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**Report of the in-depth review of  
the fourth national communication of Australia**

According to decision 4/CP.8, Parties included in Annex I to the Convention are requested to submit to the secretariat, in accordance with Article 12, paragraphs 1 and 2, of the Convention, a fourth national communication by 1 January 2006. This report presents the results of the in-depth review of the fourth national communication of Australia conducted by an expert review team in accordance with relevant provisions of the Convention.

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## I. Introduction and summary

### A. Introduction

1. Australia has been a Party to the United Nations Framework Convention on Climate Change (UNFCCC) since 1993 and to its Kyoto Protocol since 11 March 2008. Under the Kyoto Protocol, Australia committed itself to limiting the growth in its greenhouse gas (GHG) emissions to 8 per cent above the base year level during the first commitment period from 2008 to 2012.
2. This report covers the in-depth review (IDR) of the fourth national communication (NC4) of Australia, coordinated by the UNFCCC secretariat in accordance with decision 7/CP.11. The in-country review took place from 14 to 18 April 2008 in Canberra, Australia, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Ms. Barbara Buchner (International Energy Agency), Mr. Sergio Gonzalez (Chile), Mr. Sabin Guendehou (Benin) and Mr. Jim Penman (United Kingdom of Great Britain and Northern Ireland). Mr. Gonzalez and Mr. Penman were the lead reviewers. The review was coordinated by Mr. Sergey Kononov and Ms. Ruta Bubniene (UNFCCC secretariat).
3. During the IDR, the expert review team (ERT) examined each part of the NC4. It also reviewed a large amount of relevant additional information that has become available since the submission of the NC4. During the in-country visit, the ERT had extensive and constructive discussions with Australian experts on all topics reported in the NC4; the ERT also met representatives of State and Territory Governments, and with representatives of non-governmental organizations (NGOs). A draft version of this report was communicated to the Government of Australia, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

### B. Summary

4. The ERT noted that the NC4 complies in general with 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) and commended Australia for its coherent and consistent reporting. The ERT made some recommendations, mainly aimed at increased transparency and depth of reporting and a more systematic approach to reporting on policies and measures and on research. As set out below, the ERT was very interested in the important developments currently under way in Australian climate change policy and emphasized the importance of national communications in sharing experiences.

#### 1. Completeness

5. The ERT noted that the NC4 covers all the sections required by the UNFCCC reporting guidelines. The ERT also noted that projections for the sector of land use, land-use change and forestry (LULUCF) are provided only for activities relating to the Kyoto Protocol and managed forests. Only very minor issues relating to reporting on policies and measures, and on financial resources and transfer of technology, were identified, which Australia is encouraged to address in its next submission.

#### 2. Timeliness

6. The NC4 was submitted on 12 December 2005, before the submission deadline of 1 January 2006 mandated by decision 4/CP.8.

#### 3. Transparency

7. The ERT found that Australia’s NC4 is comprehensive and transparent, well structured and concise. The NC4 provides clear information on all aspects of implementation. It is structured following the outline contained in the annex to the UNFCCC reporting guidelines. In the course of the review, the

ERT formulated a number of recommendations which could help the Party to further increase the transparency of its reporting, such as giving priority to the policies and measures with a major impact on GHG emissions, and providing details on measures to give effect to commitments under Article 4, paragraphs 3, 4 and 5.

## II. National circumstances relevant to greenhouse gas emissions and removals

8. Australia is a large country situated in the southern hemisphere. Overall, it is the driest inhabited continent on Earth although the climate is highly diverse across the country. The climate is heavily influenced by the oceans and it is temperate in the south, subtropical and tropical in the north, and hot and dry inland. Most of the population is concentrated along the coastal areas in the east and south-east; the rest of the country is sparsely populated.

9. In terms of governance, the Commonwealth of Australia is a democratic federation which consists of a national Government and eight self-governing States and Territories: the Australian Capital Territory, New South Wales, the Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia. Within the States and Territories, there are also local (community) governments. All three levels of government share responsibility for reducing emissions of GHGs and enhancing sinks, as well as for action relating to vulnerability and adaptation.

