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NATIONAL COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I TO THE CONVENTION

COMPILATION AND SYNTHESIS OF THIRD NATIONAL COMMUNICATIONS

Compilation and synthesis report on third national communications

Addendum*

Summary

This is the main part of the compilation and synthesis report on third national communications from Annex I Parties. It describes and discusses the following major issues: national circumstances; general trends in greenhouse gas emissions in the period 1990–2000; policies and measures; projections; activities related to vulnerability and adaptation; financial resources and the transfer of technology; research and systematic observation; education, training and public awareness (Article 6 of the Convention).

* Please note that this document will be available in all six official languages before the ninth session of the Conference of the Parties.

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I. INTRODUCTION

1. Articles 4.1, 4.2 and 12 of the Convention require Parties included in Annex I to the Convention (Annex I Parties) to communicate information periodically to the Conference of the Parties (COP). The COP, by decision 11/CP.4, requested Annex I Parties to submit their third national communications (NC3) by 30 November 2001.[1] The COP, by decision 33/CP.7, requested the secretariat to prepare the compilation and synthesis of national communications submitted in accordance with decision 11/CP.4 for consideration at its eighth session.[2] The Subsidiary Body for Implementation (SBI), at its sixteenth session, noted that, owing to delays in the submission of national communications, the compilation and synthesis report would be prepared for the eighteenth session of the SBI.[3]

2. This note responds to these requests and contains information compiled and synthesized from the NC3 of 32 Annex I Parties submitted to the secretariat by 28 February 2003.[4] Information on the status of submissions of NC3 is contained in document FCCC/SBI/2003/INF.4.

A. Approach

3. The compilation and synthesis report consists of five parts. An executive summary is contained in document FCCC/SBI/2003/7. This note represents a main report and includes information on the major reported activities following the approach recommended in the UNFCCC guidelines for the preparation of national communications (hereinafter referred to as the UNFCCC guidelines).[5] Document FCCC/SBI/2003/7/Add.2 contains a detailed discussion of the policies and measures reported by Annex I Parties and could be used as an input to an ongoing discussion of "good practices" in policies and measures in the Subsidiary Body for Scientific and Technological Advice (SBSTA). Document FCCC/SBI/2003/7/Add.3 provides information on the approaches used by Annex I Parties in preparing their projections. Document FCCC/SBI/2003/7/Add.4 represents a first attempt to provide an overview of activities relating to education, training and public awareness. It is intended to provide an input to the consideration of activities relating to the implementation of Article 6 of the Convention by the SBI and the COP.

4. Each of the above-mentioned documents can be read as a stand alone paper. To avoid repetition and duplication, cross-references to other sections of this document or to other parts of the report are provided throughout the text. All references to Parties in this note are to Annex I Parties unless otherwise indicated. A list of Parties considered in the report and their ISO three-letter country codes is given in the Annex.

II. NATIONAL CIRCUMSTANCES

A. Reporting issues

5. All national communications submitted by 32 Parties and considered in this document contain chapters on national circumstances. They included governmental, demographic, geographic, climatic and economic and energy profiles that strongly affect greenhouse gas (GHG) emissions of individual countries, as well as sector profiles including transport, industry, waste, building stock and urban structure, agriculture and forest. The level of detail varied from country to country and in some cases

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1 FCCC/CP/1998/16/Add.1.
2 FCCC/CP/2001/13/Add.4.
3 FCCC/SBI/2002/6.
4 Slovenia and Croatia have submitted their first national communications, and Lithuania its second one.
5 FCCC/CP/1999/7.

extensive reporting did not contribute to a better understanding of climate change context. In general, Parties followed the UNFCCC guidelines to a greater extent than in the previous national communications.

6. Description of national circumstances served as a basis for further information and analysis of national activities, in particular of policies and measures, emission trends and projections. However, presentation of some of the key parameters, such as gross domestic product (GDP) and energy mix, made their comparison challenging or even impossible. Some Parties followed the UNFCCC guidelines and used GDP as an indicator of their economic activities; others preferred gross national product (GNP) or gross value added (GVA). Even for GDP, data were not always consistent because many Parties expressed GDP in their national currency and based on prices in different years with or without adjusting purchasing power parity (PPP). For consistency, data from international authoritative sources have been used for GDP values in this document.

7. The UNFCCC guidelines do not specify how information on energy profiles should be presented. Most Parties presented data on primary energy consumption in 1999, which is generally in line with the practice of preparing inventories for the energy sector. Other Parties used such terms as "primary energy resources" (Bulgaria), "primary energy sources" (Czech Republic) and "primary energy requirement" (Hungary), without defining them explicitly. Some Parties provided data on their primary energy supply, and a few others reported primary energy use (Netherlands, Norway, Poland) citing the International Energy Agency (IEA)/Organisation for Economic Co-operation and Development (OECD) as a source.

B. Overview of national circumstances

8. Most Parties reported on distribution of responsibilities for climate-change-related issues among the different levels of **government**, typically national/federal, provincial /regional and local/municipal (Austria, Canada, Czech Republic, Germany, Netherlands, New Zealand, Poland, Spain, Sweden, United States). Some emphasized that sharing responsibilities required a higher degree of cooperation (Austria, Canada). This is especially true for countries that have recently devolved power from the central government (France, Italy, United Kingdom). Implementation of climate-related actions was typically delegated to local authorities in most Annex I Parties. This included territorial planning and management of buildings, public transport and waste management. Most Parties reported that strengthening of institutional frameworks was achieved through involvement of new institutions and agencies, and by enhancing coordination and cooperation in the work of inter-ministerial committees or similar institutions.

9. The total **population** of Parties covered in this report was 1,062.2 million in 2000. Population growth in the last decade was less than 1 per cent annually in most Parties, e.g. 0.34 per cent for the countries of the European Community on average. Some countries reported a decrease in population from 1990 to 2000 (Bulgaria, Estonia, Latvia). For most Annex I Parties – except Australia, Canada, New Zealand and the United States, where the population grew by more than 10 per cent over the last decade – population growth was not a significant factor compared to economic growth and behaviour changes.

10. Population density and distribution patterns had important implications for, among other things, number of cars per person and occupancy of private houses, and therefore affected emissions from transport and housing. Some Parties are densely populated, with more than 70 inhabitants per square kilometre (Austria, Czech Republic, France, Netherlands, Poland, Slovenia, Spain, United Kingdom). This had implications for settlement and building patterns, and a tendency toward relatively short transport distances. At the other extreme are sparsely populated countries (Estonia, Latvia, Lithuania, New Zealand) and those with large areas (Australia, United States) or cold weather (Canada, Finland,

Norway, Russian Federation, Sweden). A combination of these factors often led to higher demand for space heating and transportation, which contributed to relatively higher energy use and GHG emissions from the transport and residential sectors.

11. Most Parties have forest and wooded land making up 30 per cent or more of their total land area, some even more than 50 per cent (Estonia, Finland, Japan, Slovenia, Sweden). Four Parties are less forested, with forest coverage of around 20 per cent (Australia, Belgium, Greece, Hungary) and for two Parties the figure is only around 10 per cent (Netherlands, United Kingdom). In six Parties (Canada, Finland, Japan, Norway, Russian Federation, Sweden) only around 10 per cent of total land was used for agriculture, mainly because of unfavourable climatic conditions. For the rest the figure was around 30 per cent or more. Most Parties presented their **geographical profile** in relation to their vulnerability to climate change and related factors, such as vulnerability of mountain ecosystems (Austria), availability of water and freshwater (Czech Republic), extreme events such as floods and droughts (Estonia, Poland, Slovenia, Spain, Sweden, United Kingdom), or a possible rise in sea level (Netherlands, United Kingdom). Geographical location was also linked to the transport sector, e.g. intensive transit traffic (Austria, Czech Republic, Slovenia, Switzerland).

12. All Parties reported their **climatic profile** in accordance with the UNFCCC guidelines. Several Parties (Bulgaria, European Community, Germany, United States) highlighted that degree-days can serve as an additional indicator for the energy sector, since it reflects the energy needs for space heating.

13. With respects to **economic profile**, most Annex II countries belonged to the high-income group with GDP per capita more than US$ 20,000 (in 1995 prices adjusted for PPP). Some are middle-income countries with GDP per capita of US$ 15,000–20,000 (Greece, New Zealand), including some EIT Parties (Czech Republic, Slovenia). Most Parties with economies in transition (EIT Parties) have GDP per capita of about US$ 10,000 or less. The annual GDP growth rate in most Annex II Parties was about 2 to 3 per cent in the 1990s, but for EIT Parties it varied significantly. After the initial economic decline in the early 1990s in EIT Parties (Czech Republic, –15 per cent 1990–1991; Estonia, –32 per cent 1990–1994), the economy revived and many EIT countries have achieved higher growth rates than Annex II Parties in recent years (Estonia, Hungary, Poland, Slovakia).

14. The service sector was the largest sector of the economy in all Annex I Parties (except Lithuania), with its share of GDP being more than 50 per cent. The increase in the services sector also marked the structural changes of the economy in EIT Parties. Even with the increasing share of services, the so-called tertiary sector, in all Annex I Parties, the **structure of industry** (the secondary sector) continues to affect the emissions profile significantly. As a result of their natural resources endowment some Parties continued to rely on energy-intensive industries and production and export of natural resources, mainly energy. This added to a higher GHG emission intensity or GHG emissions per capita for those Parties (Australia, Canada, Norway, Russian Federation) than for Parties that have similar geographic, demographic and climatic conditions but with relatively lighter and less energy-intensive industries (e.g. Finland). Technology and efficiency levels have also affected emission and energy intensity profiles in different Parties with similar economic and industrial structure.

15. The natural resources endowment to a large extent determines the **energy profile** and affects the possibility of fuel switching. Parties that traditionally heavily rely on hydropower (Norway, Sweden, Switzerland) continue to do so, but reported the exhaustion of viable sites and thus began to exploit other sources for power generation in order to meet the growing demand for electricity. Most Annex I Parties possess large forest resources, so renewable energy resources, particularly biomass (wood and wood waste) have been actively explored.

Table 1. Overview of national circumstances

Party	GDP in 2000 (billions of US$ 1995 PPP)	GDP per capita (US$ 1995 PPP)	GDP growth (%/year in 1990s)	Industry (% GDP/GVA 1999)	Service (% GDP/GVA 1999)	Agriculture (% GDP/GVA 1999)	Population (million in 1999)	Population density per km^2	Population change 1990-2000 (%)	Passenger car or vehicle /1000 inhabitants	Agricultural land (%)	Forest land (%)
AUS	473.340	24 399	na	20	64	3.6	19.4	2.5	12.1	506	65	21
AUT	196.022	24 230	>3	29.8	67.9	1.3	8.09	97	5.1	498	41	47
BEL	255.108	25 011	2.7	21	73	1.8	10.2	315	2.9	449	42.8	20
BGR	43.976	5 518	2.4–5	30	55	15	7.97	73.4	–6.3	239	43	30.6
CAN	818.062	26 389	2–4.6	18(+forest)	na	na	31	3	11.0	na	6.8	41.9
CHE	197.495	27 738	1.8	na	na	na	7.12	173.5	7.0	500	37	31
CZE	133.944	13 004		36.7	53	5.3	10.3	131	–0.9	358	54.3	33.4
DEU	1 910.118	23 237	1.4	30	50	1.3	82.2	230	3.5	533	54	29.4
ESP	719.114	17 844	2.6	30.5	65.9	6.4	40.3	77	2.8	568(+truck)	37.5	51.4
EST	11.977	8 555	3~6	15	60	7	1.4	31.8	–12.8	329	25	51.5
FIN	123.324	23 854	4	na	na	na	5.17	17	3.8	403	9	76
FRA	1 356.484	23 109	3–3.4	22.1	70	3.3	58.7	105	4.1	460	55	27.3
GBR	1 263.387	21 092	2.3	19	70	1	59.9	245	3.8	na	47	12
GRC	158.641	14 554	2.4	22	70	8	10.9	84	3.9	459	30	19
HRV	32.736	6 849	2.8–6.8	30	60	10	4.78	84.6	–8.4	195	56.5	36
HUN	112.934	11 072	1.5–5	na	na	na	10.2	109	–3.3	na	62.9	20.4
ITA	1 265.972	22 210	1–2.9	32.2	64.8	3	57	190	1.8	na	59.6	29.5
JPN	3 144.086	24 776	~–1	~35	~67	~1.5	126.9	340	2.7	426	13.1	66.4
LIE	na	na	na	60	20	na	0.0324	202.6	na	650	32	43
LTU	24.246	6 571	na	28–29	44	11(+forest)	3.69	56.8	–0.7	na	~50	27
LVA	15.659	6 579	3.8	24.3	70	4.6	2.38	37	–11.2	223	38.5	44.4
MCO	na	na	na	na	na	na	0.032	16 420	na	1014	na	14
NLD	393.568	24 909	2.9	27	68	3.1	15.8	465	6.5	416	59	9
NOR	118.090	26 126	2.3	35 (oil/gas16)	58.4	2	4.52	14	5.9	na	3	29
NZL	71.374	18 832	na	na	na	5.5	3.79	14	13.9	483	44	30
POL	348.346	9 025	4~7	23.6	52.6	3.4	38.6	124	1.4	245	59	29
RUS	1 111.478	7 636	–2.65	39	54.6	6.4	145.6	8.5	–1.9	na	13	46.5
SVK	56.129	10 414	4.9–6.6	25.5	54.5	4.2	5.39	110	1.9	211	50	41
SVN	31.955	16 139	2.8–5.3	32.8	51.4	3.2	1.98	98	–0.6	417	38	55
SWE	203.803	22 899	3.1	19.5	63	na	8.9	22	3.6	440	8	52
USA	8 986.900	32 096	3~4	na	na	na	280	30	10.2	750(+truck)	46	28

Source: NC3s except the GDP and population changes (from IEA data, 2002 edition) or otherwise indicated.
Note 1: The European Community (European Community) is not included in this table.
Note 2: (T)PEC(S) means (total) primary energy consumption(supply); GVA means gross value added.
Note 3: na means data not available in the NC3 or, in the case of GDP, not in the IEA database.
Note 4: For an explanation of country codes, please refer to the annex.

16. Many Annex I Parties still heavily rely on imports to meet more than half of their demand for energy. Cleaner fossil fuels, such as natural gas, are especially favoured because of their advantages in dealing with concerns about environmental issues and GHG emissions. Natural gas was also preferred for cogeneration of electricity and heat, which was encouraged by many Parties because of its more efficient energy utilization. However, only a few Annex I Parties are large natural gas producers and exporters (Canada, Russian Federation). Some exporting countries could become net importers in the foreseeable future (United Kingdom). In many Annex I countries this raised concerns about the security of energy supply and considerations of diversifying the energy supply. Together with economic and social concerns, this means that Parties, particularly those with relatively rich and cheap domestic reserves of fossil fuels, are cautious in fuel switching. Fossil fuels with a high carbon content therefore still account for a high proportion of the primary energy consumption in these countries (Australia, Bulgaria, Czech Republic, Estonia, Poland).

17. With the recovery and further growth of the economy, energy use has already increased in many EIT Parties and its rise was expected to rebound in the rest of these countries. Energy efficiency in most Parties has improved only marginally in the last decade, although the improvement has continued. One of the main reasons is that energy prices are relatively low and continuing to decline, thanks to the recent trend towards liberalization of the energy market. Some Parties are concerned that this may be a disincentive to further energy efficiency improvement and uptake of some energy-efficient technologies (United Kingdom). In addition, some EIT Parties continued to subsidize energy consumption for households for social reasons (Czech Republic). Fuel taxes and prices were in general highest in Japan, followed by the European Community countries. They were lowest in Australia, Canada and the United States. Parties generally mentioned the implications of market liberalization and market-oriented instruments for GHG emissions and mitigation.

18. The **transport sector** grew substantially in terms of activity level, passenger and freight volumes, and number of vehicles. In terms of GHG emissions it was the fastest-growing sector in virtually all Annex I countries. Most Parties observed that the growth in transport and associated emissions is closely linked to growth in GDP and industrial production. Population density, distribution patterns and the geographical situation also affect the need for transportation, and its volume. Many Annex I Parties are highly urbanized, with more than half of population living in urban areas.

19. Municipal **waste** accounted for a minor share of total waste in most Parties but has increased in the 1990s (Austria, Czech Republic, France, Poland). Reporting on the quantities of municipal waste and agricultural waste (both with high biodegradable fractions), and waste management practices (e.g. percentage of recycling and landfill) is of greater relevance to GHG emissions. Ten Parties did not mention the waste sector in their national circumstances.

20. The **agricultural sector** accounted for a small share of GDP in Annex I countries. Most Parties experienced a gradual decline in this sector in terms of land use (abandoned land contributing to the increase in forest/wooded land through natural processes) and contribution to the GDP. Important tendencies in this sector were an increase in organic farming in most European countries and a decline in the use of fertilizers and in livestock numbers. In the EIT countries a significant drop in fertilizer use was underpinned by a rise in their prices after 1990 and also by the recent tendency towards more efficient and environmentally friendly practices, mostly driven by the European Community accession process (Czech Republic, Estonia, Slovenia).

21. Many EIT Parties reported the European Community accession process as one of the important drivers behind upgrading their legislative and regulatory frameworks, especially in the field of energy and environment with implications for climate change (Czech Republic, Estonia, Slovenia). The

requirement for harmonization with European Community legislation affected a number of domestic mitigation initiatives, and was mentioned not only by EIT Parties but also by some Annex II Parties in Europe (Norway).

III. GENERAL TRENDS IN GREENHOUSE GAS EMISSIONS IN 1990–2000

A. Approach

22. By its decisions 3/CP.5 and 4/CP.5, the COP established a separate process for reporting and review of national inventory data from Annex I Parties (FCCC/CP/1999/7). In this document the latest available inventory data submitted by Annex I Parties in accordance with decision 3/CP.5 were used to illustrate general trends in GHG emissions for the period 1990–2000. Although the available data do not cover all 40 Annex I Parties, they nevertheless make it possible to present general trends in GHG emissions of Annex I Parties for these 11 years. These trends serve as background information for a discussion of policies and measures and their effects, as well as of projections and other relevant sections of the compilation and synthesis report. As a result of continuous improvements in the estimates of inventories, data for some Parties presented in this document may differ from those reported in national communications.

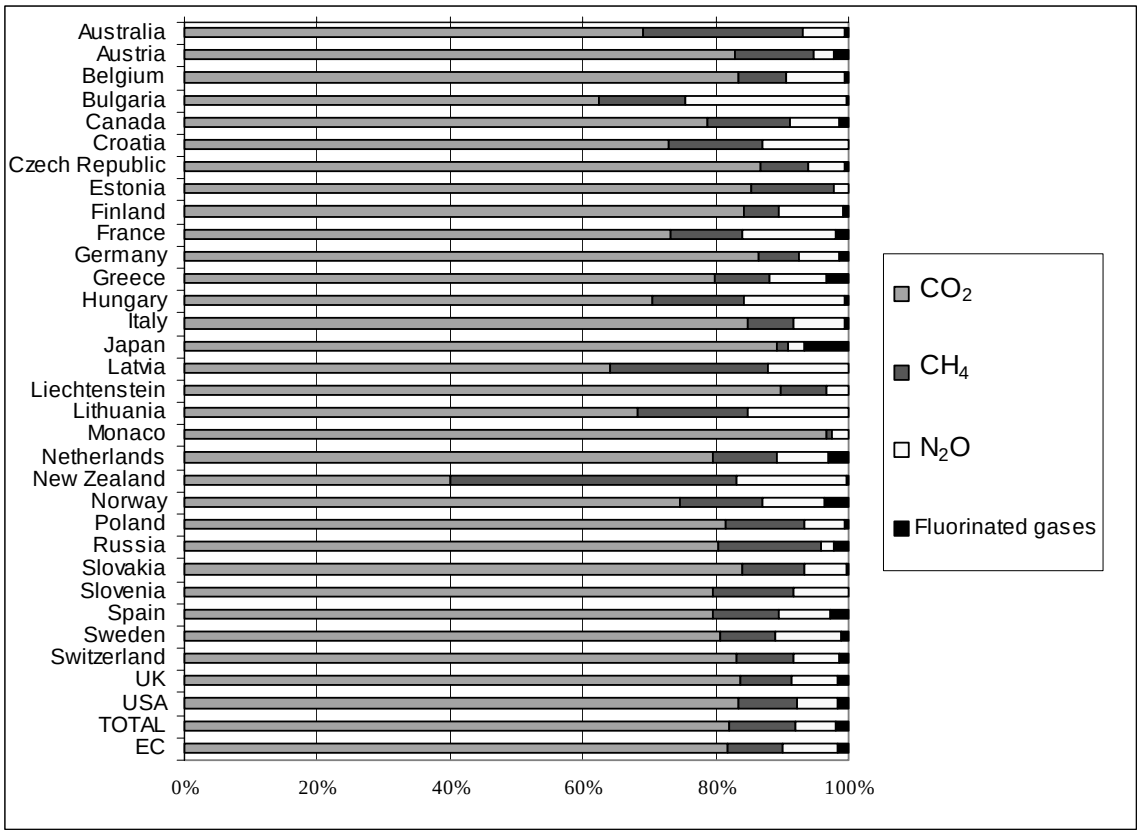
23. Data on trends in emissions and removals presented in this document cover the 32 Parties that had submitted their NC3 by 28 February 2003. To avoid double counting, data for the European Community were not included in totals.

24. All Parties reported on the three main GHGs: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Reporting on fluorinated gases – hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) – was less complete, and four Parties (Estonia, Liechtenstein, Lithuania, Monaco) did not provide any data on these gases. To ensure consistency in trends, some minor gaps in reporting were filled in using simple interpolation or data for the previous reported year. The total GHG emissions referred to in this chapter are without CO_2 emission/removal from land-use change and forestry (LUCF).

B. General emission profiles

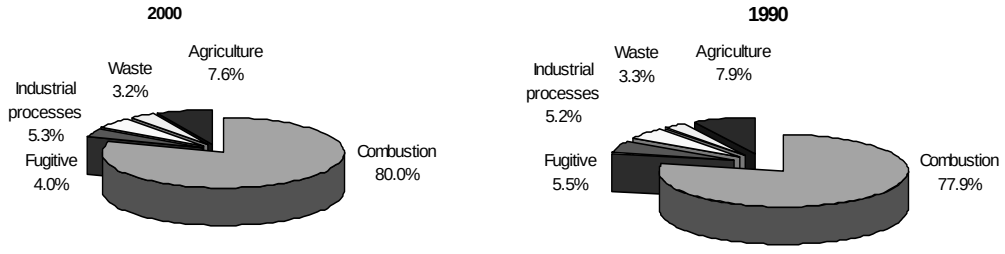
25. CO_2 remained the main contributor to the total Annex I GHG emissions in 2000, with a share of 82 per cent (80 per cent in 1990). CH_4 and N_2O accounted for 10 per cent and 6 per cent respectively in 2000 (12 per cent and 6 per cent in 1990). HFCs, PFCs and SF_6 contributed about 2 per cent in 2000 (also 2 per cent in 1990). CO_2 remained the predominant GHG for all Parties, except for New Zealand, where CH_4 dominated the GHG emissions profile. Shares of individual gases in the total GHG emissions of 32 Annex I Parties in 2000 are presented in figure 1.

Figure 1. Relative contribution of each GHG to the total GHG emissions in 2000



26. The shares of major sectors in 1990 and 2000 are shown in figure 2. As can be seen, fuel combustion remained the most important source of emissions and its share of the total GHG emissions has increased by 2 per cent (from about 78 per cent to 80 per cent) for the 31 Annex I Parties under consideration. Shares of practically all other major sectors have slightly decreased in the same period.

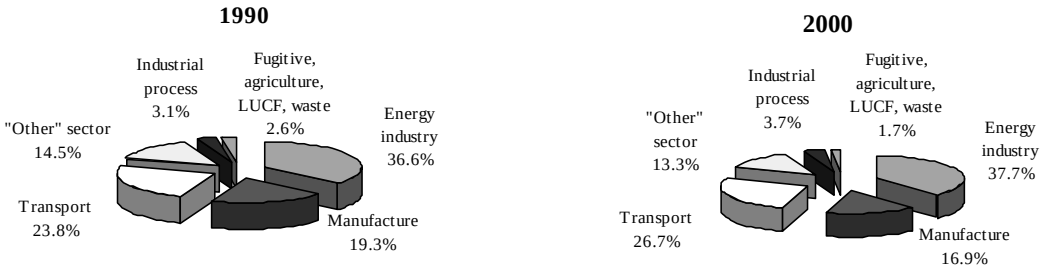
Figure 2. GHG emissions by sector for 31 Annex I Parties, 1990 and 2000



27. Fuel combustion remained a dominant source of CO_2 emissions in 2000 (95 per cent), and industrial processes contributed about 4 per cent. For 13 Parties (Australia, Czech Republic, Estonia, Germany, Latvia, Liechtenstein, Monaco, Netherlands, Poland, Russian Federation, Slovenia, United Kingdom, United States), the latest inventory showed that CO_2 emissions from fuel combustion represented more than 95 per cent of their total CO_2 emissions.

