UNITED NATIONS

UNFCCC Framework Convention on Climate Change

Distr.
GENERAL

FCCC/SBI/2007/INF.6/Add.1
23 November 2007

ENGLISH ONLY

SUBSIDIARY BODY FOR IMPLEMENTATION
Twenty-seventh session
Bali, 3–11 December 2007

Item 3 (a) of the provisional agenda
National communications and greenhouse gas inventory data from Parties included in Annex I to the Convention
Compilation and synthesis of fourth national communications

Compilation and synthesis of fourth national communications

Note by the secretariat

Addendum

Policies, measures, past and projected future greenhouse gas emission trends of Parties included in Annex I to the Convention

Summary

This document contains the first part of the compilation and synthesis report of the fourth national communications submitted to the secretariat by Parties included in Annex I to the Convention. It provides information on a range of issues relating to the implementation of the Convention, such as national circumstances; greenhouse gas inventories; policies and measures; and emissions projections and estimates of the total effect of policies and measures.

CONTENTS

I. Introduction

1. The compilation and synthesis report of fourth national communications (NC4) by Parties included in Annex I to the Convention (Annex I Parties), prepared in accordance with decision 7/CP.11, consists of three separate documents. The main report, which includes information on all reporting elements following the UNFCCC reporting guidelines is published in two separate parts: the present document contains a synthesis of the reported information on national circumstances, greenhouse gas (GHG) inventories, policies and measures, and emission projections and estimates of the total effect of policies and measures; and document FCCC/SBI/2007/INF.6/Add.2 contains a synthesis of the reported information relating to vulnerability assessment, climate change impacts and adaptation measures, financial resources, transfer of technology and capacity-building, research and systematic observation, and education, training and public awareness. An executive summary is contained in document FCCC/SBI/2007/INF.6. All references to Parties in these documents are to Annex I Parties, unless otherwise indicated.

II. National circumstances

2. All reporting Parties provided information on their national circumstances and most of them, when explaining the relationship between national circumstances and GHG emissions or removals, used demographic, economic and energy-related indicators (e.g. population size, gross domestic product (GDP), total primary energy supply (TPES)) that significantly affect GHG emissions on their territories. Some of these indicators are summarized in table 1. For completeness, data are provided for all 41 Annex I Parties, including Italy and Luxembourg, which did not submit their NC4 by October 2007.

3. Government structure, geographic and climate profiles were generally described in qualitative terms. Sector-specific information on activities in transport, industry, waste, agriculture and forestry was frequently included in the section on national circumstances as well as under the section on policies and measures. Information on building stock and urban structure was also provided by some Parties, mostly in conjunction with the energy and transport sectors. Relationships between national circumstances and emission trends were usually described in qualitative terms, except for some cases such as Canada's quantitative assessment of the link between population and emissions growth. Parties also provided information on their governmental structure and distribution of responsibilities for climate and climate-related policies. This information is addressed in chapter IV of this report.

4. The **total population** of Annex I Parties covered in this report was 1,256 million in 2004. Since 1990, total population has grown by 6.7 per cent, with population in nine Parties growing by more than 10 per cent (Australia, Canada, Iceland, Ireland, Luxembourg, New Zealand, Switzerland, Turkey and the United States of America) and in three Parties declining by more than 10 per cent (Bulgaria, Estonia and Latvia). In absolute terms, population has grown most in the United States (+43.8 million) and Turkey (+15.6 million), and has declined most in the Russian Federation (–4.8 million) and in Ukraine (–4.3 million). For all Annex I Parties except Australia, Canada, Ireland, New Zealand, Turkey and the United States changes in population numbers were not reported as a significant factor affecting GHG emissions and removals.

5. Between 1990 and 2004, **economic activity** (measured as GDP in United States dollars at year 2000 prices and based on purchasing power parity (PPP)) in Annex I Parties has grown by 36.2 per cent, or 2.2 per cent on average annually. In 11 Parties, GDP grew by more than 50 per cent (Australia, Estonia, Ireland, Latvia, Luxembourg, New Zealand, Norway, Poland, Slovenia, Turkey and United States), and in four Parties by less than 10 per cent (Bulgaria, Romania, Russian Federation and Ukraine). Among the Parties with significant growth, Ireland stands out with 145 per cent GDP growth. The annual GDP growth rate in most Annex I Parties that are not economies in transition (EIT Parties) was about 2 to 3 per cent over the whole period, but for EIT Parties it varied considerably.

Table 1. Indicators relating to national circumstances of Annex I Parties

Party	Population (million)			GDP (billion USD at 2000 prices and PPPs)[a]			TPES (Mtoe)			TPES/GDP (toe/1 000 USD)			GHG emissions per capita (tonnes CO_2 eq)		
	1990	2004	1990–2004 (%)	1990	2004	1990–2004 (%)	1990	2004	1990–2004 (%)	1990	2004	1990–2004 (%)	1990	2004	1990–2004 (%)
Australia	17.2	20.2	17.	368.4	598.3	62.4	87.5	115.8	32.3	0.24	0.19	–18.6	24.6	26.2	6.3
Austria	7.7	8.2	6.5	178.8	243.2	36.1	25.0	33.2	32.7	0.14	0.14	–2.5	10.3	11.2	8.6
Belarus	10.2	9.8	–3.8	48.5	62.9	29.9	38.9	26.7	–31.3	0.80	0.43	–47.1	12.5	7.6	–39.3
Belgium	10.0	10.4	4.5	221.4	290.1	31.1	49.1	57.7	17.4	0.22	0.20	–10.4	14.6	14.2	–2.9
Bulgaria	8.7	7.8	–11.0	60.7	57.6	–5.1	28.8	19.0	–34.3	0.48	0.33	–30.7	15.2	8.7	–42.7
Canada	27.7	31.9	15.3	644.7	946.9	46.9	209.4	269.0	28.5	0.32	0.28	–12.5	21.6	23.7	9.7
Croatia	4.5	4.4	–0.6	33.8	49.8	47.2	6.7	8.8	30.9	0.20	0.18	–11.1	7.0	6.6	–4.8
Czech Republic	10.4	10.2	–1.5	146.1	168.3	15.3	49.0	45.5	–7.1	0.34	0.27	–19.4	18.9	14.4	–23.9
Denmark	5.1	5.4	5.1	119.0	159.8	34.3	17.9	20.1	12.2	0.15	0.13	–16.4	13.7	12.9	–5.9
Estonia	1.5	1.3	–12.0	10.3	18.0	75.9	6.3	5.2	–17.4	0.61	0.29	–53.0	28.4	15.8	–44.3
EU-15	366.0	385.9	5.4	7 556.8	10 073.5	33.3	1 323.9	1 545.3	16.7	0.18	0.15	–12.4	11.6	11.0	–5.7
EU-25	441.1	460.1	4.3	8 273.2	11 048.3	33.5	1 563.6	1 756.7	12.3	0.19	0.16	–15.9	NA	NA	NA
Finland	5.0	5.2	4.8	111.4	146.5	31.6	29.2	38.1	30.6	0.26	0.26	–0.7	14.3	15.6	9.3
France	58.2	62.2	6.9	1 279.8	1 678.3	31.1	227.3	275.2	21.1	0.18	0.16	–7.7	9.7	9.0	–7.2
Germany	79.4	82.5	4.0	1 707.3	2 160.0	26.5	356.1	348.0	–2.3	0.21	0.16	–22.8	15.5	12.3	–20.4
Greece	10.3	11.1	7.0	140.9	211.3	49.9	22.2	30.5	37.4	0.16	0.14	–8.4	10.5	12.4	18.3
Hungary	10.4	10.1	–2.5	114.9	144.8	26.0	28.6	26.4	–7.7	0.25	0.18	–26.8	11.9	8.3	–30.1
Iceland	0.3	0.3	14.9	6.1	9.0	47.1	2.2	3.5	61.1	0.35	0.39	9.5	12.9	10.6	–17.4
Ireland	3.5	4.1	15.8	55.0	134.5	144.7	10.4	15.2	46.1	0.19	0.11	–40.3	15.9	16.9	6.3
Italy	56.7	58.1	2.5	1 231.7	1 495.8	21.4	148.1	184.4	24.6	0.12	0.12	2.6	9.2	10.0	9.4
Japan	123.5	127.7	3.4	2 873.6	3 431.6	19.4	446.0	533.3	19.6	0.16	0.16	0.1	10.3	10.6	3.1
Latvia	2.6	2.3	–12.1	15.0	24.8	64.7	5.9	4.6	–22.0	0.39	0.19	–52.7	9.8	4.6	–52.8
Liechtenstein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.8	NA
Lithuania	3.7	3.4	–7.1	31.5	41.4	31.5	11.1	9.1	–17.7	0.35	0.22	–37.4	13.8	5.9	–57.3
Luxembourg	0.4	0.5	18.3	12.6	24.1	91.1	3.6	4.8	33.0	0.28	0.20	–30.4	33.2	28.1	–15.3
Monaco	0.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6	NA	NA
Netherlands	14.9	16.3	8.9	340.4	467.5	37.3	66.7	82.1	23.0	0.20	0.18	–10.4	14.2	13.4	–5.9
New Zealand	3.4	4.1	19.8	60.6	93.9	54.8	13.8	17.6	28.3	0.23	0.19	–17.1	18.2	18.4	1.3
Norway	4.2	4.6	8.3	113.0	175.9	55.6	21.5	27.7	28.6	0.19	0.16	–17.4	11.7	12.0	1.9
Poland	38.1	38.2	0.2	278.0	445.2	60.2	99.9	91.8	–8.1	0.36	0.21	–42.6	14.8	10.2	–31.4
Portugal	10.0	10.5	5.3	135.0	180.9	34.0	17.7	26.5	49.6	0.13	0.15	11.6	6.0	8.0	33.9
Romania	23.2	21.7	–6.6	155.1	169.0	9.0	62.3	38.5	–38.2	0.40	0.23	–43.3	11.3	7.1	–36.9
Russian Federation	148.7	143.9	–3.3	1 231.4	1 309.1	6.3	774.6	641.5	–17.2	0.63	0.49	–22.1	20.0	14.1	–29.7
Slovakia	5.3	5.4	1.6	53.4	69.5	30.1	21.3	18.3	–14.0	0.40	0.26	–33.9	13.8	9.5	–31.5
Slovenia	2.0	2.0	0.0	24.5	38.4	57.2	5.0	7.2	43.4	0.21	0.19	–8.8	10.1	10.0	–0.8
Spain	39.0	42.7	9.4	643.9	958.0	48.8	91.0	142.2	56.1	0.14	0.15	5.0	7.4	10.0	36.2
Sweden	8.6	9.0	5.1	198.8	262.2	31.9	47.6	53.9	13.4	0.24	0.21	–14.0	8.5	7.8	–8.1
Switzerland	6.8	7.5	10.1	197.2	225.8	14.5	25.0	27.1	8.6	0.13	0.12	–5.1	7.8	7.1	–8.8
Turkey	56.2	71.8	27.7	323.2	528.6	63.5	53.0	81.9	54.6	0.16	0.15	–5.5	3.0	4.1	35.2
Ukraine	52.2	47.5	–9.0	373.4	278.9	–25.3	209.8	140.3	–33.2	0.56	0.50	–10.5	17.7	8.7	–50.9
United Kingdom	57.2	59.8	4.5	1 180.8	1 661.3	40.7	212.2	233.7	10.2	0.18	0.14	–21.7	13.6	11.1	–18.0
United States	250.2	294.0	17.5	7 055.0	10 703.9	51.7	1927.4	2326.0	20.7	0.27	0.22	–20.5	24.4	24.0	–1.4

Source: International Energy Agency. Energy Statistics of OECD Countries and Energy Statistics of non-OECD Countries databases. Data for Liechtenstein (GHG per capita only) and Monaco were retrieved from their NC4.

Abbreviations: GDP = gross domestic product, PPP = purchasing power parity, TPES = total primary energy supply, GHG = greenhouse gas, NA = not available, EU-15 = 15 member States of the European Union as of 1996, EU-25 = 25 member States of the European Union as of 2006.

Note: For completeness the table also contains indicators for Italy and Luxembourg, which did not submit their NC4.

6. After the **initial economic decline in the early 1990s in EIT Parties** (e.g. Ukraine –41 per cent 1992–1995; Estonia, –32 per cent 1990–1994 and the Russian Federation, –27 per cent 1992–1998), economic activity regained momentum and many EIT Parties have achieved higher growth rates in recent years than have most of the other Annex I Parties. For example, during the period 2000–2004, 10 out of 11 Parties with GDP growth of more than 4.4 per cent annually were EIT Parties (Belarus, Bulgaria, Croatia, Estonia, Latvia, Lithuania, Romania, Russian Federation, Slovakia and Ukraine), with Ireland as the only Party in this group that is not an EIT.

7. The analysis of **TPES** data reveals significant changes in EIT countries. During 1990–2004, TPES declined in most EIT Parties (Belarus, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovakia and Ukraine), in contrast to the general increase in TPES for Annex I Parties as a whole by 10.5 per cent. Six Parties faced increases in TPES by more than 40 per cent (Iceland, Ireland, Portugal, Slovenia, Spain and Turkey), largely following increases in economic growth, and related growth in per capita income, electricity demand and private vehicle use.

8. Some Parties reported on **economic growth that was largely based on a high share of fossil fuels within the energy supply mix**. Canada, for example, has experienced significant economic growth since the late 1990s, particularly affecting **energy- and carbon-intensive sectors,** such as aluminium, iron and steel, pulp and paper and energy production. As a result of their natural resources endowment, several other Parties also continued to rely on energy-intensive industries and production and export of natural resources, mainly energy resources. This resulted in a higher GHG emission intensity of the economy and higher GHG emissions per capita for these Parties (Australia, Canada, Norway and Russian Federation) than for Parties with similar geographic, demographic and climatic conditions but relatively lighter and less energy-intensive industries (e.g. Finland and Sweden).[1] In the longer term, the United Kingdom of Great Britain and Northern Ireland expects major changes in the electricity generation sector relating to reduction of nuclear and coal powered electricity generation capacity.

9. Most of the Annex I Parties depend on **energy imports** to meet more than half of their demand for energy. Cleaner fossil fuels, such as natural gas, and renewable energy sources (RES) recently gained shares in import markets, helping to diversify the energy portfolio, increase energy security and reduce environmental burdens. Natural gas was also preferred for cogeneration of electricity and heat, which was encouraged by many Parties because of its higher energy efficiency. However, only a few Annex I Parties are large natural gas producers and exporters (Canada, Norway, Russian Federation and United States); others rely on domestic sources of coal and lignite (Australia, Bulgaria, Czech Republic, Estonia, Germany, Greece and Poland). Some Parties, particularly those with relatively rich and inexpensive domestic reserves of fossil fuels, are slower in fuel switching than other Parties.

10. During 1990–2004, **energy intensity of the economy** (measured in TPES per GDP) in Annex I Parties dropped by 18.9 per cent on average, from 0.25 in 1990 to 0.20 toe per thousand 2000 USD PPP in 2004. This was mainly owing to the strong changes in the structure of economies of the EIT countries, where this indicator dropped by more than 20 per cent (Belarus, Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation and Slovakia). In addition, several non-EIT Parties experienced a similar drop in energy intensity, which reflected the continuous shift from industry, and in particular energy-intensive industries, towards services (Germany, Ireland, Luxembourg, United Kingdom and United States). It is noteworthy that the energy intensity declined even against the backdrop of relatively low energy prices, which did little to stimulate energy efficiency improvements, as

[1] Within the group of Annex I Parties producing more than 100 Mtoe of energy in 2004 (Australia, Canada, France, Germany, Norway, Russian Federation, United Kingdom and United States), three Parties rank highest in GHG emissions per capita (Australia, Canada and United States), together with Luxembourg.

noted by the European Community (EC). Iceland, Italy, Portugal and Spain observed an increase in the energy intensity of their economies, partly due to changes in consumption patterns of the population.

11. During 1990–2004, **per capita GHG emissions** in Annex I Parties dropped by 9.4 per cent on average, from 15.8 in 1990 to 14.3 tonnes of carbon dioxide equivalent (tCO_2 eq) in 2004. Twelve EIT Parties (Belarus, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovakia and Ukraine) and Germany saw decreases of more than 20 per cent. In contrast, three Parties (Portugal, Spain and Turkey) increased their per capita GHG emissions by more than 30 per cent.

III. Greenhouse gas emission trends

A. Objective and scope

12. This chapter presents GHG emissions data for Annex I Parties. For completeness, data are provided for all 41 Annex I Parties. Consistent with the data sources used by most Annex I Parties in their NC4, the GHG data reported by Annex I Parties in their 2006 inventory submissions has been used, as listed in table 2.[2,3] Specifically, the following information is presented for Annex I Parties: total aggregate GHG emissions; emissions by gas; emissions by sector; and emissions for individual Parties.

Table 2. Sources of greenhouse gas inventory data

Party	CRF submission date[a]	Years reported[b]	Party	CRF submission date[a]	Years reported[b]
Australia	24 May 2006	1990–2004	Liechtenstein	30 May 2006	1990, 2004
Austria	13 April 2006	1990–2004	Lithuania	15 April 2006	2004
Belarus	14 April 2006	1990–2004	Luxembourg	6 February 2006	1990–2004
Belgium	14 April 2006	1990–2004	Monaco	16 June 2006	1990–2004
Bulgaria	18 April 2006	1988, 1990–2004	Netherlands	14 April 2006	1990–2004
Canada	11 May 2006	1990–2004	New Zealand	13 April 2006	1990–2004
Croatia	31 August 2006	1990–2004	Norway	27 May 2006	1990–2004
Czech Republic	13 April 2006	1990–2004	Poland	15 April 2006	2004
Denmark	12 April 2006	1990–2004	Portugal	13 April 2006	1990–2004
Estonia	12 April 2006	1990–2004	Romania	5 May 2006	1989–2004
European Community	15 April 2006	1990–2004	Russian Federation	9 October 2006[c]	1990–2004
Finland	6 April 2006	1990–2004	Slovakia	13 April 2006	1990, 2000–2004
France	15 February 2006	1990–2004	Slovenia	26 April 2006	1986, 1990–2004
Germany	3 March 2006	1990–2004	Spain	12 April 2006	1990–2004
Greece	16 April 2006	1990–2004	Sweden	13 April 2006	1990–2004
Hungary	19 April 2006	1985–2004	Switzerland	13 April 2006	1990–2004
Iceland	26 July 2006	1990–2004	Turkey	14 April 2006	1990–2004
Ireland	13 April 2006	1990–2004	Ukraine	26 May 2006	1990–2004
Italy	18 April 2006	1990–2004	United Kingdom	13 April 2006	1990–2004
Japan	25 May 2006	1990–2004	United States	5 April 2006	1990–2004
Latvia	13 April 2006	1990–2004			

Abbreviation: CRF = common reporting format.

[a] Date of submission of CRF data; the submission date for the national inventory report may differ.

[b] Indicates the years for which complete CRF tables were submitted in 2006; for some Parties, information on 1990–2004 emissions was provided in the CRF trend tables, although complete CRF tables were not submitted in 2006 for some years.

[c] An informal provision of national inventory data, which was substituted by an official data submission later on.

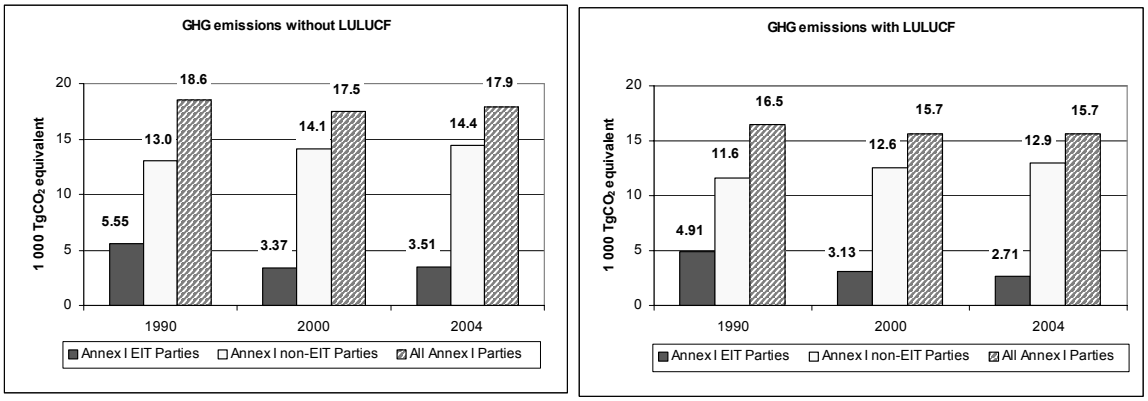
[2] For some Annex I Parties, the the NC4 section on GHG inventory information contains GHG data that differ from the data provided in the 2006 submission because the 2006 submission was not ready at the time of NC4 submission, or because the NC4 was submitted after the deadline of 1 January 2006 and more recent inventory data were available. In order to have a consistent data basis across Parties this report uses data from the 2006 submissions for all Parties.

[3] Data presented here are consistent with the GHG emissions dated presented in FCCC/SBI/2006/26. Data from individual national submissions of GHG inventories from Annex I Parties can be found at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/3734.php>.

