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**National communications and greenhouse gas inventory data from Parties
included in Annex I to the Convention**

**Compilation and synthesis of fifth national communications from Parties
included in Annex I to the Convention**

Compilation and synthesis of fifth national communications

Executive summary

Note by the secretariat

Summary

This document contains a summary of the information presented in the compilation and synthesis report of the fifth 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 emission trends; emission projections and estimates of the total effect of policies and measures; policies and measures; vulnerability assessment, climate change impacts and adaptation measures; financial resources and transfer of technology; capacity-building; research and systematic observation; and education, training and public awareness.

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I. Mandate and approach

1. Articles 4, paragraphs 1 and 2, and 12 of the Convention require Parties included in Annex I to the Convention (Annex I Parties) to communicate information periodically to the Conference of the Parties (COP). The COP, by its decision 10/CP.13, requested Annex I Parties to submit to the secretariat, in accordance with Article 12, paragraphs 1 and 2, of the Convention, their fifth national communications (NC5) by 1 January 2010. In accordance with decisions 11/CP.4, 4/CP.5 and 4/CP.8, Annex I Parties should use the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications” (hereinafter referred to as the UNFCCC reporting guidelines) for the preparation of their national communications under the Convention.

2. The COP, by its decision 9/CP.16, requested the secretariat to prepare a compilation and synthesis report on NC5, for consideration by the COP at its seventeenth session. This document responds to that request and contains information compiled and synthesized from the NC5 of the 40 Annex I Parties¹ that submitted them by 31 March 2011 and from the first national communication of Turkey, which was submitted in 2007 but not covered in the previous compilation and synthesis report. Information on the status of submissions is contained in document FCCC/SBI/2011/INF.6.

3. The compilation and synthesis report comprises three separate documents. The main report, which includes information on all reporting elements following the UNFCCC reporting guidelines, is published in two parts: document FCCC/SBI/2011/INF.1/Add.1 contains a synthesis of the reported information on national circumstances, greenhouse gas (GHG) inventories, emission projections and policies and measures (PaMs); and document FCCC/SBI/2011/INF.1/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. The present document is an executive summary of the information contained in those two documents.

4. Each of the documents referred to in paragraph 3 above can be read as a stand-alone paper. When appropriate, cross-references are made to avoid repetition. All references to Parties in these documents are to Annex I Parties, unless otherwise indicated.

II. Executive summary

A. National circumstances and greenhouse gas emission trends

5. Total aggregate GHG emissions excluding emissions/removals from land use, land-use change and forestry (LULUCF) from all Annex I Parties taken together decreased from 19.0 to 17.8 thousand teragrams of carbon dioxide equivalent (Tg CO₂ eq), a decline of 6.0 per cent, in the period 1990–2008 (see figure 1). Total aggregate GHG emissions including LULUCF decreased by 10.7 per cent over that period. Two main factors underlie these general declines in total aggregate emissions: differences in emission trends during the 1990–2000, 2000–2007 and 2007–2008 periods, and differences between the emissions from Annex I Parties with economies in transition (EIT Parties) and those from Annex I Parties that do not have economies in transition (non-EIT Parties) (see the table below). Total aggregate GHG emissions from Annex I Parties fell sharply (6.8 per cent decrease

¹ The Party that did not submit its NC5 was Turkey.

excluding LULUCF) in the period 1990–2000, as large emission reductions in EIT Parties (as a result of their economic restructuring) greatly offset emission increases in non-EIT Parties. Emissions rose modestly (0.8 per cent increase excluding LULUCF) during the period 2000–2008, as emissions increased in EIT Parties (as their economies recovered) and emissions in non-EIT Parties declined, reflecting, in particular, the effect of relevant policy packages implemented by many of the latter Parties. Between 2007 and 2008, emissions from Annex I Parties declined by 2.0 per cent (excluding LULUCF), owing in large part to decreased energy use during the economic crisis.

Percentage changes in total aggregate anthropogenic greenhouse gas emissions and gross domestic product

Parties	Excluding emissions/removals from LULUCF			Including emissions/removals from LULUCF			GDP ^a		
	1990–2000	2000–2007	2007–2008	1990–2008	1990–2000	2000–2007	2007–2008	1990–2008	1990–2008
All Annex I Parties	-6.8	2.9	-2.0	-6.0	-9.8	4.1	-5.0	-10.7	48.0
EIT Parties	-41.5	7.9	0.3	-36.7	-51.6	5.9	-1.7	-49.7	20.5
Non-EIT Parties	9.0	1.7	-2.6	8.0	10.8	3.7	-5.7	8.4	52.2

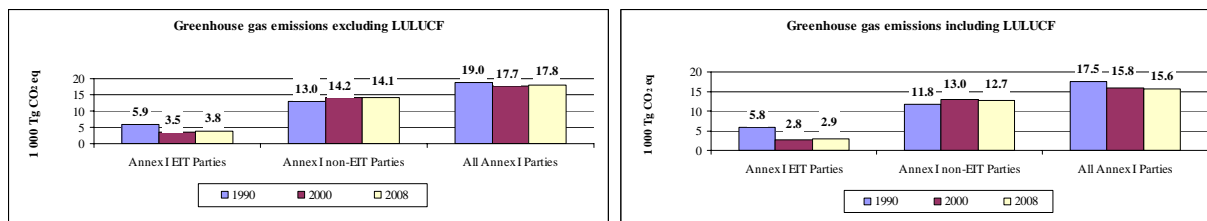
Abbreviations: EIT Parties = Parties with economies in transition, GDP = gross domestic product, LULUCF = land use, land-use change and forestry, non-EIT Parties = Parties that do not have economies in transition.