28. Within the fuel combustion figure,[6] in 2000 the energy industries accounted for 38 per cent of total CO_2 emissions for Parties as a whole, followed by the transport sector (27 per cent), energy use in manufacturing and construction (17 per cent), and the residential and public sector (13 per cent), (presented as "other" in figure 3). Compared with 1990, the share of emissions from transport has increased by almost 3 per cent while the shares of other major sectors, with the exception of manufacturing which decreased by around 2 per cent, remained almost unchanged (see figure 3).

Figure 3. Breakdown of CO_2 emissions within fuel combustion



29. The largest sources of CH_4 in 2000 were fugitive emissions and agriculture (both around 34 per cent), followed by the waste sector (29 per cent). In five Parties (Canada, Czech Republic, Croatia, Hungary, Russian Federation) fugitive emissions were the largest source of CH_4. In 16 Parties, including the European Community, agriculture was the main source, with the highest share (90 per cent) in New Zealand. In the remaining 11 Parties, the waste sector contributed the most, ranging from 38 per cent in the United States to 58 per cent in Norway.

30. Agriculture with its 70 per cent share continued to dominate N_2O emissions in 2000. In three Parties (Estonia, Hungary, New Zealand) the share of agriculture was 90 per cent or more. Fuel combustion and industrial processes retained their positions as the second and third sources, with shares of 16 per cent and 9 per cent respectively. Within fuel combustion, transport was the single largest source of N_2O, contributing 62 per cent or 10 per cent of the total N_2O emissions in 2000.

31. The share of the fluorinated gases (HFCs, PFCs and SF_6 together) for the 31 Parties was about 2 per cent on average in 2000 (figure 1). In most Parties the share of fluorinated gases is less than 3 per cent. In only four Parties (Greece, Japan, Netherlands and Norway) were shares of these gases higher, ranging from 3 per cent to 7 per cent of the total GHG emissions.

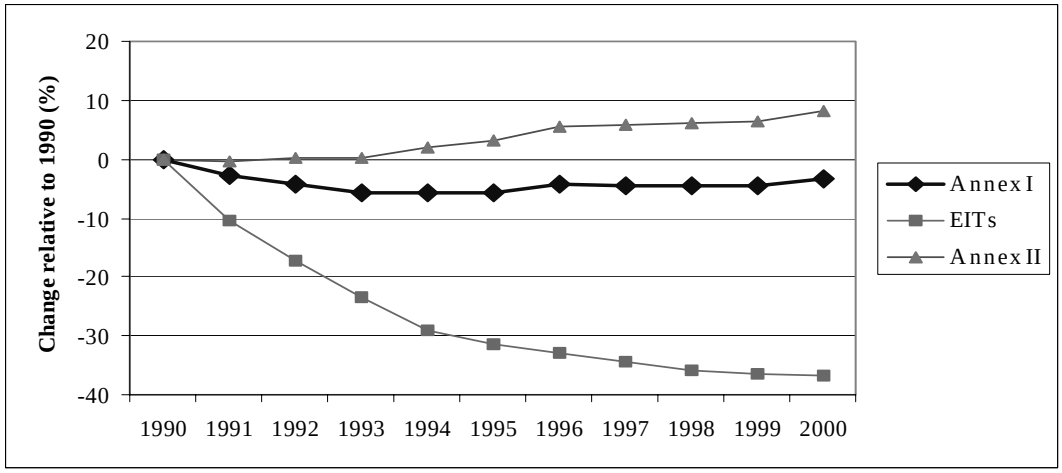
C. Emission trends by gas

32. The total aggregated GHG emissions (excluding land-use change and forestry, LUCF) **decreased by 3 per cent** from 1990 to 2000. Thus Annex I Parties have jointly attained the aim of Article 4.2 of the Convention – to return their 2000 emissions to 1990 levels, although the extent to which Annex II Parties succeeded in reversing an increasing trend in GHG emissions varied widely. The decrease was mainly due to a 37 per cent decline in emissions from EIT Parties, whereas emissions from Annex II Parties increased by 8 per cent (see figure 4). Two thirds of this increase originated in the two Annex II Parties that do not intend to be bound by the commitments of the Kyoto Protocol. The total GHG emissions of the European Community (European Community) as a whole decreased by 3.5 per cent, although in

[6] Shares of the main subsectors in fuel combustion do not include data from the Russian Federation, since its NC3 presents only a total number for fuel combustion without further breakdown by subsectors.

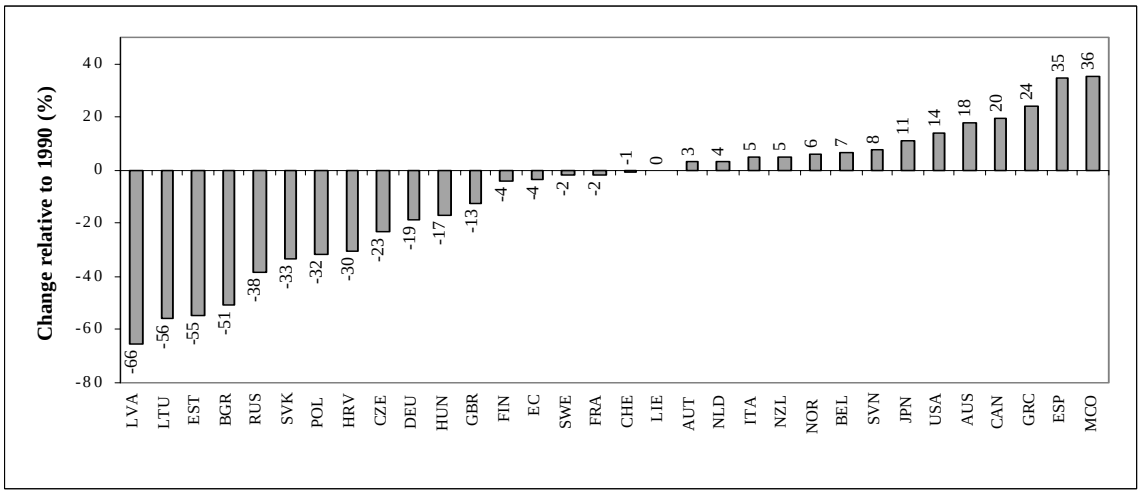
individual member States the changes varied between a decrease of 19 per cent and an increase of 35 per cent (see figure 5).

Figure 4. Trends in aggregated GHG emissions, 1990–2000



33. In seven Annex II Parties (Germany, Finland, France, Liechtenstein, Sweden, Switzerland, United Kingdom) GHG emissions were lower in 2000 than in 1990 (figure 5), compared to only two (Germany, United Kingdom) in 1995 (as mentioned in the second compilation and synthesis report).[7] GHG emissions in the remaining Annex II Parties have increased compared to the 1990 level: the increases range from 3 per cent for Austria to 35 per cent for Spain.

Figure 5. Changes in aggregated GHG emissions, 1990–2000



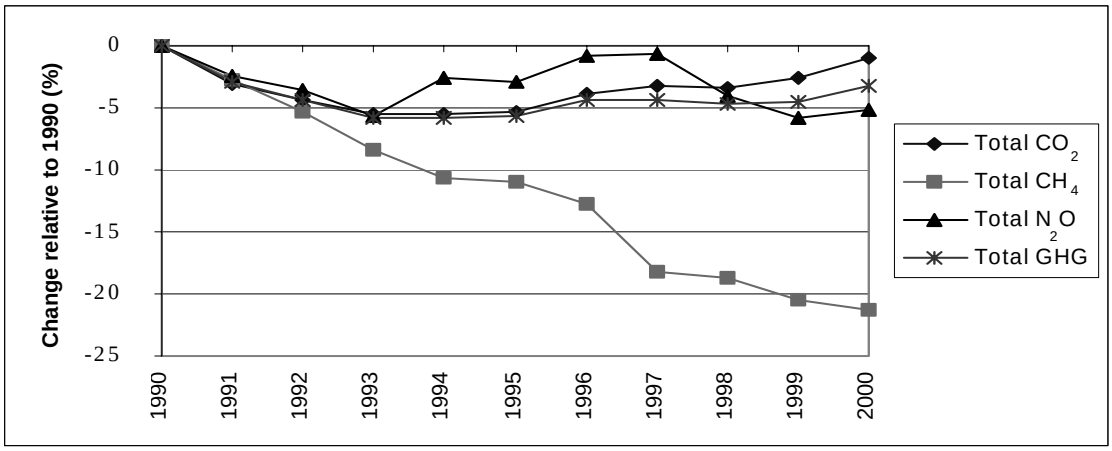
Note: For an explanation of country codes, please refer to the annex.

34. **Total CO_2 emissions** have decreased by nearly 1 per cent over the period 1990–2000, mainly as a result of a decrease in virtually all EIT Parties except Slovenia, and also in five Annex II Parties (Germany, Finland, Sweden, Switzerland, United Kingdom) ranging from 0.3 per cent to 15 per cent. France and Liechtenstein reported only a slight increase. As can be seen in figure 6, CO_2 emissions

[7] FCCC/CP/1998/11 and Add.1–2.

determine the magnitude and trend of GHG emissions for most Parties individually and for Annex I Parties as a whole.

Figure 6. Trends in Annex I GHG emissions by major gases, 1990–2000



35. Figure 6 also shows that **CH_4 emissions** decreased by 21 per cent in 1990–2000, as a result of reductions in most Parties except for a small increase in two (Australia, Norway) and despite a 20–30 per cent increase in four Parties (Canada, Greece, Monaco, Spain).

36. **N_2O emissions** in 1990–2000 decreased by 5 per cent (figure 6), as a net result of a 20–60 per cent decrease in all EIT Parties except Poland and Hungary, and a 4–35 per cent decrease in six Annex II Parties (Finland, France, Germany, Japan, Sweden, United Kingdom).

37. Overall emissions of **HFCs, PFCs and SF_6** increased by 24 per cent from 1990 to 1999 (table 2). The reason for choosing 1999 instead of 2000 is that the Russian Federation, an important emitter of these gases, did not submit its complete inventory for 2000. Emissions of PFCs and SF_6 overall decreased from 1990 to 1999, but emissions of HFCs have increased significantly since the mid-1990s because of their wide application as substitutes for ozone-depleting substances controlled by the Montreal Protocol.

Table 2. Aggregate emissions of HFCs, PFCs and SF_6 (Gg CO_2 equivalent)[a]

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Change relative to 1990 (%)
AUS[b]	4 093	4 096	4 089	3 035	1 986	1 368	1 301	1 128	1 470	1 009	976	–76.2
AUT	1 485	1 663	1 310	883	1 103	1 736	1 886	1 884	1 791	1 626	1 735	16.9
BEL[c]	na	na	na	na	na	571	624	733	735	908	900	
BGR[d]	na	na	na	na	na	na	na	na	646	146	na	
CAN	8 845	9 579	8 773	9 409	8 949	8 403	8 149	8 236	8 496	8 793	9 390	6.2
HRV[d]	939	648	na	na	na	8	na	na	na	na	na	
CZE	na	na	na	na	na	169	322	626	523	525	890	
FIN	72	49	34	27	34	45	93	185	259	378	541	651.7
FRA	7 639	6 198	5 447	4 710	4 524	4 947	5 987	6 966	7 705	9 018	10 924	43.0
DEU	8 930	9 042	9 484	11 163	11 440	11 132	10 232	10 692	11 460	10 496	12 851	43.9
GRC[d]	1 193	1 364	1 161	1 791	2 303	3 452	3 988	4 359	4 257	4 288	4 429	271.2
HUN	na	na	na	na	na	na	na	na	953	829	582	
ITA	922	945	925	932	1 082	1 414	1 153	1 497	1 794	1 864	2 521	173.4
JPN	61 840	67 938	73 920	75 580	86 524	100 341	100 440	104 252	99 338	90 166	90 291	46.0
LVA[e]	na	na	na	na	na	na	na	na	na	0.09	0.02	
NLD	7 050	7 358	6 745	7 294	8 377	8 206	9 616	10 753	11 309	6 614	5 771	–18.1

Table 2. *continued*

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Change relative to 1990 (%)
NZL	605	653	647	243	296	306	402	359	362	284	245	–59.6
NOR	5 218	4 590	2 704	2 702	2 574	2 166	2 036	2 013	2 094	2 142	2 022	–61.2
POL	na	na	na	na	na	845	843	1 024	1 040	1 349	1 627	
RUS[d]	41 565	39 339	39 339	39 339	37 855	34 191	39 082	39 952	40 885	42 464	na	2.2
SVK	272	267	249	156	144	148	91	114	80	93	103	–62.1
SVN	na	na	na	na	na	26	21	na	na	na	na	
ESP	3 287	3 027	3 608	3 120	4 319	5 529	6 194	7 414	7 533	9 393	10 495	219.3
SWE	524	517	506	522	559	633	625	735	692	766	713	36.0
CHE	215	199	187	147	133	195	247	384	466	550	733	241.5
GBR	14 379	14 425	14 138	14 604	15 855	17 433	18 466	20 371	22 319	10 789	11 525	–19.9
USA	93 625	88 130	89 450	93 971	92 757	98 530	111 881	116 908	127 654	119 973	121 331	29.6
Total	**262 697**	**260 026**	**262 715**	**269 630**	**280 816**	**301 793**	**323 680**	**340 586**	**353 862**	**324 464**	**290 593**[g]	
EC	46 411	45 538	44 337	46 165	50 893	55 866	59 801	66 632	70 709	57 048	63 086	35.9

Note 1: Small discrepancies in totals are due to rounding.
Note 2: For an explanation of country codes, please refer to the annex.
na = not available.
a Estimates given in this table refer to actual emissions, except for the Czech Republic, which reported only potential emissions, and Japan, for which potential emissions have been given as the Party did not report actual emissions for the entire period 1990–2000.
b Estimates include emissions of PFCs only.
c Estimates include emissions of HFCs and SF_6 only.
d Estimates include emissions of HFCs and PFCs only.
e Estimates include emissions of SF_6 only.
f Estimates include emissions of PFCs and SF_6 only.
g This figure does not include the Russian Federation since it did not report in 2000.

D. Emission trends by sector

38. In all major sectors an overall decline in GHG emissions in 1990–2000 can be observed, except for transport and the energy industry (see figures 7a and b). GHG emissions from the energy industry and transport increased by 10 and 20 per cent respectively. Fugitive emissions decreased the most (by 31 per cent) over the period and exhibited a continuing downward trend. Emissions from fuel combustion, agriculture and waste dropped initially, then levelled off after the mid-1990s. Fuel combustion even slightly increased from 1999 to 2000. Overall emissions from the fuel combustion, agriculture and waste sectors decreased by 1, 7 and 7 per cent respectively. The small decrease in emissions from fuel combustion was mainly due to the decrease in emissions from the manufacturing and "other" sector by 7 and 3 per cent respectively. Emissions from industrial processes decreased in the early 1990s, then increased and peaked in 1997, and declined later with an overall decrease of 3 per cent. Manufacturing shows a similar pattern.

Figure 7a. GHG emission trends by sector, 1990–2000

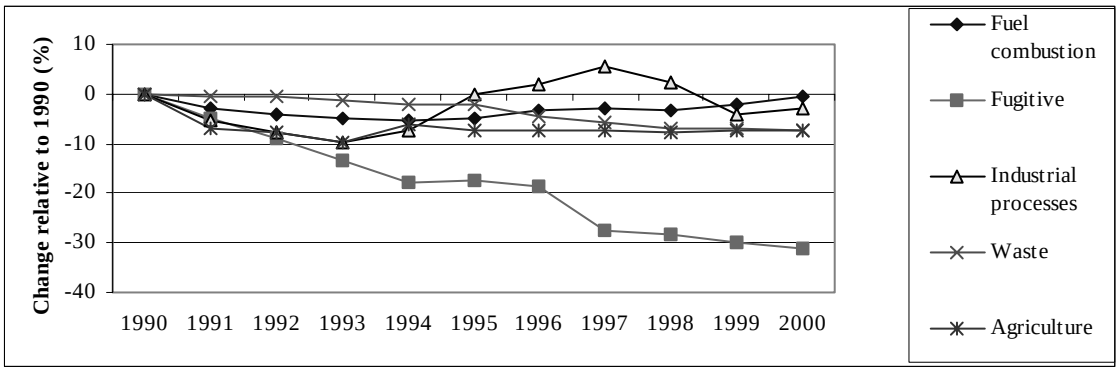
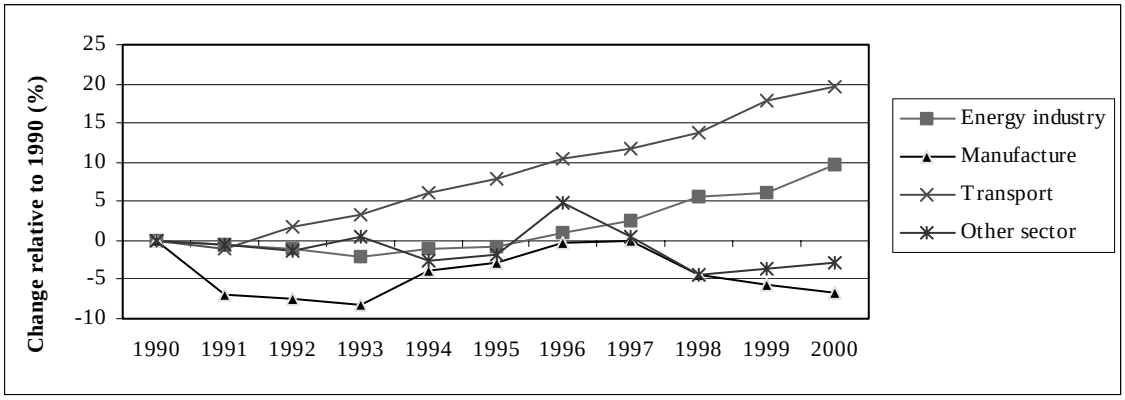
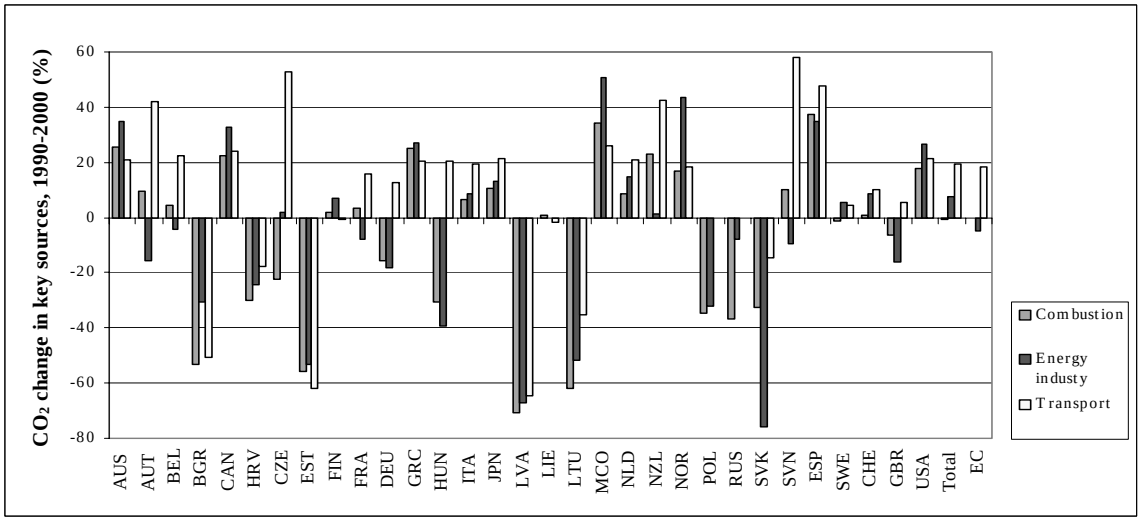


Figure 7b. GHG emission trends by sector, 1990–2000



39. **CO_2 emissions** from energy industry and transport within fuel combustion increased by 10 and 20 per cent respectively. However, for the EIT Parties excluding the Russian Federation, all four sectors within fuel combustion exhibited a decrease in CO_2 emissions by 10–50 per cent. Figure 8 presents the changes in three major sources of CO_2 emission for each Party. The Russian Federation reported only its CO_2 emission from the energy industry and fuel combustion, without a further breakdown into subsectors.

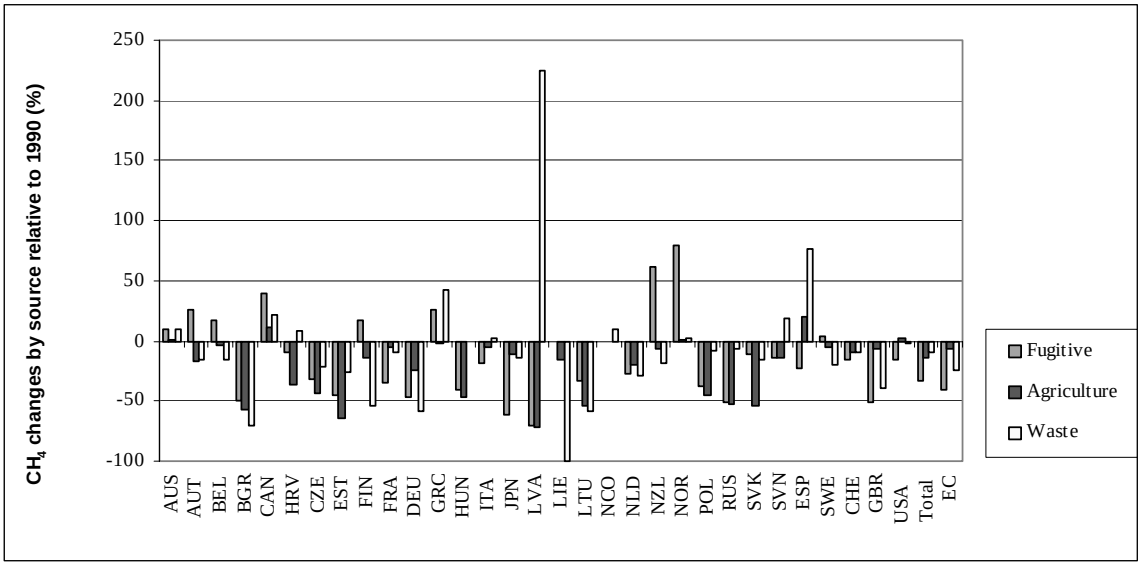
Figure 8. Changes in CO_2 emissions by major sources, 1990–2000



Note: For an explanation of country codes, please refer to the annex.

40. Among the three major sources of **CH_4 emission**, waste decreased the least, by 10 per cent in 1990–2000. Fugitive emissions have shown the greatest decrease, 34 per cent. CH_4 emissions originating from agriculture decreased by 14 per cent in 1990–2000. For the 11 EIT Parties in this period, agriculture showed the greatest decrease (51 per cent), closely followed by fugitive emissions (49 per cent) and then the waste sector (17 per cent). For Annex II Parties, fugitive emissions decreased most (16 per cent), followed by waste (9 per cent) and lastly agriculture (2 per cent). Figure 9 provides details of changes in CH_4 emission for individual Parties. The very high increase from the waste sector in Latvia is due to a correction of methodology since 1998, the result of which has not been applied to the whole time series.

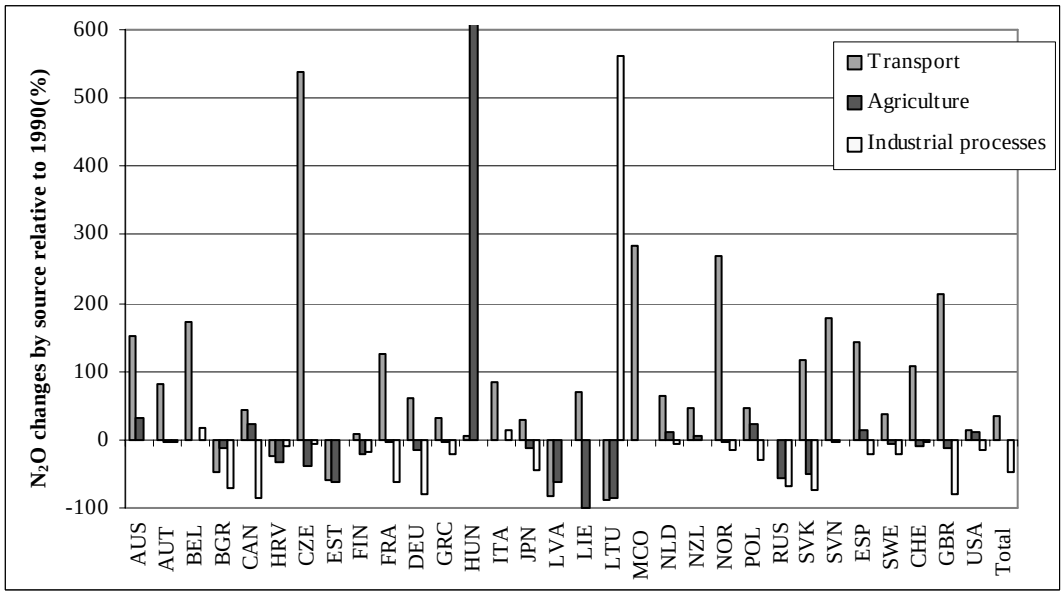
Figure 9. Changes in CH_4 emissions by major sources, 1990–2000



Note: For an explanation of country codes, please refer to the annex.