B. Total aggregate greenhouse gas emissions

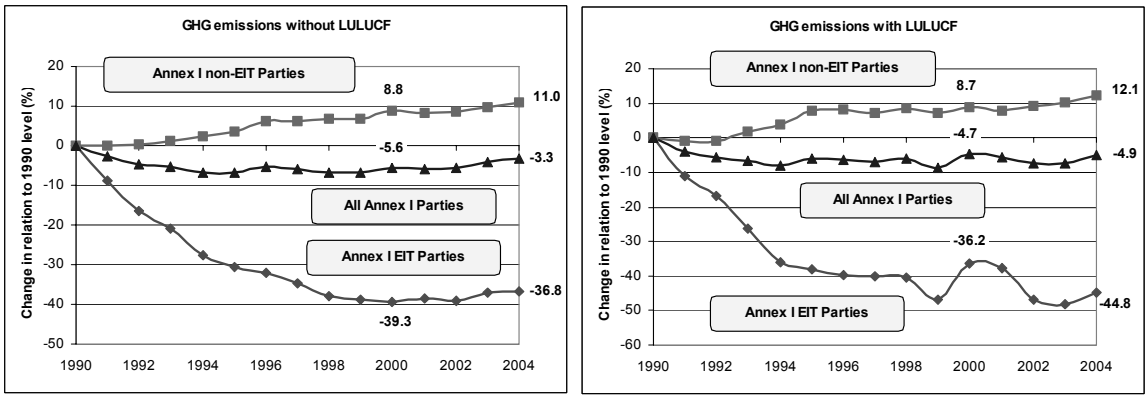
13. From 1990[4] to 2004, total aggregate GHG emissions without emissions/removals from land use, land-use change and forestry (LULUCF) from Annex I Parties taken together decreased by 3.3 per cent, from 18.6 thousand to 17.9 thousand $TgCO_2$ eq (figures 1 and 2).[5] Total aggregate GHG emissions with LULUCF decreased by 4.9 per cent, from 16.5 thousand to 15.7 thousand $TgCO_2$ eq. **Since 2000, the emissions have been on the rise**: without LULUCF they have increased by 2.4 per cent, and with LULUCF they have remained broadly stable.

Figure 1. Greenhouse gas emissions from Annex I Parties, 1990, 2000 and 2004



Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, EIT = economies in transition.
Note: For GHG emissions with LULUCF, data for Estonia, Lithuania, Luxembourg, Poland, Slovenia, Switzerland and Turkey are not included because of the unavailability or incompleteness of some LULUCF data in the period 1990–2004.

Figure 2. Changes in greenhouse gas emissions from Annex I Parties, 1990–2004



Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, EIT = economies in transition.
Note: For GHG emissions with LULUCF, data for Estonia, Lithuania, Luxembourg, Poland, Slovenia, Switzerland and Turkey are not included because of the unavailability or incompleteness of some LULUCF data in the period 1990–2004.

14. For **EIT Parties**, total aggregate GHG emissions without LULUCF decreased from 5.55 thousand $TgCO_2$ eq in 1990 to 3.51 thousand $TgCO_2$ eq in 2004 – a decrease of 36.8 per cent (decrease of 44.8 per cent for GHG emissions with LULUCF). For the period 2000–2004, GHG emissions without LULUCF increased by 4.1 per cent, reflecting economic growth, and decreased by 13.4 per cent for GHG emissions with LULUCF. This increase contributed to a large extent to the overall increase of emissions of Annex I Parties since 2000. This suggests that the structural changes in

[4] Unless specified otherwise here and elsewhere in this document, base year data are used in sums and totals instead of 1990 data (in accordance with decisions 9/CP.2 and 11/CP.4) for Bulgaria (1988), Hungary (average of 1985–1987), Poland (1988), Romania (1989) and Slovenia (1986).

[5] In these and other figures, interpolation was used for some Parties to fill in the missing data for some years.

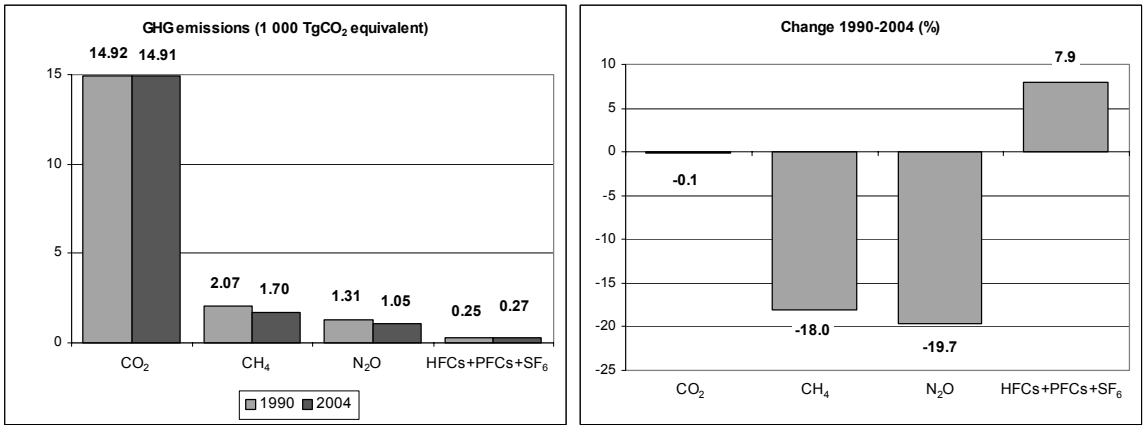
economy that resulted in major reductions in energy and emission intensity in the 1990s may no longer suffice to moderate the upward pressure of economic growth on GHG emissions.

15. For the **non-EIT Annex I Parties**, total aggregate GHG emissions without LULUCF increased from 13 thousand $TgCO_2$ eq in 1990 to 14.4 thousand $TgCO_2$ eq in 2004 – an increase of 11 per cent (12.1 per cent for GHG emissions with LULUCF). For the period 2000–2004, GHG emissions without LULUCF increased by 2 per cent (GHG emissions with LULUCF increased by 3.1 per cent). **The increase in emissions in non-EIT Parties, however, is significantly lower than their economic growth**. Almost all of these Parties saw a GDP growth between 1990 and 2004 of more than 30 per cent and seven of them saw an increase of more than 50 per cent, including Ireland and Luxembourg which saw an increase of 144.7 per cent and 91.1 per cent, respectively.

C. Greenhouse gas emissions by gas

16. Figure 3 shows changes in total emissions (without LULUCF) of individual GHGs from Annex I Parties over the period 1990–2004. It shows that the overall emission decrease was driven by the decrease in emissions of CH_4 and N_2O, by 18 and 19.7 per cent, respectively, whereas CO_2 emissions broadly remained stable (–0.1 per cent). The decrease in the non-CO_2 gases, could be attributed, at least in part, to policies addressing these gases (see chapter IV). The emissions of HFCs, PFCs and SF_6 taken together increased by 7.9 per cent (mostly because of increases in HFC emissions).

Figure 3. Annex I Party greenhouse gas emissions by gas, 1990 and 2004



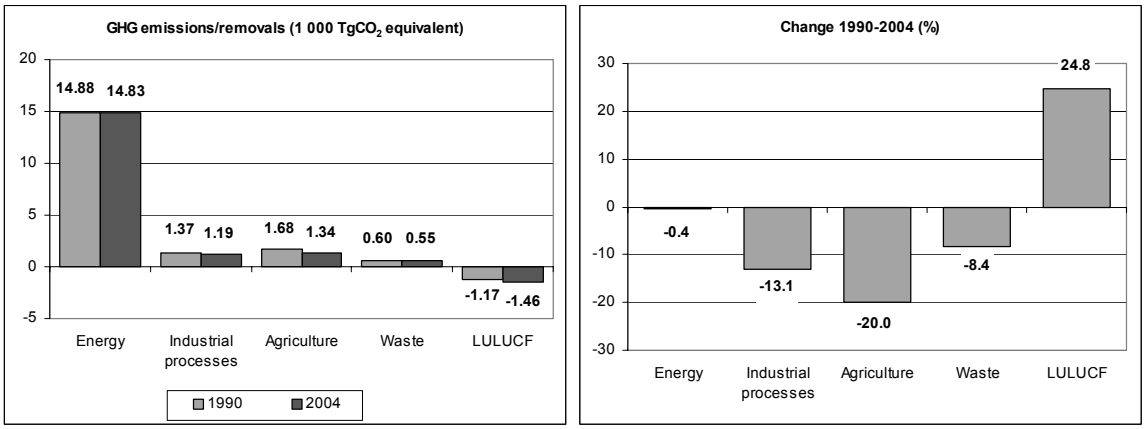
Abbreviation: GHG = greenhouse gas.

D. Greenhouse gas emissions by sector

17. Figure 4 illustrates trends in aggregate GHG emissions from Annex I Parties by sector. For all Annex I Parties taken together, emissions in all sectors decreased from 1990 to 2004, with the greatest decreases in agriculture (–20.0 per cent), industrial processes (–13.1 per cent) and waste (–8.4 per cent). Emissions from energy remained almost stable (–0.4 per cent), while the net GHG removals from LULUCF increased by 24.8 per cent.

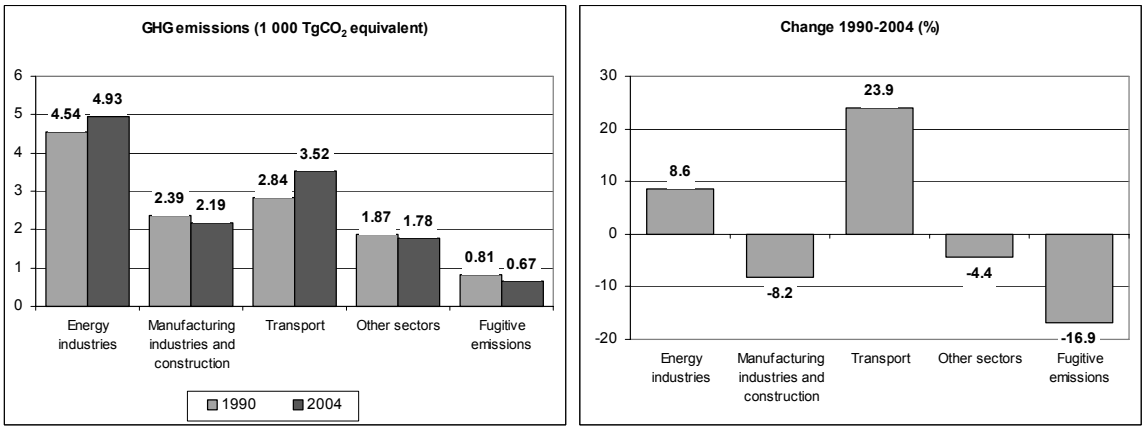
18. Within the **energy sector** (figure 5), major increases in emissions were observed in transport and energy industries, whereas decreases in emissions were observed in fugitive emissions, manufacturing industries and construction, and other sectors (residential and commercial). Emissions from transport increased the most (23.9 per cent), while fugitive emissions declined the most (16.9 per cent). The decrease in emissions in sectors other than energy and transport could be attributed, at least in part, to policies addressing emissions from these sectors (see chapter IV). Further details on sectoral trends are provided in chapter IV B.

Figure 4. Annex I Party greenhouse gas emissions and removals by sector, 1990 and 2004



Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

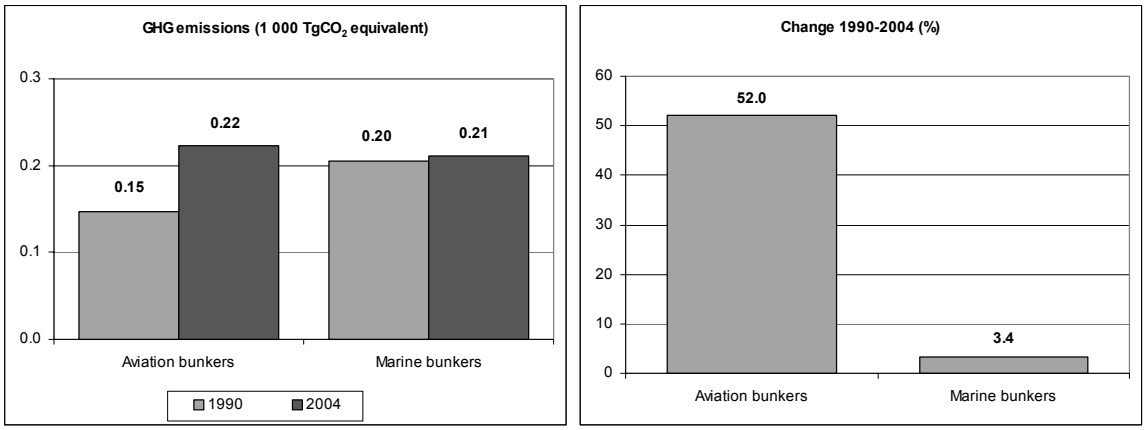
Figure 5. Annex I Party greenhouse gas emissions in the energy sector, 1990 and 2004



Abbreviation: GHG = greenhouse gas.
Note: Except for fugitive emissions, data for the Russian Federation are not included here because the emissions from subsectors in the energy sectors were reported with notation keys.

19. GHG emissions from bunker fuels sold for use in **international aviation** continued to grow unabated, increasing by 52 per cent between 1990 and 2004 (figure 6), while emissions relating to bunker fuels sold for use in **international marine** transportation grew at a much slower rate, with an increase of 3.4 per cent for the same period.

Figure 6. Annex I Party greenhouse gas emissions from bunker fuels, 1990 and 2004



Abbreviation: GHG = greenhouse gas.
Note: (1) For aviation bunker fuels, data for Estonia, Liechtenstein, Lithuania, Monaco, Poland, Romania, the Russian Federation, Slovakia, Turkey and Ukraine are not included because of their unavailability or incompleteness, or because the emissions were reported with notation keys for some years; (2) For marine bunker fuels, data for Estonia, Lithuania, Luxembourg, Poland, Romania, the Russian Federation and Turkey are not included for the same reasons.
(3) Emissions from international aviation and marine transport are not included in the national totals of Annex I Parties.

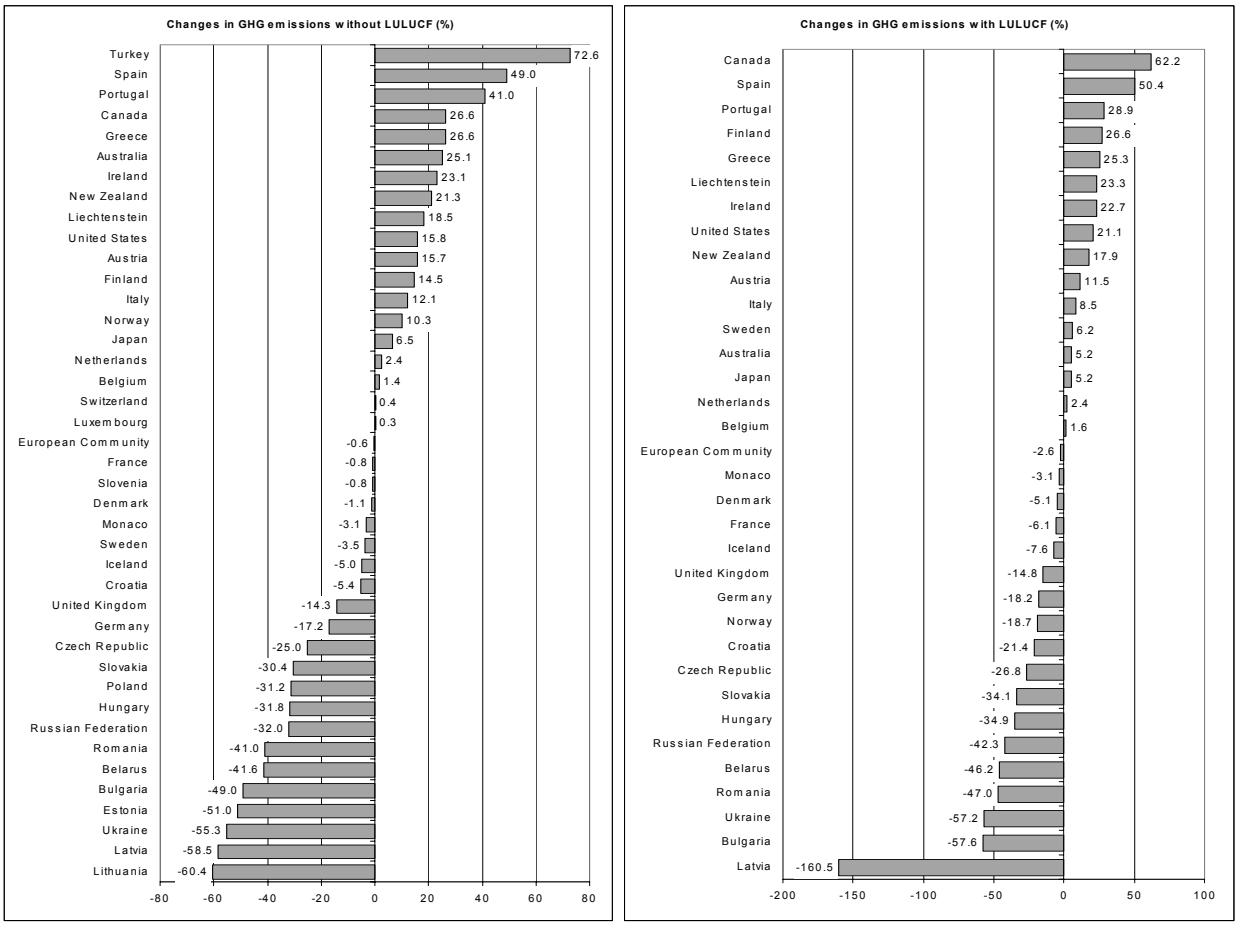
E. Emissions data for individual Annex I Parties

20. Tables 3 and 4 present total aggregate GHG emissions with and without LULUCF for individual Annex I Parties. Each table also indicates the number of Parties for which the emissions decreased by more than 1 per cent, the number of Parties for which the change in emissions was within 1 per cent range, and the number of Parties for which the emissions increased more than 1 per cent. The one per cent boundary was selected as a way to provide a simple, transparent statistical summary.

21. In table 3, containing GHG emissions without LULUCF the national totals exclude emissions and removals associated with carbon stock changes and other emission sources covered in the LULUCF sector. For the Parties which did not provide LULUCF data in 2006 or provided incomplete LULUCF data, the data on emissions with LULUCF are not included in table 4. Data are presented here only for 1990, 1995 and 2000–2004; more detailed data for all reported years are available on the UNFCCC website <http://unfccc.int>.

22. By Party, changes in total aggregate GHG emissions from 1990 to 2004 varied greatly: from a decrease of 60.4 per cent (Lithuania) to an increase of 72.6 per cent (Turkey) for GHG emissions without LULUCF; and from a decrease of 160.5 per cent (Latvia) to an increase of 62.2 per cent (Canada) for GHG emissions with LULUCF (figure 7). Altogether, in 19 Annex I Parties total aggregate GHG emissions without LULUCF decreased by more than 1 per cent from 1990 to 2004, whereas in 17 Parties the emissions increased by more than 1 per cent; and in 5 Parties, including the EC, emission trend remained stable. Of the 14 Parties with decreases in emissions by more than 10 per cent, only two are not EITs (Germany and United Kingdom). Total aggregate GHG emissions with LULUCF, from 1990 to 2004, decreased in 18 Parties and increased in 16 Parties.

Figure 7. Changes in total aggregate greenhouse gas emissions of individual Annex I Parties, 1990–2004



Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.
Note: For GHG emissions with LULUCF, data for Estonia, Lithuania, Luxembourg, Poland, Slovenia, Switzerland and Turkey are not included because of the unavailability or incompleteness of data.

Table 3. Total aggregate greenhouse gas emissions without land use, land-use change and forestry by Party, 1990, 1995 and 2000–2004

Party	$GgCO_2$ eq							Change from 1990 to 2004 (%)
	1990	1995	2000	2001	2002	2003	2004	
Australia	423 074	450 243	504 196	517 407	520 073	520 199	529 230	25.1
Austria	78 944	80 218	81 263	85 130	86 843	92 511	91 299	15.7
Belarus[a]	127 361	72 938	69 788	68 172	68 145	69 815	74 364	–41.6
Belgium	145 766	152 339	147 411	146 841	145 090	147 530	147 873	1.4
Bulgaria[a,b]	132 303	83 022	64 254	64 852	62 119	67 731	67 511	–49.0
Canada	598 911	648 685	725 048	718 819	725 547	753 751	758 067	26.6
Croatia[a]	31 124	21 913	25 268	26 424	27 609	29 192	29 432	–5.4
Czech Republic[a]	196 205	154 463	149 165	149 497	144 090	147 583	147 111	–25.0
Denmark	70 416	77 423	69 585	71 152	70 330	75 541	69 620	–1.1
Estonia[a]	43 491	22 287	19 662	19 416	19 524	21 387	21 322	–51.0
European Community[c]	4 252 461	4 144 433	4 129 317	4 174 119	4 155 328	4 216 469	4 228 006	–0.6
Finland	71 093	71 470	69 965	75 366	77 505	85 660	81 435	14.5
France	567 094	561 765	561 436	561 660	556 084	561 093	562 635	–0.8
Germany	1 226 296	1 094 740	1 022 798	1 034 912	1 018 644	1 024 377	1 015 273	–17.2
Greece	108 742	113 195	131 756	133 288	133 017	137 284	137 633	26.6
Hungary[a,b]	123 145	84 360	81 875	84 546	81 556	84 334	83 924	–31.8
Iceland	3 277	3 080	3 545	3 515	3 536	3 459	3 112	–5.0
Ireland	55 614	58 923	68 729	70 550	68 985	68 361	68 460	23.1
Italy	519 600	532 642	554 611	561 290	561 790	577 411	582 520	12.1
Japan	1 272 095	1 342 084	1 345 531	1 320 588	1 352 996	1 358 324	1 355 175	6.5
Latvia[a]	25 893	12 184	9 929	10 660	10 581	10 705	10 746	–58.5
Liechtenstein	229					264	271	18.5
Lithuania[a]	50 934			20 356	19 588	17 224	20 193	–60.4
Luxembourg	12 688	9 977	9 688	9 966	10 964	11 433	12 722	0.3
Monaco	108	115	117	119	117	111	104	–3.1
Netherlands	212 963	225 070	214 433	216 206	214 932	215 697	218 086	2.4
New Zealand	61 893	64 535	70 315	73 065	73 618	75 606	75 088	21.3
Norway	49 792	49 895	53 500	54 730	53 469	54 332	54 931	10.3
Poland[a,b]	564 408	417 349	386 181	382 787	370 239	382 639	388 063	–31.2
Portugal	59 954	71 263	82 178	83 728	88 198	83 682	84 546	41.0
Romania[a,b]	262 281	176 670	131 842	136 569	142 672	148 622	154 626	–41.0
Russian Federation[a]	2 974 863	2 173 890	1 944 767	1 974 872	1 961 415	2 021 587	2 024 229	–32.0
Slovakia[a]	73 360	53 347	49 378	52 499	50 516	51 091	51 025	–30.4
Slovenia[a,b]	20 220	18 543	18 822	19 746	19 939	19 666	20 059	–0.8
Spain	287 152	317 941	384 246	384 552	402 060	408 169	427 905	49.0
Sweden	72 361	73 894	68 389	69 067	70 073	70 907	69 854	–3.5
Switzerland	52 826	51 029	51 655	52 506	51 493	52 529	53 019	0.4
Turkey[d]	170 187	220 864	278 924	260 963	268 849	284 135	293 810	72.6
Ukraine[a]	925 362	521 149	395 095	398 950	400 479	416 017	413 411	–55.3
United Kingdom	776 142	714 321	672 195	679 700	659 243	664 471	665 330	–14.3
United States	6 103 283	6 477 148	6 975 929	6 886 890	6 909 407	6 952 561	7 067 570	15.8
Decrease in emissions by more than 1 per cent (number of Parties)								**19**
Change in emissions within 1 per cent (number of Parties)								**5**
Increase in emissions by more than 1 per cent (number of Parties)								**17**

Note: Negative values in Gg mean net removals; positive values in Gg mean (net) emissions. Blank spaces indicate that either no data were available, or notation keys were used. The changes in emissions from 1990 to 2004 were calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided.