^a GDP (2000 USD billion) using purchasing power parity.

6. In all individual Annex I Parties, either the rate of growth in emissions was slower than the rate of growth in economic activity, measured through gross domestic product (GDP), or the rate of decline in emissions was more rapid than the rate of decline in GDP in the period 1990–2008. During the period 1990–2008, GDP in all Annex I Parties overall grew by 48.0 per cent and emission intensity (emissions per unit of GDP) fell by 35.9 per cent. The level of decoupling of the trends in emissions and GDP was greater for EIT Parties (20.5 per cent increase in GDP; and 45.9 per cent decline in emission intensity), because of the vast economic restructuring and technological renewal in those countries. A considerable decoupling of the trends for non-EIT Parties also occurred (52.2 per cent increase in GDP; and 29.1 per cent decline in emission intensity).

7. Several non-EIT Parties have managed to reduce emissions despite strong economic growth. Belgium, Denmark, European Union, Finland, France, Germany, Luxembourg, Monaco, Netherlands, Sweden and United Kingdom of Great Britain and Northern Ireland succeeded in keeping their total GHG emissions without LULUCF in 2008 at or below their 1990 levels. While various factors contributed to this result, **considerable credit is due to their implementation of effective policies that, mainly, promote energy efficiency, renewable energy sources and fuel switching.**

Figure 1
Greenhouse gas emissions from Annex I Parties, 1990, 2000 and 2008^d



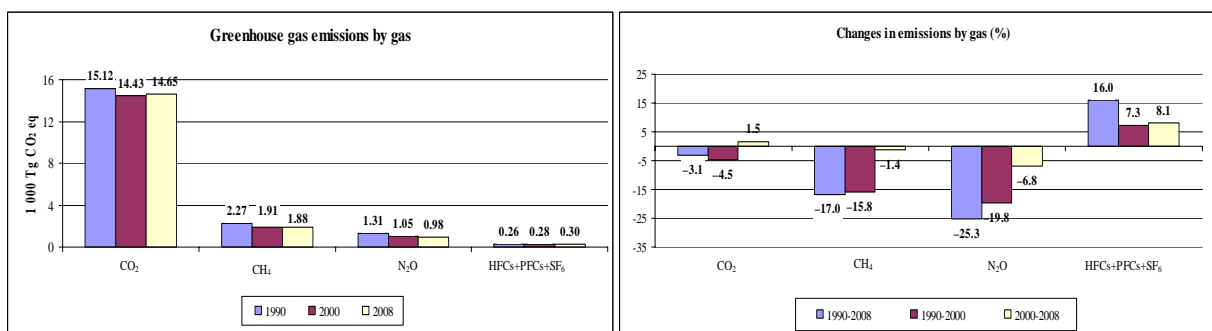
Abbreviations: EIT Parties = Parties with economies in transition, LULUCF = land use, land-use change and forestry, non-EIT Parties = Parties that do not have economies in transition.

^a The sum of the values provided for EIT and non-EIT Parties may slightly differ from the value provided for all Annex I Parties, because of rounding.

8. Emissions from Annex I Parties of each of the main GHGs, except the three fluorinated gases (F-gases), declined during the 1990–2008 period. Total emissions of methane (CH₄) and nitrous oxide (N₂O) declined substantially, by 17.0 and 25.3 per cent, respectively, while emissions of CO₂ remained broadly stable, decreasing by 3.1 per cent. The decrease in CH₄ and N₂O emissions can be attributed in part to the implementation of policies directly addressing those gases. Emissions of F-gases, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) taken together, increased by 16.0 per cent (see figure 2), owing mainly to the increase in emissions of HFCs used as a substitute for some gases controlled by the Montreal Protocol.

9. As a result of these emission trends, the shares of the GHGs in the total emissions shifted slightly in the 1990–2008 period. CO₂ continuously accounted for the largest share of the total emissions, accounting for 82.3 per cent in 2008 (79.8 per cent in 1990), while CH₄ and N₂O contributed 10.6 per cent and 5.5 per cent, respectively, of the total emissions in 2008 (12.0 per cent and 6.9 per cent, respectively, in 1990). HFC, PFC and SF₆ emissions taken together accounted for approximately 1.7 per cent of the total emissions in 2008 (1.4 per cent in 1990).

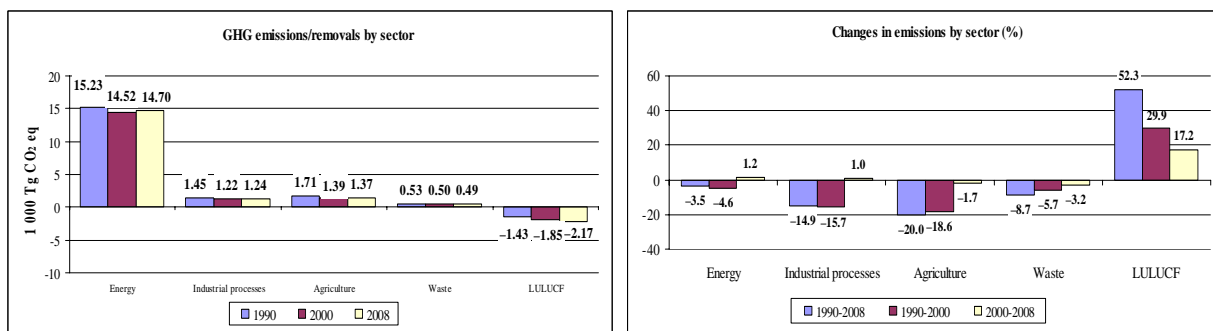
Figure 2
Greenhouse gas emissions from Annex I Parties, by gas



