access to affordable and efficient appliances.

VI. Conclusions

69. Almost all Parties that submitted their initial national communications up to 1 April 2005 included measures aimed at addressing climate change. The scope and level of detail of reports provided by Parties varied depending on national circumstances and on how Parties decided to implement decision 10/CP.2. The assessments of measures also varied across sectors and across Parties.

70. In assessing and identifying the measures and options for abating and sequestering GHGs, some Parties used expert judgement, and others applied models. In most cases when Parties used expert judgement, they based their assessments on the information in their GHG inventories, economic growth patterns and national sustainable development plans. Parties also mentioned that they would select approaches based on a holistic evaluation of the options, taking into account life cycle assessments and

the impact of implementing these options. As a result of planned responses to sustainable development, many Parties achieved substantial emission reductions or avoidance.

71. Project proposals submitted under Article 12, paragraph 4, of the Convention provided an indication of the areas of national interest for abatement and sequestration project development.

72. Most Parties experienced or are likely to experience difficulties in implementing measures. Almost all Parties mentioned the need for more financial resources, appropriate technology, capacity-building, information, public awareness and institutional capacity, legislation, economic instruments and enforcement. The prohibitive costs of clean technology, and in some cases political, cultural and social constraints, have also hindered implementation of measures. Many Parties provided lists of abatement and sequestration projects.

73. Overall there is substantial interest and activity to abate GHG emissions, with the majority of reported measures in the energy and the LUCF sectors. Many of the measures that are being considered or that have already been implemented deliver multiple benefits for development, the environment and the global climate system.

Annex**List of Parties covered in the sixth compilation and synthesis**

Albania	ALB	India	IND
Algeria	DZA	Indonesia	IDN
Antigua and Barbuda	ATG	Iran (Islamic Republic of)	IRN
Argentina	ARG	Israel	ISR
Armenia	ARM	Jamaica	JAM
Azerbaijan	AZE	Jordan	JOR
Bahamas	BHS	Kazakhstan	KAZ
Bangladesh	BGD	Kenya	KEN
Barbados	BRB	Kiribati	KIR
Belize	BLZ	Kyrgyzstan	KGZ
Benin	BEN	Lao People's Democratic Republic	LAO
Bhutan	BTN	Lebanon	LBN
Bolivia	BOL	Lesotho	LSO
Botswana	BWA	Madagascar	MDG
Brazil	BRA	Malawi	MWI
Burkina Faso	BFA	Malaysia	MYS
Burundi	BDI	Maldives	MDV
Cambodia	KHM	Mali	MLI
Cameroon	CMR	Malta	MLT
Cape Verde	CPV	Marshall Islands	MHL
Central African Republic	CAF	Mauritania	MRT
Chad	TCD	Mauritius	MUS
Chile	CHL	Mexico	MEX
China	CHN	Micronesia (Federated States of)	FSM
Colombia	COL	Mongolia	MNG
Comoros	COM	Morocco	MAR
Congo	COG	Namibia	NAM
Cook Islands	COK	Nauru	NRU
Costa Rica	CRI	Nepal	NPL
Côte d'Ivoire	CIV	Nicaragua	NIC
Cuba	CUB	Niger	NER
Democratic People's Republic of Korea	PRK	Nigeria	NGA
Democratic Republic of the Congo	COD	Niue	NIU
Djibouti	DJI	Pakistan	PAK
Dominica	DMA	Palau	PLW
Dominican Republic	DOM	Panama	PAN
Ecuador	ECU	Papua New Guinea	PNG
Egypt	EGY	Paraguay	PRY
El Salvador	SLV	Peru	PER
Eritrea	ERI	Philippines	PHL
Ethiopia	ETH	Republic of Korea	KOR
Gabon	GAB	Republic of Moldova	MDA
Gambia	GMB	Saint Kitts and Nevis	KNA
Georgia	GEO	Saint Lucia	LCA
Ghana	GHA	Saint Vincent and the Grenadines	VCT
Grenada	GRD	Samoa	WSM
Guatemala	GTM	Senegal	SEN
Guinea	GIN	Seychelles	SYC
Guyana	GUY	Singapore	SGP
Haiti	HTI	Solomon Islands	SLB
Honduras	HND	South Africa	ZAF

Sri Lanka	LKA	Tuvalu	TUV
Sudan	SDN	Uganda	UGA
Swaziland	CHW	United Republic of Tanzania	TZA
Tajikistan	TJK	Uruguay	URY
Thailand	THA	Uzbekistan	UZB
The former Yugoslav Republic of Macedonia		Vanuatu	VUT
Togo	MKD	Viet Nam	VNM
Trinidad and Tobago	TGO	Yemen	YEM
Tunisia	TTO	Zambia	ZMB
Turkmenistan	TUN	Zimbabwe	ZWE
	TKM		