10. In its NC4, Australia has provided a concise description of its national circumstances affecting GHG emissions and removals. This description covers government structure, population, geography, climate, economy, energy, transport, industry, waste, building stock and urban structure, agriculture and forestry. Table 1 illustrates the national circumstances of the country by providing some indicators relevant to GHG emissions and removals.

**Table 1. Indicators relevant to greenhouse gas emissions and removals for Australia**

	1990	2000	2005	Change 1990–2000 (%)	Change 2000–2005 (%)	Change 1990–2005 (%)
<b>Macroeconomic indicators:</b>						
Population (million)	17.2	19.3	20.5	12.2	6.2	19.2
GDP (2000 USD billion using PPP)	368.9	524.6	616.7	42.2	17.6	67.2
TPES (Mtoe)	87.5	110.5	122.0	26.2	10.4	39.3
GDP per capita (2000 USD thousand using PPP)	21.5	27.2	30.1	26.7	10.7	40.2
TPES per capita (toe)	5.1	5.7	6.0	12.4	3.9	16.9
<b>Total GHG emissions/removals:</b>						
GHG emissions without LULUCF (Tg CO <sub>2</sub> eq)	417.3	496.6	530.4	19.0	6.8	27.1
GHG emissions with LULUCF (Tg CO <sub>2</sub> eq)	516.4	525.9	555.3	1.8	5.6	7.5
<b>GHG indicators (excluding LULUCF):</b>						
GHG emissions per capita (Mg CO <sub>2</sub> eq)	24.3	25.8	25.9	6.0	0.5	6.6
GHG emissions per GDP unit (kg CO <sub>2</sub> eq per 2000 USD using PPP)	1.13	0.95	0.86	-16.3	-9.1	-23.9
<b>GHG indicators (including LULUCF):</b>						
GHG emissions per capita (Mg CO <sub>2</sub> eq)	30.1	27.3	27.1	-9.3	-0.6	-9.8
GHG emissions per GDP unit (kg CO <sub>2</sub> eq per 2000 USD using PPP)	1.40	1.00	0.90	-28.4	-10.2	-35.7

*Data sources:* (1) GHG emissions data: Australia's 2007 inventory submission; (2) Population, GDP and TPES data: International Energy Agency.

*Abbreviations:* GDP = gross domestic product; TPES = total primary energy supply; PPP = purchasing power parities; USD = United States dollars; GHG = greenhouse gas; LULUCF = land use, land-use change and forestry; CO<sub>2</sub> eq = CO<sub>2</sub> equivalent; Mtoe = million tonnes of oil equivalent; toe = tonne of oil equivalent.

*Note:* The ratios per capita and per GDP unit are calculated using the exact (not rounded-up) values and may therefore differ from ratios calculated with the rounded-up numbers provided in the table.

11. The ERT noted the following of Australia's national circumstances that are particularly relevant for understanding climate change mitigation and adaptation for Australia: a high population growth (about 20 per cent from 1990 to 2005); a high rate of growth of gross domestic product (GDP) (resulting in about a 40 per cent growth in GDP per capita from 1990 to 2005); large deposits of economically important natural resources which are being mined, processed and, to a large extent, exported; the

concentration of the population in two major coastal areas; diversity and relative dryness of the climate; high variability of rainfall; continued changes in the land-use pattern, in particular because of land clearing;<sup>1</sup> the richness and diversity of flora and fauna, with many species being vulnerable to climate change; and a strong influence of the El Niño Southern Oscillation (ENSO) on the climate.

12. The NC4 contains a summary information on GHG emission trends for the period 1990–2003. This information is consistent with the national GHG inventory submission of 2006. Summary tables, including trend tables for emissions in carbon dioxide (CO<sub>2</sub>) equivalent (eq) (given in the common reporting format (CRF)), are also provided in an appendix to the NC4. However, at the time of the IDR a new, 2007 inventory submission from Australia had become available; data from the latest 2007 submission (data version 1.6) are used in table 1 and generally throughout this report.