10. Emissions from all sectors decreased during the 1990–2008 period. The greatest decrease occurred in the agriculture sector (–20.0 per cent), followed by industrial processes (–14.9 per cent), waste (–8.7 per cent) and energy (–3.5 per cent). Net GHG removals from LULUCF increased by more than 50.0 per cent (see figure 3). Mostly as a result of the economic crisis in the period 2007–2008, emissions from energy, industrial processes and waste decreased within one year by 2.1, 5.1 and 1.0 per cent, respectively; only emissions from agriculture increased (by 1.1 per cent).

11. The relatively small change in the emissions from the energy sector during the 1990–2008 period results from changes in emissions among the energy subsectors compensating each other. Emissions from transport increased the most (by 14.0 per cent), followed by emissions from energy industries (primarily electricity and heat production) (by 3.1 per cent), while emissions from manufacturing industries and construction showed the largest decrease (–16.7 per cent), followed by fugitive emissions from fuels (–16.1 per cent) and emissions from other sectors (residential and commercial) (–13.2 per cent). Because of the strong growth in emissions from transport, many Parties identified limiting those emissions as the main challenge in their climate change mitigation policies.

Figure 3
Greenhouse gas emissions/removals from Annex I Parties, by sector^a

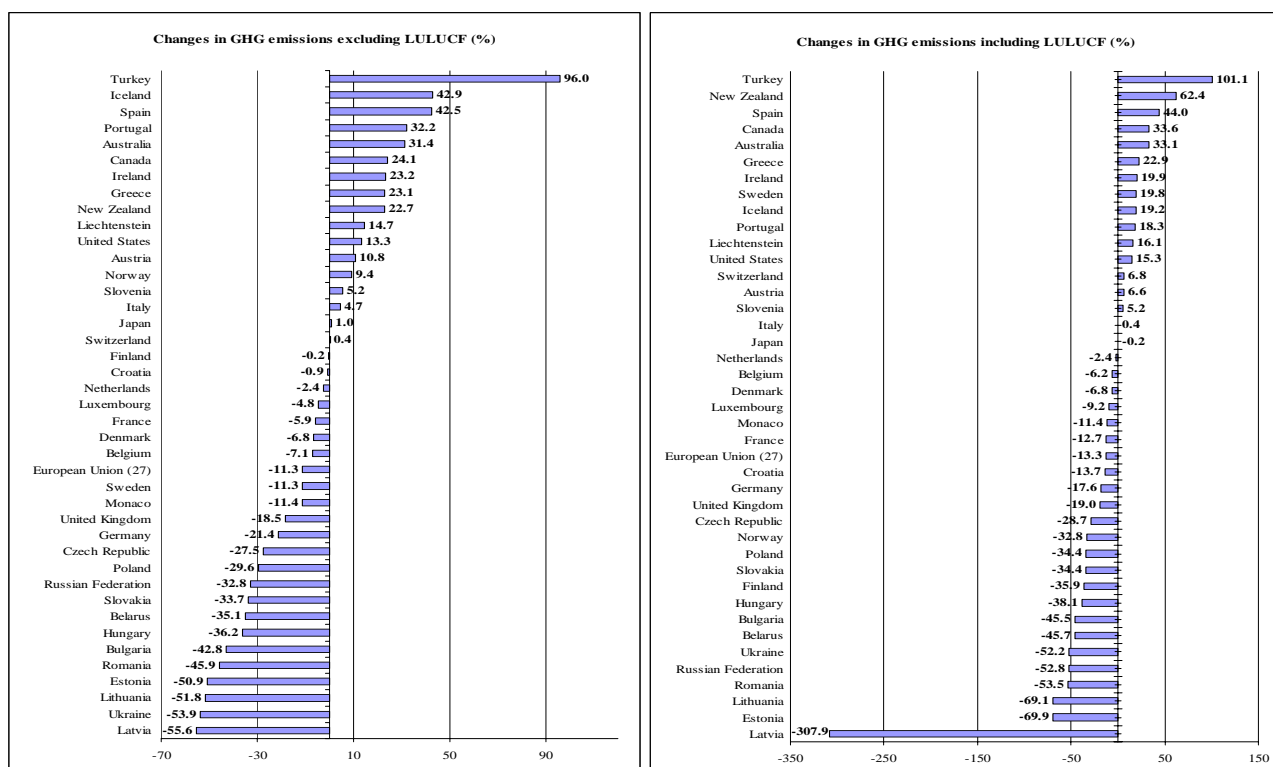


Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

^a The solvent and other product use sector is not included in the figure, because its contribution to total GHG emissions is very small.