41. Among the key sources of N_2O emissions, transport showed an increase of 34 per cent, whereas emissions from industrial processes decreased by 48 per cent, although for this sector the data were the least complete. Agricultural emissions decreased by 0.4 per cent. For individual Parties a wide range of increases and decreases can be observed (figure 10) with N_2O emissions from the transport sector being on the increase in the majority of Parties.

Figure 10. Changes in N_2O emissions by major sources, 1990–2000

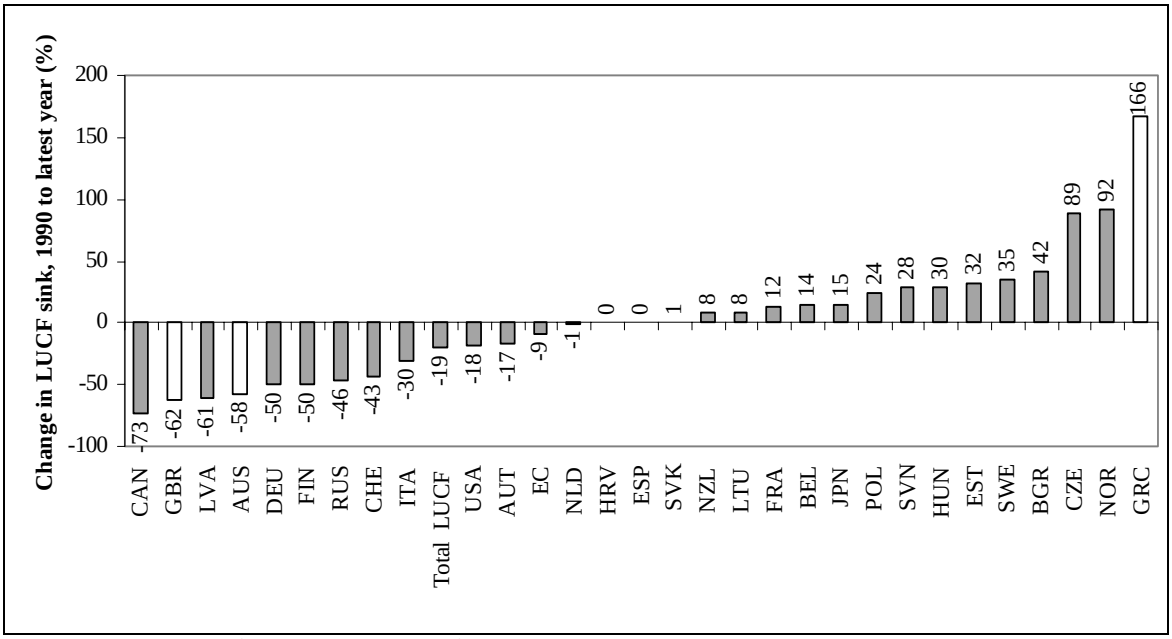


Note: For an explanation of country codes, please refer to the annex.

42. For 29 out of 32 Parties, the LUCF sector constituted a net sink throughout 1990–2000. For the United Kingdom, Australia, and Greece, except for 1995–1997, LUCF has been a net source of CO_2 emissions. For the 31 Parties as a whole, the CO_2 net removal by LUCF decreased by 20 per cent from 1990 to 2000. Figure 11 shows the changes of LUCF net CO_2 removal in individual Parties in

1990–2000. For the three countries where LUCF was a net source of CO_2 emissions in both 1990 and 2000 (indicated by white bars on the figure), the negative numbers for Australia and the United Kingdom in figure 11 indicate a reduction of net CO_2 emissions and the positive figure for Greece indicates an increase of CO_2 emissions from LUCF.

Figure 11. Changes in CO_2 removal from LUCF in 2000 compared with 1990



Note: For an explanation of country codes, please refer to the annex.

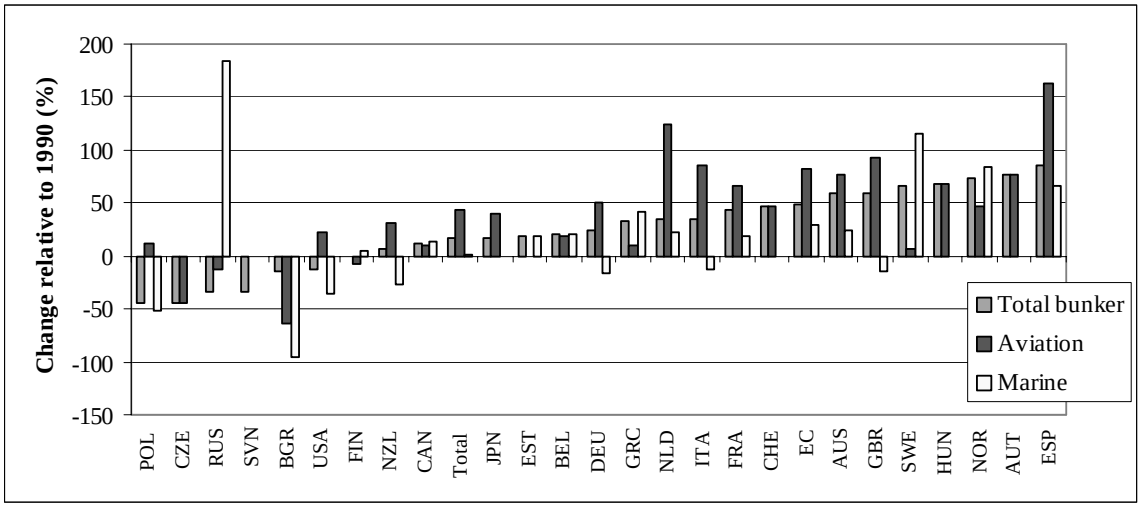
E. International bunkers

43. Overall, aggregated GHG emissions from international bunkers increased by 17 per cent from 1990 to 2000 for Annex I Parties that reported such information for 2000 or the latest year (Bulgaria, Japan, Russian Federation, Slovenia). Five Parties, all but the United States being EIT Parties, saw a decrease in 1990–2000, ranging from –12 per cent (United States) to –45 per cent (Poland). Finland's GHG emissions from international bunkers were at the 1990 level in 2000, but for the rest of Annex I Parties these emissions increased from 1990 to 2000.

44. Figures 12 and 13 present the trends in GHG emissions from 1990 to the latest reported year for international bunkers and its two subcategories, aviation and marine bunkers. The GHG emissions from aviation bunkers increased by about 44 per cent from 1990 to 2000 for those Parties that reported such information, including the Russian Federation, while GHG emissions from marine bunkers remained almost stable.[8]

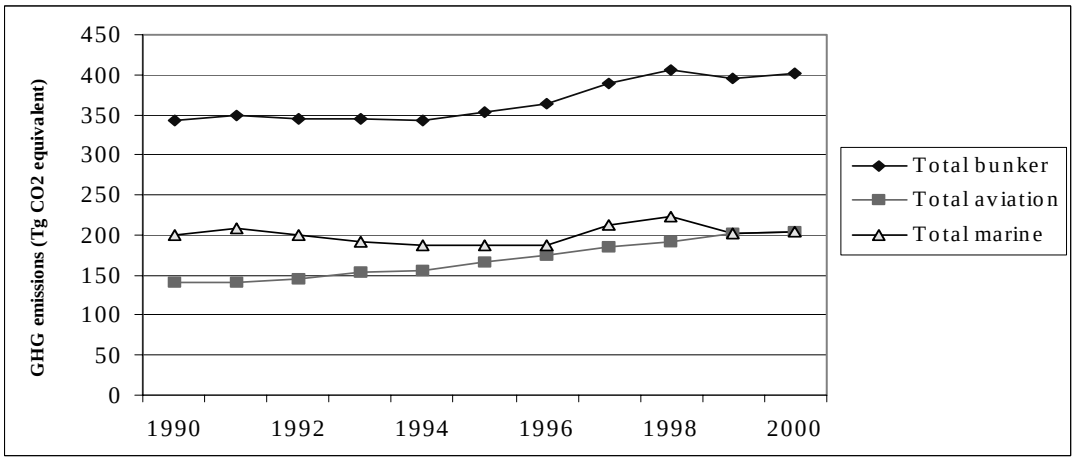
[8] See also FCCC/SBSTA/2003/INF.3. In that document, an increase in emissions from international aviation bunkers was estimated to be 48 per cent because data provided by the Russian Federation were not included.

Figure 12. Changes in GHG emissions from international bunkers, 1990 to the latest year



Note: For an explanation of country codes, please refer to the annex.

Figure 13. Trends in GHG emissions from international bunkers, 1990–2000



IV. POLICIES AND MEASURES

A. Reporting issues

45. The NC3 contain a wealth of information on climate change policies and measures.[9] Parties significantly improved the presentation of information and reporting compared to the previous national communications. This was most likely due to improvements in the UNFCCC guidelines and also because of the increased capacity of Parties for climate change analysis and reporting. The quality of reporting improved in the energy and transport sectors, which were the most important sectors in terms of emissions and mitigation policies for all Parties, except for New Zealand, where agriculture was the most important sector. The quality also improved in other sectors which received considerably less attention in previous communications. For example, the increasing role of fluorinated gases in industrial processes resulted in more attention being given to the policies targeting these gases.

[9] For a detailed discussion of policies and measures, including policies and measures by sector see FCCC/SBI/2003/7/Add.2.

46. Still, in many cases information was not always transparent and reporting did not strictly follow the requirements and categorization required by the UNFCCC guidelines. Also, the guidelines are somewhat unclear in some instances: for example, they contain a separate "industry" sector, and some Parties reported in this sector measures aiming at mitigation of emissions from industrial processes and also at emissions resulting from energy use in industry. In many communications some important elements were missing. For example, only a few Parties reported on the cost of measures (Australia, Croatia, France, Italy, Netherlands, Norway, Switzerland), although many Parties reported overall funding of certain policies and measures (e.g. Australia, Finland, Latvia, Netherlands, Sweden). Some Parties did not report policies by sector, but rather by gas and then by sector (Japan, Lithuania, Latvia, New Zealand). Most of the Parties used the terms given in the guidelines to categorize the type of policy instrument (fiscal, regulation, etc.), although there were some deviations (technical, investment decisions, etc.).

B. Overview of policies

47. Parties reported policies and measures in all sectors as required by the guidelines. These policies covered all important sources of emissions much more comprehensively than in the previous national communications. The policies and measures reported in the NC3 broadly showed continuity, as Parties continued to report on strengthening of existing policies launched with objectives other than climate change but having climate change benefits. However, there was also a clear shift towards implementing new policies and measures that have climate change as their primary objective. Examples of such policies and measures include emissions trading, carbon taxes and green certificate trading. The most important objectives of policies and measures are summarized in box 1 below.

Box 1. Major objectives of climate change policies reported by Annex I Parties

Energy

- Promotion of economically efficient energy supply and energy use
- Enhanced energy security and diversification of energy sources
- Protection of the environment
- Promotion of energy sector reform to increase economic efficiency by introducing more private sector participation, more competition in supply and distribution, and increasing consumer choice over energy suppliers
- Promotion of efficient use of resources, including energy resources, through "green tax" reform
- Climate change mitigation through emissions trading

Transport

- Air quality management
- Congestion management
- Energy security

Industrial processes

- Reduction of gases emitted as by-products in industrial processes
- Improved efficiency of industrial processes
- Improved health and safety conditions
- Minimize the use of HFCs, PFCs and SF_6 in products and minimize their emissions.

Agriculture

- Improved environmental performance of agriculture, e.g. preventing pollution of underground waters
- Promotion of sustainability through, for example, improved food quality, rural development, organic farming and land-use planning

Land-use change and forestry

- Protection and sustainable management of forests
- Conservation of biodiversity, wildlife, soil and water
- Enhanced forest sink capacity through afforestation and reforestation

Waste

- Reduced environmental impacts of waste management such as impacts on air, soil and underground waters
- Waste minimization and recycling

48. In terms of gases and sectors targeted, CO_2 emissions from the energy and transport sectors were by far the most important. This explains the large number of policies and measures reported in the energy sector. However, in the past many Parties achieved significant emission reductions of non-CO_2 gases from sectors other than energy, e.g. emissions from waste and industrial processes. Possibly these sectors and emissions were easier to address because of the much more limited number of industries and sources involved. In addition, it seems that measures targeting non-CO_2 gases are more cost-effective. This is, in part, because a large proportion of the cost is associated with objectives other than climate change, e.g. reducing pollution of air and underground waters and enhancing productivity in the production of aluminium and adipic acid. It also stems from the fact that many of the non-CO_2 gases originated from a very narrow sector of the economy, which was easier to address by policies and measures, e.g. reduction of N_2O from adipic acid production and reduction of PFCs from the aluminium industry. The most frequently reported policies and measures are summarized in table 3.

Table 3. Key policies and measures reported by Parties in all sectors

Policies and measures	AUS	AUT	BEL	BGR	CAN	CHE	CZE	DEU	ESP	EST	EC	FIN	FRA	GBR	GRC
Combined heat and power		×	×	×				×					×	×	
Renewable energy sources	×	×	×	×	×	×		×	×		×	×	×	×	×
Fuel switch (mainly to natural gas)				×			×	×	×	×		×	×	×	×
Energy efficiency improvements	×	×	×	×	×	×	×	×		×	×	×	×	×	×
Vehicle and fuel taxes		×	×			×		×		×		×	×	×	
Integrated transport policy frameworks	×	×				×					×	×			
Pollution prevention in industry	×	×	×	×		×	×	×		×			×	×	×
Landfill site gas recovery	×	×			×		×	×	×	×	×	×	×	×	×
Fertilizer and manure management	×	×	×	×			×	×	×	×	×		×	×	×
Common Agricultural Policy		×	×					×			×	×		×	×
Afforestation and reforestation	×		×	×	×	×	×	×	×	×	×	×	×	×	

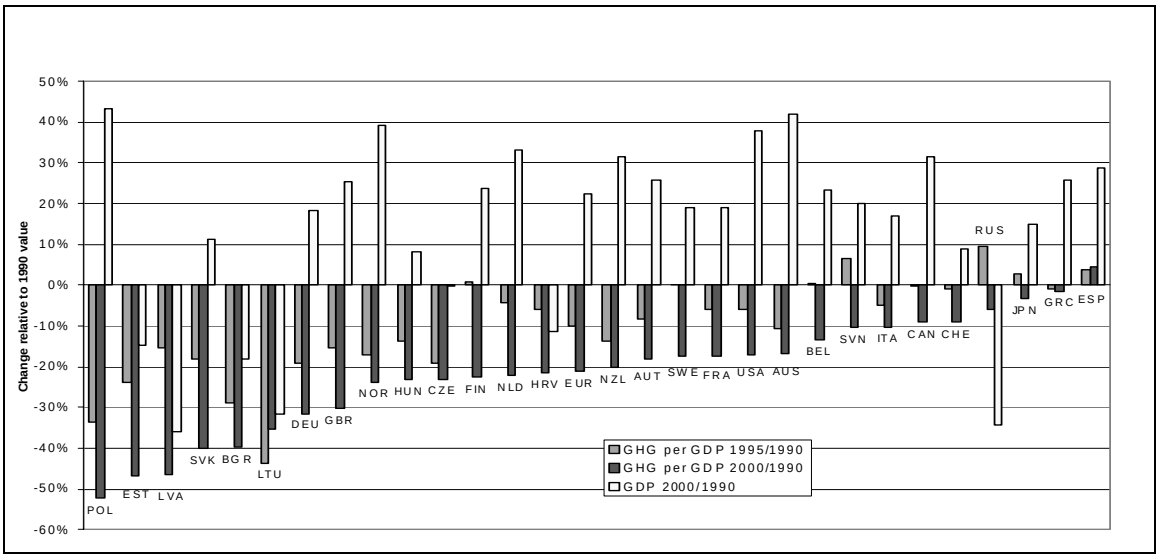
	HUN	HRV	ITA	JPN	LTU	LVA	NLD	NOR	NZL	POL	RUS	SVK	SVN	SWE	USA
Combined heat and power		×	×			×	×	×				×	×		×
Renewable energy sources	×	×	×	×	×	×	×	×				×	×	×	×
Fuel switch (mainly to natural gas)		×	×	×									×		
Energy efficiency improvements		×	×	×	×	×	×	×		×	×	×	×	×	×
Vehicle and fuel taxes							×	×						×	
Integrated transport policy frameworks							×							×	
Pollution prevention in industry		×	×	×		×	×	×				×	×		×
Landfill site gas recovery	×		×			×	×	×	×				×	×	×
Fertilizer and manure management		×	×	×	×	×			×	×		×	×		×
Common Agricultural Policy			×											×	
Afforestation and reforestation		×		×	×	×	×		×	×		×		×	

C. Indicators of policy performance based on emission trends

49. Some policy-relevant national circumstances, e.g. higher-than-expected economic growth and lower-than-expected oil prices, contributed to the higher-than-expected baseline emissions and lowered the actual emission reductions from many policies, especially of policies aimed at energy conservation, in some of the Annex II Parties experiencing emission growth, e.g. Netherlands and the United States. In addition, in many Parties climate policies implemented in the beginning of the 1990s were not sufficient to deliver the reductions needed to stabilize emissions, or the development and implementation of policies took much longer than expected, or policy mix relied heavily on voluntary approaches with no consequences in case of non-compliance with the targets set. However, the end of the last decade saw some slowdown in the rate of emission growth in several Annex II countries (Belgium, Japan, Netherlands) and in 2000 emissions in some Annex II Parties only slightly exceeded their 1990 emission levels (Austria, Italy, Netherlands, New Zealand). This observation could be at least in part explained by the effects of climate policies, energy efficiency for example, although some slowdown in economic growth at the end of the decade and milder winters could also have contributed to this.

50. Many Parties used various sets of highly aggregated indicators to assess policy performance and the impact of key drivers on emission trends at national and sectoral level. These indicators were also used for setting the national and sectoral goals for policies. In particular, Parties used such indicators to assess improvements in the emission intensity of economies expressed as a ratio between total GHG emissions and GDP (see figure 15).[10] This intensity could be defined by energy intensity of economy expressed as a ratio between the total primary energy supply (TPES) and GDP, and by emission intensity of the TPES, which could be expressed as a ratio between energy-related GHG and TPES. Finally, a combination of two indicators, such as the emission intensity of the economy and emissions per capita, was also used. In addition to these aggregated indicators, Parties used many disaggregated sector-specific indicators, by which the effect of the mix of policies affecting the same output, e.g. vehicle miles travelled, could be monitored and assessed in detail.

Figure 14. Changes in emission intensity of economies in 1995 and 2000 compared with 1990 and changes in GDP in 2000 compared with 1990 (percentage)



Note: For an explanation of country codes, please refer to the annex.

51. The data on the emission intensity of the economy suggest that, in all Parties except Spain, this intensity declined between 1990 and 2000. This reflects structural shifts and efficiency improvements in the economy, and some decarbonization of the energy supply mix. In terms of this indicator, Parties could be split into several groups. The first group encompasses Parties with intensity improvement of more than 30 per cent. The EIT Parties formed the core of this group (Bulgaria, Estonia, Latvia, Lithuania, Poland, Slovakia), together with Germany and the United Kingdom. Most Parties fell within the second group, with an emission intensity decrease of around 20 per cent (Australia, Austria, Croatia, Czech Republic, European Community, Finland, France, Hungary, Netherlands, Norway, New Zealand, Sweden, United States), which suggests intensity improvement of around 1.8 per cent annually. It is important to note that some Parties from the second group and some Parties from the first group experienced significant economic growth but still ranked high in terms of emission intensity improvement (Australia, Netherlands, Norway, New Zealand, Poland, United States). The rest of the Parties had an intensity improvement of around 10 per cent (Belgium, Canada, Italy, Slovenia,

[10] Emission estimates used to calculate the indicators were taken from the UNFCCC inventory database, and data on GDP at constant prices expressed in purchasing power, and on population were taken from the IEA database. See also section II.

Switzerland), or exhibited no clear decline in the intensity trend, or even an increase (Greece, Japan, Russian Federation, Spain). Document FCCC/SBI/2003/7/Add.2 contains a more detailed description of the other indicators.

D. Cross-cutting issues

1. Role of the Kyoto Protocol in shaping domestic policy responses

52. With a very few exceptions (e.g. Russian Federation, United States), Parties emphasized the importance of the Kyoto Protocol in shaping their domestic climate policy responses. They noted the steps taken to prepare for the ratification of the protocol, including the necessary legislation. They reiterated their Kyoto targets as a first step towards long-term and continued emission reductions, and stressed the importance of the domestic effort to deliver significant contributions towards meeting these targets. Parties stressed to a varying extent the need to use the Kyoto Protocol's flexible mechanisms and sinks, in addition to domestic measures, to achieve these targets.

2. Institutional framework

53. As part of their climate change policy framework, many Parties reported strengthening of the existing institutional arrangement for design and implementation of climate change policy. In particular, more emphasis was placed on coordination and strengthening the links between all relevant national institutions, together with involvement of new institutions, to ensure an integrated approach to policy (Sweden, United Kingdom). A few Parties reported on new institutions being set up to address climate change, which provided a strong foundation for a comprehensive and targeted set of policies and measures. New Zealand reported on the Climate Change Ministerial Group set up in 2000, directly accountable to the Prime Minister. France reported that the inter-ministerial task force on climate change had been reinforced by placing it directly under the office of the Prime Minister. Japan reported on reinforcement of the global warming prevention headquarters set up in 1997 under the Cabinet of Ministers.

54. The central governments continued to play a major role in setting the overall climate response strategy. Greater involvement of local and regional governments and municipalities, as well as consultation and collaboration with targeted groups and major stakeholders, seems to have an increasingly important role in climate change policy-making (Austria, Belgium, Canada, European Community, Finland, Netherlands, New Zealand, Switzerland). This reflected the expectation that in future regional and local governments, municipalities and key stakeholders were likely to play an increasingly prominent role in addressing both mitigation and adaptation issues. Such tendencies were either related to the existing distribution of powers (Austria, Belgium, Canada, Czech Republic, Finland, Japan, New Zealand, Norway, Slovakia, Sweden, United States) or linked to the ongoing process of devolution of power (e.g. France, Italy, United Kingdom).

3. Integrated approach to climate policy formulation and implementation

55. In some Parties the approach to climate policy formulation and implementation still remained fragmented, but a clear tendency toward using a new integrated approach can be observed in the NC3 of most of the Parties that have ratified the Kyoto Protocol or intend to do so. To a lesser extent, this tendency could also be observed in the NC3 of the remaining Parties. This tendency was characterized by an emphasis on a portfolio and phased approach, referred to below, and also by greater involvement of local and regional governments and important groups of stakeholders in the design and implementation of climate change policy. In this integrated approach, Parties placed greater emphasis on mitigation but

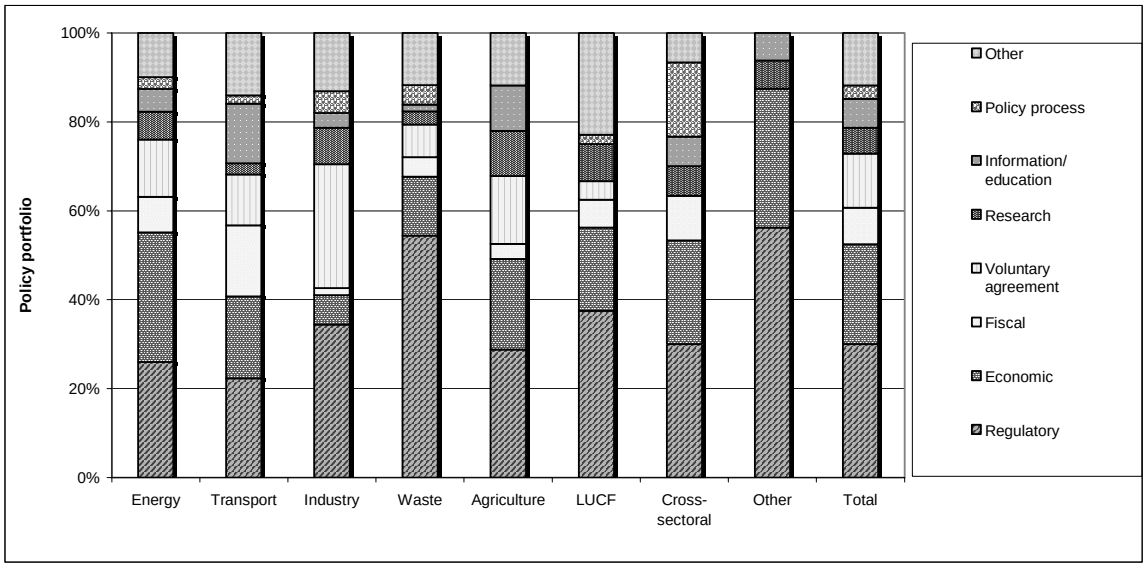
also included elements of adaptation, especially in sectors where success in mitigation may depend on enhancing the adaptive capacity of different systems, e.g. LUCF.

56. Considerable emphasis was placed on the portfolio approach, meaning that a wide range of complementary instruments was used to obtain maximum mitigation gains, for example in promoting renewable energy or energy efficiency. Many Parties estimated that, even with the most recent measures launched in the late 1990s, they may not achieve the Kyoto targets. This is why some Parties (e.g. Japan, Netherlands, New Zealand, Switzerland) outlined a phased approach to their climate policy, meaning that they clearly identified initial policies and secondary or reserve policy packages to be put in place in the interim period a few years before the first commitment period under the Kyoto Protocol, if they are not then on track to meet the Kyoto targets.