[a] A Party undergoing the process of transition to a market economy.

[b] Data for the base year as defined by decisions 9/CP.2 and 11/CP.4 (Bulgaria (1988), Hungary (average of 1985 to 1987), Poland (1988), Romania (1989), Slovenia (1986)) are used for this Party instead of 1990 data.

[c] Emission estimates of the EC are reported separately from those of its member States.

[d] Decision 26/CP.7 invited Parties to recognize the special circumstances of Turkey, which place Turkey in a situation different from that of other Parties included in Annex I to the Convention.

Table 4. Total aggregate greenhouse gas emissions with land use, land-use change and forestry, by Party, 1990, 1995 and 2000–2004

Party	$GgCO_2$ eq							Change from 1990 to 2004 (%)
	1990	1995	2000	2001	2002	2003	2004	
Australia	506 886	470 410	520 757	530 445	537 070	514 585	533 495	5.2
Austria	66 983	65 806	65 237	66 367	71 718	75 914	74 670	11.5
Belarus[a]	116 054	57 509	55 662	53 766	54 848	57 830	62 464	–46.2
Belgium	144 335	150 953	145 860	144 043	142 753	145 813	146 700	1.6
Bulgaria[a,b]	106 997	62 566	45 447	44 268	40 624	52 868	45 403	–57.6
Canada	517 146	842 979	594 115	597 730	731 670	742 425	838 907	62.2
Croatia[a]	16 687	1 378	5 983	8 647	10 813	12 544	13 111	–21.4
Czech Republic[a]	194 474	146 694	142 338	142 483	137 984	141 894	142 306	–26.8
Denmark	70 968	75 758	71 227	70 396	68 365	73 600	67 341	–5.1
Estonia[a]							13 307	
European Community[c]	4 047 252	3 904 730	3 875 904	3 892 234	3 863 562	3 937 559	3 941 605	–2.6
Finland	49 711	56 092	53 673	56 341	58 641	67 815	62 949	26.6
France	543 719	534 185	527 547	521 721	508 864	510 693	510 818	–6.1
Germany	1 198 055	1 063 578	988 866	1 000 206	983 716	988 929	979 442	–18.2
Greece	105 549	108 826	128 797	127 990	127 561	131 755	132 231	25.3
Hungary[a,b]	120 408	76 312	78 656	80 093	77 001	79 496	78 405	–34.9
Iceland	5 372	5 113	5 491	5 445	5 447	5 346	4 963	–7.6
Ireland	55 722	59 129	68 727	70 376	68 793	67 978	68 389	22.7
Italy	439 879	429 436	454 899	451 133	447 455	466 070	477 412	8.5
Japan	1 197 474	1 260 713	1 260 566	1 235 780	1 267 663	1 263 346	1 260 296	5.2
Latvia[a]	5 223	–5 465	–4 181	–3 527	–2 545	–2 930	–3 158	–160.5
Liechtenstein	190						235	23.3
Lithuania[a]						10 234	24 547	
Luxembourg								
Monaco	108	115	117	119	117	111	104	–3.1
Netherlands	215 355	227 271	216 850	218 594	217 314	218 071	220 441	2.4
New Zealand	42 915	49 450	50 099	52 551	52 374	52 864	50 606	17.9
Norway	35 224	36 071	28 242	27 615	27 224	28 347	28 623	–18.7
Poland[a,b]							361 907	
Portugal	63 484	69 361	78 095	79 831	83 773	91 603	81 804	28.9
Romania[a,b]	226 338	139 215	95 017	98 902	107 542	113 822	119 959	–47.0
Russian Federation[a]	3 165 135	2 034 099	2 310 060	2 224 094	1 784 954	1 659 440	1 825 709	–42.3
Slovakia[a]	70 972	50 663	46 992	47 291	45 290	46 276	46 795	–34.1
Slovenia[a,b]		13 526	13 647	14 471	14 443	14 348	14 415	
Spain	264 125	293 194	354 026	352 792	370 637	377 935	397 362	50.4
Sweden	50 244	56 816	50 276	52 909	53 565	54 567	53 375	6.2
Switzerland	51 047							
Turkey[d]								
Ukraine[a]	891 541	478 741	357 059	356 958	363 154	376 803	381 274	–57.2
United Kingdom	779 072	715 367	671 776	679 129	658 145	663 312	663 407	–14.8
United States	5 198 588	5 868 408	6 222 796	6 125 140	6 147 158	6 184 290	6 294 315	21.1
Decrease in emissions by more than 1 per cent (number of Parties)								**18**
Change in emissions within 1 per cent (number of Parties)								**0**
Increase in emissions by more than 1 per cent (number of Parties)								**16**

Note: Negative values in Gg mean net removals; positive values in Gg mean (net) emissions. Blank spaces indicate that either no data were available, or notation keys were used. The changes in emissions from 1990 to 2004 were calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided.

[a] A Party undergoing the process of transition to a market economy.

[b] Data for the base year as defined by decisions 9/CP.2 and 11/CP.4 (Bulgaria (1988), Hungary (average of 1985 to 1987), Poland (1988), Romania (1989), Slovenia (1986)) are used for this Party instead of 1990 data.

[c] Emission estimates of the EC are reported separately from those of its member States.

[d] Decision 26/CP.7 invited Parties to recognize the special circumstances of Turkey, which place Turkey in a situation different from that of other Parties included in Annex I to the Convention.

IV. Policies and measures

A. Objective and overview of the main policy trends

23. This chapter outlines the developments in climate change policies and measures as reported by the 39 reporting Parties in their NC4. The reported policies and measures covered a wide range of planned, adopted and/or implemented activities. Many of these policies were not introduced solely for climate change objectives, yet are contributing to the mitigation of GHG emissions and enhancing removals. The policies and measures were designed and implemented at all levels of government – regional, national, state/provincial and municipal.

24. Annex I Parties reported on over 1,000 policies and measures in their NC4. The large number reflects the **absence of a known 'silver bullet'** policy instrument or technical solution for mitigating GHG emissions. Effective climate change mitigation policy requires the use of a number of policies and measures to evoke many concrete climate-related actions in many sectors. Quantitative estimates of the mitigation effects of policies and measures are rarely reported in the NC4. Even when they are reported, estimates are not necessarily consistent among Parties, in terms of categorization, baseline assumptions, modelling procedures and methodological approaches to account for policy synergies and interactions. As a consequence, this chapter provides a mostly qualitative overview of the policies and measures in each sector, based on their frequency of use (and reporting by Parties) and their estimated mitigation effects where reported. This qualitative assessment is supplemented by quantitative information on the mitigation effects of individual policies and measures, when available, and their contribution to Parties' emission reduction portfolios.

25. Despite being a relatively young issue, climate change has become a prominent policy concern in most Annex I Parties. The reported information suggests that **all Parties have adopted national climate change strategies, action plans and programmes** with mitigation policies and measures that address many aspects of the energy supply, energy end use and non-energy emissions sectors. One of the most prominent examples of such programmes is the European Climate Change Programme (ECCP)[6], which launched a comprehensive package of policies and measures at the EU level to attain to the Kyoto Protocol target. Parties have implemented, and continue to develop further, portfolios of different types of policies and policy approaches, spanning a wide range of government activities, sectors, actors and institutions within and outside of governments.

26. **Policy efforts that in many cases began in the early 1990s, have now begun to yield results** by limiting growth in GHG emission trends. For example, among non-EIT Parties, Denmark, the EC, France, Germany, Monaco, the United Kingdom, Sweden (without LULUCF) and Norway (with LULUCF) succeeded in stabilizing emissions altogether in spite of strong economic growth, and in Finland, Germany, Monaco, Sweden and Switzerland, there has been significant progress in reducing or at least stabilizing emissions even in the sector of transport, which is very difficult to control.

27. Despite the diversity and complexity of the climate change strategies, policies and measures, **five general trends** are apparent:

(a) **Parties are increasingly relying on harder (economic and regulatory) instruments rather than softer** (voluntary) instruments to elicit emission reductions. Quotas and tradable certificates systems (i.e. regulations with an element of economic flexibility) are among the newest and fastest growing instruments. Emissions trading is the biggest and most visible form, but green (renewables) and white (energy efficiency) certificate programmes are growing as well. Canada has recently taken action to regulate the

[6] European Climate Change Programme. 2003. "Second ECCP progress report". Available at: <http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf>.

industrial emitters directly. Regulation is widely used in the high PFCs, HFCs and SF_6 emitting sectors;

(b) **Parties are making great use of the relatively low-cost (i.e. more cost-effective) options** of mitigating non-CO_2 (i.e. CH_4, N_2O, PFCs, HFCs and SF_6) emissions. A relatively high proportion (in comparison with the total emissions) of mitigation effects are expected from policies and measures that address non-CO_2 gases. Parties are using a combination of regulatory, voluntary and economic incentives to mitigate these emissions;

(c) **Parties are continuing to build policymaking capacity to deal with climate change**. The greater numbers, and greater stringency, of measures require increased policymaking efforts (e.g. planning, consultation, analysis, coordination, rule-making, administration and investment). The greater use of multilevel governance – across multiples scales of government – further expands the policymaking requirements. Cities and other sub-national governmental authorities are increasingly influencing GHG emissions trends and playing an essential role in adaptation planning;

(d) **A growing number of policies and measures involve climate-driven actions** such as emission trading systems and carbon taxes. However, there are also many measures that aim to add and integrate climate change elements into existing policy and institutional frameworks (e.g. energy and agricultural market structures and rules), where climate change mitigation may not necessarily be the primary goal. An increasing portion of emissions reductions can be expected from climate-driven policies, but considerable reductions can also be expected from non-climate-driven reforms. Policies and measures, whether climate driven or not, are increasingly aimed at multiple objectives with an overall goal of enhanced economic, environmental and social sustainability. For example, in addition to their climate objectives, biofuels programmes seek to increase energy security; energy market reforms aim to improve economic efficiency; waste regulations strive to improve local environmental conditions; and road pricing schemes aim to reduce traffic congestion. Moreover, **countries are increasingly placing climate change in the long-term framework for their energy policy**, for example as reported by the United Kingdom in their 2003 white paper "Our energy future – creating a low carbon economy";

(e) **There is greater use of international, bilateral and multilateral cooperation to foster climate-friendly technology development and deployment**, such as the International Partnership for the Hydrogen Economy (IPHE), the Carbon Sequestration Leadership Forum (CSLF), the Renewable Energy and Energy Efficiency Partnership, and the Methane to Markets Partnership.

B. Sector context

28. Policies and measures are being applied in all emission sectors, but greater reductions have been achieved and are projected to be realised in some sectors than others. From 1990 to 2004, the greatest absolute reductions for all Annex I Parties were achieved in the following sectors: agriculture (340 $TgCO_2eq$); LULUCF (290 $TgCO_2eq$); energy use in industry (200 $TgCO_2eq$); industrial processes (180 $TgCO_2eq$); and fugitive emissions (140 $TgCO_2eq$ (figures 4 and 5). Two sectors, transport and energy industry (also known as energy supply), showed the greatest increases in emissions at 680 $TgCO_2eq$ and 390 $TgCO_2eq$, respectively.

29. **The largest absolute emissions reductions have been reported by EIT Parties**. Their total emissions excluding LULUCF declined 36.8 per cent (see figure 2), while their GDP rose 11.7 per cent (in constant terms), from 1990 to 2004 (see also para. 14). The EIT Parties reported fewer policies and

measures than did the rest of the Annex I Parties. Most of their emission reductions appear to have come not from explicit climate change policies and measures but from the economic policies and market forces that shaped the economic restructuring in the early to mid-1990s. There were emission decreases in all sectors except the waste sector. The reductions were greatest in the energy industries sector (also known as the energy supply sector), energy use in industry and other sectors (residential, commercial and institutional).

30. **Non-EIT Annex I Parties have implemented many more policies and measures**, but they have not been sufficient to offset the emissions growth in most sectors. Their total emissions excluding LULUCF increased by 11 per cent (see figure 2), while their GDP rose by 39.5 per cent (in constant terms), from 1990 to 2004. There were emission increases in all the energy subsectors except fugitive emissions and decreases in nearly all the non-energy sectors. The increases were highest in the energy supply and transport sectors and decreases were greatest in the industrial processes, fugitive emissions and waste sectors. Emissions have essentially been stabilized in energy use in industry.

31. As shown in chapter V, emission trends may change sooner in the energy supply sector than in the transport sector. Parties have implemented many policies and measures aimed at the energy supply sector (primarily electricity generation) and generally report high estimated mitigation effects. The short-term situation is less optimistic for the transport sector. Fewer transport policies have been implemented, and the expected mitigation effects by 2010 are more modest.

32. There are **considerable differences in sectoral emission trends among non-EIT Parties,** where most of the policies were implemented (table 5). In the energy sector, four of them (Germany, Monaco, Sweden and United Kingdom) cut emissions between 1990 and 2004. Parties have had the least success in cutting emissions from the transport and energy supply (primarily electricity generation) sectors. In the transport sector, none of these Parties has cut emissions, although five (Finland, Germany, Monaco, Sweden and Switzerland) have kept growth to less than 10 per cent. Some 17 Parties have experienced growth in transport sector emissions of over 25 per cent. In the energy supply sector, seven of these Parties (Belgium, Denmark, France, Germany, Iceland, Luxembourg and United Kingdom) have cut emissions, but 13 have experienced growth of over 25 per cent.

Table 5. Greenhouse gas emission changes in the Annex I Parties that are not economies in transition by sector in 2004 compared with 1990

	Changes less than 0% (reduction)		Changes between 0% and 10% (increase)		Changes between 10% and 25% (increase)		Changes over 25% (increase)	
Sector	Number of Parties	Emissions changes ($TgCO_2$ eq)	Number of Parties	Emissions changes ($TgCO_2$ eq)	Number of Parties	Emissions changes ($TgCO_2$ eq)	Number of Parties	Emissions changes ($TgCO_2$ eq)
Energy	4	–203	6	36	7	1 188	10	554
Energy industries	7	–87	2	0	5	98	13	773
Manufacturing industries and construction	11	–89	7	24	5	10	3	58
Transport	0	0	5	12	5	83	17	627
Other sectors	7	–47	9	49	6	60	5	26
Fugitive emissions	14	–86	2	1	1	0	8	26
Industrial processes	11	–131	5	21	3	12	7	27
Solvents	15	–2	4	0	3	1	1	0
Agriculture	20	–59	3	3	3	22	0	0
LULUCF	15	–207	1	0	0	0	10	113
Waste	17	–88	1	2	3	5	6	37
Total excluding LULUCF	**7**	**–332**	**5**	**91**	**9**	**1 080**	**6**	**584**
Total including LULUCF	**7**	**–380**	**9**	**136**	**5**	**1 124**	**6**	**637**

Abbreviations: LULUCF = land use, land-use change and forestry, EIT = economies in transition.
Note: Other sectors include energy use in residential, commercial and institutional sectors.

33. Projections included in the NC4 show that **growth in emissions from transport** is expected to continue through 2010, with a 30.5 per cent increase from 1990 to 2010, compared with a 23.9 per cent

increase from 1990 to 2004 (see para. 154). The projections also show **erosion of the previous declines posted in the industrial processes and agriculture sectors, and a reversal of the previous declines in the overall energy sector**. Only in the waste sector are the projected reductions greater than those already posted. Total Annex I Parties' emissions excluding LULUCF are projected to reverse in trend, with an increase of 4.2 per cent from 1990 to 2010, compared with a decrease of 3.3 per cent from 1990 to 2004 (figures 2 and 8).

C. Features of main policy instruments

34. A wide variety of policy instruments is used to influence the investments, purchases and behaviour of individuals and organizations in order to mitigate GHG emissions. Although highly varied, the evolving climate change strategies and action plans of the Parties contain policies and measures that tend to have three major functions: (1) to attach a price to carbon; (2) to reduce barriers to the development and deployment of climate-friendly technologies; and (3) to directly spur new technology solutions. More specifically the reported policies and measures could be grouped as follows:

(a) **Emissions pricing mechanisms**, such as carbon taxes and tradable emissions allowances, which by attaching price to carbon seek to send pervasive and consistent signals throughout the economy to elicit the many types of investment, technology innovation and behaviour change needed to reduce GHG emissions;

(b) **Barrier reduction policies**, which aim to overcome the information, financial and market barriers to the development and deployment of climate-friendly technologies at levels consistent (from rational individual, corporate and social viewpoints) with the prevailing emissions prices.[7] These policies include: (i) energy market reform; (ii) framework targets on technologies, fuels and efficiency levels; (iii) information dissemination and awareness raising using ratings, labels, auditing, advice, etc.; (iv) models and demonstrations; (v) voluntary enterprise challenges and partnerships; (vi) voluntary sectoral commitments; (vii) regulations in the form of rules, standards, permitting, etc.; (viii) market instruments in the form of quota and certificate programmes – non-CO_2; (ix) fiscal and economic incentives in the form of taxes, usage fees, subsidies, etc. – non-CO_2; (x) government operations; (xi) public infrastructure and resource management; and (xii) systems approaches;

(c) **Creating new technology solutions, or long-term research and development (R&D)**, which provides the needed advances in energy supply, energy and non-energy technologies. Markets alone do not provide sufficient incentives for long-term R&D; government support is needed.

35. Market, and fiscal and economic incentives, depending on their design, can be used to either price emissions or reduce barriers. The distinction is whether the instrument targets emissions directly or indirectly through activities that generate or reduce emissions. For example, a quota and certificate programme denominated in CO_2 emissions is an emissions pricing mechanism, while similar programmes denominated in amounts of electricity generated from renewable sources or electricity saved are barrier

[7] For any level of emissions and energy prices (as induced by carbon and energy taxes and emissions allowance and energy markets), a large portion of cost-effective emission reduction measures are left unimplemented. The informational, financial, organizational and structural reasons why these apparently cost-effective measures are not developed and taken up are collectively known as market barriers. The untapped potential represents a loss of economic efficiency, and if left unexploited raises the overall cost of meeting any particular emission reduction goal. Parties use a variety of policies to correct, compensate for and overcome these market barriers. The same policies can also be used to provide additional motivation for emission reduction measures when emissions and energy prices are inconsistent with the climate change goals set out in the Convention.

reduction instruments. Taxes on CO_2 are an emissions pricing policy, while taxes on road use and preferential taxes (tax exemption) for biofuels are barrier reduction measures.

36. The application of these policies and measures categories to the major emissions sectors is shown in table 6. Because a fully quantitative overview of the expected mitigation effects of the policies and measures is not possible, the table shows a qualitative assessment of the importance of the policies in each sector, based on their frequency of use and their estimated effects where reported.

Table 6. Importance of policies and measures based on frequency of use and/or estimated effects, by type and emissions sector in 2010

	Emitting sector									
	Energy supply			Energy consumption			Non-energy			
Policy types	**Electricity and heat**	**Transport fuels**	**Fugitives at oil, gas and coal facilities**	**Residential, commercial and institutional**	**Transport**	**Industry**	**Industrial processes**	**Waste**	**Agriculture**	**Land–use change and forestry**
Emissions pricing										
Carbon taxes				■	■	□ [a]				
Tradable emissions allowances	■					■	□ [a]			
Overcoming barriers										
Energy market reform	□			□						
Framework targets (technologies, fuels and efficiency)	■	■		□				■		
Information dissemination and awareness-raising (labels, auditing and advice)				■	■	□		□		
Models and demonstrations	□			□					□	
Voluntary enterprise challenges and partnerships	■		■	■	■	■	■	■		□
Voluntary sectoral commitments			■		■	■	■			
Regulations (rules, standards and permitting)	■	■	■	■	■	■	■	■	□	■
Market incentives (target CO_2 indirectly, e.g. quotas and certificates)	■			□						
Fiscal and economic incentives (target CO_2 indirectly, e.g. taxes, fees and subsidies)	■	■		□	■			■	■	■
Government operations				■	■					
Public infrastructure and resource management								■		■
Systems approaches				□	□	□				
Long-term research and development	■	■			■	■				

Note: (1) ■ signifies high importance based on frequency of use and/or estimated mitigation effects.
(2) □ signifies medium importance based on frequency of use and/or estimated mitigation effects.
[a] Indirect influence.