12. The changes in total aggregate GHG emissions over the period 1990–2008 varied considerably across Parties (see figure 4). Emissions excluding LULUCF increased in 12 Parties by more than 10.0 per cent, and in 17 Parties (including European Union (27)) decreased by more than 10.0 per cent. Of these Parties, most are EIT Parties and four are non-EIT Parties (Germany, Monaco, Sweden and United Kingdom). Total aggregate GHG emissions including LULUCF over the period 1990–2008 increased in 17 Parties and decreased in 24 Parties.

Figure 4
Changes in the total aggregate emissions of individual Annex I Parties, 1990–2008



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

B. Projections and the total effect of policies and measures

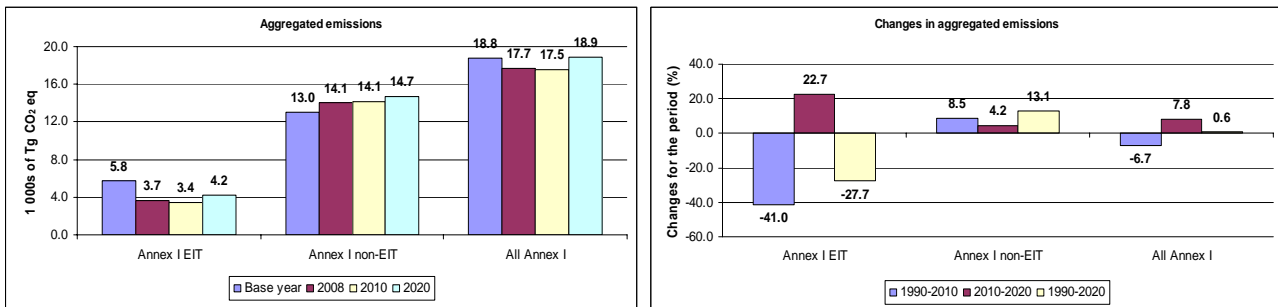
13. With the existing PaMs in place, total aggregate GHG emissions excluding LULUCF for 39 Annex I Parties² are projected to reach 17.5 thousand Tg CO₂ eq by 2010 (a decrease of 6.7 per cent from the 1990 level) and 18.9 thousand Tg CO₂ eq by 2020 (an increase of 0.6 per cent on the 1990 level) (see figure 5). The expected emission reduction of 6.7 per cent by 2010 compared with the 1990 level is significant, considering that the data reported in the fourth national communications (NC4) showed growth of 4.2 per cent in total aggregate GHG emissions excluding LULUCF for the same period, from 18.4 thousand Tg CO₂ eq in the base year to 19.2 thousand Tg CO₂ eq in 2010.

14. For EIT Parties, the increase in emissions during the post economic restructuring period (2000–2008) is projected to continue in the period 2010–2020. Emissions are projected to reach 3.4 thousand Tg CO₂ eq by 2010 (a decrease of 41.1 per cent from the 1990 level) and 4.2 thousand Tg CO₂ eq by 2020 (an increase of 22.7 per cent on the 2010 level; and a decrease of 27.7 per cent from the 1990 level).

² The various projections of the Parties are not fully comparable, because 37 Parties provided quantitative information for 2010, while 36 provided projections for 2020. A comparable data set that allows for rough comparison was created by interpolation for Monaco and Poland for 2010 and by extrapolation for Canada, Iceland and Japan for 2020. Belarus was not included, because the information provided in its NC5 was in the form of a chart, and numbers could not be derived from this information. The projections should be interpreted with caution.

15. For non-EIT Parties, the increase in emissions during the 1990–2008 period is projected to continue beyond 2008, although at a lower rate. Emissions are projected to reach 14.1 thousand Tg CO₂ eq by 2010 (an increase of 8.5 per cent on the 1990 level) and 14.7 thousand Tg CO₂ eq by 2020 (an increase of 4.2 per cent on the 2010 level; and an increase of 13.1 per cent on the 1990 level).

Figure 5
Total aggregate greenhouse gas emissions and changes therein, excluding land use, land-use change and forestry, 1990–2020



Abbreviations: Annex I EIT = Annex I Parties with economies in transition, Annex I non-EIT = Annex I Parties that do not have economies in transition.

16. In 2010, the energy sector is projected to continue being the dominant source (accounting for 86 per cent) of GHG emissions (for all Parties that provided projections by sector). **Emissions from the energy sector are projected to decrease by 2.2 per cent**, from 14.2 thousand Tg CO₂ eq in 1990 to 13.9 thousand Tg CO₂ eq in 2010. This decrease is significant in comparison with the projections provided in the NC4, in which emissions from the energy sector were projected to increase by 6.8 per cent on the 1990 level by 2010. There are, however, variations within the energy sector, for example growth in emissions of 22.2 per cent is projected for the transport sector. The industrial processes sector is the only other sector from which emissions are projected to increase by 2010 compared with the 1990 level (by 9.0 per cent). Emissions from the agriculture and waste sectors are projected to decrease between 1990 and 2010, but at much higher rates than emissions from the other sectors, by 22.0 and 24.0 per cent, respectively. Removals from the LULUCF sector are projected to increase by 34 per cent during the period 1990–2010.

17. **By 2020, emissions from the energy sector are projected to be 0.4 per cent above the 1990 level.** Further, by 2020, emissions from the transport and industrial processes sectors are projected to increase by 25.8 and 29.7 per cent, respectively, in relation to the 1990 level. Emissions from the agriculture and waste sectors are projected to decrease by 18.9 and 25.3 per cent, respectively, compared with the 1990 level.