13. Total GHG emissions excluding emissions and removals from LULUCF increased by 27.1 per cent between 1990 and 2005, whereas total GHG emissions including net emissions/removals from LULUCF increased by 7.5 per cent (see tables 1 and 2). The growth in total emissions over this period is mainly attributed to growth in CO<sub>2</sub> emissions, which increased (including changes in LULUCF) by 9.7 per cent, and in nitrous oxide (N<sub>2</sub>O) emissions (24.5 per cent growth). Emissions of methane (CH<sub>4</sub>) decreased by 2.2 per cent. Emissions of fluorinated gases (hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>)) accounted for 1.1 per cent of total GHG emissions in 1990 and in 2005. Table 2 provides an overview of GHG emissions by sector from 1990 to 2005 (see also the discussion of chapter trends in sections II.B and II.C).

**Table 2. Greenhouse gas emissions by sector for Australia, 1990–2005**

	GHG emissions (Tg CO <sub>2</sub> eq)			Change (%)		Shares <sup>a</sup> by sector (%)	
	1990	2000	2005	1990–2005	2000–2005	1990	2005
1. Energy	286.8	357.7	395.9	38.0	10.7	55.5	71.3
A1. Energy industries	143.1	192.6	214.6	50.0	11.4	27.7	38.6
A2. Manufacturing industries and construction	36.7	40.1	46.7	28.1	17.2	7.1	8.5
A3. Transport	62.1	74.9	80.8	30.1	7.9	12.0	14.5
A4–A5. Other	15.8	18.9	21.0	33.2	11.1	3.1	3.8
B. Fugitive emissions	29.2	31.2	32.5	11.5	4.2	5.6	5.9
2. Industrial processes	25.3	27.4	29.4	16.2	7.4	4.9	5.3
3. Solvent and other product use	IE,NA,NO	IE,NA,NO	IE,NA,NO	–	–	–	–
4. Agriculture	87.7	95.5	89.8	2.5	–5.9	17.0	16.2
5. LULUCF	99.1	29.3	24.9	–74.9	–15.0	19.2	4.5
6. Waste	17.5	16.1	15.3	–12.6	–4.7	3.4	2.8
GHG total with LULUCF	516.4	525.9	555.3	7.5	5.6	–	–
GHG total without LULUCF	417.3	496.6	530.4	27.1	6.8	–	–

*Abbreviations:* GHG = greenhouse gas; LULUCF = land use, land-use change and forestry; CO<sub>2</sub> eq = CO<sub>2</sub> equivalent; IE = included elsewhere; NA = not applicable; NO = not occurring.

*Note:* The changes in emissions and the shares by sector are calculated using the exact (not rounded-up) values and may therefore differ from values calculated with the rounded-up numbers provided in the table.

<sup>a</sup> The shares of sectors are calculated relative to GHG emissions including LULUCF.

14. Table 2 shows that the greatest changes in emissions in the 1990–2005 period occurred in the energy sector (an increase of 38.0 per cent) and in the LULUCF sector (a decrease of 74.9 per cent). For the energy sector, emissions increased in all subsectors, especially in the categories relating to fuel combustion. The key drivers for these increases are strong economic and demographic growth, extensive use of road transport (also because of the suburban land-use pattern, resulting in relatively long travel distances) and continued reliance on fossil fuels for the primary energy supply (coal, oil and gas taken together accounted for 94.0 per cent of the total primary energy supply (TPES) in 1990 and for 94.5 per cent in 2005). These factors outweighed the impact of notable improvements in the energy and emission intensity of the GDP achieved between 1990 and 2005 (see, for example, the data on GHG emissions per GDP unit in table 1).

<sup>1</sup> Land clearing has been generally decreasing in Australia, to a large extent because of relevant policy measures.

15. Net GHG emissions from LULUCF decreased remarkably from 1990 to 2005, the key reasons being the decreased rate of deforestation and increased CO<sub>2</sub> removal from land converted to forest. In absolute terms, the 1990–2005 decrease in emissions from LULUCF is comparable with the increase in emissions from the energy industries (see table 2).