1. Emissions pricing policies

Carbon taxes

37. Carbon or climate-oriented energy taxes are used by 10 Parties, mostly in northern Europe.[8] **They have been a cornerstone of climate policies in Denmark, Finland, the Netherlands, Norway and Sweden since the early 1990s**. More recently, they have been introduced in Germany,

[8] Energy taxes can conceivably be harmonized into de facto carbon taxes, but this has not happened in practice. They are rarely implemented in a fully carbon-consistent way. Energy taxes have historically been focused on transport fuels (mostly refined oil products) for revenue raising and oil security reasons, and most Parties continue in that purpose.

Liechtenstein, Slovenia, Switzerland and the United Kingdom. The rates of the taxes are typically EUR 7–13 per tonne CO_2, but can be as high as EUR 42 per tonne CO_2.

38. In countries with both carbon taxes and emissions trading in place, governments are seeking synergy between the two instruments to ensure comprehensive coverage of emission sources: in most cases, emissions trading targets mostly large sources and installations, while carbon taxes address those sectors that are difficult to cover by emissions trading. Moreover, in several EU member States, the role and design of carbon and energy taxes have been reconsidered in the context of the introduction of the EU emissions trading scheme (EU ETS).

Tradable emissions allowances

39. Tradable emissions allowance systems, used primarily in the European Union, are the premier instrument for reducing CO_2 emissions from energy production and use.[9] **The EU ETS is the largest and best known system**, but there are two others in operation – the New South Wales Greenhouse Gas Abatement Scheme in Australia and the Chicago Climate Exchange (CCX) in the United States – and many others under development.[10]

2. Barrier reduction policies

Energy market reform

40. Electricity and gas market reform measures – reported by Australia, the EC and the United Kingdom – are being undertaken to increase the openness, efficiency and competitiveness of the energy supply and service sectors.[11] Their primary aim is to improve economic efficiency to increase general economic growth and development. The reforms also enable, but do not necessarily encourage, the reduction of CO_2 emissions through more commercial opportunities for improving energy efficiency (e.g. energy performance contracting and third party financing), more smaller-scale local generation (e.g. distributed generation) and increased use of RES. Often additional policies are needed to support energy efficiency, local generation and renewable energy sources in liberalized markets. Moreover, market reforms can influence fuel choices in power plants and investment time frames in ways that may or may not be consistent with climate change objectives.

Framework targets

41. Framework targets for technology shares, fuel shares and efficiency levels are used mostly in the areas of energy supply (power generation and transport fuel) and landfill emissions. They are used most heavily by the EC, but other Parties use them as well. They involve setting goals (e.g. 5.75 per cent of transport fuels to be based on biofuels by 2010), but not prescribing specific measures for achieving the goals.[12] Developing and implementing specific measures is left to the EU member States. The targets provide a long-term vision to guide general activity, while implicitly recognizing that diversity of regional or national circumstances demands different implementing measures. The most prominent EU

[9] Other quota and certificate programmes – based on non-emissions denominations such as amounts of electricity from renewable sources, electricity saved or waste landfilled – are discuss in the market incentives section below.
[10] Emissions trading systems are being developed in Canada, California and the north-east and mid-Atlantic regions of the United States, Japan, New Zealand, Norway, Switzerland and the Australian states and territories.
[11] Market reforms are also occurring in non-energy sectors, most notably the restructuring of the EU Common Agricultural Policy (CAP).
[12] Targets stipulating mandatory conditions (e.g. a certain share of electricity generation to be sourced from renewables) to be met by companies or industries are classified as regulations in this context.

Directives of this type are:[13] the Renewable Electricity Directive (RES-E), the Biofuels Directive, the Landfill (of Waste) Directive, the Packaging and Packaging Waste a, the Waste Electrical and Electronic Equipment (WEEE) Directive and the EU End-use Efficiency and Energy Services Directive.

42. Targets are also a major component of the **Top Runner Programme of Japan**, the **New South Wales benchmark-based white certificates programme for power retailers** and the United States **Climate Visions programme**.

Information dissemination and awareness-raising

43. Information dissemination and awareness-raising programmes, such as ratings, labelling, auditing and advice, are used by nearly all Parties. They are most prevalent in the residential, commercial and public sectors (e.g. labels for household appliances, home entertainment devices, office equipment and buildings), but also find limited use in the industrial sector (e.g. best practice manuals and motor ratings) and the transport sector (e.g. automobiles). They combat the barrier of insufficient and inaccurate information about the emissions and energy characteristics (which are otherwise "invisible" to consumers) of appliances and equipment.

Models and demonstrations

44. Models and demonstrations – reported by Canada and Japan – are used mostly in the areas of commercial buildings, energy supply (power generation and transport fuel) and agriculture. They are a way of increasing confidence (reducing risk) in new technological methods for reducing emissions.

Voluntary enterprise challenges and partnerships

45. Voluntary enterprise challenges and partnerships are used extensively in Australia and the United States to mitigate emissions in the commercial, industrial (energy and processing), fugitive emissions, waste and forestry sectors. They are a diverse group of measures, encompassing distinct mixes of: public reporting, information, education, decision aids, outreach, promotion, advice, inventories, assessments, audits, strategies, action plans, commitments, monitoring, benchmarking, performance indicators, aspirational targets, public recognition and sometimes financing. Elements common to most are: (1) voluntary participation by relevant market actors; (2) a degree of two-way interaction between government and the private sector greater than in the traditional information, regulatory and fiscal incentives measures; (3) a focus on specific technologies (e.g. lighting, building design and cogeneration); (4) motivation methods that are generally less coercive than taxes and regulations; and (5) for more elaborate programmes, government and private sector actors (e.g. equipment producers, house builders, building managers and process designers) working together to overcome barriers to energy efficiency and emissions reductions. **Commitments and targets, where they are used, are usually aspirational in nature** (i.e. having no severe sanctions for non-attainment) and are usually applied to individual companies (in contrast to the targets in voluntary sectoral commitments). Measures in this category include: Greenhouse Challenge Plus (Australia) and the Energy Star for the Commercial Market, the Combined Heat and Power Partnership, WasteWise and the Coalbed and Landfill Methane Outreach programmes (United States). The use of voluntary enterprise challenges and partnerships reflects some governments' concern about the efficacy and efficiency of regulations and taxes in specific technology areas, and is a recognition that mitigation measures can face multiple barriers, which need the concerted effort of many actors to be overcome.

[13] Not all EU Directives are purely framework targets. The EU Energy Performance of Buildings Directive, for example, specifies concrete measures; the EU Landfill Directive specifies concrete measures along with the framework targets.

Voluntary sectoral commitments

46. Voluntary sectoral commitments – reported by the EC, Belgium (Flanders and Wallonia regions), Finland, France, Germany, Japan, Luxembourg, the Netherlands, Switzerland and the United Kingdom – are used mostly in the industrial sector, but also in the transport sector. There is a variety of agreements and arrangements involving firms or industry associations and different layers of government. They range from covenants with strict, binding targets and severe repercussions for not meeting them (e.g. loss of exemptions from current taxes and regulations or threat of future taxes and regulations) to agreements with mostly aspirational targets, with mild consequences for failure to attain them. Among the former are agreements in France, Switzerland and the United Kingdom tied to exemptions from current taxes and regulations, and in the Flanders region of Belgium and in Germany, Japan and the Netherlands tied to the threat of future taxes and regulations. Among the latter are agreements in the Wallonia region of Belgium and in Finland, Luxembourg and the United States. In some cases, such as the EU agreements with European (ACEA), Japanese (JAMA) and Korean (KAMA) car manufacturers associations, voluntary agreements are used in lieu of mandatory product standards. Voluntary sectoral commitments pre-date, and have in some cases been eclipsed by, emissions trading systems. However, the two policies are not mutually exclusive and can be combined. For example, participants in the United Kingdom Climate Change Agreements programme are eligible to be exempt from EU ETS, and the Netherlands benchmarking covenants provided the starting point for the country's national allocation plan (NAP) under EU ETS.

Regulations

47. Regulations, such as rules, standards and permitting terms are used by nearly all Parties in some circumstances. They take many forms and are used in nearly all GHG emitting sectors. They are designed to directly shape the market, by reducing the role played by less efficient, more carbon-intensive products (e.g. making it illegal to sell poorly performing equipment), or by increasing the role of climate-friendly operating practices (e.g. requiring the use of energy audits or best available technologies in industrial plants). Among the many forms are product efficiency standards, landfill operating standards, manufacturing and power plant permitting rules, and power plant fuel share obligations (e.g. minimum share of RES).

Market instruments (target CO_2 indirectly)

48. Quota and certificate programmes have only recently been applied to climate change mitigation. They combine sector or industry goals (i.e. framework targets), enterprise or company obligations (i.e. regulations), and market flexibility in meeting goals and obligations. Companies earn certificates for their actions in meeting their obligations (quotas), but can also trade (i.e. buy additional or sell excess) certificates as needed to meet their requirements. To date, quota and certificate programmes have been used to promote:

- Renewables use (green certificates denominated in kWh of electricity produced from RES);
- Energy savings (white certificates denominated in kWh of saved energy);
- Landfill waste reduction (landfill allowance certificates denominated in tonnes of landfilled waste);
- Direct CO_2 emissions reductions (certificates denominated in tCO_2 emissions), as in the emissions trading schemes described above.

49. Green certificates are being used in Australia, Belgium, Denmark, Italy, the Netherlands, Poland, Sweden, and the United Kingdom; white certificates are being used in the Flanders region of Belgium and in Denmark, France, Italy, the Netherlands and the United Kingdom.

Fiscal and economic incentives (target CO_2 indirectly)

50. Fiscal and economic incentives, such as taxes, fees and subsidies, are used by nearly all Parties in some circumstances. They are used to promote or penalize certain purchases, investments or behaviour through financial means. They can take many forms, including: subsidies for energy-efficient product purchases or home renovations; project financing assistance; guaranteed minimum feed-in tariffs for power based on RES; differentiated purchase fees on automobiles based on fuel economy; road taxes; landfill usage charges; and differentiated taxes on fuels (e.g. tax exemption for biofuels). Frequently, subsidies and fees are linked, with the fees collected from penalised purchases and behaviour used to subsidize others.

Government operations

51. Maintaining, renovating and modifying government operations – reported by Australia, Canada and the United States – are used to reduce emissions in the public and transport sectors. Government buildings, equipment and vehicle fleets are major energy users and sources of carbon emissions in many countries. By improving its own operations, government can not only have a substantial direct mitigation effect, but can also increase the markets for energy-efficient and climate-friendly products, thereby lowering their costs and encouraging their wider implementation.

Public infrastructure and resource management

52. Governments' management of public infrastructure and resources is an important mechanism for reducing emissions in the transport, waste and land-use change and forestry sectors. Governments, especially local governments, have direct control of urban infrastructure, transport systems and public lands, and can manage their forms and operations in ways that reduce emissions and increase sinks. For example, France reported development of the TGV high speed rail network; Japan reported increased use of public transport; and Denmark reported a public afforestation programme.

Systems approaches

53. Systems approaches, such as spatial planning, are used primarily by Japan. Systems approaches seek to gain efficiencies and emission reductions through tighter integration among the components of large systems and networks. Japan has measures to make urban design, transport networks, power networks and industrial parks more climate-friendly.

3. Creating new technology solutions and long-term research and development

54. Long-term R&D activities were reported by Australia, Canada, the EC, Japan and the United States. These efforts are intended to provide a **long-term signal to industry to enhance its ability to deliver needed emission reductions** in the energy supply, energy end-use and non-energy fields, while improving the Parties' competitive position in the potential markets for the new technologies. This approach stems from the recognition by the governments that development of cleaner and more efficient technologies is of importance not only for climate change mitigation, but also to enhance energy security, to reduce the impact on the environment and to stimulate economic growth.

55. All emission reduction technologies can benefit from additional R&D, but the ones offering the **largest potential emissions reductions** according to Parties and **facing the technological challenges** are: carbon capture storage (CCS); advanced fossil-fuelled power plants; advanced nuclear power reactors; hydrogen networks; energy efficiency technologies; fuel cells; cellulosic biofuels and solar power options.

56. The EU's seventh Framework Programme for Research energy theme focuses on: hydrogen and fuel cells; renewable electricity generation; renewables for heating and cooling; CCS technologies for zero emission power generation; clean coal technologies; smart energy networks; energy efficiency and savings; and knowledge for energy policymaking. The Programme's transport theme focuses on: reduction of emissions and the use of alternative fuels for air transport; traffic management; reduction of pollution, promotion of efficient engines, hybrid technology and alternative fuels for surface transport; and encouraging modal shift and decongesting transport corridors.

57. The long-term component of the United States climate change strategy includes the following programmes: the Carbon Sequestration Regional Partnerships; Generation IV Nuclear Energy Systems; the Nuclear Hydrogen Initiative; the Advanced Fuel Cycle Initiative; the Global Nuclear Energy Partnership; the Clean Automotive Technology; Hydrogen Technology; and High-Temperature Superconductivity.

58. Japan is supporting the development of breakthrough energy conservation technologies, technologies utilizing the vast unused energy sources (e.g. waste incineration), hydrogen and CCS. It is also focusing on promoting technology for encouraging reform of regional and urban structures and reform of socio-economic systems to form the foundation for medium- and long-term global warming countermeasures.

59. A substantial portion of Parties' R&D effort is conducted within international bilateral and multilateral collaboration frameworks, such as the IPHE and CSLF.

D. Implementation of policies and measures by sector

1. Cross-cutting instruments and policies

60. Parties reported portfolios of policies that cover all sectors. Some policies and measures cover multiple emissions sectors themselves. The most inherently cross-sectoral are carbon and energy taxes, tradable permits and energy market reform, but systems approaches and long-term R&D sometimes span several sectors as well. None of these policies, however, are used by any Party on an economy-wide scale. Even carbon and energy taxes and tradable permits, which are conceptually universal in scope, are applied only to selected several sectors in practice.[14]

61. **Carbon and energy taxes**, as currently applied, influence most directly the electricity generation sector and the transport, residential, commercial and public sectors. These are sectors where compliance costs are either relatively low or can be passed through to consumers, and thus the taxes do not greatly influence the international competitiveness of the sectors. For the industrial sector, especially energy-intensive subsectors exposed to global market forces, the influence of carbon and energy taxes is more indirect. Unconditional exemptions, exemptions tied to emissions reduction performance, or opportunities to obtain subsidies for emission reduction projects are often accorded to the industrial sector. In some Parties, the threat of being assessed for the taxes leads industrial companies to participate in voluntary sectoral commitments in order to reduce their emissions (United Kingdom Climate Change Agreements); in other Parties, the taxes are recycled back to industry as subsidies for emission reduction measures (Denmark). As yet, carbon taxes are not applied to non-energy sources of GHG emissions. In addition, there is little information reported by Parties on the shift in taxation from income towards natural resources and emissions, also known as the green tax reform, which was mentioned by some Parties, for example Denmark, Germany and Sweden, in their third national communications (NC3) . Carbon taxes account for significant portions of the expected emission reductions of Parties where they are used. (Denmark, CO_2 tax, 1.5 $TgCO_2$ 6.5%; Norway, offshore and

[14] This chapter does not include umbrella programmes (e.g. Australia's Greenhouse Gas Abatement Programne and Greenhouse Challenge Plus) that group similar stand-alone (not fully interdependent) project or sector-specific measures under a single name.

onshore CO_2 tax, 4.3 $TgCO_2$, 34.7 to 46.3%; Switzerland, CO_2 tax on heating and process fuels, and climate cent on motor fuels (domestic projects), 0.9 $TgCO_2$, 69.2%; United Kingdom, Climate Change Levy, 13.6 $TgCO_2$,
12.7%; United Kingdom, motor fuel tax escalator, 7.0 $TgCO_2$, 6.5%; Denmark, higher fuel taxes for transport; 1.2 $TgCO_2$, 5.2%; France, special tax rates for biofuels, 9.4 $TgCO_2$, 8.6%; Germany, ecological tax reform, 12.0 $TgCO_2$, 5.4%; Sweden, motor fuel taxes, 1.6 to 3.4 $TgCO_2$, 10.0 to 19.1%).[15]

62. **Tradable emissions allowances**, such as EU ETS, are the newest and fastest growing policy instrument. Although a relatively young instrument, EU ETS is the centrepiece of the EU's strategy to meet its Kyoto emissions commitment. It is a truly innovative cap and trade system, wherein regulations require certain power generation and industrial installations to surrender an allowance for each tonne of CO_2 emitted during each year. They receive a certain number of allowances each year, as specified in their country's NAPs, and they are free to buy additional allowances from within EU ETS or emission units from the project-based mechanisms under the Kyoto Protocol (i.e. the clean development mechanism (CDM) and joint implementation (JI) to cover any extra emissions, or to cut emissions and sell any extra allowances they might have.[16] EU ETS is significant in all countries in terms of the scope of emissions covered, with coverage of 52 per cent of overall EU CO_2 emissions in the 2005–2007 pilot period. In some countries (e.g. Denmark and Finland), it covers 50 per cent of total GHG emissions whereas in others it covers only 30–40 per cent of emissions (e.g. Sweden and Netherlands). In general, the share of emissions covered in the system is higher in newer EU member States (e.g. Czech Republic and Estonia) than in the 15 member States of the European Union as of 1996 (EU-15).

63. In the first trading period, the NAPs allow for a small (3.5 per cent) increase in overall emissions from the covered facilities above 2003 emission levels, with an estimated decline (–3.4 per cent) below expected 'business as usual' emissions in the 2005–2007 period. Thus the system has begun with a modest goal to reduce the growth in emissions from covered facilities. In the second period, 2008–2012, the approved emissions cap of the 21 member States with NAPs approved as at June 2007 is 2.7 per cent below 2005 verified emissions.[17] The caps of individual member States range from 16.7 per cent below to 33.3 per cent above their 2005 verified emissions.

64. The CCX is a smaller, but more diverse trading system. It integrates the voluntary, legally binding emission reductions commitments of a wide range of member organizations, including: manufacturing, mining, power generation, food processing, forest product, environmental service and retail companies; farms; municipalities, counties and states; and universities, churches and non-governmental organizations. The Phase I (2003–2006) emission reduction target for each of the 38 full members (i.e. entities with significant GHG emissions) was 4 per cent below baseline by 2006. The Phase II (2007–2010) emission reduction target will require all members to reduce 6 per cent below baseline by 2010. Members must either reduce emissions to the targeted levels or comply through the purchase of allowances and/or project-based offsets so as to meet the reduction goal.

65. As applied in EU ETS and the CCX, emissions trading schemes most directly influence the electricity generation and industrial sectors. The EU ETS could integrate the aviation sector from 2011. These sectors are subject to emission permitting requirements, because they are large, concentrated sources of emissions, which means they are amenable to emissions monitoring and useful for testing

[15] Party, policy, emissions and percentage combinations noted in brackets in this chapter show projected emissions mitigation impacts of certain policies in 2010, or 2012 for the United States, and their portfolio share of the Party's total projected emission reductions from existing, adopted and planned domestic policies (calculated as the sum of quantified impacts of all reported measures, rather than the aggregate projections presented in chapter V). The portfolio shares for EU policies are overestimates, because the EU's sum excludes policies reported without quantified impacts.

[16] EU ETS is a particular type of quota and certificate system, one that is denominated in tonnes of CO_2 equivalent.

[17] This figure does not include some additional allowances (53 $TgCO_2$) for new sectors to come under the coverage of the scheme in 2008 to 2012.

emissions trading concepts before their possible wider use. Tradable allowances also affect the residential, commercial and public sectors, albeit indirectly through electricity price increases arising from the allowance costs passed through by power generators (Finland, ETS, 5.9 $TgCO_2$, 34.4%; France, ETS, 3.2 $TgCO_2$, 2.9%; Netherlands, ETS, 1.4 $TgCO_2$, 15.5%; Slovakia, ETS, 0.8 $TgCO_2$, 76.2%; United Kingdom, ETS, 11.0 to 29.3 $TgCO_2$, 10.3 to 23.2%).

66. Energy **market reform** measures were reported by Australia and the EC and are underway in the United States and the United Kingdom. They are expected to influence most directly the electricity generation sector (via more distributed generation and increased use of RES) and the residential, commercial, public and industrial sectors (via energy performance contracting and third-party financing). These measures are expected to generate large emission reductions in these Parties (EC, reform of electricity and gas markets, 80 to 120 $TgCO_2$, 8.2 to 10.7%).

67. **Long-term research and development** is similarly sector-specific. The largest long-term options include: CCS for the power generation and industrial sectors; hydrogen networks for the transport sector; cellulosic biofuels for the transport sector; and solar power for the power generation sectors. These research areas can be cross-sectoral, as they are all likely to require advances in biotechnology, nanotechnology, computational technology, materials science and complex systems tools to be successful. They all also depend on a strong and coherent science and technology research enterprise.

2. Energy supply

68. The predominant focus of policies and measures in the energy supply sector is on **electricity and heat** generation. Policies on **transport fuels** (primarily increased use of biofuels) were reported to a lesser extent, and those aimed at reducing **fugitive emissions at oil, gas and coal facilities** were reported by only a few Parties. Policies to increase the use of natural gas, reported by Australia (Queensland), the EC, Greece, Japan, Portugal and Turkey are generally directed more towards electricity generation and than end-uses (Greece, promotion of natural gas, 22.1 $TgCO_2eq$, 56.3%).