18. While estimates of the total effect of implemented and adopted PaMs are not available for several Parties,³ the available estimates suggest that **implemented and adopted PaMs are expected to result in a sizeable reduction of GHG emissions:** emission savings of about 1.5 thousand Tg CO₂ eq by 2010, which will almost double to 2.8 thousand Tg CO₂ eq by 2020 (at least 5.0 and 10.0 per cent, respectively, of the GHG emissions in 1990). Most of these emission savings are projected to occur in the energy sector (accounting for 57.0 and 71.0 per cent of the total savings in 2010 and 2020, respectively) and they will more than double from 0.9 thousand Tg CO₂ eq by 2010 to 2.0

³ Seven Annex I Parties are not included in the total aggregation, because insufficient quantitative information on the effect of PaMs was provided in their NC5.

thousand Tg CO₂ eq by 2020. Within the energy sector, transport-related PaMs are expected to result in emission savings by 2020 almost five times as great as those achieved in 2010. The PaMs in the other non-transport energy sectors are expected to result in savings of about 0.8 thousand Tg CO₂ eq by 2010, which will almost double to 1.5 thousand Tg CO₂ eq by 2020. PaMs in the industrial processes sector are expected to lead to substantial emission savings: 0.4 thousand Tg CO₂ eq by 2010, rising to 0.5 thousand Tg CO₂ eq by 2020. Emission savings are also expected to be achieved by both 2010 and 2020 in the other remaining sectors, such as agriculture and waste. **Planned PaMs are expected to deliver further emission savings: 0.3 thousand Tg CO₂ eq by 2010, increasing to 0.8 thousand Tg CO₂ eq by 2020.**

C. Policies and measures

19. **Most Parties view climate change as a prominent policy concern**, with all Parties adopting and updating national climate change strategies, action plans and programmes with mitigation PaMs. Over 1,000 implemented, adopted and planned mitigation PaMs, with highly diverse scopes and likely emission impacts, were reported by Parties in their NC5. The **PaMs are applied at all levels of governmental jurisdiction** – regional, national, state/provincial and municipal – and involve a wide range of actors and institutions in many activities related to energy supply, energy end-use and non-energy emissions.

20. On the whole, the types of PaMs reported in the NC5 are similar to those reported in the NC4. However, since the NC4, which was due on 1 January 2006, **some Parties have made major overhauls to their climate change policy portfolios. This has resulted in PaMs in some key areas being substantially strengthened**, through more stringent requirements, wider coverage and increased expenditure of resources.

21. Between 2004 and 2010, most Annex I Parties that are also Parties to the Kyoto Protocol made the most substantial changes to their PaMs, in order to deliver the emission savings needed to achieve their targets under the Kyoto Protocol. Their mixes of PaMs show a pronounced move towards greater use of broad carbon-pricing frameworks, based on emissions trading schemes, and stronger mandatory regulations.

22. Policy efforts that in many cases began in the early 1990s seem to have begun yielding the result of limiting growth in GHG emissions. Despite the diversity and complexity of Parties' climate change strategies and PaMs, eight general trends are apparent:

(a) Most Parties now treat climate change mitigation as a **core top-level issue** in the national policy agenda and have developed greater policy capacity as well as legal and institutional frameworks – including top-level inter-ministerial coordinating groups – to reduce emissions;

(b) Parties are making broad use of **multilevel governance** – across multiple levels of government (e.g. local to regional) and non-governmental actors – when it comes to climate change issues;

(c) Parties, in the context of the economic crisis and shifts in global economic and energy flows, are looking for climate change PaMs that can **combine the goals of emission reductions, energy security, job creation and economic competitiveness, as well as air and water quality**. To that end, integrated energy and climate packages have been developed by several Parties, and emphasis is being put on research and development (R&D) in relation to new technologies and innovative solutions, such as carbon capture and storage;

(d) Some Parties have progressed through one or more policy cycles and are now implementing **second- and third-generation policy strategies and PaMs**, which reflect lessons learned and are likely to be more effective in reducing emissions than previous efforts;

(e) Many Parties have **established or are planning multi-sector (cross-cutting) emissions trading schemes** as a foundation element upon which climate change mitigation strategies are based (see box below);

(f) Many Parties are supplanting voluntary programmes with **mandatory regulations**, including mandatory emissions trading schemes, in the key sectors of electricity generation, emission-intensive industry, transport energy supply and road vehicle transportation;

(g) Parties are continuing to make wide use of the **relatively low-cost options** of mitigating non-CO₂ (i.e. CH₄, N₂O, PFCs, HFCs and SF₆) **emissions in the industrial processes and waste sectors**, but there is little remaining room for further emission reductions in these areas;

(h) Several Parties are developing **long-term strategies (e.g. to 2050)**, with corresponding R&D programmes, for decoupling GHG emissions and economic growth and establishing low-carbon societies.

Emissions trading schemes

As at March 2011, there were nine active greenhouse gas emissions trading schemes reported by Parties included in Annex I to the Convention.

Two of them were reported in the fourth national communications (NC4): the New South Wales Greenhouse Gas Reduction Scheme and the European Union emissions trading scheme (EU ETS).

Seven other active systems have been developed since the NC4: Norway's emissions trading scheme (which began in 2005 as part of the EU ETS); the Greenhouse Gas Emissions Regulation of Alberta, Canada (2007); the New Zealand Emissions Trading Scheme (2008); the Swiss Emissions Trading Scheme and carbon dioxide tax (2008); the Regional Greenhouse Gas Initiative in the north-east United States of America (2009); the United Kingdom of Great Britain and Northern Ireland's Carbon Reduction Commitment Energy Efficiency Scheme (2010); and the Tokyo Cap-and-Trade Program in Japan (2010).