4. Policy instruments and major changes in policies and measures by sector[11]

57. Parties used combinations of policy instruments for climate change mitigation. There was a clear common trend towards widening the scope and increasing the coverage of the policy instruments within each sector. Some important cross-sectoral instruments, such as carbon taxes and emissions trading, were given an increasingly prominent role. When the information from the key policies and measures is considered, economic and fiscal instruments together with regulations appear to be by far the most important policy instruments used, in terms both of their number and of the emission reduction expected (figure 15). In many cases, these instruments have created a pressure for businesses to innovate, e.g. the CO_2 tax in Norway induced some of the innovations in the oil and gas industry. The mix of instruments used varied from sector to sector. For example, voluntary agreements still prevailed in the energy use by industry and industrial processes sectors, whereas regulations together with a target-oriented approach were typical for the waste sector.

Figure 15. Composition of portfolio of policy instruments reported by Annex I Parties by sector



[11] A more detailed discussion of policies and measures implemented or planned in specific sectors is contained in FCCC/SBI/2003/7/Add.2.

5. Role of new technologies

58. Most of the Parties attached great importance to policies fostering new technologies[12] in dealing with climate change, which underpins the need to consider these technologies as a separate issue. They also see these technologies in a broader context of dealing with other issues of environmental economics, employment and natural resource management. However, it does not seem that so far environment and, in particular, climate change have been a principle area of corporate or technological emphasis. Important developments noted by most Parties included renewables, fuel cells and more efficient energy end-use technologies.

59. Where they provided details, larger Parties generally reported a mix of long-term goals (e.g. nuclear fusion) and near-term goals (e.g. improved designs for wind turbine blades). In most cases, the new technologies were referred to in the context of the Parties' research and development effort, or in the consideration of policies and measures, with no reference to their effect on GHG mitigation and impact on emission levels in the near and medium term. This is probably due to the uncertainty over when these technologies will become commercially available and how quickly they will penetrate the market.

E. Methodological issues

1. Criteria for climate change policy design and implementation

60. Parties used different sets of criteria and applied different weights to individual criteria in the ex-ante choice of climate change policies and in the ex-post evaluation of their effects. Environmental effectiveness, together with cost-efficiency, appeared to be the most prominent of these criteria. Others included distributional impacts; social inclusiveness; competitiveness of industry and commercial opportunities; impacts on employment; commercial opportunities; human health and welfare; acceptability to various stakeholders; and effects in changing attitudes and awareness.

61. There was, however, limited information in the NC3 on how these criteria were considered in policy-making. Information on the cost of implementation of specific policies was largely missing or considered uncertain and referred to other sources outside the NC3. Information on the reductions delivered or planned was provided for less then half of the measures. In most cases, only highly aggregated information on the total effect expected or the effect expected by sector was reported. Even when information on cost was provided, it was difficult to judge what type of cost it represented – social, economic, marginal, shadow or other – as Parties used different cost concepts. It seems that in most cases when information on cost was provided, a cost-efficiency analysis was conducted to estimate it, i.e. the cost associated with the implementation of policy was assessed with regard to a policy goal set (e.g. $/tonne GHG emissions saved). Ranking the policies and measures in terms of cost-efficiency depended to a large extent on national circumstances. Still, energy efficiency appeared among the most cost-effective measures even in countries with very different national circumstances (e.g. Australia, Netherlands).

2. Monitoring and evaluation, and projections of emission levels

62. Many Parties, especially the countries of the European Community, stressed the role of monitoring and evaluation of climate change mitigation as an integral element of their climate change strategies. Monitoring provided a means of tracking annual emission levels and assessing the progress

[12] Parties refer to new environmental and climate technologies in a broader sense, including technological aspects, skills and know-how in terms of technology and risk management.

towards meeting the policy objectives and targets, e.g. national emission targets and targets for renewables and CHP. In particular, the European Community made reference to the report *1999 Monitoring mechanism of Community CO_2 and other GHG emissions*. Many Parties noted methodological difficulties in *ex-post* evaluation of the implementation of policies and measures and, in particular, the difficulty of establishing a counterfactual baseline scenario, obtaining high-quality data and clearly separating the effect of different measures or portfolios of measures. They also noted uncertainties associated with estimates of mitigation effects and cost.

63. Methods used by Parties in the NC3 for preparing projections of future emission levels, and for assessing the *ex-ante* effect of policies and measures and their impact on future emission trends, remained broadly the same as in the previous communications.[13] To assess the total effect of policies and measures in the future, in most cases Parties used complex macroeconomic equilibrium or partial equilibrium models, or models combining the features of macroeconomic models with engineering bottom-up models (optimization and simulation). As in the *ex-post* evaluation, Parties noted difficulties associated with *ex-ante* assessment of the effects from policies and measures and possible double counting, and referred to internationally accepted good practice in this field. In particular, Australia noted the OECD paper *Greenhouse Gas Emission Projections and Estimates of the Effects of Measures – Moving towards Good Practice*. Notwithstanding these difficulties, a few Parties estimated emission reductions from the key policies (e.g. Austria, Bulgaria, Germany).

F. Policies and measures having a negative impact on emission trends

64. A few Parties noted that energy market reforms had reduced energy prices, favouring established, low-cost, fossil-fuel-based electricity producers and reducing incentives for energy efficiency (Australia, Austria, Switzerland). Austria reported that it had increased electricity taxes, to "compensate for demand-driving electricity price-cutting", following market liberalization. Most Parties were yet to study such negative effects of energy market liberalization in any detail.

65. Finland noted that its border charges on imported electricity, intended to reflect the CO_2 content of the source fuels in neighbouring Parties, were disallowed under European Community trade rules. These charges were replaced with a tax on electricity consumption that was less cost-effective in reducing CO_2 emissions.

V. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

A. Reporting issues

66. This chapter is a compilation of information on the GHG projections presented by Parties in their latest national communications. It contains a general overview of results, namely projected emission trends for Parties and projected changes in sectoral GHG emissions. A more detailed description of the information submitted, including assumptions, approaches and results, is provided in document FCCC/SBI/2003/7/Add.3.

67. According to the UNFCCC guidelines for the preparation of national communications,[14] Parties should present a "with measures" projection of GHG emissions for 2005, 2010, 2015 and 2020. In addition, projections "without measures" and "with additional measures" may be provided. The projected GHG emissions should be presented by GHG (for CO_2, CH_4, N_2O and the sum of HFCs, PFCs

[13] A more detailed discussion of projections is contained in section V below; see also FCCC/SBI/2003/7/Add.3.
[14] FCCC/CP/1999/7, paragraphs 27–48.

and SF_6)[15] and by sector, preferably for the sectors used in the reporting on policies and measures (energy, transport, industry, agriculture, forestry and waste management). Table 4 summarizes the submissions by 32 Parties of information on GHG projections considered in this report.

Table 4. Summary of Parties' information on GHG projections

Type of information	Submissions by Parties	Number of Parties
Projection scenarios	Projection "with measures"	30
	Projection "with additional measures"	21
	Projection "without measures"	7
GHG projections presented by gas	CO_2 projections	29
	CH_4 projections	26
	N_2O projections	25
	Projection for HFCs, PFCs and SF_6	20
GHG projections presented by sector	Energy sector[a]	30
	Transport	22
	Industry[b]	26
	Agriculture	28
	Waste management	26
	Forestry[c]	21
Projection period	Projection at least until 2010	31
	Projection until 2020	22

[a] Some Parties included transport in the energy sector and did not provide a separate projection for GHG emissions from transport.
[b] Often considered as industrial processes, consistently with the approach used in the GHG inventories.
[c] Often considered as land-use change and forestry (LUCF), consistently with the approach used in the GHG inventories.

68. Overall, the reporting on projections has improved in comparison with the previous national communications. Submissions reflect considerable efforts made by Parties in the preparation of the projections. Nevertheless, table 4 also shows that some Parties have not reported their GHG projections in full compliance with the UNFCCC guidelines. Typical deficiencies are the absence of a GHG projection for transport and forestry, the absence of a projection for HFCs, PFCs and SF_6, and the limitation of the projection period to 2010.

69. Using the information in table 4 and a more detailed summary of submitted information in FCCC/SBI/2003/7/Add.3, the presentation of GHG projections in this chapter is based on the GHG projections of 30 Parties (the 32 Parties considered in this report, excluding Lithuania[16] and Monaco[17]).

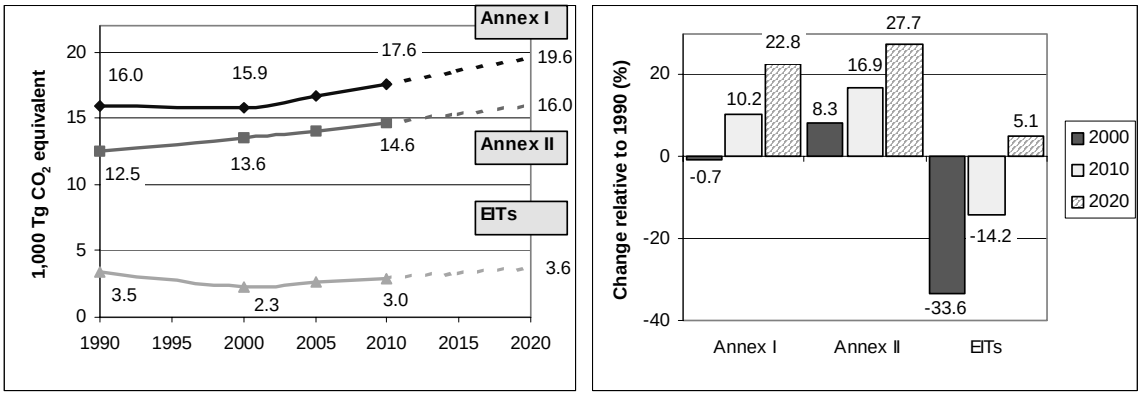
B. GHG projections for Annex I Parties

70. ***GHG projections under the "with measures" scenario:*** Figure 16 shows the sum of 29[18] national projections for the total of the six GHGs – CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 (CO_2 removals by LUCF are not taken into account). Projections for two Annex I sub-groups, Annex II Parties and EIT Parties, are also shown. The data for 1990 and 2000 are taken, as a rule,[19] from the latest submissions of

[15] Projections for CO, NO_X, NMVOC and SO_2 may be also provided.
[16] The NC2 of Lithuania mentions several emissions scenarios (see pages 29, 31, 54 of the NC2) but a UNFCCC-compliant definition of scenarios is not provided. Emission projections (available for CO_2 only) are presented in the NC2 only graphically (in figure 3.9, page 33) and they relate to different shutdown options of the nuclear units at the Ignalina power plant. The secretariat was unable to interpret this information in a way consistent with the projections of other Parties.
[17] Monaco provided a discussion of future trends in GHG emissions but not a quantitative projection.
[18] The 32 Parties considered in this report, excluding the European Community (to avoid double counting of national emissions of member States), Monaco and Lithuania.
[19] There are several exceptions, because some Parties have not yet submitted the 2000 GHG inventory (Bulgaria, Croatia, Russian Federation, Slovenia) and also because for some Parties reported emissions projected for 2000 differ from the 2000 emissions presented in the GHG inventory (Belgium, Hungary, Netherlands, Poland). In such cases, data from modelling were used for 2000 to make projections internally consistent. See FCCC/SBI/2003/7/Add.3 for more details.

the national GHG inventories; data for 2005, 2010, 2015 and 2020 are from projections. The projection from 2010 to 2020 is shown with a dashed line to indicate that it is less credible than the projection from 2000 to 2010 because of the use of extrapolation for Parties that did not project beyond 2010 (see FCCC/SBI/2003/7/Add.3 for more details). As some of the projection data submitted by Parties were not complete or appeared to be not fully consistent, in a number of cases the secretariat had to use judgement to interpret the projections submitted in the national communications. Corresponding notes on such cases are provided in document FCCC/SBI/2003/7/Add.3.

Figure 16. GHG projection "with measures"



Note1: The percentages shown in the right part of the figure may not correspond exactly to the numbers in the left part because of rounding.

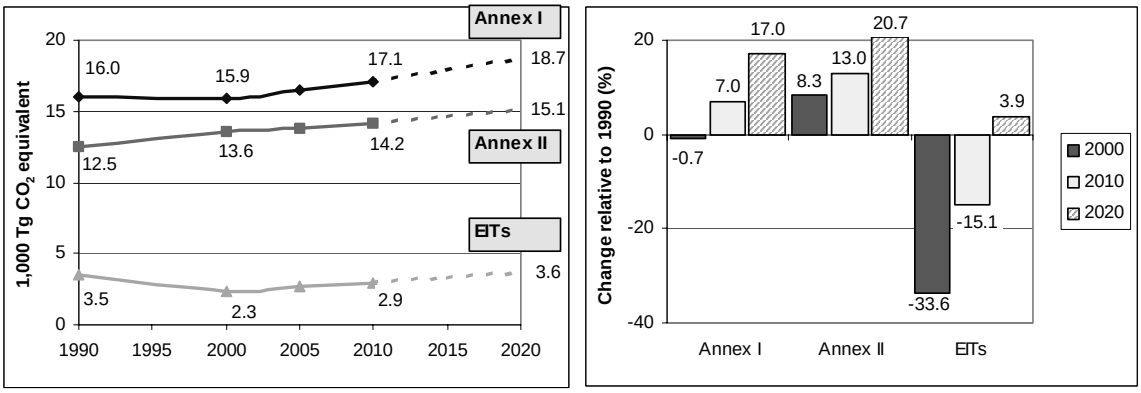
Note 2: The percentages of change to the 1990 level for the year 2000 slightly differ from the corresponding numbers provided earlier in the inventory chapter. There are three reasons for the difference: (a) for some Parties, the 2000 information in projections was taken from modelling and not from the GHG inventory (if the inventory data differed from the data used in the models); (b) some Parties projected some, but not all, gases (for example, CO_2); (c) some Parties did not project GHG emissions from all sectors.

71. It is important to interpret the information presented below in a correct context. Long-term emission projections are subject to considerable uncertainties because of the need to make assumptions about important parameters for which future behaviour cannot be known with certainty. A number of caveats should be borne in mind when considering data summarizing individual projections. First, Parties used differing assumptions for some underlying parameters, such as oil prices on the international market (see the discussion of assumptions in FCCC/SBI/2003/7/Add.3). Second, it was difficult for national projections to take into account consistently the international dimension of economic development. Third, national projections were prepared at different times. Thirteen Parties provided their communication by the deadline of 30 November 2001, but the others did not. As a result, some Parties took into account the impact of recent GHG mitigation programmes, or of the recent economic slowdown, whereas other Parties did not. Information on projections, presented below, should therefore be considered as an attempt to highlight and qualitatively assess some factors that might influence possible future behaviour of GHG emissions in Annex I Parties.

72. Information presented in figure 16 indicates that after being relatively stable in the 1990s, GHG emissions of Annex I Parties are expected to increase after 2000. Under the "with measures" scenario, the overall GHG emissions of Annex I Parties in 2010 are projected to be about 10 per cent above the 1990 level. The emissions are projected to increase both in Annex II Parties and, contrary to the situation in the 1990s, in EIT Parties, which reflects an economic recovery that occurred in most EIT Parties in the late 1990s and is expected to continue. Information contained in the national communications seems to indicate that emissions in Annex II Parties could increase under this scenario because expected rates of economic growth would outweigh the impact of GHG mitigation measures included in the national "with measures" projections.

73. ***GHG projections under the "with additional measures" scenario:*** The submission of a scenario "with additional measures" is not mandatory under the UNFCCC guidelines. Nevertheless, most Parties (21) presented such a scenario. Figure 17 shows the effect of additional measures on the overall GHG emission trends of Annex I Parties. In figure 17, it is assumed that for those Parties that did not submit a scenario "with additional measures" such a scenario would be equivalent to the "with measures" scenario. Similarly to figure 16, the projection from 2010 to 2020 is shown with a dashed line to indicate that it is less credible than the projection from 2000 to 2010 because of the use of extrapolation for Parties that did not project beyond 2010 (see FCCC/SBI/2003/7/Add.3 for more details).

Figure 17. GHG projections "with additional measures"



Note 1: The percentages shown in the right part of the figure may not correspond exactly to the numbers in the left part because of rounding.

Note 2: The percentages of change to the 1990 level for the year 2000 slightly differ from the corresponding numbers provided earlier in the inventory chapter. There are three reasons for the difference: (a) for some Parties, the 2000 information in projections was taken from modelling and not from the GHG inventory (if the inventory data differed from the data used in the models); (b) some Parties projected some, but not all, gases (for example, CO_2); (c) some Parties did not project GHG emissions from all sectors.

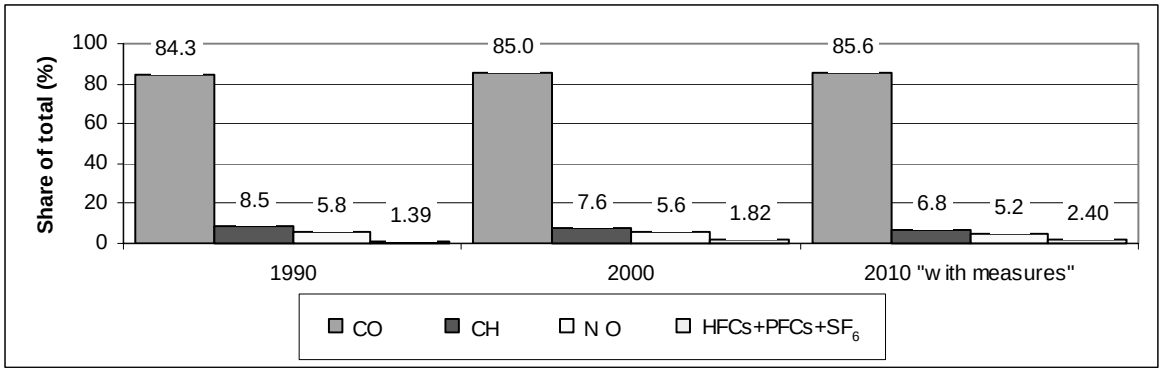
74. As figure 17 illustrates, the use of additional policies and measures for GHG mitigation would lead to lower emission levels than the "with measures" scenario. Nevertheless, total GHG emissions of Annex I Parties would still increase after 2000, although at a lower rate than in the "with measures" scenario. The fact that the difference between figures 16 and 17 is small could also be explained by the fact that not all Annex I Parties have provided a projection "with additional measures"; therefore, the impact of additional measures to be implemented by several Parties is barely discernible compared with the total GHG emissions.[20] The effect of additional measures is most visible in Annex II Parties; for EIT Parties, additional policies seem to be considered as less relevant, primarily because implementation of existing policies would still result in GHG emissions being below the 1990 level (see a more detailed discussion of national projections below).

75. ***Projected changes in the emission profiles by gas:*** Profiles of GHG emissions by gas are projected to change only slightly between 1990 and 2010 (see figure 18). CO_2 remains the dominant GHG, accounting for about 84–86 per cent of the total GHG emissions. An increasing share of HFCs, PFCs and SF_6 should be noted; these emissions are expected to grow in many Parties, mostly as a result of an increase in HFC emissions. The shares of CH_4 and N_2O are projected to decrease between 2000

[20] The in-depth review of national communications conducted by 31 March 2003 indicates that quite a few Parties are in the process of refining and extending their GHG mitigation measures. Implementation of such measures could lead to lower GHG emissions for Annex I Parties than those shown in figure 17.

and 2010, mostly as a result of emission decreases in the chemical industry, agriculture and waste management.

Figure 18. GHG emissions pattern for the total of Annex I Parties



Note: This figure is for the scenario "with measures". The information available for the scenario "with additional measures" indicates that the GHG emission pattern by gas would not differ between the two scenarios.

76. ***Comparison with earlier projections:*** The GHG projections presented above differ from the projections submitted by Annex I Parties in their previous national communications, as shown in table 5. The NC3s projected a similar rate of growth in emissions from Annex II Parties, but much smaller emission reductions by 2010 (compared to 1990) for EIT Parties. As a result, higher emissions by 2010 are projected for Annex I Parties as a whole.

Table 5. Comparison of projections in NC2 and NC3

	NC2 projections ("with measures")			NC3 projections ("with measures")		
	Tg CO_2 equivalent		Change	Tg CO_2 equivalent		Change
	1990	2010	(%)	1990	2010	(%)
Annex II	12 782	15 154	18.6	12 526	14 641	16.9
EIT	5 304	3 977	–25.0	3 456[a]	2 965[a]	–14.2
Annex I	18 086	19 131	5.8	15 982	17 606	10.2

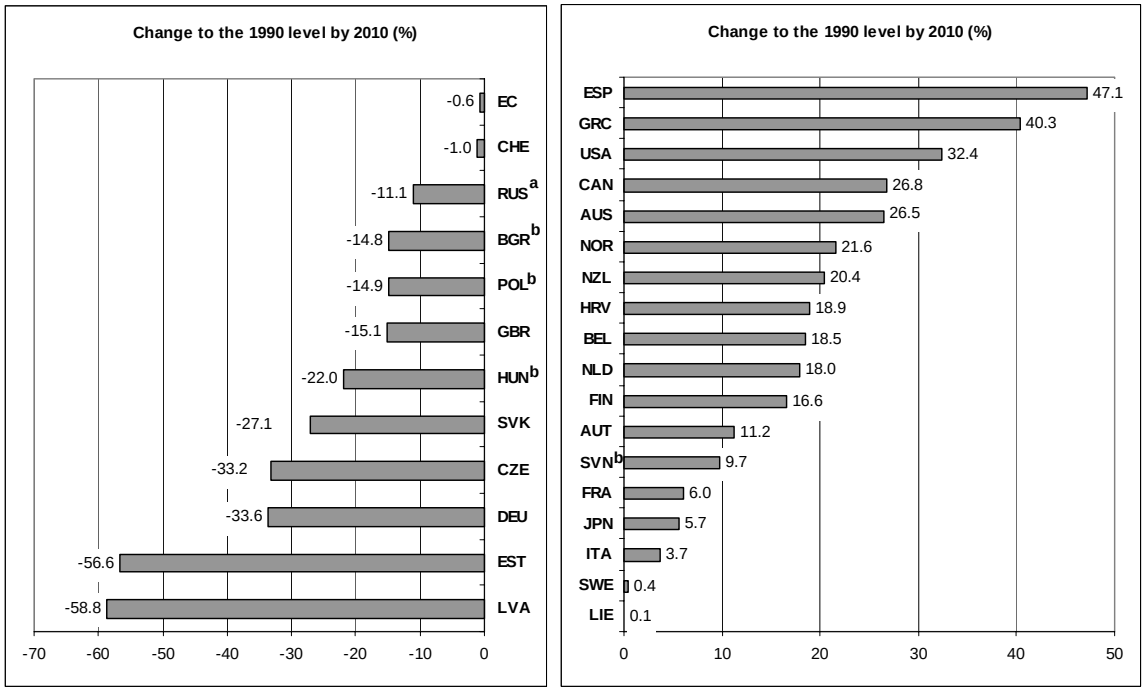
Source: The information on NC2 projections is taken from the previous compilation and synthesis report (document FCCC/CP/1998/11/Add.1) and from the UNFCCC technical paper FCCC/TP/2001/1.

[a] The number differs considerably from that in NC2 because the projections for Lithuania, Romania and the Ukraine are not considered in this document. The GHG projections of these Parties, if added, may influence the trend for the total of EIT Parties.

77. Figure 19 shows the GHG projections for 2010 by Party in comparison with the 1990 level (for the "with measures" scenario). For 12 out of 30 Parties, GHG emissions in 2010 are projected to be lower than in 1990; for 18 Parties, an increase is projected. Emissions levels lower than in 1990 are projected for most EIT Parties and for some Annex II Parties (European Community, Germany, Switzerland, United Kingdom). Detailed data by Party are given in FCCC/SBI/2003/7/Add.3.