Electricity and heat

69. Policies and measures directed at electricity and heat generation seek to achieve several objectives:

- Increased generation shares from energy sources that are less carbon-intensive than coal, (i.e. renewables, natural gas and nuclear energy;
- Increased generation efficiency through combined heat and power (CHP) and other means;
- Increased use of distributed (i.e. small scale) generation;
- Implementation of non-specified (i.e. they are industry chosen and do not target specific appliances and processes) energy efficiency and emission reduction measures;
- Increased CCS in the longer term.

70. The most important policies, in terms of frequency of use and mitigation effects, to address these objectives are: tradable emissions allowances; framework targets; fiscal incentives; regulations; voluntary enterprise challenges and partnerships; and long-term R&D.

71. **Tradable emissions allowances** are used to reduce CO_2 emissions at power plants throughout the EU. About 7,000 energy producing installations are covered by the EU ETS because the rated thermal inputs of their energy combustion operations are greater than 20MW. These installations include power generation plants, CHP facilities and heat plants and are estimated to account for 34 per cent of EU CO_2 emissions. Installations may undertake measures to improve generation efficiency, substitute to lower carbon fuels, buy allowances from other entities, or capture and store emissions in the longer term.

There is little information reported in the NC4 on the actions undertaken by the installations to reduce emissions.

72. The **promotion of RES is generally based on a broad portfolio of policy instruments**. The EU uses **framework targets** to advance the use of RES in the electricity and heat sectors. The EU Renewable Electricity Directive (RES-E) aims to have renewables energy account for 21 per cent of total electricity production in the 25 member States of the European Union as of 2006 (EU-25) source of electricity by 2010, and stipulates specific indicative renewables share targets for each member State. The Directive does not specify how member States are to meet their targets. The EU is also planning a Renewable Heat Directive (RES-H) to increase the share of renewables as a source of heat production. The principal policies member States are using to comply with the targets for electricity from RES are:

- **Fiscal** incentives (guaranteed feed-in tariffs) in Austria, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, the Netherlands, Portugal, Slovakia, Slovenia and Spain;
- **Market** incentives (quotas and tradable green certificates) in Belgium, Italy, Poland, Sweden and the United Kingdom;
- **Fiscal** incentives (tax incentives and investment grants) in Finland.

73. Several Parties increased significantly the share of **renewable energy** in their overall energy supply mix. Spain, for example, designed a RES-specific portfolio approach in its Plan for the Promotion of Renewable Energy (PFER) for the period 2000–2010, with clear quantitative targets (12.1 per cent RES in TPES, 30.3 per cent RES in electricity and 5.83 per cent biofuels in transport fuels by 2010) and establishing a comprehensive portfolio of policies and measures to achieve these targets. This plan is backed by state investments of EUR 23.6 million, including EUR 8.5 million direct subsidies for RES (Spain, PFER, 27.3 $TgCO_2$). Denmark increased the share of renewables in its TPES several times, from 6.7 per cent in 1990 to 14.3 per cent in 2003. Several other Parties reported significant mitigation effects from promotion of renewable energy (Germany, Renewable Energies Act, Biomass Ordinance, ecological tax reform, and support for research and development, 13.5 $TgCO_2$, 6.5%; France, Renewables Tariffs and Purchase Obligations, 5.5 to 7.0 $TgCO_2$, 5.0 to 6.4%; United Kingdom, Renewables Obligations, 9.2 $TgCO_2$, 8.6%). The Netherlands uses **voluntary sectoral commitments** to increase the share of RES in power generation. The Coal Covenant requires power producers to use increasing amounts of biomass and the Intergovernmental Wind Energy Agreement obligates the provinces and municipalities to use more onshore wind power. Also, economic incentives subsidies are provided for environmentally friendly power generation, specifically that based on renewable energy and CHP.

74. In Australia, wholesale electricity purchasers are required to purchase increasing amounts of electricity generated from renewable sources. The programme is implemented via a **quota and tradable green certificate programme** (Australia, Mandatory Renewable Energy Target, 6.6 $TgCO_2$, 9.9%).

75. Elsewhere, **fiscal incentives** are used to promote electricity from renewables in Canada (tax incentives), to promote nuclear power in Japan (public funding of spent nuclear fuel reprocessing), and to support cost-effective abatement opportunities in Australia (grants).

76. **Regulations** are also used to advance specific technologies (e.g. CHP and nuclear power), increase low-carbon fuel source shares and set emissions intensity benchmarks. In the many situations where productive uses for both power and steam exist in close proximity, CHP is an important source of energy efficiency and is actively promoted by many Parties. The EU Cogeneration Directive requires member States to report annual CHP statistics, to analyse and report national potentials for high-efficiency CHP and to facilitate access to the electricity grid for CHP. Finland uses permitting approval to promote the construction of a nuclear power plant (Finland, nuclear plant permitting, 8.0 $TgCO_2$,

46.7%). Japan uses rules to ensure power transmission capacity, so that long-term and stable nuclear power generation is feasible and economically attractive. Regulations are also implemented at **sub-national** levels. In Australia, Queensland requires power providers to source at least 13 per cent of their electricity from natural gas; New South Wales mandates emissions intensity (per capita) benchmarks for power retailers, which can be met by purchasing increased amounts of electricity from less carbon-intensive sources, reduced consumer demand or the purchase of carbon sinks to offset emissions; and the Australia Capital Territory requires electricity retailers to source an increasing percentage of their product from cleaner and/or renewable energy sources.

77. **Voluntary enterprise challenges and partnerships** are used to promote renewables and CHP in the United States, and generator efficiency – through benchmarking – is used in Australia.

78. Various **long-term R&D** efforts are directed at electricity and heat generation. Japan and the United States fund the development of CCS and advanced nuclear fission power technologies. The United States supports distributed energy research; Canada funds research on the geological aspects of carbon storage.

79. Other measures include: **energy market reforms** (Australia and the EC) which could lead to increased generation from renewable and distributed sources; **systems approaches** with **models and demonstrations** (Japan), which could lead to the development of a network of dispersed new energy sources based on wind power, biomass, photovoltaic power generation, cogeneration systems and fuel cells with IT control units; **government operations** (Canada) which support renewable-based electricity through procurement; and **information** (Australia, National Green Power Accreditation Programme, 0.9 $TgCO_2$, 1.3%) which provides accreditation to green power.

Transport fuels

80. Policies and measures directed at the supply of transport fuels seek increased production of liquid renewables fuels (biofuels). The most important policies, in terms of frequency of use and mitigation effects, to effect these changes are: framework targets, fiscal incentives, regulations and long-term R&D. The EU uses a **framework target** to advance biofuels as a transport fuel. The Biofuels Directive aims to have biofuels account for 5.75 per cent of the EU-25's transport fuels by 2010, and stipulates specific indicative biofuels share targets for each member State. The Directive requires the substitution of conventional transport fuels by biofuels derived from agricultural crops, notably biodiesel and bioethanol. Member States may choose how to implement the Directive, but are required to ensure that such measures are selected and designed with the whole life cycle of the particular biofuel in mind, taking account of the overall carbon balance and other impacts, and giving priority to promoting those fuels that are environmentally cost-effective. The member States' policies being used to comply with the Biofuels Directive are:

- **Fiscal incentives** (tax reductions/exemptions for biofuels) in Austria, Belgium, Czech Republic, Denmark, Estonia, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Sweden and the United Kingdom;
- **Regulations** (biofuels obligations, requiring fuel suppliers to meet a minimum proportion of their sales with biofuels) in Austria, Czech Republic, France, Germany, the Netherlands, Slovenia and the United Kingdom (Germany, promotion of biofuels, 3.0 $TgCO_2$, 1.4%; United Kingdom, Renewable Transport Fuel Obligation, 5.9 $TgCO_2$, 5.5%).

81. Elsewhere, **fiscal incentives** are used to expand biofuels capacity and production in Australia (grants), to increase purchase and use of biofuels in Canada (consumer tax exemptions), to increase production of biofuels in Canada (capacity construction loan guarantees) and to support cost-effective abatement opportunities in Australia (grants).

82. **Long-term R&D** on biofuels is supported in the United States and Canada. Other measures include agricultural market reform, with its long-term **fiscal incentives** for biocrop production (EC).

Fugitive emissions at oil, gas and coal facilities

83. Policies and measures directed at fugitive CH_4 emissions at oil, gas and coal facilities seek to enhance the capture and use or flaring of CH_4 emissions at oil, gas and coal production and distribution facilities. The most important policies, in terms of frequency of use and mitigation effects, to give effect to these changes are voluntary enterprise challenges and partnerships, regulations, and voluntary sectoral commitments.

84. **Voluntary enterprise challenges and partnerships** are used to capture CH_4 at coal and natural gas facilities in Australia and the United States. **Regulations** are used to reduce (capture) the GHG precursors at offshore oil facilities in Norway. **Voluntary sectoral commitments** (environmental covenants) are used in the Netherlands to reduce CH_4 emissions from the oil and gas sector. **Fiscal incentives**, in the form of grants, are used to support cost-effective fugitive abatement opportunities in Australia.

3. Energy consumption

85. The focus of policies and measures aimed at energy consumption is on the **industry** and the **residential, commercial and public** sectors. Policies aimed at **transport** were reported to a lesser extent. Most of the policies focus on improving energy efficiency (as opposed to fuel switching), and are generally sector-specific or even more narrowly targeted. There are, however, several broader policies being pursued, such as systems-oriented policies (e.g. urban design) in Japan and **energy market reforms** in Australia and the EC, which could lead to a greater role for commercial energy service providers.

Residential, commercial and institutional

86. Policies and measures directed at energy use in the residential, commercial and public sectors seek:

- Increased energy efficiency of new and existing residential and commercial buildings (via designing, building, renovating and purchasing);
- Increased energy efficiency of household appliances, home entertainment devices and office equipment (via manufacturing, retailing and purchasing);
- Increased energy efficiency using cross-cutting instruments such as carbon taxes;
- Increased use of less carbon intensive space and water heating in buildings;
- Increased use of alternative energy supplies.

87. The most important policies, in terms of frequency of use and mitigation effects, to give effect to these changes are: framework targets; regulations; information; voluntary enterprise challenges and partnerships; and government operations and carbon taxes.

88. The EU uses a **framework target** to underscore the importance of action in this sector. The EU Energy End-use Efficiency and Energy Services Directive calls on members States to adopt general national targets of annual 1 per cent cumulative savings, and to ensure that the public sector in each member State sets a good example with indicative national targets of annual 1.5 per cent cumulative savings. Some member States (Belgium (the Flanders region), Denmark, France, Italy, Netherlands and United Kingdom) are using **market instruments** (white certificates in quota and certificate programmes)

to comply with the Directive (France, White certificates, 2.4 $TgCO_2$, 2.2%; United Kingdom, Energy Efficiency Commitment, 5.9 $TgCO_2$, 5.5%).

89. **Regulations** (mandatory standards) are widely used for buildings, appliances, devices and equipment. The EU Energy Performance of Buildings Directive requires member States to adopt energy performance standards for new buildings and large existing buildings that are subject to major renovation (EC, Energy Performance of Buildings Directive, 20 $TgCO_2$, 1.8 to 2.1%). Mandatory standards are also used in Australia and the United States; voluntary standards are used in Canada (Australia, Energy Efficiency Standards for Residential and Commercial Buildings, 3.5 $TgCO_2$, 5.2%; Germany, heating and insulation regulations, 5.2 $TgCO_2$, 2.5%; United Kingdom, Building Regulations, 7.7 $TgCO_2$, 7.2%; Netherlands, Energy Performance of New and Existing Buildings, 2.1 $TgCO_2$, 8.0%).

90. For equipment (household appliances, home entertainment devices and office equipment), **regulations** (mandatory standards) are used by all Annex I Parties, although they are used by some Parties, such as Australia, Canada, Japan, New Zealand and the United States, more than others, such as the EC. Japan's Top-Runner standards programme is unique, in that it incorporates periodic recalibration automatically (see box 1). Top-Runner sets future standards based on the most energy-efficient model on the current market, and when the future date is reached the process repeats itself. In some cases, voluntary sectoral commitments to targets or codes of conduct are used in lieu of mandatory standards. (EC, Directive on Boilers, 22 $TgCO_2$, 2.0 to 2.3%; Australia, National Appliance and Equipment Energy Efficiency Programme, 7.9 $TgCO_2$, 11.8%; United States, Residential Appliance Standards, 5.1 $TgCO_2$, 1.3%). For some types of equipment, the EU uses **voluntary sectoral commitments** instead of regulations (EC, Energy Star Programme and Code of Conduct for Digital TV Services and standby losses, 30–35 $TgCO_2$, 3.1%).

Box 1. Japan Top-Runner programme

Japan's Top-Runner programme sets energy efficiency targets and timetables in 21 product categories based on the most energy-efficient model on the current market, to be met by all manufacturers and importers in the target year. A labelling scheme for consumer information and a transparent non-compliance regime for producers supplement this regulatory approach.

Japan introduced the programme in 1998, based on the New Energy Conservation Law to improve the energy efficiency of energy-consuming products. The industries targeted are household and office appliance industries (e.g. photocopiers, air conditioners, space heaters and TV sets), information technology industries (e.g. personal computers) and car manufacturing (passenger cars and light-duty vehicles below 3.5 tonnes). As at 2003, approximately 80 per cent of gasoline passenger automobiles had already achieved the Top-Runner standards for 2010, due to active efforts by major domestic car manufacturers and the effects of the green tax on vehicle purchase in Japan. The process of setting targets and timetables for each product sub-category is based on extensive consultations, coordinated by the Ministry of Economy, Trade and Industry, involving all important stakeholders.

Japan intends to expand both the range of products subject to Top-Runner standards and the range of applications, and tighten the standards for types of equipment already covered.

91. There are also regulations mandating certain market conditions and setting energy service company obligations. The EU Energy End-use Efficiency and Energy Services Directive (40–55 $TgCO_2$, 4.1 to 4.9%) contains, in addition to the framework targets mentioned in paragraph 88 above, **regulatory provisions** (in line with EU energy market reform measures) that call for removing barriers and providing credible information for companies to offer energy services and energy-efficiency programmes, and ensuring that retail suppliers or distributors of electricity, natural gas, fuel oil and

district heating offer and actively promote energy services or energy audits. In Australia, regulations oblige electricity and natural gas suppliers to offer energy efficiency improvements.

92. **Information** (labels, ratings and certifications) programmes are likewise used widely for appliances, devices and equipment, and increasingly for buildings as well. One of the most wide-ranging measures is the United States Energy Star programmes (box 2). Auditing and advice programmes are also widespread; in the United Kingdom they are tied to **fiscal incentives** (based on expected allowances generated). Comparison and endorsement labels on appliances, devices and equipment can be tied to various **fiscal incentives** and **government operations** (government procurement) programmes. Building certificates can be tied to **fiscal incentives** (financing terms) in Canada (EC, Labelling and Minimum Energy Efficiency Requirements for Household Appliances, 54 $TgCO_2$, 4.8 to 5.5%).

93. **Voluntary enterprise challenges and partnerships** aimed at mostly commercial buildings and equipment are particularly important in the United States (United States, Energy Star for Commercial and Residential Markets (see box 2)).

Box 2. United States Energy Star

The United States Energy Star was established by the United States Environmental Protection Agency in 1992. It was originally a voluntary labelling system designed to highlight and endorse office equipment of superior energy efficiency. The programme has grown to encompass more than 50 residential and commercial product categories, as well as new homes, office buildings and improved energy management within organizations. The label is licensed for use internationally.

(United States, Energy Star Labelled Products, 102.7 $TgCO_2$, 25.4%)
(United States, Energy Star for the Residential Market – Buildings, 7.3 $TgCO_2$, 1.8%)
(United States, Energy Star for the Commercial Market – Buildings, 64.2 $TgCO_2$, 15.9%)
(United States, Energy Star for Industry, 21.3 $TgCO_2$, 5.3%).

94. Government-owned and managed public buildings (e.g. offices, police stations, military facilities, libraries and post offices) are often a significant portion of the building stock. **Government operation** of its own buildings and equipment offer direct opportunities to improve energy efficiency and reduce carbon emissions. Some Parties (Australia, Canada and the United States) report explicit programmes to improve these operations (United States, Federal Energy Management Program, 2.2 $TgCO_2$, 0.5%; Australia, 0.6 $TgCO_2$, 0.9%).

95. Other measures include: **fiscal incentives** (subsidies) for energy efficiency improvements for low income households in the United Kingdom and the United States; **fiscal incentives** (tax incentives) for solar water heating in Portugal; (Germany, low interest financing, 8.4 $TgCO_2$, 4.0%); **systems approaches** with **models and demonstration** of new building concepts and spatial planning in Japan and Canada; and **long-term R&D** in the United States (United States, Emerging Buildings Technologies, 4.4 $TgCO_2$, 1.1%; United Kingdom, Carbon Trust, 4.0 $TgCO_2$, 3.8%).

Transport

96. Policies and measures directed at energy use in transport can be broadly divided into:

- Technical measures aimed at improving the energy efficiency of the vehicle fleet and the carbon intensity of the fuel mix;

- Non-technical policies and measures addressing transport activity and structure through transport demand management, push-and-pull incentives for modal shifts towards less polluting transport modes, traffic flow improvements and spatial planning.

97. The most important policy instruments, in terms of frequency of use and mitigation effect, to give effect to these changes are: regulations; voluntary sectoral commitments; fiscal incentives; voluntary enterprise challenges and partnerships; information; and long term R&D programmes. These are often implemented at subnational levels.

98. Transportation is major source of GHG emissions (mostly CO_2). **Most Parties report policies and measures to curb transportation emissions**, but, to the extent that they are quantified, their **mitigation effect appear to be low**. This may indicate that some transportation initiatives (road, traffic control and urban design) are inherently local. Or it might indicate that-low cost opportunities are fewer, and that greater emphasis is placed on longer-term solutions (i.e. long-term R&D).

99. Automobile fuel economy standards, implemented via **regulations** or **voluntary sectoral commitments,** are the most effective measure in transport. Four distinct programmes, with different implementation rules and targets, exist in:

- North America – consisting of Canada's Motor Vehicle Fuel Efficiency Initiative (voluntary sectoral commitment) and the United States Corporate Average Fuel Economy (regulation), which is being strengthened (United States, Corporate Average Fuel Economy 41.8 $TgCO_2$, 10.3%);
- Europe – EU agreements with European, Japanese and Korean car manufacturers (voluntary sectoral commitments). The voluntary agreements seeks to increase the fuel efficiency of new passenger cars in order to achieve total new passenger car fleet average CO_2 emissions of 140 g CO_2/km by 2012. (EC, Agreements with ACEA, JAMA and KAMA, 75–80 $TgCO_2$, 7.2 to 7.7 %; France, Automotive Agreements, 8.0 to 10.0 $TgCO_2$, 7.3 to 9.1%; United Kingdom, Automotive Agreements, 8.8 $TgCO_2$, 8.4%);
- Japan – the Top-Runner Standards programme for automobiles (see box 1).
- Australia – voluntary sectoral commitments by the automotive industry to improve the fuel efficiency of new passenger motor vehicles by 18 per cent between 2002 and 2010. The target will be converted to a national average CO_2 emissions target to reflect both fuel and carbon efficiency, and will be expressed in gCO_2 per km.

100. There are fiscal **incentives**, such as differentiated vehicle taxes and fees, used in Austria, Belgium, Denmark, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, Sweden and the United Kingdom, infrastructure charging on heavy goods vehicles used in Austria and Germany, and the 'climate cent' fuel tax in Switzerland that funds mitigation projects. (Germany, ecological tax reform, 5.0 $TgCO_2$, 2.4%). In addition, urban and long distance public transport is subsidized in many places.

101. Mandatory labels are used in the EU and Australia to give consumers information on the fuel economy and CO_2 emissions of new cars in order to encourage them to buy fuel-efficient models (Australia, Fuel Economy Labelling Scheme, 0.5 $TgCO_2$, 0.7%).

102. In many countries, government-owned and managed vehicle fleets are a significant source of emissions. **Government** operations programmes to increase the energy efficiency of, and reduce CO_2 emissions from, government fleets are used in Australia, Canada and the United States.

103. **Voluntary enterprise challenges and partnerships** are used mostly to influence vehicle fleets, where relatively few decision makers can influence purchases and operations. The United States Government has formed partnerships with corporations from the maritime, trucking, and rail industry that

deliver their products to accelerate development of fuel-saving technology and practices in transport and freight operations (United States, SmartWay Transport Partnership, 33.0 $TgCO_2$, 8.1%).

104. **Longer-term R&D programmes** focus on onboard technology and the supporting fuelling infrastructure that would enable widespread use of alternative fuel vehicles such as those based on biodiesel, electricity and hydrogen. Canada, Japan and the United States fund programmes on fuel cells and advanced hybrids (United States, FreedomCAR and Fuel Partnership and Vehicle Technologies Program (includes Clean Cities), 11.5 $TgCO_2$, 2.8%).

105. **Tradable emissions** allowances could be applied to aviation in the EU from 2011. Japan is promoting **systems approaches** to emission reductions in transportation and shipping/distribution.

Industry

106. Policies and measures directed at energy use in industry seek:

- Increased energy efficiency and general emission reductions (i.e. do not target specific appliances and processes) in energy-intensive industries (e.g. iron and steel, non-ferrous metals, cement and other building materials, chemicals and petrochemicals, and pulp and paper);
- Increased implementation of energy-efficient equipment (e.g. motors, boilers and lighting) and methods (e.g. energy management systems) in less energy-intensive industries, especially small and medium-sized enterprises (SMES);
- Increased long-term research and development of CCS by energy-intensive industries.