One additional system, the Western Climate Initiative, is planned to commence in 2012, and three others are still under development: the Australian Carbon Pollution Reduction Scheme; the Midwestern Greenhouse Gas Reduction Accord; and the mandatory Japanese national trading system.

D. Vulnerability assessment, climate change impacts and adaptation measures

23. Parties provided information on the observed and expected impacts of climate change, ways to assess their vulnerability, and possible adaptation measures, strategies and options. The information suggests that since the preparation of the NC4 **issues related to vulnerability and adaptation receive much more attention in the overall climate change strategies of Annex I Parties**, even though mitigation remains the core of these strategies, and **adaptation and mitigation are increasingly viewed as complementary parallel tracks in the development of Parties' climate policy**.

24. Compared with in their NC4, in their NC5 Parties provided substantial additional information on adaptation measures and plans, with concrete and practical examples for key vulnerable sectors, and new and more complete information on **research efforts relating to adaptation options**. Some Parties reported on **new multilateral, bilateral and development cooperation initiatives with developing country Parties**, intended to enable the latter Parties to address and undertake research on the impacts of climate change and the required adaptation processes.

25. According to Parties' assessment, the areas and sectors most vulnerable to climate change include: water resources, coastal zones, agriculture and food security, human health, forestry, biodiversity and natural ecosystems, and infrastructure and economy. Key climate change impacts of concern reported by Parties include sea level rise, floods, heat waves and water stress. In addition, some Parties expressed concerns about glacier retreat, permafrost thawing and wildfires.

26. Parties' efforts to protect coastal zones against sea level rise have included mainly the construction of barriers. To minimize the effects of floods and safeguard water resources, the main measures include the restoration of river systems, the support of healthy rivers, the protection of low-level rivers and the 'climate proofing' of roads. Measures to respond to the increased occurrence of severe heat waves include: land-use planning and integrated approaches to disease control in agriculture; in forests, the diversification of the species and age of stands, as well as converting single-species stands into stable deciduous and mixed stands; and the development and transfer of knowledge, capacity-building and the strengthening of national and international collaboration in relation to public health.

E. Financial resources, transfer of technologies and capacity-building

27. The overall figures for and trends in the financial resources allocated to climate change by Parties included in Annex II to the Convention (Annex II Parties) in the period 2005–2010 suggest that contributions through **multilateral institutions and channels experienced a marked increase** in relation to those in the 1998–2000 and 2001–2003 periods. Approximations made on the basis of the reported figures seem to suggest that the **level of total bilateral contributions to mitigation-related activities has remained stable since the last reporting period**.⁴ Following past patterns, the **energy and transport sectors continued to account for the largest share of the total bilateral assistance** for mitigation between 2005 and 2010. Bilateral contributions for mitigation activities continued to dominate compared with funding for adaptation; however, **total bilateral contributions for adaptation-related activities** in the reporting period **reveal a significant increase** in comparison with those reported in the NC4.⁵

28. Figures reported reveal that **bilateral and multilateral channels remain the preferred choice for contributions**, compared with the Global Environment Facility (GEF) Trust Fund, the Least Developed Countries Fund, the Special Climate Change Fund and the Adaptation Fund under the Kyoto Protocol. Nevertheless, **contributions and pledges to the GEF as reported in Parties' NC5 show an important increase** compared with the total amounts presented for previous periods. Pledges for the fifth replenishment (2010–2014) of the GEF had not been finalized at the time of submission of the NC5;

⁴ Owing to significant differences in reporting approaches and in reporting periods between Parties, especially in relation to a major contributor, it is difficult to assess the overall trend in the total bilateral contributions to mitigation-related activities.

⁵ Many data gaps and inconsistencies in reporting approaches across Parties and across periods still persist, which was also noted in the previous compilation and synthesis report, and thus the conclusions on trends should be interpreted with due caution.

nevertheless, various Annex II Parties indicated an increase in their intended contributions compared with the last replenishment cycle (2006–2010).

29. In the context of **the clean development mechanism**, nearly all of the Annex II Parties reported information on how they have encouraged **private-sector activities and public–private partnerships**, and most Annex II Parties reported their pioneering use of **carbon finance through the establishment of carbon funds** as a means of transferring financial resources to support mitigation activities in developing country Parties.

30. Several Annex II Parties made reference to **expected significant increases in their provision of financial resources for the period between 2010 and 2012**, particularly in the context of the fast-start USD 30 billion target suggested at the United Nations Climate Change Conference in Copenhagen as well as in the negotiations for the fifth replenishment of the GEF. In addition, the Climate Investment Funds were highlighted and identified by several Annex II Parties as one of the main emerging channels for providing climate finance. Some Annex II Parties indicated that these funds aim to address the short-term financing gap between now and 2012 and to pilot approaches for the longer term.