16. For the other sectors, the ERT noted a considerable decline in GHG emissions from waste (12.6 per cent from 1990 to 2005) and a relatively recent decrease in GHG emissions from agriculture (5.9 per cent from 2000 to 2005).

### III. Policies and measures

17. As required by the UNFCCC reporting guidelines, Australia has provided in its NC4 comprehensive and well-organized information on its package of policies and measures (PaMs) implemented, adopted and planned in order to fulfil its commitments under the UNFCCC and the Kyoto Protocol. Each sector has its own textual description of the principal PaMs, supplemented by summary tables on PaMs by sector at the end of the chapter. The ERT considered the summary tables to be very useful and noted that information from the tables could also be used in the textual description of the measures, which Australia should address in its next national communication.

18. The ERT noted, however, that to the extent that there is no clear order in the description of PaMs, and both more and less important policies are given the same space, Australia has not quite followed the recommendation in the UNFCCC reporting guidelines that Parties should, to the extent possible, give priority to PaMs which have the most significant impact in affecting GHG emissions and removals. The ERT also noted that the NC4 presents policies by groups of gases affected, an approach that was also adopted in the NC3. This is not in full adherence with the guidelines, but could be a way of organizing information on PaMs which affect more than one gas. In addition, the reporting of the elements “type or types of policy or measure” and “status of implementation” of PaMs has not been as complete as required by the guidelines. The ERT noted that the NC4 does not systematically contain information on the PaMs which are no longer in place, on planned PaMs, and on PaMs that may lead to a higher level of emissions. These departures from the agreed guidelines have to a certain extent increased the complexity of understanding the overall policy picture, even though the summary tables at the end of the chapter provide much of the information required and additional clarification was provided during the in-country visit. Australia is encouraged to report on these issues in future. Table 3 provides a summary on the reported information on Australia’s PaMs.

19. The ERT noted that, although the NC4 does not provide sufficient information on how Australia believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals consistent with the objective of the Convention, during the in-country visit information was provided on the adoption of a domestic emissions reduction target of 60 per cent by 2050 compared to 2000 levels, which is an effort by Australia to contribute to modifying longer-term trends in GHG emissions.

**Table 3. Summary information on policies and measures**

Major policies and measures	Examples / comments
<b>Framework policies and cross-sectoral measures</b>	
Integrated climate program	Climate Change Strategy (2004); <i>Australia’s Climate Change Policy (2007)</i>
Emissions trading	<i>Nationwide scheme planned for 2010</i>
Project-based activities	Greenhouse Gas Abatement Programme (GGAP) (1999) (6.1 Mt)
National partnerships	Greenhouse Challenge Plus – Industry Partnerships (2004) (15.8 Mt); Local Greenhouse Action (2004) (0.4 Mt)
Support for research and development	Low Emissions Technology Demonstration Fund; <i>the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Energy Transformed National Research Flagship</i>
International climate change partnerships	Asia-Pacific Partnership on Clean Development and Climate; G8 Gleneagles Plan of Action, G8 Dialogue on Climate Change, Clean Energy and Sustainable Development; <i>US Major Economies processes; International Forests and Climate Initiative; International Carbon Partnership; Methane to Markets Partnership; Renewable Energy and Energy Efficiency Partnership; Carbon Sequestration Leadership Forum; International Partnership for Hydrogen Economy; bilateral partnerships; development assistance</i>