107. Most of the reported policies and measures focus on energy efficiency and general emissions reductions in the energy-intensive industries. A few are aimed at less energy-intensive industries and only research is being directed at CCS in energy-intensive industries. The most important policies, in terms of frequency of use and effect on emissions, to trigger these changes are: tradable emissions allowances; voluntary sectoral commitments; reporting, voluntary enterprise challenges and partnerships; regulations; information; and long-term R&D. Unlike the case for other sectors, industrial sector measures are not often implemented at subnational levels. The competitiveness and carbon leakage implications of measures aimed at energy-intensive industries require that they be implemented on as wide a scale as possible (i.e. national, if not international).

108. **Tradable emissions allowances**, as implemented by the EU, focus on energy-intensive industry and electricity generators. In its first trading period, 2005–2007, EU ETS covers the CO_2 emissions of about 11,000 installations, of which about a third are oil refineries, coke ovens, metal production and processing, and cement, lime, glass, bricks, ceramics, paper and pulp from timber production. In the first trading period, the NAPs allow for a small (3.5 per cent) increase in emissions from the covered facilities above 2003 emission levels, with an estimated decline (–3.4 per cent) below expected 'business as usual' emissions in the 2005–2007 period.

109. Until tradable emissions allowance schemes began, **voluntary sectoral commitments** were the most important measure aimed at industrial sector emissions reductions and energy efficiency. Although they have been overshadowed by tradable emissions allowance schemes in some regions (most notably the EU), voluntary commitments are still in place in some Parties. There is a wide range of agreements and arrangements involving companies or industry associations and different layers of government (see para. 45 and table 7).

110. **Carbon taxes** are expected to generate relatively small direct emission reductions in the industrial sector, because their implementation is limited (mostly to northern Europe) and because of the exemptions that are often given to industry in countries where they are implemented. However, the threat of implementing carbon taxes if emissions performance is deemed unsatisfactory, and the

conditional terms of the exemptions used, can have greater effects on mitigation. Industries are often granted exemptions from carbon taxes, which are tied to participation in voluntary commitments (and emissions reduction performance therein), or opportunities to receive **fiscal incentives** (subsidies) for emission reduction projects.

Table 7. Voluntary sectoral commitments concerning industrial energy use

Parties	Agreement	Projected emissions reductions in 2010 (2012 for United States), ($TgCO_2eq$)	Share of the Party's total projected emissions reductions (%)
Agreements tied to current taxes or regulations			
France	Association des Entreprises pour la Réduction de l'Effet de Serre (AERES)	5.0 (CO_2, PFC, SF_6) NA	4.6 NA
Switzerland	CO_2 Law Measures – agreements with the Energy Agency for the Economy	NA	NA
United Kingdom	Climate Change Agreements	10.6	9.9
Agreements tied to potential future taxes or regulations			
Belgium (Flanders)	Benchmarking Covenants and Auditing Agreements	NA	NA
Germany	Agreement on Global Warming Prevention	5.4–5.9	2.6–2.8
Japan	Keidanren Voluntary Action Plans on the Environment	NA	NA
Netherlands	Benchmarking Covenants and Long Term Agreements on Energy Efficiency (LTA2)	1.4	5.3
Agreements based on aspirational targets			
Belgium (Wallonia)	Voluntary Agreements on Energy Efficiency	NA	NA
Finland	Promotion of Energy Conservation in Industry	NA	NA
Luxembourg	FEDIL Agreements	NA	NA
United States	Climate Vision	NA	NA

Abbreviation: NA = not available.

111. **Voluntary enterprise challenges and partnerships** are used widely in the industrial sector. The Australian Greenhouse Challenge Plus programme (Australia, 4.1 $TgCO_2eq$, 6.1%), in which businesses measure and monitor GHG emissions and work towards specific milestones set out under individual agreements, has around 800 participants, representing almost 50 per cent of energy and process GHG emissions from industry. The EU Motor Challenge Programme (EC, up to 30 $TgCO_2eq$, 3.1%) aids companies in improving the energy efficiency of motor-driven systems (e.g. compressed air, fan and pump systems), which account for close to 70 per cent of industrial electricity consumption in Europe. The United States Best Practices and Save Energy Now programmes work with industry to identify plant-wide opportunities for energy savings and process efficiency. The United States Energy Star for Industry (see box 2) programme works with manufacturing industries to enable them to enhance their corporate energy management systems, by identifying barriers to energy performance, defining strategies for minimizing these barriers, and design management tools that will assist the industries with improvements (Australia, Energy Efficiency Opportunities, 0.8 $TgCO_2$, 1.2%).

112. Benchmarking and best practice programmes are cited in many Parties' plans. Benchmarking is a tool to help plant managers know how energy-efficient or carbon-intensive their plants are compared with others of similar configuration and vintage, and as a consequence how much energy and carbon might be saved. Best practice programmes, which can include auditing and promotion of energy management systems, offer companies, especially small and medium-sized enterprises, information and advice on the most efficient ways to run their operations. Examples include practices in the maintenance of motor systems, steam systems and foundry practice. Benchmarking and best practice programmes can be stand-alone **information** programmes or **voluntary enterprise challenges and partnerships** (e.g. the Canadian Industry Program for Energy Conservation, which helps industry reduce its emissions via awareness-building, emissions benchmarking, energy efficiency audits and improved energy/emissions tracking and reporting) or can be integrated into **voluntary sectoral commitments**. The auditing and energy management elements of best practice programmes can also be offered through energy performance contracting, which **energy market reform** seeks to promote.

113. **Regulations** (not related to tradable emissions allowances) aimed at emissions reductions and energy efficiency are used in only a few special circumstances in the industrial sector, because of the diversity of industrial processes and equipment. Canada reported its intention to regulate industrial emissions, and recently imposed mandatory targets on industry to achieve a goal of an absolute reduction of 150 $TgCO_2eq$ of GHG emissions by 2020. Regulations in Japan require industrial plants over a certain size to have an appointed energy manager. Australia, Canada, New Zealand and the United States have implemented energy efficiency standards for electric motors, which are augmented by **information labels** to make buyers of motor vehicles more aware of the energy, climate and cost consequences of their purchases.[18] The EU Integrated Pollution Prevention and Control Directive contains requirements that industry use energy efficiently.[19]

114. Other measures include: **information** (audits) for SMEs, used in the EU and the United States (United States Industrial Assessment Centers, 17.6 $TgCO_2eq$, 4.3%); (United States, Best Practices Program, 16.9 $TgCO_2eq$, 4.2%); **long-term R&D** being pursued on CCS and industrial technologies in the United States and EU (United States, Industrial Technologies R&D, 17.6 $TgCO_2eq$, 4.3%); **energy market reform**, which is reported by some Parties as a way to promote energy service companies; **fiscal incentives**, in the form of grants, are used to support cost-effective abatement opportunities in Australia, and **systems approaches** for energy interchange among multiple entities, including the interchange among businesses of factory exhaust heat in industrial complexes and others of high industry concentration, being explicitly investigated by Japan.

4. Non-energy

115. The predominant focus of reported policies and measures aimed at non-energy sectors are the **waste** and **industrial processes** sectors. Policies aimed at **agriculture and land-use change and forestry** were reported to a somewhat lesser extent.

Industrial processes

116. Policies and measures directed at industrial processes seek:

- Limitations (bans) on the use of certain HFCs and PFCs, used as substitutes for ozone-depleting substances;
- Improved manufacturing, handling, use and end-of-life recovery of fluorine-containing gases used as substitutes for ozone-depleting substances;
- Reduced PFCs, HFCs and SF_6 emissions in semiconductor manufacture, PFCs emissions in aluminium production, SF_6 emissions in electric power transmission and distribution and magnesium production, and HFCs and SF_6 emissions from miscellaneous sources;
- Reduced CO_2 emissions through improved operations in cement, lime and ammonia production;
- Reduced N_2O emissions through improved operations in adipic and nitric acid production.

117. The most effective and most frequently reported measures are those directed at fluorinated gases (F-gases). Those aimed at CO_2 and N_2O receive less attention. The most important policies, in terms of frequency of use and mitigation effect, to give effect to these changes are: regulations; reporting; voluntary enterprise challenges and partnerships; and voluntary sectoral commitments.

118. The EU uses **regulations** to pursue these objectives. The EU Directive on Fluorinated Gases (EC, 23 $TgCO_2eq$, 2.1 to 2.4%) contains mandates for the containment and recovery of F-gases;

[18] The EU Motor Challenge Programme is a voluntary enterprise challenges and partnerships programme having the same goals.

[19] The Directive contains strict requirements concerning N_2O, CH_4 and fluorinated gases in industrial processes.

requirements for the training and certification of personnel involved in maintaining equipment containing F-gases; restrictions on the marketing and use of specific F-gases in specified applications; and provisions to strengthen the monitoring of emissions through reporting requirements. The EU Mobile Air Conditioning Directive prohibits the use of certain HFCs in mobile air conditioning systems in new vehicles. The EU Integrated Pollution Prevention and Control Directive (IPPC) stipulates that pollution issues be integrated into the plant permitting procedures and that Best Available Techniques (BAT) are applied.

119. **Regulations** are also used in Australia and the United States to limit the manufacture, or to improve the manufacturing, handling, use and end-of-life recovery, of fluorine-containing gases used as substitutes for ozone-depleting substances (United States, Significant New Alternatives Program, 149.6 $TgCO_2eq$, 36.9%; Australia, regulations, 4.7 $TgCO_2eq$, 7.0%).

120. **Voluntary enterprise challenges and partnerships** are used in Australia to reduce industrial process emissions in general and to develop SF_6 handling guidelines in particular. In the United States, these programmes are used to limit emissions of HFCs, PFCs and SF_6 in semiconductor production, electric power distribution and magnesium production; reduce PFCs emissions in aluminium production; reduce trifluoromethane (HFC-23) emissions; and improve the environmental performance of mobile air conditioners. In Iceland, management of PFCs from aluminium production (United States, Environmental Stewardship, 35.6 $TgCO_2eq$, 8.8%; United States, HFC-23 Partnership, 16.5 $TgCO_2eq$, 4.1%; United States, Mobile Air Conditioning Climate Protection Partnership, 5.5 $TgCO_2eq$, 1.4%; Australia, Best Practice management of SF_6, 0.3 $TgCO_2eq$, 0.4%).

121. **Voluntary sectoral commitments** are used in a few instances to reduce industrial processes emissions. An industry-led initiative seeks to reduce PFCs emissions in aluminium production worldwide, and there are also commitments at the national level (United States, Voluntary Aluminium Industry Partnership, 10.3 $TgCO_2eq$, 2.5%; Netherlands, Low PFC Aluminium Production, 1.1 $TgCO_2eq$, 4.2%; Norway, Climate Change Agreement with the Aluminium Industry, 1.4 to 4.1 $TgCO_2eq$, 16.5 to 37.3%). In France, there is an agreement to reduce industrial N_2O emissions (France, AERES N_2O Agreements and regulations, 25.7 $TgCO_2eq$, 23.4%; France, other industrial process emission agreements, 12.2 $TgCO_2eq$, 11.1%).

122. Other measures include **fiscal incentives** such as grants for cost-effective abatement opportunities in Australia and **information dissemination** on the use of supplementary cementing materials (cement clinker substitute) in Canada.

Waste

123. Policies and measures directed at the waste sector seek CH_4 reductions via:

- Waste minimization through reduced packaging and increased product and packaging reusability and recyclability;
- Waste reuse through implementation of waste separation and recycling;
- Waste minimization through processing and incineration;
- Landfill management with CH_4 capture or flaring.

124. The most important policies, in terms of frequency of use and mitigation effect, to give effect to these changes are: framework targets; regulations; fiscal incentives; voluntary enterprise challenges and partnerships; and public infrastructure and resource management. The local nature of landfills means that many measures are implemented at the subnational level.

125. The EU uses **framework** targets and **regulations** to pursue these objectives.

- The Landfill Directive (EC, 41 $TgCO_2eq$, 3.7 to 4.2%) **regulates** waste acceptance procedures and technical configurations of landfills, and sets **targets** for reducing the amount of biodegradable municipal waste put in landfills (25 per cent cut by 2006, 50 per cent cut by 2009, 65 per cent cut by 2016).
- The Waste Incineration Directive (EC, 3 $TgCO_2eq$, 0.3%) sets (**regulation**) stringent operational conditions, technical requirements, emission limits for waste incineration to reduce as far as possible negative effects on the environment caused by the incineration and co-incineration of waste.
- The Packaging and Packaging Waste Directive sets **targets** that by 2008, at least 60 per cent (by weight) of packaging waste be recovered or incinerated at waste incineration plants with energy recovery, and 55 to 80 per cent (by weight) of packaging waste be recycled.
- The Waste Electrical and Electronic Equipment (WEEE) Directive prescribes (**regulation**) extended producer responsibilities and includes the **target** that by 31 December 2006 member States should be achieving separate collection rates of at least 4kg per capita per year of WEEE from private households, to be taken for reuse or recycling.
- The End-of-Life Vehicles Directive **regulates** the acceptance of used vehicles and recovery by their producers.

126. To meet the EU Landfill Directive targets, member States are using **fiscal incentives** (landfill taxes and price supports for electricity from waste incineration), **regulations** (landfill quotas and tradable allowances; waste acceptance standards; green certificates for electricity from waste incineration; and operating permits for landfills and compliance enforcement, including the closure of illegal sites) and **public infrastructure and resource management** (construction of collection facilities, incinerators and municipal waste treatment plants). To meet the targets for waste packaging, member States are using **fiscal incentives** (deposit-return systems) and **regulations** (producer responsibility schemes). Austria (82 per cent), the Netherlands (81 per cent), Belgium (76 per cent), Germany (72 per cent) and Denmark (66 per cent) have the highest rates of recycling, recovery and biological treatment; Luxembourg (30 per cent), France (29 per cent), Denmark (26 per cent), Finland (22 per cent) and Portugal (21 per cent) have the highest rates of incineration.[20] To meet the WEEE Directive targets, member States are using **regulations** (producer responsibility for product take-back from collection facilities), **public infrastructure and resource management** (to establish public collection facilities) and **fiscal incentives** (visible fees to fund collections and management of older wastes); (France, landfill regulations, 14.4 $TgCO_2eq$, 13.1%; Netherlands, landfill policy, 4.0 $TgCO_2eq$, 15.2%; Sweden, landfill regulations, 1.4 $TgCO_2eq$, 7.9 to 8.8%).

127. **Landfill regulations** are also used in New Zealand and the United States. The New Zealand National Environmental Standard for Landfill requires landfills with a lifetime design capacity exceeding one million tonnes and a current stock capacity of 200,000 tonnes to collect and destroy landfill gas. The United States Stringent Landfill Rule (9.5 $TgCO_2eq$, 2.3%) requires large landfills to capture and combust their landfill CH_4 emissions.

128. Australia's federal, state, territorial and local governments use a combination of voluntary, regulatory and fiscal instruments in their waste management strategies (9.0 $TgCO_2eq$, 13.5%).

129. **Voluntary enterprise challenges and partnerships** are used in Australia, Japan and the United States. In the Australian Greenhouse Challenge Plus programme, businesses measure and monitor GHG emissions and work towards specific milestones set out under individual agreements. In Japan, in addition to more traditional recycling measures, the government is encouraging manufacturers to improve

[20] Golder Europe EEIG. 2005. "Report on Implementation of the Landfill Directive in the 15 member States of the European Union."

the durability of and enhance the repair system for their products. In the United States, the Landfill Methane Outreach Program seeks to reduce GHG emissions at landfills by supporting the recovery and use of landfill gas for energy. The programmes works with landfill owners and operators, state energy and environmental agencies, utilities and other energy suppliers, corporations, industry and other stakeholders to lower the barriers to promote cost-effective landfill gas energy projects. It focuses its efforts on smaller landfills not required to collect and combust their landfill gas, as well as larger, regulated operations that are combusting their gas but not using it as a clean energy source. The United States WasteWise programme works with organizations to reduce solid waste through voluntary waste reduction activities (United States, Landfill Methane Outreach Program, 24.6 $TgCO_2eq$, 6.1%; United States, WasteWise, 20.9 $TgCO_2eq$, 5.2%; Australia, Greenhouse Challenge Plus, 0.2 $TgCO_2eq$, 0.3%).

Agriculture

130. Policies and measures directed at agriculture seek to:

- Reduce N_2O emissions through manure management;
- Reduce N_2O emissions through optimized nitrogen fertilizer use;
- Reduce CH_4 emissions through changes in livestock management.

131. Parties reported relatively few policies and measures aimed at the agriculture sector.[21] The most important policies, in terms of frequency of use and mitigation effects, to give effect to these changes are: fiscal incentives (either direct or within the context of agricultural market reform); and regulations (e.g. the EU Nitrates Directive, up to 10 $TgCO_2eq$, 0.9 to 1.0%) to a lesser extent.

132. The EU Nitrates Directive (**regulation**) seeks to prevent water pollution caused by N_2O coming from the excessive use of agricultural fertilizers and from agricultural waste. The reduction of N_2O in soils also has climate change mitigation benefits.

133. In the EU, **fiscal incentives** and **regulations** (i.e. Common Agricultural Policy (CAP) subsidies and production quotas) are the principal instruments used to pursue these objectives. For the most part, however, the primary purposes of these policies are economic efficiency and the environmental quality of water and soil (EC, CAP reform of market policies, 12 $TgCO_2eq$, 1.1 to 1.2%).

134. **Fiscal incentives** are also used in the United States, in the form of innovation grants to livestock producers and owners of working farmlands to accelerate the development, transfer and adoption of innovative technologies and approaches, including those that deliver GHG mitigation benefits and improve the quality of nutrient management systems (United States, Environmental Quality Incentives Program (including Innovation Grants), 26.1 $TgCO_2eq$, 6.4%).

135. Other, more climate-focused, policies include: **voluntary enterprise challenges and partnerships** which promote the reduction of GHG emissions at farms in Canada and the United States, **long-term R&D** in Australia, and **models and demonstrations** in New Zealand.

Land-use change and forestry

136. Policies and measures directed at land use, land-use change and forestry seek to reduce emissions from sources and enhance removals from sinks through:

[21] Parties misclassified some policies and measures as agricultural, when they should have been reported elsewhere. These include: policies concerned with agricultural energy should be classified under energy consumption; energy crops should be classified under energy supply; land sinks from shifts in planting should be classified under land use, land-use change and forestry.

- Prevention of forest fires;

- Forest, grasslands, wetlands and croplands management, and afforestation and reforestation);
- Urban greening.

137. As with agriculture, Parties reported relatively few policies and measures aimed at land-use change and forestry. The most important policies, in terms of frequency of use and mitigation effects, to give effect to these changes are: fiscal measures (subsidies) and regulations (environmental codes) for private lands, and public infrastructure and resource management rules and procedures for public lands. Efforts to prevent forest fires on public and private lands are also important. The measures tend to be part of larger policy strategies aimed at rural development, agricultural reform, environmental stewardship and biodiversity rather than solely climate-focused.

138. The EU Forest Action Strategy (EC, 33 $TgCO_2$, 124 $TgCO_2$ beyond 2010, 3.0 to 3.4%) provides for **fiscal incentives** (grants) and **public infrastructure and resource management** (public lands management schemes). The EU CAP market and rural development policies provide fiscal incentives for actions that affect sinks in agricultural soils (EC, EU CAP reform, market policies, 12 $TgCO_2$, rural development support, up to 60 to 70 $TgCO_2$, 7.3 to 7.4%).

139. Japan has undertaken efforts to steadily and comprehensively manage and conserve its forests and timber supply and to effectively use its timber. The efforts include: development of sound forests; promotion of appropriate management and conservation of protected forests; promotion of activities by a wide range of actors for establishing forests; and promotion of the use of timber and wood biomass.

140. **Fiscal incentives** are also used in the United States, in the form of assistance to farmers to convert highly erodible cropland or other environmentally sensitive acreage to native grasses, wildlife habitats, tree plantings, filter strips and riparian buffers. In Australia, grants are given for cost-effective abatement opportunities.

141. Numerous **regulations, fiscal incentives and information dissemination** programmes are used in Australia to enhance forest sinks. The package of programmes, which feature measures to reduce land-use change emissions from clearing native vegetation in Queensland and New South Wales, is estimated to offset 18.0 $TgCO_2$ of emissions in 2010, representing 26.9 per cent of Australia's emissions reduction portfolio. Slovakia uses **regulations** for sustainable forest management.

V. Projections and total effect of policies and measures

A. Objective and scope

142. This chapter presents data on GHG emissions projections for Annex I Parties to the Convention. The data are provided for 39 Parties, based mostly on the information reported in their NC4. For Italy, the NC4 was not available at the time when this report was prepared and therefore the projections from the NC3 are used. For two Parties, Luxembourg and Monaco, GHG projections data are not available, because the NC4 of Luxembourg was not available when this report was prepared and the NC4 of Monaco does not contain quantitative GHG projections.[22]

143. According to the UNFCCC reporting guidelines,[23] Annex I Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios; the projections

[22] The third national communication of Monaco also did not contain quantitative GHG projections. For Luxembourg, the latest available communication is the initial national communication submitted in 1996; although that communication contained GHG projections, these are believed to be outdated and therefore are not included in this report. However, the projections for the EU-15 cover the emissions from Luxembourg.

[23] FCCC/CP/1999/7, paragraphs 27–48.

should be provided for 2005, 2010, 2015 and 2020. The 'with measures' scenario includes the policies and measures that are either implemented or adopted, whereas the 'with additional measures' scenario also includes policies and measures that are only planned (at the time when the projections were prepared). The 'without measures' scenario is to reproduce the situation which would have happened if some or all (depending on the definition) of the existing policies and measures had not been implemented. Table 8 provides the sources of projections data used in this report and summarizes the projection scenarios reported by Annex I Parties.