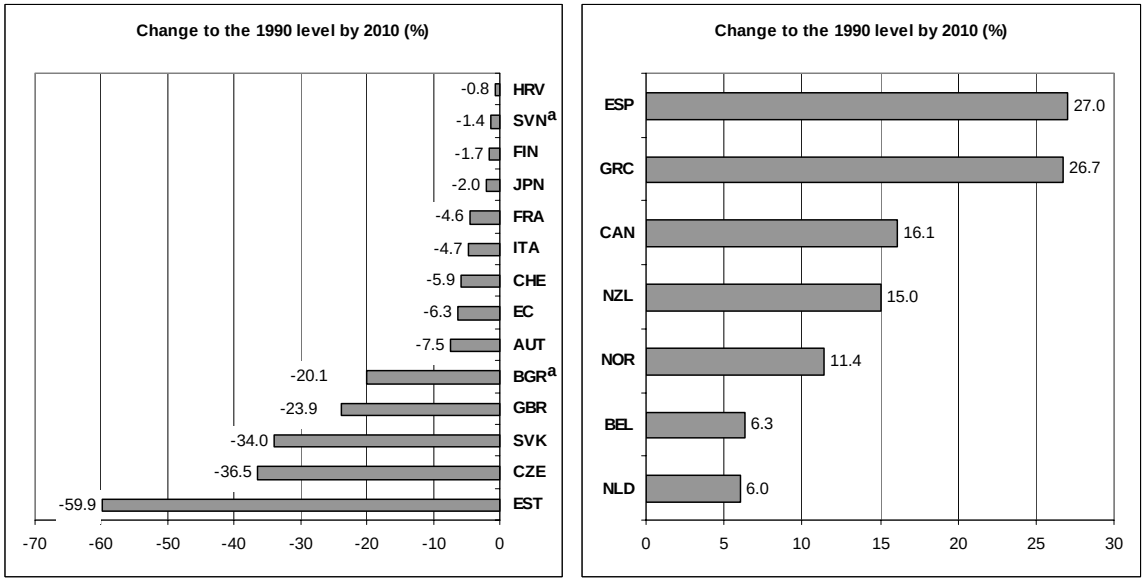
78. Figure 20 provides a similar presentation for the scenario "with additional measures" (for those 21 Parties that provided such a scenario). Comparison between figures 19 and 20 shows that the effect of additional measures is considerable. For several Parties (Austria, Croatia, Finland, France, Italy, Japan, Slovenia), implementation of additional measures is projected to lead to a reduction in GHG emissions by 2010 compared with the 1990 level, which was not the case under the "with measures" scenario.

Figure 19. GHG projections by Party relative to the 1990 level ("with measures")



Note 1: For an explanation of country codes, please refer to the annex.
Note 2: The GHG totals used in this comparison are calculated based on the level of detail in the national projections. For those Parties that projected only some of the six GHGs, only those gases that were projected are included in the total. For example, only CO_2 emissions are used in this graph for the Russian Federation and Spain.
[a] The comparison is made with scenario III of the three "with measures" scenarios presented in the NC3. For scenarios I and II, the change from 1990 to 2010 would be –19.6 per cent and –25.0 per cent respectively.
[b] The comparison is made with the respective base year stipulated in decisions 9/CP.2 and 11/CP.4.

Figure 20. GHG projections by Party relative to the 1990 level ("with additional measures")



Note 1: For an explanation of country codes, please refer to the annex.
Note 2: The GHG total used in this comparison is calculated based on the level of detail in the national projections. For those Parties that projected only some of the six GHG, only those gases that were projected are included in the total (see table 4). For example, only CO_2 emissions are used in this graph for Spain.
[a] The comparison is made with the respective base years stipulated in decisions 9/CP.2 and 11/CP.4.

C. Sectoral projections and the projected effects of policies and measures

79. Table 6 shows the projected sectoral GHG emissions of Annex I Parties for 2010 compared with 1990 and 2000. Shares of individual sectors in the GHG totals for 1990 and 2010 are presented in figure 21. For the Annex II Parties considered, GHG emissions are projected to increase between 2000 and 2010 in all but one sector. The exception is the waste sector, where implementation of existing waste reduction policies and recycling, as well as further improvement in the management of waste sites (such as landfill gas recovery and use) are expected to lead to continued GHG reductions after 2000. Emissions in the EIT Parties after 2000 are projected to increase in all sectors although, with the exceptions of transport, they are expected to remain well below 1990 levels.

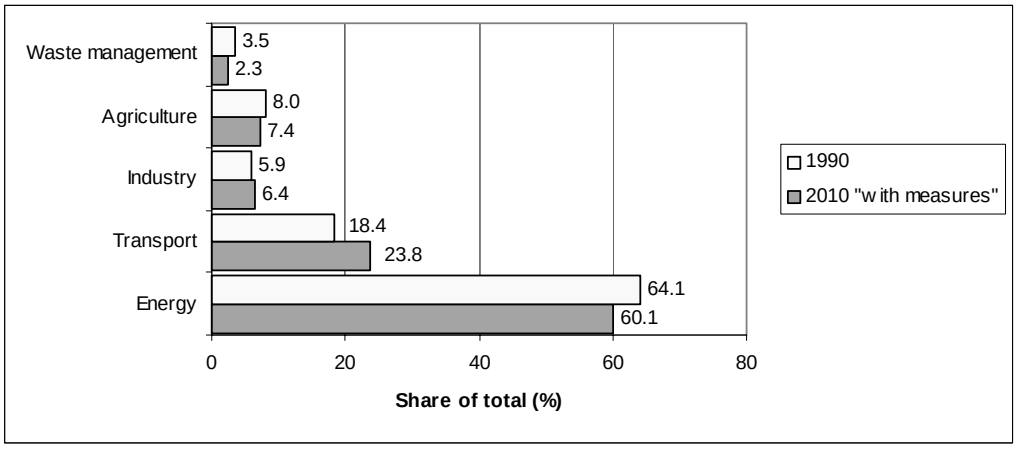
Table 6. Sectoral projections for Annex I Parties (the "with measures" scenario)

		Gg CO_2 equivalent					Change relative to the 1990 level (%)				
		Energy (EN)	Transport (TRN)	Industry (IND)	Agriculture (AGR)	Waste (WST)	EN	TRN	IND	AGR	WST
Annex II	1990	7 717.4	2 471.8	775.2	1 029.1	451.7					
	2000[a]	8 285.8	2 975.9	756.5	1 038.4	421.2	7.4	20.4	–2.4	0.9	–6.8
	2010	8 571.6	3 650.2	966.4	1 090.0	342.9	11.1	47.7	24.7	5.9	–24.1
EIT	1990	3 320.3	23.3	28.9	55.3	25.2					
	2000[a]	2 185.7	31.3	16.5	41.1	14.0	–34.2	34.3	–42.8	–25.8	–44.6
	2010	2 830.1	33.6	21.0	49.1	15.5	–14.8	44.3	–27.3	–11.2	–38.5
Annex I	1990	11 037.7	2 495.1	804.0	1 084.4	477.0					
	2000[a]	10 471.5	3 007.1	773.0	1 079.5	435.2	–5.1	20.5	–3.9	–0.5	–8.8
	2010	11 401.8	3 683.8	987.4	1 139.1	358.4	3.3	47.6	22.8	5.0	–24.9

Note 1: This table includes sectoral information as presented by Parties in their national communications. Where a GHG projection was not available for a particular sector, that sector was not included in the totals (see also table 4 and table 8).
Note 2: The GHG total calculated as a sum of sectoral emissions may slightly differ from the total calculated as the sum of GHGs (shown in figures 18 and 19) due to the absence or incompleteness of some sectoral projections (see table 4 and table 8).
Note 3: For simplicity, GHG emissions from the use of solvents are not included here. These emissions are small and their projections are available for only a few Parties.
[a] For some Parties (Belgium, Bulgaria, Croatia, Hungary, Netherlands, Poland, Russian Federation, Slovenia), the sectoral data for 2000 were taken from projections rather than from the latest inventory submission. Projection data were used where the national inventory for 2000 was not available or where the 2000 data used in the projections differed noticeably from the inventory data.

80. The trend for all Annex I Parties is largely determined by the trend of Annex II Parties (with the exception of the energy sector where the share of EITs is considerable). Therefore, the total GHG emissions of Annex I Parties under the "with measures" scenario are projected to increase after the year 2000 in all sectors except waste. Among all the sectors, transport shows the highest increase of GHG emissions in comparison with the 1990 level.

Figure 21. GHG emission pattern by sector



81. Table 6 shows only the overall trend for all Annex I Parties, but within each sector some Parties project increased emissions and some Parties decreased emissions. Table 7 summarizes the projected sectoral trends from 2000 to 2010 for individual Parties.[21]

Table 7. Summary of GHG projections by sector (the "with measures" scenario)

Sector	Parties projecting an increase in GHG emissions from 2000 to 2010	Parties projecting a decrease in GHG emissions from 2000 to 2010	The sectoral projection was not provided or did not allow a consistent interpretation
Energy	AUS, AUT, BGR, CAN, CHE, ESP, FIN, FRA, GRC, HRV, HUN, LVA, NLD, NOR, POL, RUS,[a] SVK, USA	BEL, CZE, DEU, EC, EST, GBR, ITA, JPN, LIE, NZL, SVN, SWE	LTU, MCO
	Total 18 Parties	***Total 12 Parties***	***Total 2 Parties***
Transport	AUS, AUT, BEL, CAN, EC, ESP, FIN, FRA, DEU, GBR, GRC, HUN, ITA, LIE, NLD, NOR, NZL, SVK, SVN, SWE, USA	CHE, CZE	BGR,[b] HRV,[b] EST,[b] JPN,[b] LTU, LVA,[b] MCO, POL,[b] RUS[b]
	Total 21 Parties	***Total 2 Parties***	***Total 9 Parties***
Industrial processes	AUS, AUT, BEL, BGR, CZE, EC, FIN, FRA, DEU, GRC, HRV, JPN, LVA, NLD, NZL, NOR, SVK, SVN, SWE, USA	CAN, CHE, EST, GBR, ITA	ESP, HUN, LIE, LTU, MCO, POL, RUS
	Total 20 Parties	***Total 5 Parties***	***Total 7 Parties***
Agriculture	BGR, CAN, CZE, EC, EST, HRV, HUN, LVA, NZL, NOR, SVK, USA	AUS, AUT, BEL, CHE, DEU, FIN, FRA, GBR, GRC, ITA, JPN, LIE, NLD, SVN,[c] SWE	ESP, LTU, MCO, POL, RUS
	Total 12 Parties	***Total 15 Parties***	***Total 5 Parties***
Waste management	BGR, CZE, HRV, LIE, NZL, EC	AUS, AUT, BEL, CAN, CHE, DEU, EST, FIN, FRA, GBR, GRC, ITA, JPN, LVA, NLD, NOR, SVK, SVN,[c] SWE, USA	ESP, HUN, LTU, MCO, POL, RUS
	Total 6 Parties	***Total 20 Parties***	***Total 6 Parties***

Note: For an explanation of country codes, please refer to the annex.

[a] Only a CO_2 total was presented in the NC3. This table assumes that the largest part of these emissions is from the energy sector, including transport.

[b] The emissions from transport are included in the emissions from the energy sector.

[c] These emissions are projected to remain constant from 2000 to 2010.

82. By sector, table 7 shows the following:

(a) For the energy sector, emissions are projected to increase in most Parties, most probably because of the expected economic growth but also because the switch from coal to gas, which occurred in some Parties in the 1990s, may not bring similar CO_2 reductions in 2000–2010. Nevertheless, quite a few Parties expect that the continuation of the existing policies would allow for the emissions to be reduced from 2000 to 2010.

(b) For transport, all Parties, except the Czech Republic and Switzerland, expect an increase in emissions.

(c) For industrial processes**,** emissions are projected to increase in most Parties because of anticipated economic growth and an increase in emissions of HFCs and PFCs; this seems to outweigh the expected progress in reducing the process emissions of N_2O, CO_2 and SF_6. Nevertheless, five Parties (Canada, Estonia, Italy, Switzerland, United Kingdom) project a decrease in these emissions.

[21] Detailed numerical information by Party is provided in FCCC/SBI/2003/7/Add.3.

(d) For agriculture**,** almost as many Parties project an increase in emissions as project a decrease. This reflects the particular situation of this sector; emission reductions usually do not come from a specific GHG mitigation policy in the sector, but are rather a result of general economic and environmental policies.

(e) For waste management**,** continued decrease in emissions is projected by most Parties; this follows the expected continuation of the policies to decrease the amount of waste and to manage the remainder better. For six Parties (Bulgaria, Croatia, Czech Republic, European Community, Liechtenstein, New Zealand), an increase in the emissions from waste was projected.

83. As noted, only 21 Parties submitted a projection "with additional measures". Moreover, some Parties (Canada, Croatia,[22] European Community, Italy, Norway) provided a GHG total but not a breakdown of the emissions by sector for this scenario. Therefore, it was not possible to present a general emission trend for Annex I Parties similar to that given in table 6. However, it was possible to review the behaviour of sectoral emission individually for those Parties that presented a projection "with additional measures" (see table 8).

Table 8. Summary of GHG projections by sector (the "with additional measures" scenario)

Sector	Parties projecting increase in GHG emissions from 2000 to 2010	Parties projecting decrease in GHG emissions from 2000 to 2010	The sectoral projection was not provided or did not allow a consistent interpretation
Energy	BGR, FIN, FRA, GRC ***Total 4 Parties***	AUT, BEL, CHE, CZE, EST, GBR, JPN, NLD, SVK, SVN, ESP ***Total 11 Parties***	AUS, CAN, DEU, EC, HRV, HUN, ITA, LIE, LTU, LVA, MCO, NOR, NZL, POL, RUS, SWE, USA ***Total 17 Parties***
Transport	BEL, ESP, FIN, FRA, GBR, SVK, SVN ***Total 7 Parties***	AUT, CHE, CZE, GRC, NLD, ***Total 5 Parties***	AUS, BGR, CAN, DEU, EC, EST, HRV, HUN, ITA, JPN, LIE, LTU, LVA, MCO, NOR, NZL, POL, RUS, SWE, USA ***Total 20 Parties***
Industrial processes	AUT, BEL, BGR, CZE, JPN, SVK, SVN ***Total 7 Parties***	CHE, EST, FIN, FRA, GBR, GRC, NLD ***Total 7 Parties***	AUS, CAN, DEU, EC, ESP, HRV, HUN, ITA, LIE, LTU, LVA, MCO, NOR, NZL, POL, RUS, SWE, USA ***Total 18 Parties***
Agriculture	BGR, CZE, EST, SVK ***Total 4 Parties***	AUT, BEL, CHE, FIN, FRA, GBR, GRC, JPN, NLD, SVN ***Total 10 Parties***	AUS, CAN, DEU, EC, ESP, HRV, HUN, ITA, LIE, LTU, LVA, MCO, NOR, NZL, POL, RUS, SWE, USA, ***Total 18 Parties***
Waste management	BGR, CZE ***Total 2 Parties***	AUT, BEL, CHE, EST, FIN, FRA, GBR, GRC, JPN, NLD, SVK, SVN ***Total 12 Parties***	AUS, CAN, DEU, EC, ESP, HRV, HUN, ITA, LIE, LTU, LVA, MCO, NOR, NZL, POL, RUS, SWE, USA ***Total 18 Parties***

Note: For an explanation of country codes, please refer to the annex.

84. By sector, table 8 shows the following (for the period from 2000 to 2010):[23]

(a) For the energy sector, the use of additional measures would allow five Parties (Austria, Netherlands, Slovakia, Spain, Switzerland) to reverse the emission growth that was observed in the "with measures" projection.

[22] In the NC1 of Croatia, sectoral data are available as graphs but it is not possible to estimate the quantities accurately from the graphs. Therefore, only the GHG total was estimated for this scenario.

[23] Detailed numerical information by Party is provided in document FCCC/SBI/2003/7/Add.3.

(b) For transport, the impact of additional measures appears to be low. In addition to the Czech Republic and Switzerland (where emission decreases are projected already under the "with measures" scenario), three more Parties (Austria, Greece, Netherlands) projected a reduction in emissions from transport.

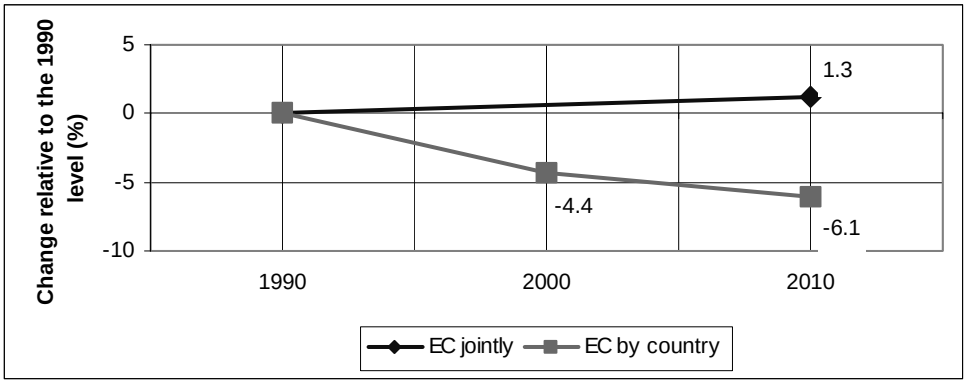
(c) For industrial processes, the impact of additional measures is notable for Finland, France, Greece and Netherlands, where implementation of additional measures would allow for the "with measures" trend to be reversed (industrial emissions for these Parties were projected to decrease between 2000 and 2010).

(d) For agriculture and waste management**,** the additional measures seem to have little effect because the Parties consider only a few such measures and these measures mostly have a small impact on the emissions in comparison with the measures already implemented.

85. ***GHG projections for the European Community:*** The European Community, currently made up of 15 European states, is also a Party to the UNFCCC in addition to its member States.[24] The 15 members of the Community intend to meet the commitments of the Kyoto Protocol to the UNFCCC jointly, the common target being an overall 8 per cent reduction in comparison with the 1990 level. As some policies with impact on GHG emissions are designed and implemented at Community level, the national GHG reductions in European Community members are usually a result of both national and European Community policies.

86. Figure 22 compares the GHG projections for the European Community as whole, as presented in the Community's NC3, with the sum of GHG projections of 11 Community members, as presented in their national communications. (Denmark, Ireland, Luxembourg and Portugal had not submitted their national communications by the time this report was prepared).[25] This makes the absolute numbers (shown in table 9) not fully comparable, but the trend in relative numbers, shown in figure 22, may be representative.

Figure 22. GHG projections for the European Community



87. There seem to be at least two reasons for the difference shown in figure 22. First, the assumptions in the Community-wide projections differ from some of the national assumptions. This

[24] At present, the members of the EC are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom. Ten countries – Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia – should join the EC on 1 May 2004.

[25] Denmark provided an advance submission of its third communication but it does not contain GHG projections.

becomes noticeable, for example, when comparing the assumptions on the price of oil on the international market (see the discussion of assumptions in FCCC/SBI/2003/7/Add.3). Second, projections are calculated in different ways. Community-wide projections take into account only the impact of common European Community policies and not the impacts of national policies, so the national projections indicate larger GHG reductions than do the Community-wide projections.

Table 9. Sectoral projections for the European Community

Sector		EC jointly	EC by Party[a]	EC jointly	EC by Party[a]
		Tg CO_2 equivalent		Change relative to 1990 (%)[b]	
Energy	1990	1 908	2 430	–	–
	2000	not available	2 249	not available	–7.4
	2010	1 912	2 115	0.2	–13.0
Transport	1990	753	695	–	–
	2000	not available	814	not available	17.1
	2010	985	901	30.8	29.6
Industry	1990	893	330	–	–
	2000	not available	272	not available	–17.6
	2010	759	321	–15.0	–2.7
Agriculture	1990	417	338	–	–
	2000	not available	309	not available	–8.6
	2010	398	275	–4.6	–18.6
Waste management	1990	167	136	–	–
	2000	not available	96	not available	–29.4
	2010	138	55	–17.4	–59.6

Note: The absolute numbers for individual sectors may differ considerably between the two sets of projections presented in this table, because the definition of emission categories, in particular the allocation of emissions from fuel combustion in industry, may differ. Therefore, it is the change from 1990 that should be compared, and not the absolute emissions.

[a] Of the 15 European Community members, Denmark, Ireland, Luxembourg and Portugal are not included here in the sum of the projections by Party because these Parties had not submitted their national communications by the time this report was prepared.

[b] The change is calculated as $[(2000 - 1990) / 1990] \times 100$ or $[(2010 - 1990) / 1990] \times 100$.

88. Table 9 shows a comparison of the projected sectoral emissions. For the energy sector, agriculture and waste management, the national projections of GHG emissions are lower, which is methodologically consistent with the fact that the Community-wide projections include only the effects of common policies. For industry, the situation is different: the national projections indicate more modest emission reductions than do the Community-wide projections. The likely reason is that the definition of industrial emissions is different: the Community-wide projections of industrial emissions, presented in the European Community's NC3, include emissions from fuel combustion within industry whereas the projections presented in the communications of individual Parties exclude them (they are part of the emissions from the energy sector). For transport, expected reductions are similar in both national and Community-wide projections, which indicates that Parties expect the common European Community policies to be dominant in this sector.

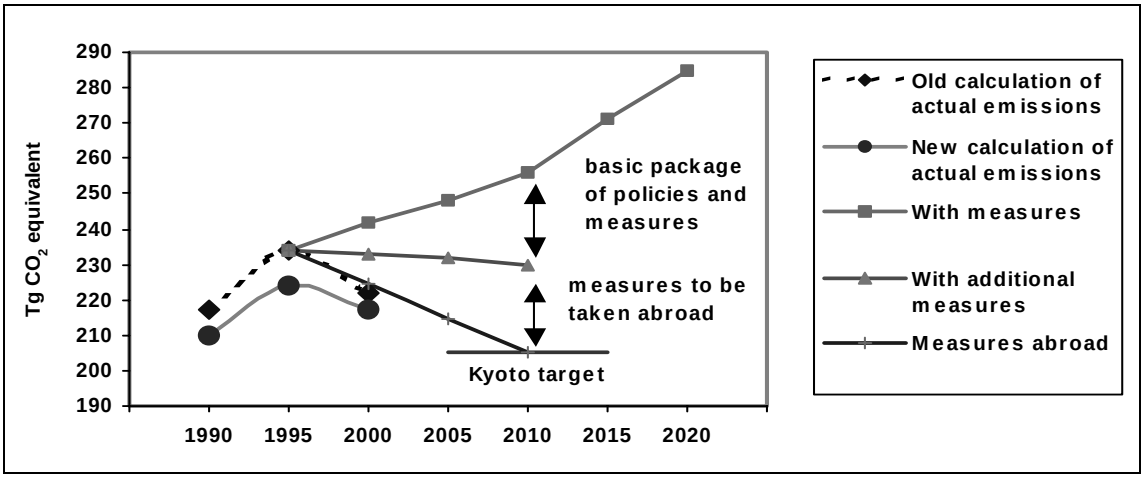
D. GHG projections and the international mechanisms of the Kyoto Protocol

89. Many Parties mention in their national communications the possible use of the international mechanisms under the Kyoto Protocol. All three Kyoto mechanisms are under consideration: joint implementation (JI) (mentioned, for example, by Bulgaria, Canada, Czech Republic, Finland, Hungary, Italy, Japan, Latvia, Netherlands, Norway, Poland, Slovakia, Sweden, United Kingdom), emissions trading (Hungary, Japan, Latvia, Netherlands, Slovakia) and the clean development mechanism (CDM) (Canada, Finland, Italy, Japan, Netherlands, Norway, Sweden, United Kingdom). European Community members and European Community accession States apparently intend to use the European Community scheme of emission trading in addition to emission trading under the Kyoto Protocol outside the European Community.

90. The impact of such mechanisms is not reflected in the projection results shown above, because only a few Parties quantified the expected impact of the mechanisms. Moreover, the impact of the mechanisms is usually not modelled but assumed as a means to close the eventual gap between the emissions in 2008–2012 and the Kyoto Protocol target. An example of such approach for one Party (Netherlands) is shown in figure 23. However, one Party (Italy) included 12 Tg CO_2 equivalent of credits from JI/CDM projects into its reference ("with measures") scenario.

91. The in-depth reviews of national communications of Annex I Parties (conducted by 31 March 2003) showed that work was in progress in some Parties to better estimate the future role of the international Kyoto mechanisms and to include them in the scope of projection modelling.

Figure 23. A possible role of the international flexible mechanisms in the Netherlands



VI. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

A. Reporting issues

92. In their NC3 all reporting Annex I Parties provided information on their current and future vulnerability to climate change, as well as on the impacts by sector and adaptation measures, in accordance with the UNFCCC guidelines. The assessments of climate change impacts presented by all Parties are scenario based and include data on recent projections of likely future climate change. In this regard, several Parties presented detailed information on the methods and approaches applied for assessing vulnerability and evaluating the potential for adaptation, as well as the limitations of these techniques. Some Parties reported on the steps taken in the national climate change process, including the allocation of additional funding to develop a policy framework for adaptation. All Parties presented initiatives on adaptation research that are in the planning stage or the very early stages of implementation.

93. Overall, three broad approaches for identifying vulnerability of important sectors of the economy to the impacts of climate change and for exploring adaptation options have been presented in national communications. First, some Parties reported on government-led studies of climate change impacts and vulnerability on a national or sector specific basis. Second, Parties reported on various ongoing research programmes carried out by a range of publicly owned and private research institutes, aimed at gaining a better understanding of projected climate changes and their impact on a variety of areas, including water resources and hydrology, agriculture, fisheries, drought, human health, forestry, sea-level rise, coastal

and marine ecosystems, and socio-economic areas and infrastructure. Third, most Parties listed initiatives for future research into assessment of vulnerability and identification of adaptation options and areas by integrating existing knowledge, models and data, and improving model simulations of natural climate variations and how such variations are likely to change.

94. Many Parties reported a range of ongoing research programmes[26] aimed at gaining a better understanding of projected climate changes and their impact on specific sectors. Some Parties (Australia, Finland, Italy, New Zealand, United States) reported on the preparation of a comprehensive set of scenarios for future climate and national impacts. Canada, Finland and the United Kingdom reported on the development of indicators to monitor how climate is changing in the national context.