31. Many Annex II Parties engage bilaterally with both developed and developing countries at all stages of the technology cycle in activities relating to research and development, demonstration, deployment, diffusion and transfer of technology, in support of action on mitigation and adaptation. Regarding engagement with developing countries, the activities focused mostly on the latter stages of the technology cycle and were usually in the form of efforts to share knowledge and foster enabling environments in order to transfer technologies. The majority of the **activities relating to technology transfer targeted mitigation and involved technology transfer in the energy sector**, in particular related to the deployment and diffusion of renewable energy and energy efficiency technologies. This is in line with the findings contained in the compilation and synthesis of NC4. Most of the programmes and projects reported by Annex II Parties were implemented in Africa and Asia and the Pacific.

32. Many Annex II Parties reported on success stories related to selected technology transfer programmes and projects, and also highlighted factors which contributed to the successful implementation of those programmes and projects. Capacity-building and cooperation with local stakeholders were among the success factors most frequently reported by Annex II Parties. **Many Annex II Parties consider partnerships between various stakeholders as an effective channel for the successful transfer of technology to developing countries.**

33. Most Annex II Parties recognize that capacity-building is essential to enable developing countries to effectively implement the Convention and its Kyoto Protocol. In addition, most Annex II Parties reported paying increased attention to capacity-building needs since the submission of their NC4, supporting capacity-building across all areas identified in the UNFCCC reporting guidelines.

34. Although many Annex II Parties reported financial data, the detail and level of aggregation of these data vary significantly. The main challenges when comparing data across Annex II Parties, in terms of carrying out a robust aggregation of the data in order to establish the overall trends, relate to the significant differences in the approaches and methodologies applied by the Parties. These refer to, inter alia, the sectoral categories used by Annex II Parties to aggregate their financial data, the reporting periods/years and currency used by Annex II Parties, as well as the tabular and textual formats used, which are not always consistent with the format recommended in the UNFCCC reporting guidelines.

F. Research and systematic observation

35. Many Parties are continuing their national research and systematic observation programmes and plans concerning climate change over the long term, and several Parties are enhancing their strategic focus on climate change research. Research on climate processes and the climate system continues to be a high priority for many Parties. **Scientific information on climate change is increasingly connected to policy processes, the formulation of strategies to address climate change and the development of technological solutions in the context of sustainable development.**

36. Many Parties reported on their continued efforts to reduce uncertainties associated with the physical science basis and the understanding of the climate system. In addition, interdisciplinary research activities, in particular relating to socio-economic aspects and adaptation to climate change, were highlighted by many Parties. Climate change related research is increasingly incorporated into energy research and other sectoral research as well as into research and development in relation to innovative technologies for mitigation. In this regard, the energy, infrastructure and transport sectors were highlighted as priority areas for research by several Parties.

37. **Parties generally engage actively in international research cooperation and programmes.** As in previous national communications, several Parties reported in their NC5 on their active participation in the work of the Intergovernmental Panel on Climate Change and their contributions to its assessment reports and their participation in relevant international research programmes. Many Parties cooperate also in **regional research activities**. Polar research (e.g. in the context of the International Polar Year) emerged as a prominent area for international cooperation on research.

38. A variety of activities relevant to capacity-building for climate-related research and systematic observation in developing countries was highlighted by Parties. Such activities include collaboration on regional research networks and projects, enhanced partnerships with institutions and private-sector partners, and the provision of support to other relevant activities to build capacity, such as for gathering climate-related information and enhancing understanding of regional climate trends and vulnerabilities.

39. With regard to systematic observation, Parties reported on cooperation through networks for systematic observation and data exchange, in particular within the framework of the Global Climate Observing System and the World Meteorological Organization. While most Parties emphasized the monitoring of atmospheric climate variables, several Parties highlighted also their contributions to terrestrial and oceanic observing systems. Advances reported by Parties relating to **systematic climate observations** include progress made in **improving the coordination of activities relevant to observations**, for example in the oceanic domain. In addition, information was provided on activities initiated in response to the actions identified in the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC*.

G. Education, training and public awareness

40. There is **broad consensus** among Parties on the **importance of education on climate change**. This is evident from the growing number of national strategies that have been prepared and implemented since the Parties' NC4. For many Parties, the United Nations Decade of Education for Sustainable Development, which runs from 2005 to 2014, provides a valuable framework for educational activities, both in schools and in non-formal education settings. Many Parties reported on their participation in world-renowned education programmes, such as GLOBE and Eco-Schools.

41. The growing need for **‘green’ skills and knowledge, necessary to enable the transition to a low-carbon society**, underpins Parties’ efforts in developing training programmes for the benefit of the current and future workforce. On the other hand, several Parties noted that many of the training initiatives are small-scale and one-off activities and they stressed **the need to adopt a more comprehensive and inclusive approach when developing training programmes**. Many Parties reported on training initiatives undertaken at the national and international levels, the latter in the form of courses and workshops benefitting developing countries.

42. Almost all Parties reported having developed public awareness raising campaigns to build broad-based support for action on climate change. Parties’ awareness-raising efforts are increasingly characterized by a participatory approach, whereby several stakeholders, such as government agencies, enterprises and businesses, non-governmental organizations and civil society, join forces to reach out to target audiences and help them acknowledge the importance of their impact on the environment and a changing climate. Some Parties noted that climate scientists and climate science agencies could play a more active role in disseminating their findings.