144. Overall, 39 Parties have reported quantitative GHG projections under the mandatory 'with measures' scenario whereas 22 Parties have reported 'with additional measures' scenario and 16 Parties – 'without measures' scenario. Most Parties (30 of 39) have projected their GHG emissions until 2020; one Party – until 2025; 3 Parties – until 2030; and 5 Parties limited their projection period by 2010. For a number of Parties, projections at a sectoral levels are either not available, or available for few sectors only (e.g. Iceland, the Russian Federation, Spain, the United States). Accordingly, some of the sectoral totals for projections for Annex I Parties provided here are calculated without these Parties and are not fully consistent with projected total GHG emissions from all Annex I Parties taken together. For 1990, these sectoral totals are also not fully consistent with the sectoral data provided in the chapter on GHG trends, where emissions from all Annex I Parties were included.

145. The following information on GHG projections under 'with measures' scenarios is provided in this chapter: total aggregate GHG emissions, with and without LULUCF; emissions by sector; effects of policies and measures; and projections data for individual Parties. Information on GHG projections under 'with additional measures' scenarios is reported mostly by the Annex I Parties that are also Parties to the Kyoto Protocol; a discussion of this scenario is provided in document FCCC/SBI/2007/INF.7.

B. Total aggregate greenhouse gas emissions

1. Projections excluding emissions/removals from land use, land-use change and forestry

146. Figure 8 shows, for the 'with measures' scenario, the aggregated GHG emissions (without LULUCF) from Annex I Parties for 2010 as well as the projected changes in these emissions from 1990[24] to 2010 and 2020. As shown, under this scenario **total aggregate GHG emissions from Annex I Parties taken together are projected to increase from 18.4 thousand $TgCO_2$ eq in 1990 to 19.2 thousand $TgCO_2$ eq in 2010, or by 4.2 per cent.**

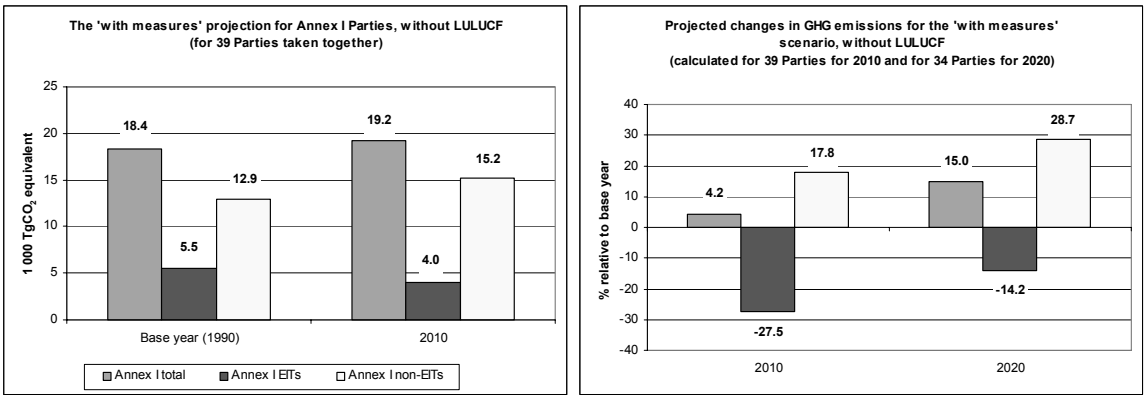
147. **Projections for 2020 show further increases in GHG emissions from Annex I Parties** , to about 15 per cent over the 1990 level. They also show a 10.7 per cent increase in emissions between 2010 and 2020. However, the projections data for 2020 have been reported by only 34 Parties, compared with 39 Parties that have reported projections data for 2010. Therefore, the estimates of changes by 2010 are not fully consistent with the estimates of changes by 2020.

148. For the **EIT Parties**, total aggregate GHG emissions without LULUCF are projected to **decrease** from 5.5 thousand $TgCO_2$ eq in 1990 to 4.0 thousand $TgCO_2$ eq in 2010, or by **27.5 per cent**. For the period 1990–2020, a decrease of 14 per cent is projected, and for the period 2010–2020 GHG emissions without LULUCF for these Parties are projected to increase by 18.2 per cent.

149. For the **non-EIT Annex I Parties**, total aggregate GHG emissions without LULUCF are projected to **increase** from 12.9 thousand $TgCO_2$ eq in 1990 to 15.2 thousand $TgCO_2$ eq in 2010, or by **17.8 per cent**. For the period 1990–2020, the projected increase is 28.7 per cent. For the period 2010–2020 GHG emissions without LULUCF for these Parties are projected to increase by 8.6 per cent.

[24] Unless specified otherwise, here and elsewhere in this chapter base year data are used in sums and totals instead of 1990 data (in accordance with decisions 9/CP.2 and 11/CP.4) for Bulgaria (1988), Hungary (average of 1985–1987), Poland (1988), Romania (1989) and Slovenia (1986).

Figure 8. Projected greenhouse gas emissions from Annex I Parties, without LULUCF

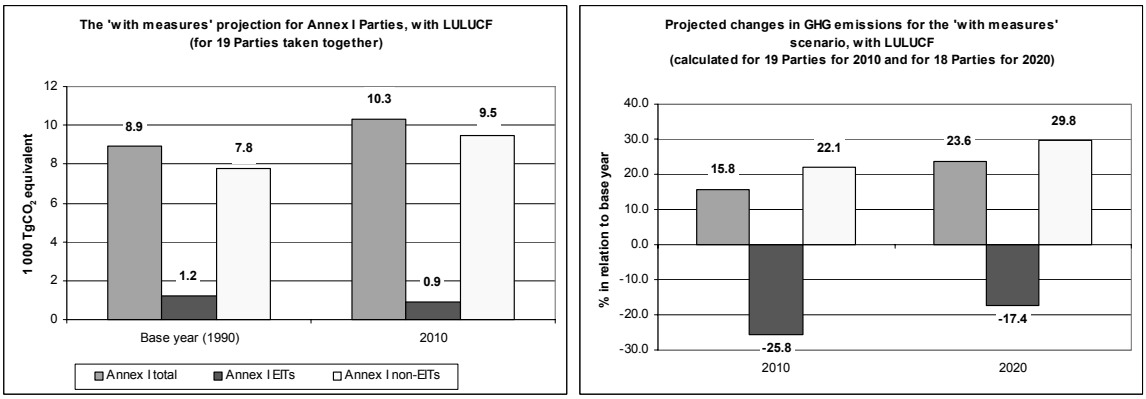


Abbreviations: LULUCF = land use, land-use change and forestry, GHG = greenhouse gas.
Note: (1) The base year under the Convention is 1990 for all Parties except for Bulgaria (1988), Hungary (average of 1985 to 1987), Poland (1988), Romania (1989) and Slovenia (1986), as defined by decisions 9/CP.2 and 11/CP.4; (2) The base year data used by Parties in their projections are not always consistent with the base year data reported in the GHG inventories. Therefore, the base year level in the projections may differ from the base year level estimated with the inventory data.

2. Projections including emissions/removals from land use, land-use change and forestry

150. Only 19 Parties provided projections of total GHG emissions including LULUCF. For these Parties, **GHG emissions with LULUCF in 2010 are projected to increase** from 8.9 thousand $TgCO_2$ eq in 1990 to 10.3 thousand $TgCO_2$ eq in 2010, or by 15.8 per cent (figure 9).[25]

Figure 9. Projected greenhouse gas emissions from Annex I Parties, with LULUCF



Abbreviations: LULUCF = land use, land-use change and forestry, EITs = economies in transition.
Note: (1): The base year under the Convention is 1990 for all Parties except for Bulgaria (1988), Hungary (average of 1985 to 1987), Poland (1988), Romania (1989) and Slovenia (1986), as defined by decisions 9/CP.2 and 11/CP.4; (2) The base year data used by Parties in their projections are not always consistent with the base year data reported in the annual GHG inventories. Therefore, the base year level in the projections may differ from the base year level estimated with the inventory data; (3) Because of the difference in the number of Parties included, this figure is not comparable with figure 8

[25] The projections for GHG emissions with and without LULUCF are not comparable as they differ significantly in the number of Parties covered: projections for GHG emissions with LULUCF until 2010 are available only for 19 Parties, whereas 39 Parties reported projections for GHG emissions without LULUCF. This explains the considerable difference in total emissions between figures 8 and 9, and suggests that the difference in projected emission trends in figures 8 and 9 needs to be interpreted with caution.

151. **Projections for 2020 show GHG emissions from Annex I Parties with LULUCF** increasing to 23.6 per cent over the 1990 level. For the 18 Parties which have reported projections until 2020, GHG emissions with LULUCF are projected to increase by 6.7 per cent between 2010 and 2020.

152. For **EIT Parties**, total aggregate GHG emissions with LULUCF are projected to **decrease** from 1.2 thousand $TgCO_2$ eq in 1990 to 0.9 thousand $TgCO_2$ eq in 2010, or by 25.8 per cent. For the period 1990–2020, a decrease by 17.4 per cent is projected; which means that from 2010 to 2020 GHG emissions with LULUCF for these Parties are projected to increase by 11.4 per cent.

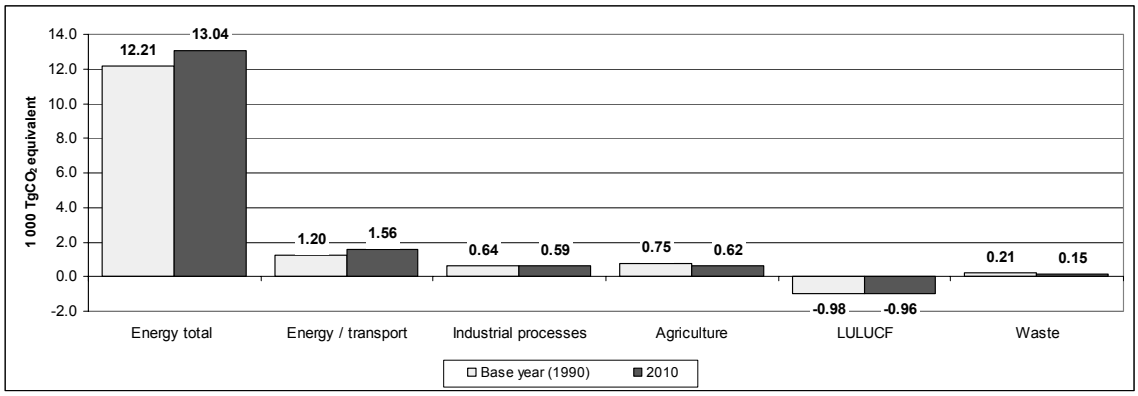
153. For the **non-EIT Annex I Parties**, total aggregate GHG emissions with LULUCF are projected to **increase** from 7.8 thousand $TgCO_2$ eq in 1990 to 9.5 thousand $TgCO_2$ eq in 2010, or by 22.1 per cent. For the period 1990–2020, the projected increase is 29.8 per cent and for the period 2010–2020 GHG emissions with LULUCF for these Parties are projected to increase by 6.3 per cent.

C. Greenhouse gas projections by sector

1. Projected changes in sectoral greenhouse gas emissions

154. Figures 10 and 11 illustrate projected trends in aggregate GHG emissions from Annex I Parties by sector. **For all reporting Parties taken together**,[26] sectoral emissions are projected to increase, from 1990 to 2010, for the energy sector (by 6.8 per cent) whereas in all other sectors decreases are projected: in industrial processes by 7.5 per cent, in agriculture by 17.3 per cent and in the waste sector by 27.3 per cent. Within the energy sector, considerable growth is projected for transport: 30.5 per cent between 1990 and 2010. Net GHG removals by LULUCF are projected to decrease by 1.9 per cent.

Figure 10. Projected Annex I Party greenhouse gas emissions/removals by sector, 1990 and 2010



Abbreviation: LULUCF = land use, land-use change and forestry.
Note: (1) Most of the sectoral totals for projections do not include all reporting Parties, due to problems with reporting (see para. 144 of this document). Therefore, they are not fully consistent with projected total GHG emissions from all Annex I Parties taken together and with the sectoral data provided in chapter III of this document. (2) The data for the energy sector includes data for transport; transport is shown also separately.

[26] Note that detailed projections data by sector are not available for Iceland, Russian Federation and Spain. Therefore, the sectoral values provided here do not include the data for these Parties. For some Parties, projections are available only for some sectors.

Table 8. Greenhouse gas projection scenarios reported by Annex I Parties

Party	Data source[a]	Projection scenarios reported[b,c]			Projection period	Notes
		WM	WAM	NM		
Australia	NC4 (2005)	Yes	No	Yes	to 2020	–
Austria	NC4 (2006)	Yes	Yes	No	to 2010	Two 'with measures' projections have been reported; the projections for the draft national climate strategy II (2006), made until 2010, have been used as they are more recent (the other set of projections is until 2020).
Belarus	NC2 (2006)	Yes	No	No	to 2020	(1) Only data for CO_2, CH_4, N_2O from the energy sector have been provided in detail and therefore only these data are used. (2) "Baseline" scenario is used as a 'with measures' scenario
Belgium	NC4 (2005)	Yes	Yes	No	to 2020	–
Bulgaria	NC4 (2006)	Yes	Yes	Yes	to 2020	–
Canada	NC4 (2006)	Yes	No	No	to 2020	–
Croatia	NC2&3&4 (2007)	Yes	Yes	Yes	to 2020	–
Czech Republic	NC4 (2006)	Yes	Yes	Yes	to 2020	–
Denmark	NC4 (2005)	Yes	No	Yes	to 2030	Only emissions from mainland Denmark are projected.
Estonia	IDR4 (2006)	Yes	Yes	Yes	to 2030	Projections data (only CO_2 from the energy sector) are taken from IDR4.
European Community	NC4 (2006)	Yes	Yes	No	to 2010	The NC4 provides an indication of its 'without measures' scenario only in graphical format
Finland	RDP (2006)	Yes	Yes	No	to 2020	The projections data in the RDP and NC4 are slightly different. The RDP data are used as more recent.
France	NC4 (2006)	Yes	Yes	Yes	to 2020	–
Germany	NC4 (2006)	Yes	Yes	No	to 2020	–
Greece	NC4 (2006)	Yes	Yes	No	to 2020	–
Hungary	NC4 (2006)	Yes	Yes	Yes	to 2020	The reported national totals (annex 2 of NC4) slightly differ from the sum of sectoral projections. The sum of sectoral projections used.
Iceland	NC4 (2006)	Yes	No	No	to 2020	Two "with measures" projections have been provided; scenario 1 is used as the "with measures" scenario. For 2008–2012 on average, the emissions under scenario 2 are estimated to be about 10 per cent higher than under scenario 1.
Ireland	NC4 (2007)	Yes	No	No	to 2020	–
Italy	NC3 (2003)	Yes	Yes	No	to 2020	The NC4 was not available when this report was prepared; therefore, data are taken from the NC3.
Japan	NC4 (2006)	Yes	Yes	No	to 2010	The projection model uses an approach to emission allocation that differs from the approach used in the GHG inventory.
Latvia	NC4 (2006)	Yes	Yes	No	to 2020	–
Liechtenstein	NC4 (2006)	Yes	No	No	to 2010	–
Lithuania	NC3&4 (2005)	Yes	No	Yes	to 2020	The reported projections do not follow the reporting requirements fully (see IDR4). Only emissions from the energy sector, industrial processes (partially), waste and agriculture are included.

Party	Data source[a]	Projection scenarios reported[b,c]			Projection period	Notes
		WM	WAM	NM		
Luxembourg	–	–	–	–	–	The NC4 was not available when this document was produced; the previous communication (NC3) does not contain GHG projections.
Monaco	NC4 (2006)	–	–	–	–	The NC4 does not contain quantitative GHG projections; the previous communication (NC3) also does not contain GHG projections.
Netherlands	NC4 (2005)	Yes	Yes	Yes	to 2020	Two "with measures" scenarios have been reported: "Strong Europe" (SE) and "Global Economy" (GE). The SE scenario has been used; the emissions under the GE scenario in 2010 are higher by about 5 $TgCO_2$ eq.
New Zealand	NC4 (2006)	Yes	No	No	to 2020	–
Norway	NC4 (2006)	Yes	No	No	to 2010	–
Poland	NC4 (2006)	Yes	No	Yes	to 2020	–
Portugal	NC4 (2006)	Yes	Yes	No	to 2020	–
Romania	NC4 (2006)	Yes	Yes	Yes	to 2020	–
Russian Federation	NC4 (2006)	Yes	No	No	to 2020	Two "with measures" scenarios have been reported. Scenario II is used, because only for this scenario non-CO_2 projections are reported.
Slovakia	NC4 (2006)	Yes	Yes	Yes	to 2025	–
Slovenia	NC4 (2006)	Yes	Yes	No	to 2020	–
Spain	NC4 (2006)	Yes	No	Yes	to 2020	–
Sweden	NC4 (2006)	Yes	No	No	to 2020	–
Switzerland	NC4 (2006)	Yes	Yes	No	to 2020	–
Turkey	NC1 (2007)	Yes	No	Yes	to 2020	Only energy-related emissions have been projected in a consistent manner; therefore, only these projections are used.
Ukraine	NC2 (2006)	Yes	No	No	to 2030	Three "with measures" scenarios have been reported. The "baseline" scenario is used as a "with measures" scenario.
United Kingdom	NC4 (2006)	Yes	Yes	No	to 2020	–
United States	NC4 (2007)	Yes	No	Yes	to 2020	The two scenarios provided by the Party ("Business as Usual" and "Full Implementation") differ not only in the portfolio of policies and measures adopted and implemented, but also in terms of important assumptions, including the oil price and GDP level.
Total reported	**40**	**39**	**22**	**16**	**–**	**–**

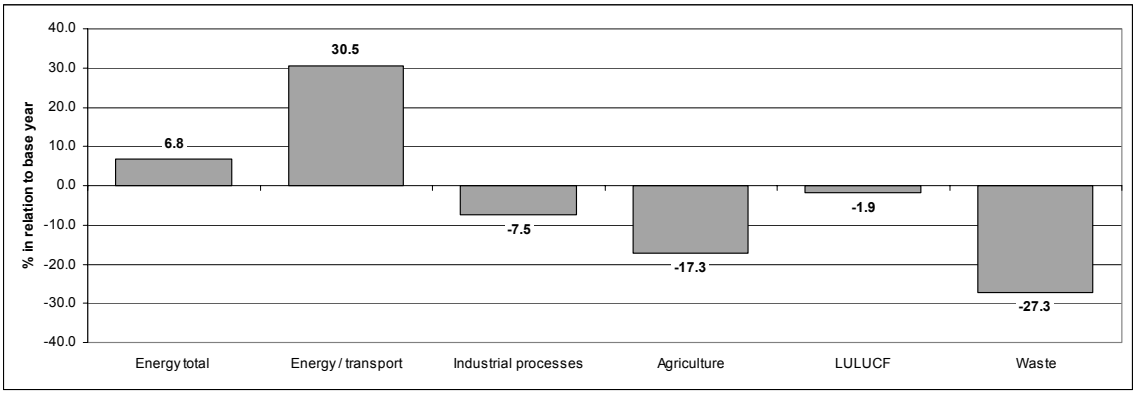
Abbreviations: LULUCF = land use, land-use change and forestry, RDP = report demonstrating progress und the Kyoto Protocol.

[a] The data sources are abbreviated as: NC1 = first national communication, NC2 = second national communication, NC3 = third national communication, NC4 = fourth national communication, NC2&3&4 = combined second, third and fourth national communication, NC3&4 = combined third and fourth national communication, IDR4 = report on the in-depth review of the fourth national communication.

[b] The scenarios are abbreviated as: WM = with measures, WAM = with additional measures, NM = without measures. Of these, only the WM scenario is mandatory under the UNFCCC reporting guidelines.

[c] A scenario is considered as reported if data are available for GHG emissions without LULUCF. Projections with the LULUCF sector are available for fewer Parties than projections without LULUCF.

Figure 11. Projected changes in Annex I Party greenhouse gas emissions/removals by sector, 1990 to 2010



Abbreviation: LULUCF = land use, land-use change and forestry.

3. Projected changes in greenhouse gas emissions from bunker fuels

155. Only five Annex I Parties (the Czech Republic, Denmark, the Netherlands, New Zealand and Switzerland) have reported projections of GHG emissions from fuels sold for use in aviation and shipping. These projections are shown in table 9; it is not possible to estimate projected trends for all Annex I Parties taken together based on reported projections from so few countries.

Table 9. Projections of greenhouse gas emissions from bunker fuels

	Actual 1990 emissions $TgCO_2$ eq		Projected 2010 emissions $TgCO_2$ eq		Change from base year (1990) to 2010 (%)	
Party	Aviation	Maritime	Aviation	Maritime	Aviation	Maritime
Czech Republic	0.63	–	0.75	–	19.9	–
Denmark	1.76	3.15	2.47	3.20	40.7	1.7
Netherlands	5.42	34.51	13.30	46.70	145.4	35.3
New Zealand	1.35	1.04	2.61	0.81	92.9	–21.9
Switzerland	3.23	–	3.82	–	18.3	–

Note: Emissions from international aviation and marine transport are not included in the national totals of Annex I Parties.

D. Projected total effect of policies and measures

1. Projected total effect of implemented and adopted measures

156. For Parties that reported a 'without measures' scenario, the projected aggregate GHG emissions can be compared with those from the 'with measures' scenario. Such a comparison provides only an indication of the aggregated effect of implemented and adopted measures (which may differ from a sum of the effects of individual measures because of possible correlation between the effects). Also, the estimated effect might be lower than the actual effect because most of the policies and measures that were implemented in the 2000s will need some time and thorough implementation before their full effects manifest themselves. Table 10, which includes the 16 Parties which provided a 'without measures' scenario, summarizes the aggregated effects of implemented and adopted measures, estimated through a comparison of 'without measures' and 'with measures' scenarios.[27]

157. Table 10 shows that **implemented and adopted policies and measures are estimated to result in sizeable reductions of GHG emissions**: the total effect of policies and measures projected for 2010 ranges from 0.8 to 33.3 per cent of base year emissions. However, comparisons of total effects among Parties cannot be done accurately because the definition of the 'without measures' scenario differs from

[27] The EC also provided an estimate of the total effect of 420–450 $TgCO_2$ eq for implemented policies and measures that is based on the aggregation of potential effects of individual policies and measures once fully implemented.