95. Other specific areas of research reported include: estimating present and past climate variability; downscaling global climate models to the regional and national level; developing and refining crop models based on national experimental work; developing soil models to increase the understanding of the turnover of soil carbon; linking projected climate changes (temperature, rainfall, sea level) to effects on biophysical variables such as river flows, water catchments or rainfall patterns. Many Parties also reported on their participation in research efforts at the European level.

96. Several Parties (Canada, European Community, New Zealand, Switzerland, United Kingdom) mentioned bridging the gap between the research community and policy-makers as a priority, through the dissemination of findings on the impacts of climate change, vulnerability and adaptation options to the public at large as well as to decision-makers. Since the preparation of the NC2, several Parties (Canada, Switzerland, United Kingdom, United States) have also reported steps taken to form direct links between the science and policy-making communities to address needs at the regional and local level in order to ensure that research is user driven. Germany and Switzerland reported on the increase in costs of extreme weather events and the need to adapt. Other Parties (Canada, Switzerland, United Kingdom, United States) reported on the development of new partnerships of stakeholders for impact assessments at the state/federal/central government levels and local/devolved levels, and by the private sector. Many Parties cited comprehensive reports of national experts' reviews of current knowledge, assessment of the impacts of climate change, vulnerability assessments and evaluation of the potential for adaptation as supplementary information in this area.

B. Assessment of vulnerability to climate change

97. The national communications generally treated the impacts of climate change and the assessment of vulnerability to climate change as a single issue. At the country level, a wide range of models as well as expert judgement were used in the assessment of impacts in various sectors. Climate scenarios were primarily drawn from results available from global circulation models (GCMs) developed and used by the United Kingdom's Hadley Centre (HadCM2); the Max-Planck Institute for Meteorology (ECHAM4); the Canadian Centre for Climate Modelling and Analysis; Goddard Institute for Space Studies (GISS), the Geophysical Fluid Dynamics Laboratory (GFDL) and GFD3 from the United States; the SCENGEN technique, SCM (MAGICC), the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO – Mk2b), and from model simulations carried out at national centres in many of the countries, for example SwedenCLIM in Sweden (see tables 10 and 11).

[26] See also section VIII.

Table 10. Methods used by Parties to estimate climate change impacts and vulnerability (scenarios)

GCM equilibrium	GCM transient	Other[a]	Not specified
AUS, AUT, BEL, BGR, CAN, CZE, EC, ESP, EST, FIN, FRA, GBR, HRV, ITA, LTU, LVA, NOR, POL, SVK, SVN, USA	AUS, AUT, BEL, BGR, CAN, CZE, EC, EST, FIN, GBR, NZL, SWE	AUS, CAN, EC, EST, FIN, GBR, LVA, NZL,[b] SVK, SVN, SWE,[c] USA	CHE, DEU, GRC, HUN, LIE, MCO, RUS
21 Parties	***12 Parties***	***12 Parties***	***7 Parties***

Note: For an explanation of country codes, please refer to the annex.

[a] Includes other models, such as the SCENGEN technique, SCM (MAGICC), Intergovernmental Panel on Climate change (IPCC) SLR and national models.

[b] New Zealand reported using results from downscaling models for rainfall projections.

[c] Sweden used its own hydrological model.

Table 11. Methods used by Parties (where reported) to estimate climate change impacts and vulnerability (sectoral assessment)

Sector	Method	Parties
Agriculture	DSSAT 3/IBSNAT and CERES	BGR, CZE, EST
	National models	AUS, GBR, NZL, SWE, USA
	Other methods	ESP, FRA, NOR, POL, SVK, SVN, USA
Water resources	CLIRUN	CZE
	National models	ESP, FRA, GBR, HRV, SVK, SWE
	Other methods	EC, EST, NOR, POL, SVN, USA
Coastal zones and marine ecosystems[a]	Common IPCC methodology including economic analysis	DEU
	Other methods	EC, ESP, FRA, GBR, ITA, LTU, NLD, NOR, NZL, POL, SWE
Terrestrial ecosystems	Holdrige or GAP	BGR, CZE, EST, SVK
	National methods	AUS, GBR, USA
	Other methods	EC, ESP, LTU, NOR, NZL, SVN
Human health	Other methods	AUS, BEL, CAN, DEU, EC, FRA, GBR, HRV, ITA, NOR, NZL, ITA, JPN, RUS, USA
Other sectors[b]	Other methods	EST, ITA, LTU, SVN
	Not specified	CAN, DEU, EC, GBR, HRV, HUN, NOR, USA
Integrated analysis	Other methods	AUS, DEU, GBR, NZL, USA

Note 1: For an explanation of country codes, please refer to the annex.

Note 2: "Qualitative" means an approach that includes expert assessments and qualitative assessments of possible impacts of climate change.

[a] Includes sea-level rise.

[b] Includes fisheries, energy, industry, and human settlements.

98. Sector-specific models included GAP for forestry, CLIRUN for water resources, and DSSAT 3/IBSNAT and CERES for agriculture. Most Parties presented new scenarios in their NC3 that differed from earlier scenarios, based on up-to date projections of likely future climate change. Parties described in various degrees of detail the expected socio-economic or ecological impacts of climate change, depending on the level of research in different subject areas and development of models. These models were either process-based or integrated for a wide range of sectors such as water resources; soil and land resources; coastal zones; ecosystems; forestry; agriculture; fisheries; socio-economic aspects of transport,

tourism, energy, and other industries; insurance; and human health. Information provided by Parties on current and future vulnerability was dependent on the relative importance of these sectors in their economy. Most Parties reported that assessing their vulnerability and/or benefits for the environment and key sectors, in the event of climate change, is consistent with projections produced by the IPCC.

99. ***Water resources:*** Water is an issue for many countries, but the nature of the vulnerabilities varies. Some Parties reported that the most direct impacts they will experience are in freshwater systems as a result of a change in water levels and water reserves, effects on water quality, and greater stress on groundwater levels and quality. Norway indicated a possible increase or decrease in precipitation over the long term of between 10 and 30 per cent. Some Parties reported possible impact on frequency and amplitude of high stream and river flows, with major implications for infrastructure and emergency management in areas vulnerable to flooding. This may be due in part to greater stream flow variability, with greater precipitation during winter months. The European Community reported that annual stream flow is predicted to increase in northern Europe and that flood risk across Europe is likely to increase, although times of peak floods may change as a result of changes in seasonal precipitation levels.

100. ***Forestry:*** Most Parties reported that forestry and forest productivity is likely to benefit from climate change as a result of increased concentrations of CO_2 and higher temperatures. Large changes in species composition were expected in forest vegetation (alpine forests, tropical forests) with temperature fluctuations. The genetic variability of tree species will probably mean that most species will be able to acclimatize to changes in temperature and precipitation. However, some Parties stressed the need to preserve the biodiversity and genetic resources of the flora and fauna to guarantee forest reproduction. A number of Parties (Australia, Canada, Finland, France, Italy, Latvia, New Zealand, Norway, United Kingdom, United States) reported that milder winters or hot, dry summers might increase the risk of damage caused by insect pests, and by fires which reduce forest productivity. Canada noted that the combined impacts of increased pollutants such as CO_2, nitrogen and tropospheric ozone on forests are also still uncertain.

101. ***Agriculture and food security:*** Almost all Parties assessed agriculture as being of key concern because of the possible effects of climate change on this sector, which is important to national economies and food security. All reporting Parties (in particular, Australia, Canada, European Community, New Zealand, United States) noted that future yields would depend both on the positive effect of increased CO_2 levels and on the generally negative impact of decreased precipitation. Several Parties noted that with global warming the growing season would become more intense and that agriculture may otherwise benefit considerably from longer growing seasons and higher temperatures, enabling a wider selection of crops to be cultivated. Future changes in climate are also expected to determine levels of soil erosion, the use of agricultural chemicals, pest control and pasture growth.

102. ***Human health:*** Many Parties reported information with varying levels of detail on a wide range of negative health effects that might result from specific weather and climatic features. These included health impacts from vector-borne diseases; a major spread of malaria in western Europe; and heat stress and thermal adaptation with increased exposure to heat. Most of the reporting Parties indicated that with milder winters cold-related illness could be expected to decrease. The Russian Federation reported the possible effects of extreme changes in climate on diseases of the respiratory systems, sensory organs and blood circulation, and increased morbidity rates.

103. ***Coastal, marine and mountain ecosystems:*** Many Parties assessed the vulnerability and sensitivity of ecosystems to the projected rate and magnitude of climate change. A few ecosystems, such as alpine meadows in the United States and some barrier islands, may disappear in some areas. Other systems such as coastal areas may experience an increase in the risk of flooding and storm damage due to

rising sea levels and associated economic impacts. Australia, France and the United States indicated that coral reefs may experience a further decline in health, or experience a higher incidence of coral bleaching, or die.

104. France, Greece, Italy and Spain reported an increase in the degradation of coastal marshes and intertidal ecosystems on the Mediterranean coast, and Estonia, Latvia, Lithuania, reported similar phenomena for the Baltic coast. Austria, France, Italy, Liechtenstein and Switzerland were among those Parties that reported on the possible effects of climate change on the Alpine region, which might experience perturbation of hydrological regimes. The European Community reported that 50–90 per cent of glaciers in mountain regions would disappear by the end of the 21st century. Canada reported on the possible effects on the thickness of Arctic sea ice and permafrost thawing.

105. ***Fisheries:*** Some Parties (e.g. Canada, Spain, Japan, Norway, United States) reported that climate change is likely to substantially alter the distribution and abundance of major fish stocks such as salmon and tuna. This in turn will have important implications for marine populations and ecosystems, and perhaps the viability of migration paths for marine mammals and other species.

106. ***Drought:*** Australia, Bulgaria, Hungary and the United States reported experiencing several drought episodes of varying intensities during the 20th century, as a result of an overall decrease in mean annual precipitation.

107. ***Infrastructure and service sectors:*** Some Parties provided information on the vulnerability of other sectors or resources such as tourism, energy, transport and biodiversity. However, they also noted that many uncertainties are involved in estimating the economic effects of climate change. Some (Austria, Canada, Germany, Switzerland, United States) outlined the effects of frequent storms on individual sectors of the economy and on infrastructure such as dams, power lines and transportation. Incidents such as flooding, landslides and storms were cited as events that will probably result in an increase in the costs of maintaining infrastructure. Norway indicated that higher precipitation might result in higher electricity production at hydropower installations but also noted that the risk of more frequent flooding would make it necessary to strengthen dams and other installations. However, some Parties (e.g. Austria, Canada, Spain, Switzerland) predicted that any negative changes in seasonal run-off patterns of rivers and lakes where hydropower stations are located would reduce hydroelectricity production.

108. More than half of the Parties reported tourism, especially winter tourism (e.g. Austria, Canada, Italy, Liechtenstein, Switzerland, United States), as one of the sectors that may be affected in the short and long term by variability, extremes and shifts of climate zones.

109. Canada reported that its indigenous communities are vulnerable to climate change. Those in the north of the country would be affected by ecosystem shifts that may be outside the limits of historical memory. Extreme events and unusual fluctuations in temperature can hinder the ability of these communities to maintain their subsistence lifestyles and can also create safety hazards.

110. Several Parties (e.g. Austria, Germany, European Community, Liechtenstein, Switzerland) mentioned that the insurance business, as well as government insurance and relief schemes, are directly affected by catastrophes relating to changes in climate because of their involvement in property insurance against weather events such as storms, flooding and drought. Some Parties (Austria, Germany Switzerland) also highlighted that claims due to natural disasters have risen over the past decade, although it has not been possible to attribute this directly to climate change. Switzerland noted that the property insurance industry is the part of the financial services sector most likely to be directly affected as a result of extreme weather events.

C. Adaptation measures

111. Most Parties described adaptation activities in terms of future programmes and ongoing areas of research and provided information on potential adaptation options, measures or strategies relating to climate change impacts for a wide range of sectors at the national and regional levels.[27] Many of the reporting Parties did not provide a clear indication of the methods used to assess and analyse adaptation options. However, where present, this information is based on studies and findings on climate variability; climate change scenarios derived from GCMs; and sector-specific studies in areas such as agriculture, forests, water resources and coastal, marine and other ecosystems. Most Parties reported on the significant challenges that exist in the development of adaptation strategies as a result of the uncertainties in climate change science and in projections of possible future climate change at the regional or national level, because current downscaling of models is still too coarse. Liechtenstein highlighted the difficulties it faces in transposing the effects of global warming to its territory using global models. With an improvement in resolution, more information on regional effects would ensure that adaptation measures could be better targeted.

112. Some Parties reported that initial work has been undertaken to identify strategic adaptation priorities over the next decades. Potential adaptive measures identified have, so far, been very limited and sector specific, and several communications (Australia, Canada, France, Norway, United Kingdom, United States) reported on efforts by environmental ministries, devolved administrations, provinces, states, territories and cantons to encourage sectoral authorities to take climate considerations into account in their planning processes where relevant. Others (e.g. France, Switzerland), reported on the inclusion of climate change in the preparation or amendment of existing laws governing natural disasters. Most Parties presented a set of strategies for vulnerable sectors and areas where planning horizons are 30–50 years, such as coastal and river flood defence, coordinated approach to infrastructure planning, water resources, forestry and agriculture.

113. Parties also reported an increasing focus on integrated assessments to include economic and cross-sectional analysis of adaptation options. As most of the decision-makers who will be planning for climate change and implementing adaptation strategies are regionally based, such as State, provincial or local governments, many Parties have underlined the importance of ensuring that they have access to information, guidelines and policy advice. To this end, these Parties have developed improved access to such information through briefings, seminars, written material, and web-based information with search capabilities, as well as through networking. Many Parties included in their NC3 details of national websites for additional information on national adaptation to climate change.

114. ***Water resources:*** Most Parties reported on possible adaptation options for water resources and indicated various initiatives under consideration such as water conservation, controlled management of surface water and groundwater; greater emphasis on planning and preparedness for droughts and severe floods; and the establishment of national monitoring systems for water quality and quantity. The United Kingdom reported that climate change projections are taken into account in strategies and plans for water resources management; catchment abstraction management and maintenance of water supplies in drought conditions; and incentives and penalties to encourage more efficient use of water.

115. ***Forestry:*** Many Parties reported on adaptation options for forestry and indicated various forestry management projects including changing harvest schedules and adjusting replanting and species including conservation of the genetic resources of forests; putting other measures in place to improve the stability and autonomous adjustment of forest stand to changing natural conditions; and introducing

[27] See also section VIII.

measures to prevent and combat pests and parasites. Austria and Switzerland reported that legal provisions are in place to allow for public assistance, where necessary, to counteract damage to forests and their protective functions.

116. ***Agriculture and food security:*** Some Parties (e.g. Canada, United Kingdom, United States) noted that there is a large range of potential adaptation options in this sector that will vary depending on the climatic changes involved and on non-climactic factors such as the economy, policies, environment and technological development. The European Community noted that adaptation policies for agriculture should encourage flexibility of land use, crop production and farming systems. Adaptation options highlighted in the NC3 include more efficient irrigation systems; development of new crop varieties that are temperature and moisture tolerant; land-use changes and different farming systems; changes in the regulation of soil water regimes; changes in plant nutrition; protection of livestock from high temperatures; application of livestock breeding systems which will allow reduction of the influence of extreme climatic conditions on production and health of livestock; and modifying subsidy, support and incentive programmes to influence farm-level production and management practices.

117. ***Human health:*** Potential adaptation measures reported in the NC3 to address health impacts include strengthening public health programmes (education and vaccination programmes), supporting methods for early detection of climate-change-related health impacts and developing surveillance systems to detect changes in the occurrence of infectious diseases. The Russian Federation indicated the need to establish a federal database of historical statistics and data on the health of its population and the environmental factors affecting it.

118. ***Flood and coastal defence:*** Several Parties reported on adaptation efforts for flood and coastal defence. The United Kingdom reported that guidance provided by government to flood defence authorities in England and Wales includes allowances for sea-level rise and higher river flows as a result of climate change. Climate change and sea-level rise projections are being used in land-use planning, for preparing long-term shoreline management plans, and river and catchment flood management plans. Several Parties (Canada, Germany, France, Liechtenstein, Netherlands, Norway, United Kingdom, United States) reported on the allocation of additional financial resources for improvements to flood warning dissemination, flood prevention and coastal protection infrastructure.

119. ***Fisheries:*** Several Parties reported on possible adaptation options for this sector, including modifying and strengthening fishery operations and fish monitoring programmes to prevent overfishing and ensure sustainable harvesting; enhancing fish breeding to preserve the genetic diversity of fish populations; restocking areas with robust species; and taking into consideration fish habitat needs in planning and coastal development.

120. ***Infrastructure and service sectors:*** Several countries reported that greater emphasis has been placed on the protection of infrastructure (e.g. Liechtenstein, United Kingdom, United States). Some Parties cited the revision of building codes and regulations to reflect new climate change conditions as being an important adaptation option in the short term. The United Kingdom reported that climate change projections are now used in reviewing building and infrastructure regulations, including technical revisions that may be required to address climate change impacts. Some Parties mentioned other adaptation measures such as incorporating climate change into land use, community and transportation planning.

121. Liechtenstein revised its Tourism Act in the year 2000, based on the principle of sustainability and taking into account the natural environment in preparation for the potential effects of climate change. Germany mentioned that North Sea and Baltic resorts might benefit from warmer temperatures.

VII. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

122. According to the UNFCCC guidelines, Annex II Parties are to provide details of measures taken to give effect to their commitments under Article 4.3, 4.4, and 4.5 of the Convention with reference to years 1997, 1998, 1999 and, if available, 2000.

123. A significant improvement was recorded both in the quality and the quantity of information provided by Annex II Parties in their NC3[28] compared to the NC1 and NC2. Parties made considerable progress in following the requirements of the new guidelines and this is reflected in more effective reporting:

(a) Annex II Parties reported information using a more uniform format and have completed at least two of the four tables requested by the guidelines, with the exception of Belgium which provided information only in a textual format.

(b) All reporting Parties provided information on their contributions to the Global Environment Facility (GEF) and other multilateral institutions. Almost all Parties provided extensive and detailed information on bilateral and regional cooperation projects.

(c) Most of the Parties provided information on specific activities relating to adaptation, in both textual and tabular formats. A general overview can be obtained by an analysis of the relevant tables, which indicates an increase in the share of projects relating to adaptation to climate change.

(d) Some Parties reported information on private sector activities and public–private partnerships that contributed effectively to the transfer of technology to non-Annex II Parties, including examples of innovative initiatives to stimulate private sector participation. However, the number of Parties reporting on the private sector activities is still limited. Although this is only a partial picture, the increased amount of information on the role of the private sector suggested increased interest and involvement of private companies in the Convention process.

(e) Several Parties highlighted activities relevant to supporting the development and enhancement of endogenous capacities and technologies of developing countries, either in textual format or by completing the tables. Information provided by Parties shows that capacity-building activities have been increasing, and this issue affects all sections of the chapter on financial resources and technology transfer.

(f) Although the amount of information reported increased and the reporting format is more standardized than in the previous national communications, there are still gaps. However, it is possible to make an initial comparison of the information provided and draw some conclusions on the flow of financial resources and transfer of technology. In particular, the analysis of the tables provides a wide range of information and examples, leading to an interesting global picture.

A. Financial contributions to multilateral institutions and programmes

124. All Annex II reporting Parties indicated their total contribution to the GEF for a multi-year period or for each of the years 1997–1999 (see table 12). Information provided by Parties makes it possible to analyse the trend of contributions paid to the GEF over the years. However, it is not easy to

[28] Excluding Ireland, Luxembourg and Portugal, which have not yet submitted their NC3. An advance submission from Denmark does not include information on financial resources and technology transfer.

compare this with the information reported by the GEF, because of the different reporting systems used.[29] The information reported about other multilateral institutions focuses on contributions to the World Bank, the United Nations Development Programme, the United Nations Environment Programme, the UNFCCC and some regional banks (see table 13).

Table 12. Financial contributions to the Global Environment Facility (GEF)[a]

Party	Contribution (millions of US$)			
	1997	1998	1999	2000
AUS	2.9 (1996–1997)	5.9 (1997–1998)	3.0 (1998–1999)	3.4 (1999–2000) 5.1 (2000–2001)
AUT	4.1	2.2	2.0	1.9
BEL	30.7 (1995–1998)		29.0 (1999–2002)	
CAN	78.8 (1994–1998)		79.7 (1998–2002)	
CHE	7.4	7.5	5.0	6.4
DEU	53.3	48.8	42.2	not available
ESP	14.6	not available	not available	12.8
FIN	7.6	3.6	5.4	1.7
FRA	143 (1995–1998)		144	
GBR	15.3 (1997–1998)	17.3 (1998–1999)	15.8 (1999–2000)	not available
GRC	1.28	1.30	1.25	1.05
ITA	not available	17.3	not available	3.6
JPN	36.9	143.5	174.0	not available
NLD	8.3	8.2	8.6	8.4
NOR	6.6	7.8	7.8	7.8
NZL	0.7	0.7	0.5	0.9
SWE	not available		53.1 (1998–2001)	
USA	35.0	47.5	167.5	35.8

Note: For an explanation of country codes, please refer to the annex.

[a] The GEF reported the paid total contributions from Annex II Parties as follows (in SDR millions): GEF I (1995–1998) = 1,392.7; GEF II (1998–2002) = 1,215.69.

B. Bilateral activities

125. All Annex II reporting Parties provided information on their bilateral financial contributions relating to the implementation of the Convention, by completing the relevant tables and by providing relevant examples of projects. From the information reported, it can be seen that the energy, transport and forestry sectors are the main areas in which bilateral assistance is provided, both in developing countries and in EIT countries. An increase in the share of bilateral projects has been recorded particularly in capacity-building, as well as in agriculture and coastal zone management. The regions receiving the largest amount of bilateral financial resources are Asia and the Pacific and Africa.

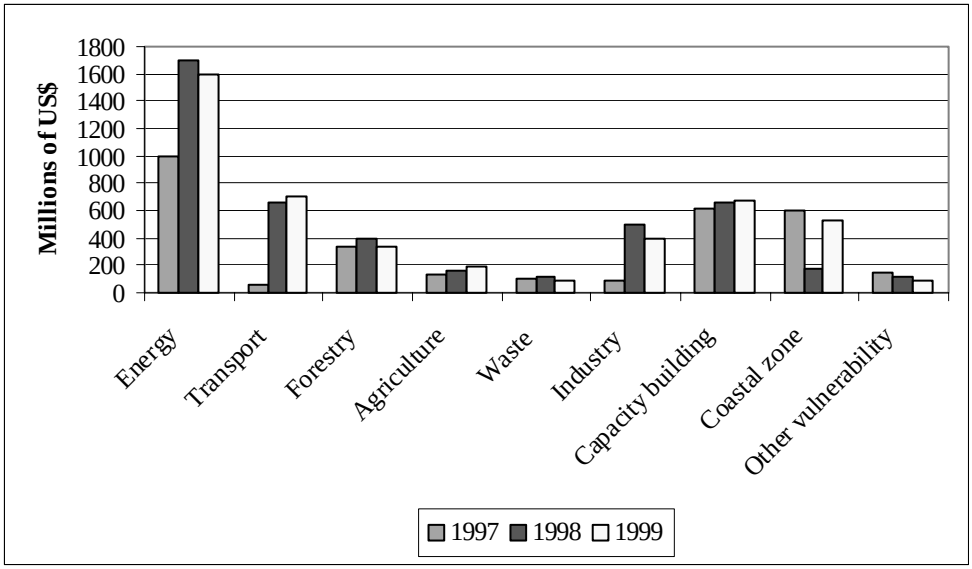
126. In the energy sector, bilateral assistance is aimed at the improvement of energy efficiency, planning and management, and utilization of renewable energy sources, as well as energy planning and

[29] The GEF reported on contributions by replenishment periods, i.e. GEF 1 and GEF 2, expressed in Special Drawing Rights (SDR) millions. Parties reported on yearly contributions expressed in US$ or other national currencies.

market reform. Projects in the forestry sector seek to improve forest management, create protected areas and increase afforestation. Aid in the agriculture sector is directed to facilitating sustainable land-use, soil management, and protection against desertification. Integrated coastal zone management, protection against sea-level rise and capacity-building (see sub-section G), receive most of the support targeted to adaptation (see table 14). On the basis of the information reported by Parties it is possible to make an initial assessment of the bilateral support of Annex II Parties by sectors over the period 1997–1999 (see table 15 and figure 24).

127. Some Parties described at length specific bilateral initiatives established to assist developing country Parties to address the various aspects of climate change. Examples are the French Fund for the Global Environment (FFEM), the Netherlands Climate Change Studies Assistance Programme (NCCSAP), the German initiative "Protecting the future through climate protection", and Canada's Climate Change Action Fund. The United States described three major bilateral initiatives: the U.S. Initiative on Joint Implementation, the U.S. Country Studies Program and the Climate Change Initiative. The European Community indicated its numerous programmes of bilateral cooperation in a wide range of sectors relevant to climate change to support Accession countries. Other Parties (e.g. Japan, Netherlands, Norway, Switzerland) provided detailed information on their past and ongoing Activities Implemented Jointly (AIJ) projects.