**Table 3 (continued)**

<b>Major policies and measures</b>	<b>Examples / comments</b>
<b>Policies and measures by sector</b>	
<b>Energy sector</b>	
Energy sector liberalization	Energy market reform, National Electricity Market (1998), Australian Energy Regulator (2003); <i>National Gas Law and Gas Market Initiatives; Australian Energy Market Operator; Retail Package; Smart meters</i>
Emissions trading	Regional scheme in operation (New South Wales, 2003) (18.1 Mt)
Support of research and development	Low Emissions Technology and Abatement Programme (2004) (0.2 Mt); Queensland Centre for Low Emission Technology (2003); Victorian Government Energy Technology and Innovation Strategy (2005); Renewable Energy Development Initiative (2004); Advanced Energy Storage Technologies (2004); Low Emission Technology Demonstration Fund; <i>Renewable Energy Fund (2007); Energy Innovation Fund</i>
Natural gas	Queensland Government 13 per cent Gas Scheme (2005) (1.1 Mt)
Renewable energy sources	Australian Capital Territory Greenhouse Gas Abatement Scheme (2005); Mandatory Renewable Energy Target (1997/2003) (6.6 Mt) (20% by 2020, 2007); Solar Cities (2004); National Green Power Accreditation Programme (0.9 Mt); strategic development of renewable energy (Photovoltaic Rebate Program, Renewable Remote Power Generation Program) (1997/99) (0.5 Mt); Wind Energy Forecasting Capability (2004); Renewable Energy Support Fund
Energy efficiency improvements	National Framework for Energy Efficiency (2004); Energy Efficiency Opportunities (2004) (0.8 Mt); National Appliance and Equipment Energy Efficiency Programme (7.9 Mt); energy efficiency standards for residential and commercial buildings (3.5 Mt); improving energy efficiency in government operations (0.6 Mt); Energy Efficiency Best Practice and Benchmarking Programme (0.2 Mt); State and Territory action on energy efficiency (2.9 Mt); <i>Energy Efficiency Data Project; international engagement in energy efficiency activities (IEA, APEC)</i>
Fugitive emissions from fuels	Queensland Government coal mine gas capture; Greenhouse Challenge Plus (4.9 Mt); GGAP (2.3 Mt)
<b>Transport</b>	
Vehicle and fuel subsidies	Alternative Fuels Conversion Programme (2000/2002) (0.04 Mt); State and Territory alternative fuels programmes
Biofuels	350 ML Biofuels Target (0.3 Mt)
Agreements/partnerships	Environmental Strategy for the Motor Vehicle Industry (0.5 Mt); Local Greenhouse Action (0.02 Mt)
Integrated transport planning	National average CO <sub>2</sub> emissions target; Strategic transport planning (2003); State and Territory transport measures (0.8 Mt); <i>EPHC/ACT Vehicle Fuel Efficiency Measures; ACT National Transport Policy</i>
Other	GGAP (0.6 Mt); <i>Green Vehicle Innovation Fund; Green Vehicle Challenge</i>
<b>Industry</b>	
Pollution prevention and control	Ozone-depleting substances and synthetic GHG replacements from Montreal Protocol industries (4.7 Mt); other initiatives to reduce emissions from industrial processes; GGAP (0.7 Mt)
Agreements/partnerships	Best Practice Management of SF <sub>6</sub> (0.3 Mt); Greenhouse Challenge Plus (4.1 Mt)
<b>Agriculture</b>	
National programmes	Greenhouse Action in Regional Australia (2004) (0.6 Mt); <i>National Agriculture and Climate Change Action Plan; Australia's Farming Future; Caring for our Country</i>
Agreements/partnerships	Environmental Management Systems Programmes (2002); bilateral partnership projects
<b>Waste management</b>	
Waste management	Australian Government, State, Territory, and local government waste management strategies (9.0 Mt)
Agreements/partnerships	Greenhouse Challenge Plus (0.2 Mt)
<b>Forestry</b>	
Land-clearing protection	Queensland Government legislation for the management of native vegetation (2003) (17.5 Mt); New South Wales Government legislation for the management of native vegetation (2004) (3.4 Mt)
Land and vegetation programmes	Greenhouse Action in Regional Australia; Natural Heritage Trust – land and vegetation programmes (Landcare and Bushcare); National Landcare Programme; Plantations for Australia: The 2020 Vision; National Action Plan for Salinity and Water Quality; other land and vegetation programmes
Other	GGAP (0.1 Mt); Greenhouse Friendly Initiative; <i>tax deductibility for carbon sink forests</i>

*Abbreviations:* GGAP = Greenhouse Gas Abatement Programme; GHG = greenhouse gas; IEA = International Energy Agency; ACT = Australian Capital Territory; EPHC = Environment Protection and Heritage Council; APEC = Asia-Pacific Economic Cooperation; ML = million litres.