Party to Party, in terms of what existing measures are excluded from the 'without measures' scenario and the starting year for this scenario.

158. As 'without measures' scenarios has been provided by a minority of Parties (16 out of 39), it is not possible to estimate aggregated effects of implemented and adopted measures for all Annex I Parties taken together. For the 16 Parties that reported a 'without measures' scenario, **the total effect of implemented and adopted measures in 2010 amounts to 8 per cent of total base year emissions, and 14 per cent in 2020**. In absolute terms, the EC and the United States reported the by far highest total effects of implemented and adopted policies and measures (420–450 and 405 $TgCO_2$ eq, respectively).

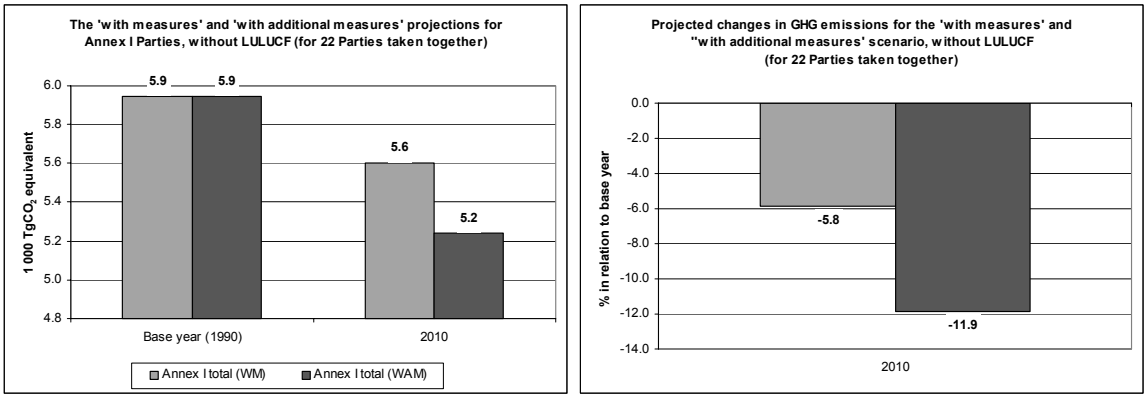
2. Projected total effects of additional (planned) policies and measures

159. Twenty-two out of 39 Parties have provided a 'with additional measures' scenario, which include those policies and measures that were in a planning stage at the time of reporting (i.e., not yet implemented or adopted). These measures include further action in the context of the existing national programmes, or the launch of new measures and programmes. Belgium, for example, intends to take further action in the new phase of its Climate Action Plan. Norway plans to implement a revised national emissions trading scheme for 2008–2012. Therefore, such 'with additional measures' scenarios can be used to estimate the aggregated effects of planned policies and measures (see table 11).

160. Table 11 shows that for most Parties **the implementation of planned policies and measures can reduce GHG emissions noticeably**, in most cases by an additional 5–10 per cent. In absolute terms, the EC and Germany reported the by far highest total effects of planned policies and measures (218 and 102 $TgCO_2$ eq, respectively). Comparisons among Parties, however, cannot be made accurately because the definition of additional policies and measures (their nature, scope and stage of implementation planning) differs considerably from Party to Party.

161. For the same reason the impact of planned policies and measures on total GHG emissions can be estimated only roughly for the 22 Annex I Parties that reported a 'with additional measures' scenario. As figure 12[28] shows, **the implementation of these currently planned measures is estimated to support the overall GHG reduction by 2010, in relation to the base year emissions, from 5.8 per cent under the 'with measures scenario' to 11.9 per cent under the 'with additional measures' scenario**. This estimate is based on only 22 out of 39 reporting Annex I Parties, and therefore cannot be extrapolated to the total of all Annex I Parties.

Figure 12. Projected aggregated effects of planned policies and measures



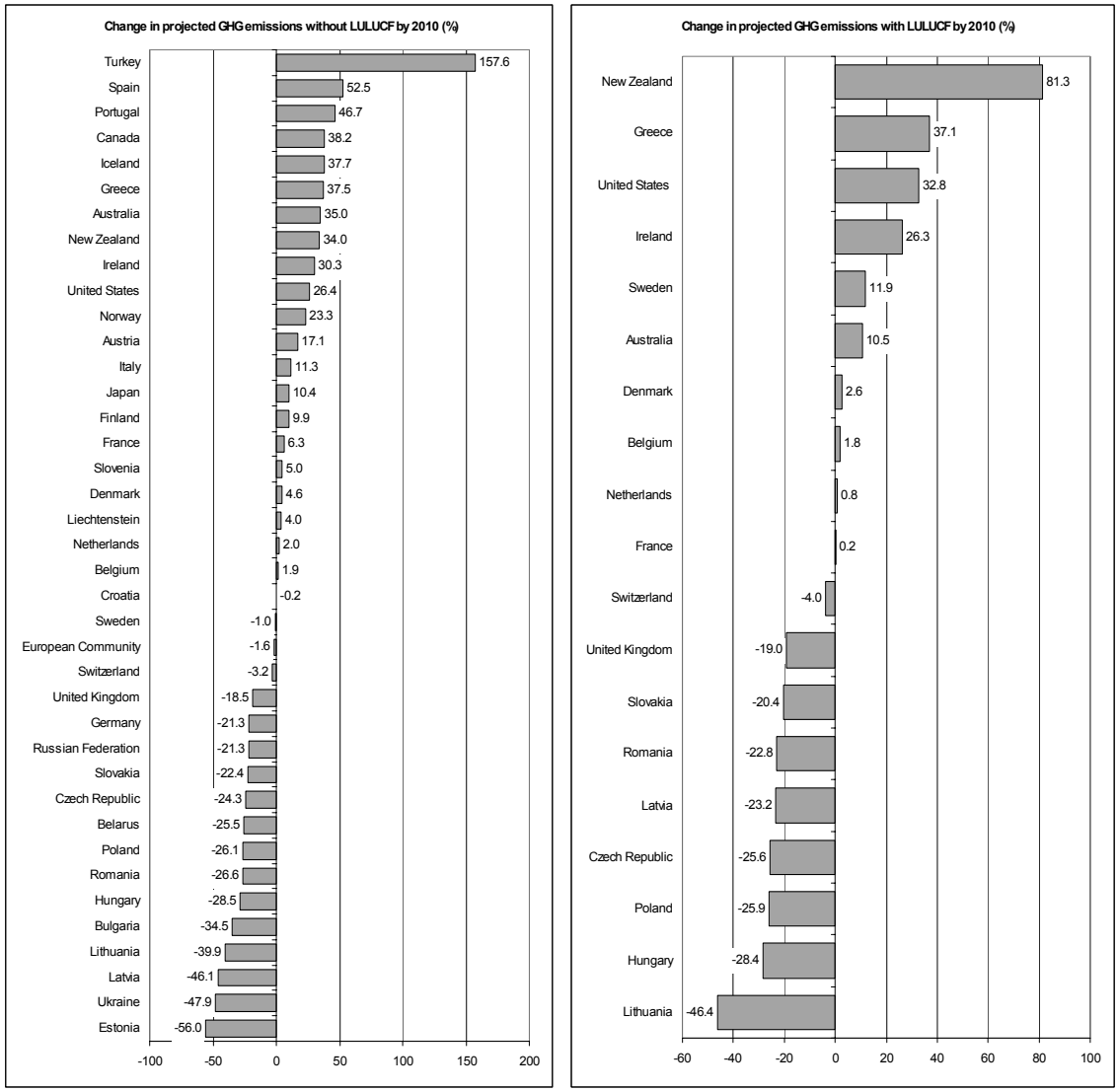
Abbreviations: LULUCF = land use, land-use change and forestry, GHG = greenhouse gas, WM = with measures; WAM = with additional measures.

[28] This figure covers only the projections for 2010. The 'with additional measures' projection to 2020 is available only for 13 Parties and it is therefore not possible to derive a comparable estimate of aggregated effects for 2020.

E. Projections data for individual Annex I Parties

162. Figure 13 represents the projected changes in GHG emissions for individual Annex I Parties from 1990 to 2010 under the 'with measures' scenario. More detailed data, for both 'with measures' and 'with additional measures' scenarios can be found in tables 12 and 13.

Figure 13. Projected changes in total aggregate greenhouse gas emissions of individual Annex I Parties under the 'with measures' scenario



Abbreviation: LULUCF = land use, land-use change and forestry.

163. By country, projected changes in total aggregate GHG emissions from 1990 to 2010 under the 'with measures' scenario vary greatly: from a decrease of 56 per cent (Estonia) to an increase of 157.6 per cent (Turkey) for GHG emissions without LULUCF; and from a decrease of 46.4 per cent (Lithuania) to an increase of 81.3 per cent (New Zealand) for GHG emissions with LULUCF. Altogether, in 18 Annex I Parties total aggregate GHG emissions without LULUCF are projected to decrease from 1990 to 2010, whereas in 21 Parties the emissions are projected to increase. For total aggregate GHG emissions with LULUCF, in nine Annex I Parties the emissions are projected to decrease from 1990 to 2010 and in 10 Parties the emissions are projected to increase.

Table 10. Projected aggregated effects of implemented and adopted measures

Party	Base year (1990)	Emissions ($TgCO_2$ eq) Without measures 2010	Without measures 2020	With measures 2010	With measures 2020	Effects of existing and adopted measures ($TgCO_2$ eq) 2010	2020	Effects of existing and adopted measures (% of 1990 emissions) 2010	2020
Australia	417.0	630.0	–	563.1	640.7	66.9	–	16.0	–
Bulgaria	138.4	107.2	135.6	90.6	104.6	16.5	31.0	11.9	22.4
Croatia[a]	33.6	34.4	40.9	33.6	38.7	0.9	2.2	2.6	6.5
Czech Republic	192.0	157.8	136.1	145.3	121.6	12.5	14.5	6.5	7.6
Denmark	69.3	95.6	–	72.5	67.8	23.1	–	33.3	–
Estonia	37.5	17.2	–	16.5	–	0.7	–	1.9	–
France	567.1	677.9	785.2	602.8	632.7	75.1	152.5	13.2	26.9
Hungary	122.2	88.4	100.5	87.4	97.9	1.0	2.6	0.8	2.1
Lithuania	41.2	30.3	33.4	24.8	27.4	5.6	6.1	13.5	14.7
Netherlands	211.5	236.7	260.4	215.7	221.7	21.0	38.7	9.9	18.3
Poland	568.5	472.3	517.2	420.0	479.0	52.3	38.1	9.2	6.7
Romania	262.3	207.4	255.8	192.5	233.4	14.9	22.4	5.7	8.5
Slovakia	71.9	56.9	71.2	55.8	69.6	1.1	1.7	1.6	2.3
Spain	286.2	495.1	662.4	436.3	528.9	58.8	133.5	20.5	46.6
Turkey	132.1	358.3	615.7	340.3	539.0	18.0	76.6	13.6	58.0
United States[b]	6 103.3	8 117.0	9 015.0	7 712.0	8 278.0	405.0	737.0	6.6	12.1

Note: The aggregated effects of implemented and adopted measures are estimated as the difference between emissions in the 'without measures' scenario and those in the 'with measures' scenario.

[a] For Croatia, 3.5 $TgCO_2$ eq are added to the 1990 emissions to calculate the base year level in accordance with decision 7/CP.12.

[b] For the United States, the reported 2012 value is used as a 2010 estimate; GHG projections for 2010 have not been reported in the fourth national communication.

Table 11. Projected aggregated effects of additional (planned) measures

Party	Base year (1990)	Emissions ($TgCO_2$ eq) With measures 2010	With measures 2020	With additional measures 2010	With additional measures 2020	Effects of additional (planned) measures ($TgCO_2$ eq) 2010	2020	Effects of additional (planned) measures (% of 1990 emissions) 2010	2020
Austria	78.9	92.4	–	78.0	–	14.4	–	18.2	–
Belgium	145.7	148.5	154.0	145.7	–	2.8	–	1.9	–
Bulgaria	138.4	90.6	104.6	82.5	93.2	8.1	11.4	5.9	8.2
Croatia	33.6	33.6	38.7	29.6	31.2	3.9	7.5	11.7	22.5
Czech Republic	192.0	145.3	121.6	140.8	118.7	4.6	2.9	2.4	1.5
Estonia	37.5	16.5	–	16.5	–	0.0	–	0.0	–
European Community	4 145.0	4 080.0	–	3 862.0	–	218.0	–	5.3	–
Finland	71.5	78.5	82.2	69.7	69.4	8.8	12.8	12.3	17.9
France	567.1	602.8	632.7	568.1	556.1	34.7	76.6	6.1	13.5
Germany	1 275.0	1 003.0	1 013.0	901.0	757.0	102.0	256.0	8.0	20.1
Greece	109.4	150.4	166.8	139.5	–	10.9	–	9.9	–
Hungary	122.2	87.4	97.9	87.1	93.7	0.3	4.2	0.2	3.4
Italy	521.0	579.7	660.3	540.1	–	39.6	–	7.6	–
Japan	1 187.9	1 311.0	–	1 231.0	–	80.0	–	6.7	–
Latvia	25.4	13.7	16.5	13.0	14.0	0.6	2.5	2.5	9.8
Netherlands	211.5	215.7	221.7	210.3	216.3	5.4	5.4	2.6	2.6
Portugal	59.9	88.0	96.0	85.6	94.0	2.4	2.0	4.0	3.3
Romania	262.3	192.5	233.4	181.4	222.1	11.1	11.3	4.2	4.3
Slovakia	71.9	55.8	69.6	54.1	66.3	1.6	3.2	2.3	4.5
Slovenia	20.2	21.2	20.4	19.9	18.9	1.3	1.5	6.4	7.4
Switzerland	52.5	50.8	49.3	49.5	–	1.3	–	2.5	–
United Kingdom	763.2	622.1	620.7	597.5	–	24.6	–	3.2	–

Note: The aggregated effects of planned measures are estimated as the difference between emissions in the 'with measures' scenario and those in the 'with additional measures' scenario.

164. For the **'with additional measures' scenario** (tables 12 and 13) projected changes in total aggregate GHG emissions from 1990 to 2010 vary from a decrease of 56 per cent (Estonia) to an increase of 42.7 per cent (Portugal) for GHG emissions without LULUCF. Of the 22 Parties that provided the 'with additional measures' scenario, in 16 Annex I Parties total aggregate GHG emissions without LULUCF are projected to decrease from 1990 to 2010, whereas in six Parties the emissions are projected to increase. For GHG emissions with LULUCF, data are available for only a few Parties (9 of 22) and therefore it is not possible to make reasonable comparisons of changes among Parties.

Table 12. Projected total aggregate greenhouse gas emissions, excluding emissions/removals from land use, land-use change and forestry

Party		Emissions ($TgCO_2$ eq)				Changes in relation to 1990 (%)			
	Base year	With measures		With additional measures		With measures		With additional measures	
	(1990)	2010	2020	2010	2020	2010	2020	2010	2020
Australia	417.0	563.1	640.7	–	–	35.0	53.6	–	–
Austria	78.9	92.4	–	78.0	–	17.1	–	–1.2	–
Belarus	105.4	78.6	88.3	–	–	–25.5	–16.2	–	–
Belgium	145.7	148.5	154.0	145.7	–	1.9	5.8	0.0	–
Bulgaria	138.4	90.6	104.6	82.5	93.2	–34.5	–24.4	–40.4	–32.6
Canada	599.0	828.0	897.0	–	–	38.2	49.7	–	–
Croatia[a]	33.6	33.6	38.7	29.6	31.2	–0.2	15.2	–11.8	–7.3
Czech Republic	192.0	145.3	121.6	140.8	118.7	–24.3	–36.7	–26.7	–38.2
Denmark	69.3	72.5	67.8	–	–	4.6	–2.3	–	–
Estonia	37.5	16.5	–	16.5	–	–56.0	–	–56.0	–
European Community	4 145.0	4 080.0	–	3 862.0	–	–1.6	–	–6.8	–
Finland	71.5	78.5	82.2	69.7	69.4	9.9	15.0	–2.5	–2.9
France	567.1	602.8	632.7	568.1	556.1	6.3	11.6	0.2	–1.9
Germany	1 275.0	1 003.0	1 013.0	901.0	757.0	–21.3	–20.5	–29.3	–40.6
Greece	109.4	150.4	166.8	139.5	–	37.5	52.5	27.5	–
Hungary	122.2	87.4	97.9	87.1	93.7	–28.5	–19.9	–28.7	–23.4
Iceland	3.3	4.5	4.5	–	–	37.7	37.7	–	–
Ireland	55.6	72.4	77.3	–	–	30.3	39.0	–	–
Italy	521.0	579.7	660.3	540.1	–	11.3	26.7	3.7	–
Japan	1 187.9	1 311.0	–	1 231.0	–	10.4	–	3.6	–
Latvia	25.4	13.7	16.5	13.0	14.0	–46.1	–34.7	–48.6	–44.6
Liechtenstein	0.25	0.26	–	–	–	4.0	–	–	–
Lithuania	41.2	24.8	27.4	–	–	–39.9	–33.6	–	–
Netherlands	211.5	215.7	221.7	210.3	216.3	2.0	4.8	–0.6	2.3
New Zealand	61.5	82.4	91.2	–	–	34.0	48.2	–	–
Norway	50.1	61.8	68.8	–	–	23.3	37.2	–	–
Poland	568.5	420.0	479.0	–	–	–26.1	–15.7	–	–
Portugal	59.9	88.0	96.0	85.6	94.0	46.7	60.1	42.7	56.8
Romania	262.3	192.5	233.4	181.4	222.1	–26.6	–11.0	–30.8	–15.3
Russian Federation	2 961.0	2 329.0	2 823.0	–	–	–21.3	–4.7	–	–
Slovakia	71.9	55.8	69.6	54.1	66.3	–22.4	–3.2	–24.7	–7.7
Slovenia	20.2	21.2	20.4	19.9	18.9	5.0	1.3	–1.4	–6.1
Spain	286.2	436.3	528.9	–	–	52.5	84.8	–	–
Sweden	72.2	71.5	76.6	–	–	–1.0	6.1	–	–
Switzerland	52.5	50.8	49.3	49.5	–	–3.2	–6.1	–5.7	–
Turkey	132.1	340.3	539.0	–	–	157.6	308.0	–	–
Ukraine	925.4	482.4	571.3	–	–	–47.9	–38.3	–	–
United Kingdom	763.2	622.1	620.7	597.5	–	–18.5	–18.7	–21.7	–
United States[b]	6 103.3	7 712.0	8 278.0	–	–	26.4	35.6	–	–

Note: For those Parties that have not reported 2010 data but have reported average emissions in the period 2008–2012, the 2008–2012 averages are used as 2010 emissions.

[a] For Croatia, 3.5 $TgCO_2$ eq are added to the 1990 emissions to calculate the base year level in accordance with decision 7/CP.12.

[b] For the United States, the reported 2012 value is used as a 2010 estimate; GHG projections for 2010 have not been reported in the fourth national communication.

Table 13. Projected total aggregate greenhouse gas emissions, including emissions/removals from land use, land-use change and forestry

Party	Emissions ($TgCO_2$ eq)					Changes in relation to 1990 (%)			
	Base year (1990)	With measures		With additional measures		With measures		With additional measures	
		2010	2020	2010	2020	2010	2020	2010	2020
Australia	510.7	564.5	646.4	–	–	10.5	26.6	–	–
Belgium	142.6	145.2	150.7	142.4	–	1.8	5.7	–0.1	–
Czech Republic	189.9	141.2	117.3	136.6	114.4	–25.6	–38.2	–28.0	–39.7
Denmark	69.5	71.3	66.0	–	–	2.6	–5.0	–	–
France	543.7	544.8	567.7	510.3	490.1	0.2	4.4	–6.1	–9.9
Greece	106.2	145.6	162.6	–	–	37.1	53.1	–	–
Hungary	120.9	86.5	93.0	85.9	87.2	–28.4	–23.1	–28.9	–27.9
Ireland	55.7	70.4	72.7	–	–	26.3	30.4	–	–
Latvia	7.0	5.3	3.4	4.8	0.2	–23.2	–51.1	–30.8	–97.5
Lithuania	34.2	18.3	20.2	–	–	–46.4	–41.0	–	–
Netherlands	214.4	216.1	–	–	–	0.8	–	–	–
New Zealand	40.2	72.8	86.8	–	–	81.3	116.1	–	–
Poland	532.5	394.6	458.4	–	–	–25.9	–13.9	–	–
Romania	226.3	174.7	214.6	163.3	203.1	–22.8	–5.2	–27.8	–10.3
Slovakia	69.6	55.3	68.5	53.6	65.1	–20.4	–1.5	–22.9	–6.4
Sweden	51.9	58.1	69.5	–	–	11.9	33.9	–	–
Switzerland	51.2	49.2	47.7	47.9	–	–4.0	–6.9	–6.5	–
United Kingdom	766.2	620.2	623.3	595.7	–	–19.0	–18.6	–22.3	–
United States[a]	5 198.6	6 906.0	7 569.0	–	–	32.8	45.6	–	–

Note: (1) This table includes only those Parties that have reported projections for GHG emissions/removals from the land use, land-use change and forestry sector. (2) For those Parties that have not reported 2010 data but have reported average emissions in the period 2008–2012, the 2008–2012 averages are used as 2010 emissions.

[a] For the United States, the reported 2012 value is used as a 2010 estimate; GHG projections for 2010 have not been reported in the fourth national communication.

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