Figure 24. Bilateral financial contributions by sectors, 1997–1999[a]

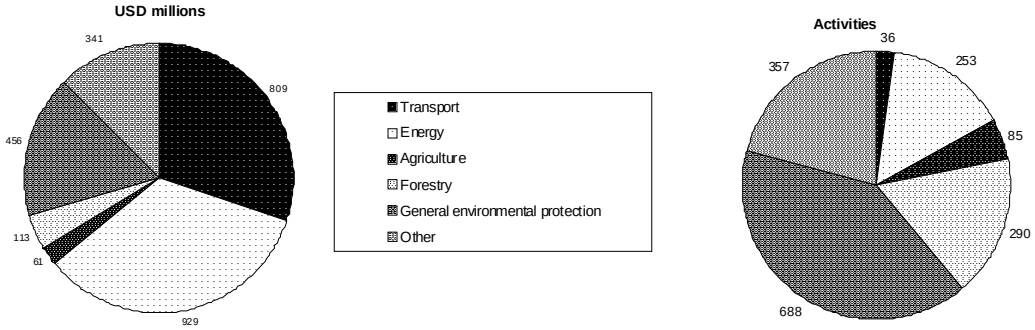


[a] The figure includes an estimate of the United States official development assistance (ODA) or direct contributions made from the reported figures, which included other categories such as commercial sales and indirect financing.

128. In 2000 the Development Assistance Committee of the OECD (OECD/DAC) completed a pilot study aimed at identifying in their statistics the amount of bilateral ODA from OECD countries targeted to the objectives of the Rio Conventions, including the climate change convention. Following the pilot study, which was limited to 1998 financial flows, the OECD/DAC conducted a project to assess the financial flows for the period 1998–2000. The results of the project, published in 2002 and summarized in figure 25, are encouraging. If this data collection using the so-called "Rio markers" continues on a regular basis, Parties may report on their climate-change-related aid using a common platform, thus making it easy to compare the data. Future refinements could include additional in-depth analysis of specific sectors.

129. Some Parties already reflected their ongoing experience with the OECD/DAC in NC3. For example, Norway presented its bilateral and regional financial contributions according to OECD/DAC specific main sectors; Sweden stated that since 1998 all Swedish projects have been classified in accordance with the OECD/DAC system for classifying the environmental relevance of projects; and Netherlands highlighted the ongoing efforts of OECD countries to obtain data that will make it possible to distinguish between funding for mitigation and for adaptation projects.

Figure 25. US$ 2,707.7 million in 1,708 projects (average 1998–2000)



Source: Aid targeting Rio Conventions, OECD 2002

C. New and additional financial resources

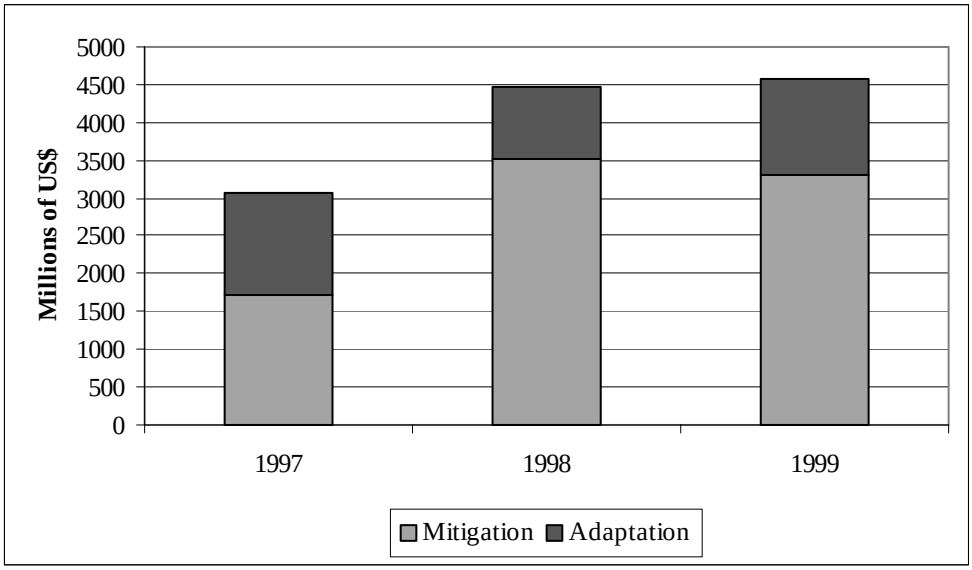
130. Nine Parties (Austria, Canada, Germany, Finland, Italy, Japan, Netherlands, Sweden, United Kingdom) provided information on this issue, but the criteria for determining new and additional resources differed. Austria, Finland, Germany and Italy identified their contribution to the GEF as "new and additional" resources. Canada reported that in addition to its ongoing development assistance efforts, it provides new and additional funding for climate change to the GEF. Japan listed its support to the GEF and the IPCC as measures concerning new and additional financial resources. The Netherlands indicated that, starting from 1997, a sum amounting to 0.1 per cent of GNP has been earmarked yearly to make available new and additional means on top of regular development assistance budgets. Sweden indicated that most of its new and additional support is provided via the GEF. The United Kingdom listed a number of initiatives as new and additional financial resources, including its contribution to the GEF.

D. Adaptation

131. Almost all Parties referred to bilateral projects and programmes that will help countries to adapt to climate change, but the quality and quantity of information provided is still variable. Some Parties indicated that it was difficult to single out the adaptation component of a climate change project; others indicated that projects designed to achieve sustainable development can be considered as indirectly intended to adapt to the adverse effects of climate change.

132. Analysis of the relevant tables shows an increase in the share of projects addressing adaptation issues (see figure 26, based on the data contained in table 14). This is confirmed by the increased capacity of Parties to clearly identify adaptation projects and the amount of information provided in NC3 on these projects.

Figure 26. Bilateral financial contributions directed to mitigation and adaptation, 1997–1999[a]



[a] The higher shares of adaptation activities in 1997 and 1999 are influenced by considerable contributions from Japan to coastal zone management projects.

133. The adaptation activities receiving most support are the ones suggested by the guidelines: capacity-building and coastal zone management. The former in particular has been seen as a cross-cutting aim in all projects relevant to climate change. Some Parties described projects aimed at assessments of vulnerability, disaster preparedness, and response and risk management as key components of adaptation policies. Other sectors included integrated water management, prevention of desertification, and support of meteorological networks and monitoring of extreme weather events. It was also noted that much of the bilateral assistance directed toward sustainable forestry management and agriculture would also facilitate adaptation to climate change. The ongoing effort of OECD countries to develop a set of "markers" to distinguish between climate-related funding and other environment-related funding in the OECD/DAC statistics (see also sub-section B), could provide additional relevant information on bilateral aid targeted to adaptation.

E. Transfer of technology

134. Eleven Parties (Australia, Austria, Belgium, Canada, Germany, Finland, Japan, Netherlands, Norway, Sweden, United Kingdom) included a separate section on transfer of technology in their NC3, and the other Parties reported relevant activities in their description of multilateral and bilateral cooperation or provided examples of technology transfer projects[30] in tabular format.

135. Parties participating in multilateral cooperative initiatives such as the International Energy Agency's Greenhouse Gas Technology Information Exchange (GREENTIE), the Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADETT) and the Climate Technology Initiative (CTI) highlighted the important role played by these initiatives in enhancing the transfer of technology.

[30] Details of these projects are compiled in a table available on TT:CLEAR (http://ttclear.unfccc.int).

136. None of the reporting Parties made a clear distinction between “hard” and “soft” technology as requested by the guidelines. However, most Parties provided a great deal of information on capacity-building activities including training and research, and the “hard/soft” distinction can be retrieved from that (see also sub-section G).

F. Private sector

137. Canada and Japan provided a substantial description of activities undertaken by their governments to involve the private sector in projects and programmes relating to the transfer of technologies that will help developing country Parties to mitigate or adapt to climate change. The United States described in detail the assistance provided to the private sector, as well as a number of public–private partnership activities already established to help address climate change in developing countries and EIT countries. This information is complemented by an indication of direct commercial sales and indirect financial flows for 1997–2000.

138. Some Parties described policies or programmes relating to the private sector. For example, Germany supported (via targeted loans) the introduction of new technologies into developing countries by small and medium-sized German companies. The Netherlands, among other initiatives, presented the concept of green certificates, allowing tax exemptions for companies investing in a green project elsewhere. Other activities were reported by Italy, Sweden and the United Kingdom. Several Parties indicated their plans to ensure greater involvement of private entities in ongoing activities relating to the Kyoto Protocol mechanisms.

139. Among the initiatives reported by Parties in facilitating private sector participation in the transfer of environmentally sound technologies, a few main categories can be identified: financial support for the development and commercialization of private-sector technologies to mitigate and adapt to climate change; facilitation of information sharing and personal contacts between private-sector technology producers and potential users of these technologies such as web-based databases and information clearing houses; provision of financial guarantees against risks in international transactions; and technical assistance for members of the private sector seeking to make their technologies available to non-Annex II Parties.

G. Capacity-building

140. The UNFCCC guidelines requested Parties to report information on steps taken by governments to support the development and enhancement of endogenous capacities and technologies of developing countries.

141. Nine Parties (Australia, Belgium, Canada, Germany, Japan, Netherlands, Norway, Sweden, United States) included a separate section on capacity-building in their NC3. Other Parties reported capacity-building activities in their bilateral projects, or by completing the relevant table with respect to adaptation. The Netherlands also made a distinction between its support for capacity-building activities for mitigation and adaptation.

142. The fields of activity which received most of the support are: training and education; the preparation and implementation of national environmental strategies and plans, including GHG inventories; vulnerability assessments; institutional development; research institutes; environmental management; disaster preparedness including climate change monitoring and response programmes; the participation of non-Annex II representatives to meetings and workshops; and capacity-building activities relating to the development and implementation of clean development mechanism/joint implementation (CDM/JI) projects.

143. Information reported in other parts of national communications, such as education, training and public awareness, is also relevant to this activity (see FCCC/SBI/2003/7/Add.4).

Table 13. Financial contributions to multilateral institutions and programmes in the period 1997–2000 (millions of US$)

Donor	Years	Multilateral institutions										
		WB	IFC	AfDB	AsDBa	EBRD	IADB	UNDP	UNEP	UNFCCC	Others	Scientific (total)
AUS	96/97	100.3	4.3		60,8	1		7	0.8	0.09	4.3	
	97/98	86.6	4.6		78.7			4.3	0.3	0.2	4.2	
	98/99	80.5	5.6		71			4.1	0.3	0.1	4	
	99/00	80.6	5.3		70.3			4.4	0.3	0.2	9.5	
	00/01	66.1			72.7	8.5		4	0.3	0.2	8.7	1.4
AUT	97	373.1	1.7	8	127.9	2.5	391				589.5	1.6
	98	47.1		10.5	138.5	3.9	933				749.7	1.4
	99	39.9		8.6	120.3	6.4	493				52.7	
	00	584.3		362.9	118.8	8.1	643				609.8	1.5
CAN	96/97	162.3	6.6	28.5	3.2	0.7	4	30.4	1.1	0.4		1.4
	97/98	145.3		37.2	28.2	1.3	3.7	27	1	0.3		1.8
	98/99	241.4		47.3	29.2	6.3	0	23	1	0.3	2.8	17.7
CHE	97	72.8	3.6	20.1	16.1	1.4	10.3	40.2				25.5
	98	31.7		35.4	7.5	3.9		41.6				13
	99	83.2		28.9	11.1	4.1	2	32.7				3.4
	00	83.9		52.4	6	4.4		29.6				
ESP	97	44.1		11.3	8.9	3.8	5.4				20.4	
	98	56	0.9	13	13.4	2	6.4				21.3	
	99	64.9		11.1	0.1	13.1	19.5				8.5	
	00	33.3		4.7	0.2	5.3	14.3				6.9	
EC	97					516.3[a]		113.7[b]	2[c]	0.1		
	98					0.1		13.9	3.3	0.2		
	99					4.8		13.4	3.2	0.1		
	00					3.8		12.5	3.5	0.2		
FIN	97	13.7		4.2	3.9	27.5	1.8				138	
	98	10		5.6	3.7	28.5	1.6				150	
	99	13		11.5	4	25.7	1.8				129.6	
FRA	97	281.6	11	104.6		22.3	7.6				114.6	
	98	234.6		91.4	29.3	7.5	7.4	7.4	7.4	0	120.2	
	99	212.5		87.3	27.1	7.2	8.4	7.2	7.2	0	112.3	
	00	224.7		75.2		1.6	0	6.5	6.6	0	117.6	
GBR	97/98	0.3	23.4	53.1	3.9	1.2	37.3	0.3	0.05	0.8	3.8	
	98/99	0.3	30.6	50.9	13.1	2	49.3	0.5	0.03	1.1	3.7	
	99/00	0.3	24.3	50.3	14.9	2.4	53.2	0.2	0.2	1	3.3	
GRC	97	4.2				2.1		0.2	0.5		0.6	
	98	3						13.8	0.3		1.3	
	99	3.4				10.8		13.5	0.4		0.6	
	00	3.2				16.8		12.4	0.6		0.5	

Table 13. (*continued)*

Donor	Years	Multilateral institutions										
		WB	IFC	AfDB	AsDBa	EBRD	IADB	UNDP	UNEP	UNFCCC	Others	Scientific (total)
ITA	97	20.9	0.6			0.3	1.3	38.4	0.7	0.4	15.6	
	98	331.8	0.6	33.9	26.3		18.6			0.4	16.6	
	99	300.6	1.1	0.3	0.2		6.4			0.5	77.6	
	00	13.8	0.9	3.2			11			0.6	45.6	
JPN	97	152.1	4.7	1.6	81.1	21.8	17.1	99	6	0.2	13.6	
	98	142.6	4.9		59.1	10.5	11.3	80	4.9	0.07	11	
	99	87.2	2.9		251.4	9.3	8.8	80	4.8	0.2	11.2	
NLD	97	13.7						17.4	1		5.4	
	98	25.6						16.8	1	0.2	11	
	99	43.9						14.2	1.2	0.2	7.6	
	00	21.5						13	1.8	0.2	7	49.1
NOR	97	81.7	1.6		0.3		0.7	79.7				47.3
	98	59.8			0.3	3.7	0.8	80.2	2			40.4
	99	54.6		0.9	0.3	3.7	0.7	76.4	1	0.03		48.3
	00	33.4		0.9	0	3.4	0.6	90.8	0.7	0.1		1.5
NZL	97	0.5	0.5		6.5			2.9				2.1
	98	0.4	0.2		4.5			2.3	0.05	0.01		1.7
	99	0.4	0.2		4.6			2.3	0.01			1
	00	0.3	0.2		3.5			2	0			11
SWE	97	124.6		28.9	14.8	2.6	2.2	93	6.1	0.1	184	9.4
	98	122.5	2.2	34	22	6.7	1.8	86.8	6.6	0.2	190.6	13.2
	99	101.7		16.8	22.1	6.7	1.4	88.4	5.6	0.2	183	2.7
USA	97	700	6.7		113.2	11.9	25.6	76	11	2.6		2.5
	98	1034		45	150	35.8	25.6	93.7	9	3.9		4.7
	99	800		128	223.2	35.8	25.6	97.4	12	3.8		3.6
	00	771.1		131.1	90.7	35.8	25.6	77.9	10	4.9		0

Note: For an explanation of country codes, please refer to the annex.
WB = World Bank, IFC = International Finance Corporation, AfBD = African Development Bank, AsDB= Asian Development Bank, EBRD = European Bank for Reconstruction and Development, IADB= Inter-American Development Bank, UDEP = United Nations Development Programme, UNEP = United Nations Environment Programme, UNFCCC = United Nations Framework Convention on Climate Change.

[a] 1992–1998.
[b] 1997–1999.
[c] 1997–1999.

Table 14. Bilateral financial contributions related to adaptation in the implementation of the UNFCCC, 1997–2000 (millions of US$)

	Capacity-building				Coastal zone management				Other vulnerability assessments			
Donor	**1997**	**1998**	**1999**	**2000**	**1997**	**1998**	**1999**	**2000**	**1997**	**1998**	**1999**	**2000**
AUS	0.07	0.05	0.8	0.8	0	0	0.02	0.3	1.3	0.9	1.0	1.1
AUT												
CAN	21.6	24.5	32.9		2.3	4.2	2.3		0.8	1.1	2.1	
CHE												
DEU									70.8	16.4	9.1	
ESP		1.1	1.4	1.8								
EC												
FIN	0.09	2.6	4.7		0.2	0.7	0.5		8.5	1.9	2.7	
FRA												
GBR												
ITA	2.9	4.9	3.7	3.0		0.6				0.09	0.04	0.04
JPN[a]	43.2	48.9	46.6		589.3	145.5	497.9		51.1	81.0	42.0	
NLD												
NOR			0.6	0.5								
NZL	0.7	1.6	1.6	2.2	0.3	0.6	0.4	0.2	0.02	0.02	0.03	
SWE	3.0	34.8	31.3	35.7	0.4	4.3	6.7	3.2	11.5	19.1	27.0	21.7
USA[b]	779.11	754.6	2 484.7	943.24	9.1	15.5	5.2	22.2	1.9	2.0	2.9	3.4

Note: For an explanation of country codes, please refer to the annex.

[a] Figures shown in the table are obtained by adding loan aids, grant aids and technological cooperation presented in three separate tables by Japan.

[b] Figures in the table include direct financing and commercial sales.

Table 15. Bilateral financial contributions related to mitigation in the implementation of the UNFCCC, 1997–2000 (millions of US$)

	Energy				Transport				Forestry				Agriculture				Waste management				Industry			
Donor	97	98	99	00	97	98	99	00	97	98	99	00	97	98	99	00	97	98	99	00	97	98	99	00
AUS[a]	21.4	3.3	1.6	3.7	0.7	0.04			8.8	8.4	8.7	11.2				1.1					1.8	2.9	3.3	0.4
AUT	3.7	2.5	3.7		0.3	0.2	0.01		0.7	2.0	1.0													
CAN	151.9	132.4	152.6		4.1	2.0	3.0		14.8	25.6	41.0		7.8	12.9	20.3		7.8	10.8	9.8		24.0	21.9	21.3	
CHE	2	1.6	0.9	0.7	1.2	1.2	2.1	1.7				0.01									1.3	1.3	1.1	1.0
DEU	193.4	218	92.7		45.4	50.8	12.9		48.6	66.9	54.8		5.4				44.7	31.4	51.6		1.4	6.6	6.1	
ESP		0.3	0.2	0.3						1.7	2.8	2.3		4.2	4.6	4.9		1.5	1.1	1.2		0.9	0.7	0.7
EC[b]	324.8	487.5			495.7	1 042			57.7	67.4			199.2	413.4										
FIN	0.2	2.4	5.0				2.4		5.9	21.5	1.6		6.0	9.0							0.8			
FRA		56.5				4.3								4.7										
GBR[c]	139.5		110.6	131.0					37.3		30.1	34.5	101.0		91.9	140.5								
ITA	1.7	0.09	7.2	0.07						0.02	0.5	0.1	1.4	0.2	1.7	0.9	0.1	0.03	0.03	0.02				
JPN[d]	188.0	875.6	859.1			586.8	673.3		94	125.2	78.2			19.2			44.6	59.7	7.8		51.6	457.5	351.4	
NLD	12.2	16.5	16.1	17.9																				
NOR			63.1	54.3																				
NZL	0.4	0.2	0.4	0.2					2.4	2.2	1.9	0.9	1.7	1.3	1.3	1.4			0.04	0.1	0.03	0.01	0.02	0.04
SWE	26.0	25.6	31.2	34.0	1.0	3.4	2.6	1.9	8.0	3.2	3.0	2.5	7.6	6.5	8.2	10.6	0.6	1.3	1.6	1.3	1.7	4.7	5	6.8
USA[e]	325.5	390.5	523.8	624.4	4.7	8.6	6.8	5.2	159.8	83.3	81.3	114.9	0.4	0.09	3.3	27.9	0.1	39.0	0.7	1.0	1.8	4.0	6.4	6.7

Note: For an explanation of country codes, please refer to the annex.

[a] The Australian financial year is from 1 July to 30 June.

[b] EC figures were not included elsewhere since “With the classification used within the EU it has not been possible to identify only those parts directly relevant to climate change”.

[c] The United Kingdom reported its contributions for 1997–1998, 1998–1999 and 1999–2000.

[d] Figures shown in the table are obtained by adding loan aids, grant aids and technological cooperation presented in three separate tables by Japan.

[e] Figures in the table include direct financing and commercial sales.

VIII. RESEARCH AND SYSTEMATIC OBSERVATION

A. Reporting issues

144. All Annex I Parties included information on research and systematic observation in their NC3. The level of detail of reporting varied considerably, in most cases depending on the comprehensiveness of Parties' activities in these areas. The status of reporting on research and systematic observation by Parties is presented in Table 16. Specific research areas and activities in different observational domains of climate observations are indicated separately in the table.

145. In general, Parties followed the UNFCCC guidelines. However, in about half of the national communications reporting on **research** was structured according to national research programmes, planning or infrastructure, rather than following the structure proposed in the guidelines. For that reason reported research activities were often divided into three categories: issues relating to scientific aspects, including modelling of climate processes; climate change impacts and adaptation; and climate change mitigation.

146. Most Parties reported on their research activities in a summary form, as requested in the guidelines. Some Parties nevertheless provided detailed results of research studies, such as observed historical trends in mean climatic characteristics and climate variability. Notably, Parties presented the results of studies on climate change impacts and adaptation, including climate modelling and prediction, in greater detail when describing impacts and adaptation measures (see section VI). Similarly, results of studies on mitigation technologies and on effects of measures taken were integrated in the reporting on policies and measures (see section IV). Some of the research results are mentioned in section IX.

147. Reporting on **systematic observation** followed the guidelines more closely. Twenty-two Parties (23 of them listed in document FCCC/SBSTA/2002/INF.15, plus Germany) submitted detailed reports on systematic observation[31] in accordance with the separate UNFCCC reporting guidelines on the global observing systems for climate.[32]

B. General policy and funding of research and systematic observation

148. Almost all Parties referred to their general policy, planning, and infrastructures and also presented data on funding of research and systematic observation.

149. Some Parties (e.g. Australia, Belgium, Canada, Japan, Netherlands, United States) noted that they have special national research plans and long-term strategies in different areas of climate change research. The United Kingdom and Norway indicated that research activities were coordinated by a high-level research committee or council. Several Parties (Bulgaria, Hungary, Liechtenstein, Monaco) indicated that they included climate change in research programmes on other environmental and energy-related issues or conducted research on the basis of ad hoc projects.

150. In most countries research was carried out by government-funded research institutions and by universities. Some Parties with comprehensive climate research activities (e.g. Australia, Canada, Japan, United Kingdom, United States) indicated that special funds have been established for climate change research. Most of these Parties also reported specific figures (giving absolute values or percentages of

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[31] For detailed information see documents FCCC/SBSTA/2002/INF.15, containing the compilation and synthesis of reports from 23 Parties on systematic observation, and FCCC/SBSTA/2002/MISC.10, containing an interim report by the GCOS secretariat on the preparation of the report on the adequacy of the global observing system for climate.

[32] See FCCC/CP/1999/7.

GDP) allocated for climate change research in their countries. A few EIT countries noted that climate change research is carried out with international and/or bilateral support.

151. Almost all Parties noted involvement of several governmental bodies, agencies and research institutes in systematic observation, organized hierarchically. Most Parties identified agencies responsible for ground- and space-based observations.

152. Information on data exchange and capacity-building in developing countries was reported in relation to research as well as to systematic observation. For example, the European Community submission included data for each of its member States on contributions in research cooperation and on training activities for developing countries and EITs. Several Parties (e.g. Canada, Sweden, United Kingdom, United States) mentioned collaboration with and providing training to researchers in developing countries and EITs within cooperative programmes in the areas relating to the scientific basis of climate change, impacts and adaptation and mitigation studies.[33] The United Kingdom and the United States noted that they made model data available to the national and international research community. Most Parties reported on data management, quality, and opportunities for free and open exchange of data. Reporting in relation to atmospheric observations was the most comprehensive.

C. Research

153. Most Parties addressed domestic and international research[34] activities and identified priority areas for national climate change research. Parties widely reported on their participation in projects of the World Climate Research Programme (WCRP), the International Geosphere-Biosphere Programme (IGBP) and the International Human Dimensions Programme on Global Environmental Change (IHDP). Furthermore, Parties described bi- or multilateral research activities within organizations, such as the Asia-Pacific Network on Climate Change or the DIVERSITAS programme, and cooperative modelling initiatives or research carried out at international agencies (e.g. the IEA). A number of Parties mentioned their membership in the International Group of Funding Agencies. European Community member States frequently referred to their involvement in research projects coordinated by the European Community.

154. Most Parties reported on their active participation in and support of the work of the IPCC. Many of them (e.g. Australia, Canada, Japan, New Zealand, United Kingdom, United States) noted that the results of their research on the scientific basis, impacts, adaptation and mitigation contributed greatly to the IPCC Third Assessment Report (TAR).