III. Conclusions

43. Emissions from Annex I Parties fell from 19.0 to 17.8 thousand Tg CO₂ eq (a decline of 6.0 per cent) during the 1990–2008 period, the major reasons for this being: the economic restructuring in EIT Parties during the 1990–2000 period; the strengthening of the implementation of PaMs, in particular after 2000; the overall efforts to reduce energy use by enhancing energy efficiency and developing renewable energy sources, resulting in a declining emission intensity (emissions per unit of GDP) in all Parties over the entire period; and, recently, the decreased energy use during the economic crisis in the 2007–2008 period. In all Annex I Parties, either the rate of growth in emissions was slower than the rate of growth in economic activity, measured through GDP, or the rate of decline in emissions was more rapid than the rate of decline in GDP in the 1990–2008 period.

44. With the existing PaMs in place, total aggregate GHG emissions excluding LULUCF for 39 Annex I Parties are projected to reach 17.5 thousand Tg CO₂ eq by 2010 (a decrease of 6.7 per cent from the 1990 level) and 18.9 thousand Tg CO₂ eq by 2020 (an increase of 0.6 per cent on the 1990 level). The expected emission reduction by 2010 compared with the 1990 level is significant, considering that the data reported in the NC4 showed growth of 4.2 per cent in total aggregate GHG emissions excluding LULUCF from 1990 to 2010.

45. Estimates of the total effect of implemented and adopted PaMs suggest that implemented and adopted PaMs are expected to deliver emission savings of about 1.5 thousand Tg CO₂ eq by 2010, which will almost double to 2.8 thousand Tg CO₂ eq by 2020 (i.e. result in a sizeable reduction of GHG emissions by at least 5.0 per cent (2010) and 10.0 per cent (2020) of the GHG emissions in 1990). Most of these emission savings are projected to occur in the energy sector.

46. Although total aggregated GHG emissions from Annex I Parties decreased noticeably in the past (in the period 1990–2008), according to the current scenarios up to 2020 that take into account the existing PaMs, they are expected to increase again. This suggests that additional PaMs have to be implemented and innovative approaches have to be explored further by **Annex I Parties for them to be able to modify long-term trends in emissions consistent with the objective of the Convention and in accordance with its Article 4, paragraph 2(a)**.

47. On the whole, the types of PaMs reported in the NC5 are similar to those reported in the NC4. However, since the NC4, some Parties have made major overhauls to their climate change policy portfolios. This has resulted in **PaMs in some key areas being substantially strengthened, through more stringent requirements, wider coverage and increased expenditure on resources.**

48. Between 2004 and 2010, most Annex I Parties that are also Parties to the Kyoto Protocol made the most substantial changes to their PaMs, in order to deliver the emission savings needed to achieve their Kyoto Protocol targets. Their mixes of PaMs show a pronounced move towards greater use of broad carbon-pricing frameworks, based on emissions trading schemes, and stronger mandatory regulations. Some Parties have progressed through one or more policy cycles and are now implementing second- and third-generation policy strategies and PaMs, which reflect lessons learned and are likely to be more effective in reducing emissions than previous efforts.

49. Many Parties have established or are planning multi-sector (cross-cutting) emissions trading schemes as a foundation element upon which climate change mitigation strategies are based. **Many Parties are supplanting voluntary programmes with mandatory regulations, including mandatory emissions trading schemes,** in the key sectors of electricity generation, emission-intensive industry, transport energy supply and road vehicle transportation. **Several Parties are developing long-term strategies** (e.g. to 2050), with corresponding R&D programmes, for decoupling GHG emissions and economic growth and establishing low-carbon societies.

50. Parties provided information on the observed and expected impacts of climate change, ways to assess their vulnerability, and possible adaptation measures, strategies and options. **Adaptation and mitigation are increasingly viewed by Parties, as reported in their NC4, as complementary parallel tracks in the development of their climate policy.** The key sectors of concern include: water resources, coastal zones, agriculture and food security, human health, forestry, biodiversity and natural ecosystems, and infrastructure and economy.

51. Financial resources and contributions to developing countries provided through multilateral institutions and channels and bilateral contributions for adaptation-related activities have markedly increased, while bilateral contributions to mitigation-related activities have remained stable, compared with in the last reporting period. Following past patterns, bilateral contributions for mitigation activities continued to dominate compared with funding for adaptation, and the energy and transport sectors continued to account for the largest share of the total bilateral assistance for mitigation between 2005 and 2010.

52. The majority of the **activities relating to technology transfer targeted mitigation and involved technology transfer in the energy sector,** in particular related to the deployment and diffusion of renewable energy and energy efficiency technologies. **Most Parties recognize that capacity-building is essential to enable developing countries to effectively implement the Convention and its Kyoto Protocol.**

53. Research on climate processes and the climate system continues to be a high priority for many Parties, and scientific information on climate change is increasingly connected to policy processes, the formulation of strategies to address climate change and the development of technological solutions in the context of sustainable development. In addition, there is broad consensus among Parties on the importance of education on climate change, which is evident from the growing number of national strategies that have been prepared and implemented since the Parties' NC4.

54. As reported in their NC5, Annex I Parties are continuing to make progress in implementing their commitments under the Convention. The coverage of their respective domestic activities and the provision of the essential information on the implementation of

the Convention at the international level have improved in the NC5 compared with in the NC4. Despite these improvements, some reporting issues and problems remain, and the usefulness of the reported information could be enhanced by addressing those. Such issues include: the need for reporting on all elements (and not only on the mandatory elements) of the UNFCCC reporting guidelines on emission scenarios and estimates of the impact of PaMs, and on financial assistance and technology transfer, using approaches that are fully consistent with the UNFCCC reporting guidelines.