1. Climate processes and system, climate modelling and prediction

155. Almost all Parties reported on their research activities regarding climate process and system studies as well as modelling and prediction. Most Parties mentioned studies to observe climate and to identify historical trends, in some cases including paleoclimatic studies. Parties that possessed general GCMs (Austria, Canada, Germany, France, Japan, Netherlands, New Zealand, Sweden, United Kingdom, United States), reported on their experiments and research in the area of climate processes, which often include climate predictions and studies of future regional climate change. Many Parties (e.g. Bulgaria, Czech Republic, Hungary, Slovakia, Spain) also reported on the use of outputs from GCMs to predict future regional climate change using downscaling techniques.[35]

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[33] More details on support for developing countries in these areas can be found in section VII.

[34] Many Parties followed a structure of reporting that departed from the guidelines, for reasons explained in the text. In this document the information is therefore summarized in three main categories: process and system studies including modelling and prediction; impacts, vulnerability and adaptation; and mitigation studies. The latter two include information on corresponding socio-economic studies and research on technologies.

[35] Methods used by Parties are specified in section VI.

156. Some Parties (Canada, Japan, Norway, Spain, United Kingdom, United States) noted advances in research on climate processes, climate modelling and prediction, including detailed assessments of the likely contribution of human activities. They provided information on long-term atmospheric CO_2 levels, the risks for large-scale processes (such as changes of the North Atlantic circulation, polar vortex or intertropical convergence zone) posed by climate change, Atlantic thermocline circulation mapping in global carbon circulation, etc. Many of these results were mentioned to have contributed to the TAR.

2. Impacts of and adaptation to climate change

157. In this area, most Parties focused on key priority sectors such as agriculture, water resources, fisheries and coastal zones, as well as on the biophysical impacts of changes in mean temperature and precipitation on natural ecosystems. Almost all reporting Parties mentioned the use of sophisticated sectoral impact models and integrated models in their assessments. Many Parties (Australia, Canada, New Zealand, United States) mentioned that the results of their research contributed directly to the TAR.

158. Fewer Parties reported on socio-economic analyses of the impacts of climate change. Several Parties (Australia, Japan, Netherlands, New Zealand, Sweden) mentioned studies on the economic effects of sea-level rise or droughts, or on historical effects of climate variability. Some Parties (e.g. New Zealand) noted that comprehensive quantitative assessments of net costs of climate impacts were not yet well developed.

159. The research on climate change impacts and vulnerability was, in most cases, related to research on adaptation to climate change. Ongoing studies on adaptation included the assessment of different adaptation options in different priority sectors; studies on interdisciplinary approaches to adaptation to climate change; and development of adaptation strategies together with stakeholders. Several Parties reported on research networking and collaborative efforts in this area. Some Parties (Canada, Germany, Finland, New Zealand) reported on their efforts to incorporate consideration of sustainable management and of development and risk assessments into the assessments of vulnerability and adaptation measures in important economic sectors, such as agriculture, water resources, health, and coastal zones and settlements. Research results and methods used for assessments of impacts and adaptation are presented in more detail in table 17.

3. Mitigation of climate change

160. Research reported by Parties targeted several main objectives, including higher efficiency of energy supply and use, developing renewable energy sources, and enhancing natural take-up of CO_2 from the atmosphere. Most Parties noted the direct relevance of these activities to the development of national climate change strategies. The research on mitigation in different sectors directly corresponds to key policies and measures reported by Parties and mentioned in chapter IV.

161. Most Parties described their research on development of new technologies, particularly renewable energy resources, end-use technologies with higher energy efficiency, and fuel cells. Research was also under way to optimize the energy efficiency of transportation systems. A number of Parties (e.g. Netherlands, New Zealand) mentioned that their research was specifically targeted to assess technologies and measures to meet their Kyoto targets and post-Kyoto requirements. Several Parties reported on extensive research into forest carbon sinks and pools (e.g. Canada, Finland, New Zealand, Norway, Russian Federation) and studies on mitigation technologies and measures in agriculture and waste management (Finland, France, Japan, New Zealand, Sweden, United States).

162. Almost all Parties reported on socio-economic analyses of the impacts of different mitigation measures and policies on national economy and stated that these analyses were well developed. Parties studied combinations of different policy instruments for climate change mitigation within different sectors. A number of Parties (Belgium, Canada, European Community, Estonia, France, New Zealand,

Poland, Slovenia, Sweden, United Kingdom) noted the need for more studies on how to integrate climate change mitigation into the development of objectives, especially in the energy sector.

163. Parties mentioned research programmes covering issues relating to inventories (Finland, United Kingdom), such as measurements of emissions and developing specific emission factors from soil.

D. Systematic observation

164. Twenty-two Parties reported on the status of national plans and/or national policy guidance on systematic observation. Some Parties (Australia, Canada) reported the existence of specific national plans or of a national Global Climate Observing System (GCOS) secretariat (Germany). Several Parties (Australia, Canada, France, Japan, Sweden, United Kingdom, United States) have instituted internal mechanisms to ensure the coordination of climate activities. Parties that reported on national policy guidance (e.g. Canada, France, Japan) noted that this linked their observational programmes more directly to their national needs.

165. Most Parties provided information on data exchange in different areas of observation. All Parties noted that international agreements regarding data exchange were adhered to in principle and that much of the GCOS data were being exchanged and, in particular, supplied to international data centres. This was particularly the case for operational systems such as meteorological and atmospheric systems. Parties noted that terrestrial and oceanographic systems were currently mostly research-based. A number of Parties (Bulgaria, Canada, European Community) provided information on some of their activities on management and operation of data and on collaborative efforts in this area. A few barriers to the exchange of data were reported, such as financial restrictions and the need for technical assistance and capacity-building (Bulgaria, Croatia) or potential non-regulated commercial use of data (Finland).

166. About half of the Parties reported in general terms on the adherence of their systems to the GCOS best practices and climate monitoring principles,[36] including long-term continuity of data. It is clear that not all monitoring principles and best practice guidelines are being met, and that they represent a challenge for even the most developed countries. Continuity of homogeneous time series appears to be at risk in many areas.

1. Atmospheric observations

167. Most Parties (see Table 16) provided summary information on the status of meteorological and atmospheric networks and their components, such as the GCOS Surface Network (GSN), the GCOS Upper-Air Network (GUAN), and the World Meteorological Organization (WMO) Global Atmosphere Watch (GAW). The meteorological and atmospheric stations comprehensively exchanged data with international data centres. Only a small number of GSN and GUAN stations did not provide data to international data centres in a timely fashion, and a small percentage of GAW observations did not reach relevant data centres.

168. Many Parties reported the use of standard quality control procedures for data and retention of these data in accessible archives. Several Parties (Australia, Austria, Canada, France, Japan, Netherlands, New Zealand, Switzerland, United Kingdom, United States) reported that some of their metadata were available (although not usually online).

169. Parties recognized that ongoing automation and site relocations can potentially disrupt the homogeneity of the data record. For example, Sweden, Switzerland and the United States mentioned significant changes in networks.

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[36] See FCCC/CP/1999/7.

170. Several Parties reported on measurements of atmospheric constituents, such as CO_2 (e.g. Poland, Russian Federation), ozone (e.g. Greece, Sweden) and atmospheric pollutants (e.g. Greece, Russian Federation).

2. Oceanographic observations

171. Most Parties reported on maintaining the key elements and components of the Global Ocean Observing System (GOOS). Oceanographic data were successfully exchanged under the GCOS umbrella, although to a slightly lesser extent than atmospheric data. Some of the data were available in real time and almost all were available to international data centres. Parties generally rated the data quality as acceptable.

172. Most reporting Parties expressed concern that short-term research programmes and the modification of those programmes to allow continuous operational observations could adversely affect the continuity and quality of observations and data.

3. Terrestrial observations

173. Most Parties reported on terrestrial observations, as requested in the guidelines. Data exchange was limited. With the exception of observations of fire, snow melt and flooding, the need to provide day-by-day services did not exist to the same degree as for atmospheric and oceanographic observations.

174. Parties noted that adherence to such fundamental principles of global observations as continuity and homogeneity was problematic for the terrestrial domain, since most the current terrestrial observing programmes were relatively short-term scientific projects.

4. Space-based observational programmes

175. Four of the reporting Parties (Canada, Japan, Sweden, United States) produced raw data, two (Japan, United States) had extensive satellite programmes and two (Canada, Sweden) operated one specialized satellite each. The European Community report also provided some information on activities of the European Space Agency (ESA), which is the primary raw data producer for the European countries.

176. Other Parties reported on their contributions to satellite-based efforts for climate purposes, comprising areas such as instrument development, algorithm development, quality control and analyses of data, and the hosting of ground stations for satellites. Most Parties reported using satellite data or derived products in their routine weather and climate operations and for various land monitoring purposes. The high level of participation in satellite applications indicated the increasing and fundamental importance of satellite information.

5. Capacity-building in developing countries

177. About half of the Parties (see table 16) reported specifically on their activities in support of developing countries, including the support to observing networks, equipment, training and assistance in the preparation of workshops. Several Parties noted new and planned commitments, e.g. financial resources for essential observations (United States), recently allocated funds for restructuring measures in developing countries (Finland), continuing support to GCOS-related workshops for the Asia–Pacific Network on Climate Change (New Zealand), and general strengthening of capacity-building in developing countries (Switzerland).

Table 16. Overview of reporting by Parties on research and systematic observation

Annex I Party	General reporting				Research					Systematic observation					
	General policy and funding	Data exchange	Capacity-building	International activities	Climate process/ system studies	Modelling / Prediction (e.g. GCM)	Impact / socio-economic studies	Mitigation of climate change	Adaptation to climate change	*d*	A	O	T	S	D
AUS	x			x	x	x	x	x	x	x	x	x	x	x	x
AUT	x				x	x	x	x	x	x	x		x	x	x
BEL	x			x	(x)	(x)	(x)				x	(x)	x	x	
BGR	(x)	x		(x)	x	x	x	x	x		x	x	x		
CAN	x			x	x	x	x	x	x	x	x	x	x	x	x
CHE	(×)			×	(×)	(×)	(×)			×	×		×	×	×
CZE	×	×	(×)	(×)	×	×	×				×				
DEU	×	×	×	x	×	×	×	×		×	×	×	×	×	
EC	×	(×)	×	×	×	(×)	×	×	×	×	×	×	×	×	×
ESP	×	(×)		×	×	×	×			×	×	×	×	×	(×)
EST	(×)			(×)			(×)	(×)	(×)						
FIN	×	×		×	×	×	×	(×)	(×)		×	×	×		×
FRA	×		(×)	×	×	×	×	×		×	×	×	×	×	
GBR	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
GRC	×		(×)	×							×	×	×	×	×
HUN	×	(×)		×	×		×	×			×				
ITA	×	(×)		×	(×)	(×)									
JPN	×	×	×	×	×	×	×	×	×		×	×	×	×	×
LIE	×		×	×				(×)							
LVA	×	×					×	×			×	×	×		
MCO								×							
NLD	×	×	×	×	×		×	×	×	×	×	×	×	×	×
NOR	×				(×)	×	×	×	×			×	×	×	
NZL	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
POL	×			×	(×)		×		×		×	×	×	×	(×)
RUS	×				×		×				×	×	×	×	
SVK					(×)	(×)	(×)								
SWE	×				×	×	×	(×)	(×)	×	×	×	×		×
USA	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×

Note: For an explanation of country codes, please refer to the annex.

× = addressed in the report, (×) = generally mentioned in the report, but not specifically addressed.

d = detailed report on systematic observation provided, A = atmospheric observing system, O = ocean climate observing system, T = terrestrial climate observing system, S = space-based observations, D = support for developing countries.

IX. EDUCATION, TRAINING AND PUBLIC AWARENESS

178. Almost all Parties dedicated a separate chapter to reporting on initiatives relating to education, training and public awareness (Article 6 of the Convention). These issues continued to feature prominently in the national communications, and most Parties could demonstrate a solid track record of recent achievements (in the last 3 to 5 years). In addition, there was a growing tendency to report on other elements pertaining to Article 6, such as public participation and public access to information. Parties generally provided ample information on their initiatives. They outlined the objectives, identified the specific targets to which they were directed, reported on the status of development and implementation, and listed a wide variety of instruments used. On the other hand, Parties provided little or no information on international cooperation, in particular with regard to technical and financial support to developing countries, and did not provide information on cost and evaluation of activities.

179. All Parties agreed that there was a need for long-term sustained efforts to increase public awareness and understanding of climate change, climate change impacts, and actions to reduce emissions and to adapt to change. Some Parties, and in particular EIT Parties, perceived their current efforts as insufficient, mainly due to financial constraints.

180. There is evidence that activities under Article 6 of the Convention are emerging as a significant policy tool to respond to climate change. Parties often emphasized a more integrated, strategic and phased approach to developing and implementing Article 6 related initiatives and programmes within their national climate change action plans.

181. While the central governments continued to play a major role in setting strategies and coordinating implementation of Article 6 initiatives, the increasing role and involvement of municipalities and non-governmental organizations (NGOs) in designing and implementing similar initiatives was also recognized. About one third of Parties emphasized the role and contribution of the municipalities in engaging the population in more sustainable consumption patterns, and most Parties elaborated on the contribution of NGOs. Also, Parties generally concurred that climate change issues had to be integrated into the decisions and investment choices made by the economic players. Many Parties therefore encouraged cooperation and consultations with business and industry to secure participation and commitment of all economic players.

182. Youth was widely recognized as a key target for raising awareness and understanding of climate change issues. Many of the efforts and initiatives in the area of education were reported by most Parties as recent, and a few Parties noted that some programmes were still being developed. Depending on the national circumstances and capacities, the focus of action for formal education was twofold: (i) developing and implementing a sound framework to further integrate climate change issues in the curricula; and (ii) identifying needs and developing tools for facilitating the implementation of the framework. Almost all Parties reported on the growing importance of extra-curricular or non-formal education programmes. These programmes were usually developed and implemented by governments in cooperation with other governmental and non-governmental organizations, and efforts were underway to strengthen these partnerships as well as to promote innovative activities in this area.

183. The importance of training and the breadth of opportunities it provides to support policies and measures relating to mitigation, was acknowledged by most Parties. Many new programmes are being developed accordingly, and some Parties have already identified priority areas and key targets. The growing importance of collaborative activities with NGOs as well as the private sector was noted by many Parties. It was noted that several private sector associations have developed education and training programmes for employees and their customers.

184. Public awareness was most extensively covered by all Parties due to the large scope of possible activities. A significant feature that emerged from most NC3 was the establishment of comprehensive communication strategies that were usually guided by the current status of awareness and understanding of the population with regard to environmental issues. Parties reported on diverse levels of awareness, which was identified as high and increasing by many Parties, and for others as low, or as low but increasing. Parties generally found it difficult and challenging to maintain interest on climate change issues and to motivate the population to contribute individually, or to support the policies and measures to combat the problem. In this context, some Parties reported that compared to previous awareness campaigns, there had been a shift in message, i.e. from creating awareness of the problems to gaining and maintaining support for implementing solutions. Significant emphasis was placed on the portfolio approach, meaning that a wide range of instruments and targets were used to obtain maximum impact. The role of the media, and in particular the press, was highlighted by Parties, and many of them stressed the importance of better informing and preparing the journalists, through press briefings, press releases, training, development of kits and adapted guides, translation of scientific reports, presentations in user-friendly formats, up-to-date audio visual materials, etc.

185. Most Parties also placed strong emphasis on facilitating access to information, since effective public participation in decision-making depends on full, accurate, up-to-date information. The emerging use of electronic tools to facilitate this process was reported by many Parties, and was identified as a major opportunity to build up information resources and enhance partnerships and networking in this area. Almost all Parties noted the development of websites for which a majority provided the related addresses (Uniform Resource Locators, URL).

186. While only a few Parties dedicated separate sections to public participation, many more referred to it with respect to involvement of NGOs and decision-makers, or as an overall principle. The principle of public participation in addressing climate change and its effects was reported to rely, for its effectiveness, on the other elements of Article 6 to ensure that the public can participate in an informed fashion. Environmental education and training, information and initiatives to raise awareness, were seen as key elements in the process.

187. While reporting in the NC3 was generally more comprehensive than in the previous national communications, the level and scope of reporting varied widely between Parties, and some gaps still remained. In order to ensure greater coherence and avoid gaps in future communications, a more specific guidance and a format for providing information on programmes and initiatives could be developed. The set of criteria used for the preparation of document FCCC/SBI/2003/7/Add.4, which discusses issues relating to Article 6 in more detail, could serve as a basis for that future guidance.

X. CONCLUSIONS

188. Climate change increased in importance in Parties' national policy agenda, and climate change objectives were integrated into the objectives of several sectors to various extents. Linkages were established between climate change issues, including energy and mobility, on the one hand, and sustainable development, on the other. With few exceptions, climate change policies were driven by objectives other than climate change. Some climate-driven policies and measures led to notable emission reductions from specific sources.

189. The total aggregated GHG emissions (excluding LUCF) of the 32 reporting Annex I Parties decreased by about 3 per cent from 1990 to 2000. Thus Annex I Parties have jointly attained the aim of Article 4.2 of the Convention – to return their 2000 emissions to 1990 levels, although the extent to which Annex II Parties succeeded in reversing an increasing trend in GHG emissions varied widely.

190. Climate change policies and measures have had an impact on past emission trends. In particular, several Annex II Parties, including the European Community, Finland, France, Germany, Sweden Switzerland and the United Kingdom, returned their emissions in 2000 to their 1990 levels (excluding LUCF), or even reduced them. Twelve other Annex II Parties and Slovenia exceeded their 1990 emission levels in 2000. Some of these Parties slowed their emission growth or even stabilized their emissions after an initial emission increase in the early 1990s. Policies relating to climate change seemed to be partly responsible for stabilization and the significant slowdown of emission growth in all these countries. However, a number of Parties had clearly rising emission trends at the end of the decade.

191. After being relatively stable in the 1990s, the GHG emissions of Annex I Parties are projected to increase after 2000 reaching about 10 per cent above the 1990 level (under the "with measures" scenario). By 2010, the emissions are expected to increase both in Annex II Parties and, contrary to the situation of the 1990s, in EIT Parties, reflecting the economic recovery that occurred in most EIT Parties in the late 1990s. The use of additional policies and measures for GHG mitigation, as presented by the Parties, can slow down the increase in emission.

192. For the "with measures" scenario, the projected GHG emissions in 2010 are lower than the 1990 emissions for 12 of the 30 Parties; for 18 Parties, an increase is projected. Emissions levels lower than in 1990 are projected for most EIT Parties and for some Annex II Parties. For several Parties, the implementation of additional measures is projected to reduce GHG emissions by 2010 in comparison with the 1990 level, which was not the case under the "with measures" scenario.

193. For all Annex II Parties considered together, growth of GHG emissions in all but one sector (waste) is projected from 2000 to 2010. For all EITs considered together, GHG emissions are projected to increase after 2000 in all sectors. As a result, the total GHG emissions of Annex I Parties under the "with measures" scenario are projected to increase after 2000 in all sectors except waste management. The highest increase of GHG emissions is projected for transport.

194. The contribution of the EIT countries to an overall decrease in emissions in the period 1990-2000 was significant. It stemmed from the steep economic decline resulting from the transition from centrally planned to market economies, associated structural changes and a drop in emission levels. Of overriding importance, however, was the fact that in recent years most EIT countries exhibited significant economic growth which was not accompanied by a correspondingly large increase in emissions.

195. The effective integrated climate strategies that are now emerging are based on a diverse and carefully designed policy mix. They focus clearly on climate mitigation, but also contain elements of adaptation. Innovative policy approaches, such as emission and green certificate trading, are also likely to play an increasingly important role in these strategies. There seems to be evidence that many Annex I Parties bound by the commitments of the Kyoto Protocol, or intending to be so, are on track to design and implement integrated strategies that could achieve significant emission reductions in the medium term.

196. Most Parties are developing and implementing a broad range of measures that have already delivered emission reductions and have a reasonable prospect of stabilizing or reducing emissions from the energy sector. Increased use of quotas or portfolio standards for renewables and CHP should increase these reductions and drive down costs. Agreements between government and industry are proving increasingly effective, as participants learn how to ensure meaningful participation. Mandatory regulations for energy efficiency of buildings and appliances have been extended since the NC2, and are widely used in conjunction with policies of persuasion and information. Parties reported some innovative policies and measures – e.g. green certificate trading and materials substitution – and there

was a trend towards closer integration of policy instruments, such as taxes and emissions trading, in some Parties.

197. Transport is one of the largest and fastest-growing sectors, but policies and measures implemented by Parties so far have had a limited effect on mitigation compared to other sectors. The policy response pattern of Parties showed a clear preference for addressing energy intensity of vehicles and transport fuel mix. Transport activity and structure were rarely addressed, although analysis of the emission trends in transport suggests that these two drivers contributed most to emission growth in this sector. Improvements in public transport, walking and cycling were frequently reported but in most cases did not seem to be sufficiently implemented to avoid the decline in their shares.

198. In industrial processes, measures to reduce emissions from some large-scale processes resulted in relatively large emission reductions (up to a few per cent of national total emissions in 1990) at relatively low cost (below 1 US$/tonne CO_2, or even a negative cost). They were implemented by the industries with relatively little pressure from governments, e.g. through voluntary agreements. Other process-related emissions received less attention. Emissions resulting from the use of HFCs increased in all countries, although alternatives or reduction technologies for almost all uses of fluorinated gases were available. The current measures for the uses of HFCs are unlikely to stop the global growth in HFC emissions. Some Parties followed the earlier strategy of promoting industry partnerships aimed at reducing emissions without restricting the use of substances; others moved towards developing comprehensive strategy including phase-out legislationfor certain applications, or taxes.

199. Most Parties reported decreasing emissions from agriculture, partly as a result of some climate-specific policies and measures but also of others (e.g. structural changes) that were not driven by climate policy . These Parties expected agriculture to make significant contributions to the reduction of long-term emission trends. Research-based policies and measures appear promising, as they could lead to new agricultural activities and practices that are less emission intensive.

200. Parties reported a range of policies and measures in the LUCF sector, focusing on afforestation, reforestation and forest management, and forest programmes with wider policy objectives than climate change. There was less emphasis on the role of other LUCF activities such as cropland and grazing management, revegetation and the role of soils in carbon sequestration. Parties reported a range of research-based policies and measures including some that have potential to improve understanding of carbon dynamics and others tackling fire and pest control. Few Parties reported quantitative estimates of the effects of individual policies and measures.

201. The waste sector has been a major concern for governments. Measures to reduce the volume of waste and to increase recycling were aimed at achieving longer-term objectives. They have shown effects only in some countries, and in most countries the amount of waste is still increasing. The most important contribution to declining GHG emissions in the waste sector came from regulations relating to landfill gas recovery and combustion.

202. Parties placed much emphasis on the role of new technologies in modifying medium- and long-term emission trends. There was little indication of which technologies are the most promising in achieving emission mitigation, and how research is targeting them. Also, there was little information on how existing policies could persuade the markets to take up new efficient technologies that are close to economic viability.

203. Many Parties considered monitoring of implementation of policies and measures and estimation of their effects to be a priority. Moreover, they noted that monitoring would be critical to ensure that policies are on track to deliver the effect expected or to trigger the strengthening of existing policies, and

the launch of new ones if necessary, to meet the Kyoto targets. However, Parties acknowledged methodological problems relating to *ex-ante* and *ex-post* assessment, data quality, and inevitable uncertainties associated with estimates of mitigation effects or cost, as the main reasons for not providing a comprehensive assessment of the effects of policies and measures in their NC3. Further refinement of methods for assessing the effects of policies and measures could help to overcome these problems and to make these methods consistent across Parties in terms of assumptions, approaches and results. This could help Parties to improve the cost-benefit analysis which appears to be essential at the current stage of formulation and implementation of climate policies.

204. Developed countries continued to provide bilateral assistance to non-Annex I Parties and Parties with economies in transition countries and contributed to multilateral institutions, in particular to the GEF. Energy, transport and forestry were the main areas in which bilateral assistance was provided. An increase in the share of bilateral projects has been recorded in capacity-building, agriculture and coastal zone management. Support to developing countries was also mentioned in relation to research and systematic observation. Some barriers to the exchange of data were reported, such as financial restrictions and the need for technical assistance and capacity-building.

205. Activities under Article 6 of the Convention (education, training and public awareness) were emerging as a significant policy tool to respond to climate change. Parties often emphasized a more integrated, strategic and phased approach to developing and implementing initiatives and programmes related to Article 6 within their national climate change action plans.

Annex

List of Parties considered in this report and their ISO three-letter country codes

Party	Country code	Party	Country code
Australia	AUS	Latvia	LVA
Austria	AUT	Liechtenstein	LIE
Belgium	BEL	Lithuania	LTU
Bulgaria	BGR	Monaco	MCO
Canada	CAN	Netherlands	NLD
Croatia	HRV	New Zealand	NZL
Czech Republic	CZE	Norway	NOR
European Community	EC[a]	Poland	POL
Estonia	EST	Russian Federation	RUS
Finland	FIN	Slovakia	SVK
France	FRA	Slovenia	SVN
Germany	DEU	Spain	ESP
Greece	GRC	Sweden	SWE
Hungary	HUN	Switzerland	CHE
Italy	ITA	United Kingdom	GBR
Japan	JPN	United States	USA

[a] This is not an ISO symbol.

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