*Note 1:* The GHG reduction estimates given for some measures (in parentheses) are reductions in CO<sub>2</sub> or CO<sub>2</sub> eq for the year 2010.

*Note 2:* PaMs introduced/announced after the NC4 are indicated in italics.

### **A. Policy framework and cross-sectoral measures**

20. At the time when Australia's NC4 was prepared, the Australian Greenhouse Office (AGO), within the Department of Environment and Heritage, had the role of a central agency responsible for coordinating domestic climate change policy at national level. After a change in Government at the end of 2007, Australia's responsibilities with regard to climate change-related policies in the national Government were restructured. A Department of Climate Change (DCC) has been created, which for the

first time covers comprehensively all the relevant responsibilities which previously were spread across different departments. The DCC is responsible for coordinating and implementing climate policy, and has particular responsibility for development and coordination of domestic and international climate change policy; international climate negotiations; design and implementation of emissions trading; Mandatory Renewable Energy Target (MRET) policy, regulation and coordination; reporting on GHG emissions and energy consumption; climate change adaptation strategy and coordination; and coordination of activities relating to climate change science.

21. Given Australia's federal system of government, State and Territory Governments are responsible for various climate change issues, such as waste and vegetation management. Therefore, State and Territory climate strategies form an important part of Australia's policy response. The implementation of national, State and Territory strategies requires a more coordinated approach, due to a renewed emphasis on nationwide policies and the harmonization of existing policies. Through a forum called the Council of Australian Governments (COAG) the Australian Government is working with the six State Governments and two Territory Governments to implement a comprehensive national response to climate change. COAG is the highest intergovernmental forum in Australia and comprises the Prime Minister, State premiers, Territory chief ministers and the President of the Australian Local Government Association. COAG is strongly committed to cooperative action to address climate change and has established a Climate Change and Water Working Group chaired by Senator the Honourable Penny Wong, Minister for Climate Change and Water.

22. The NC4 shows that Australia is on track to meet its Kyoto commitments, even though Australia had not planned to ratify the Kyoto Protocol at the time of preparing the document. Also in the NC4, Australia has emphasized the importance of reviewing the performance of its PaMs. However, the ERT noted that it would be helpful to include in Australia's next communication some more information on how progress with PaMs to mitigate GHG emissions is monitored and evaluated over time.

23. The NC4 provides, to a large extent, quantitative estimates of the impacts of PaMs as well as references to information on costs relating to the implementation of PaMs. Given the importance of such information, the ERT suggests that Australia include in its next national communication a table showing the costs of implementation of its PaMs, complemented if possible with estimates of the cost of abatement per tonne of CO<sub>2</sub> eq, clarifying also the way in which these estimates are calculated.

24. The NC4 mentions a wide range of PaMs, sometimes without a clear indication of their mitigation impacts and interactions. This reflects a patchwork of activities at State and Territory level, complemented by nationwide PaMs. Overall, the NC4 could be said to describe a "portfolio approach", as policies target both demand and supply in the energy, industry and transport sectors, and are implemented through a diverse set of policy instruments which seek to complement each other. The ERT considers the action at State and Territory level as essential in bringing about change in Australian climate policy, but its overall impact is not always clear.

25. A revised Climate Change Policy was published in July 2007. However, following a change in government in November 2007, a new Climate Strategy based on a three-pillar framework has been announced; the three pillars are mitigation, adaptation and international engagement. Mitigation aims at reducing Australia's GHG emissions, setting a target of a 60 per cent reduction from the 2000 level by 2050. This target is to be achieved largely through an emissions trading scheme (ETS) which is to begin in 2010, and a 20 per cent renewable energy target by 2020, supported by a number of complementary measures including an AUD 500 million Renewable Energy Fund, an AUD 500 million National Clean Coal Initiative and an AUD 150 million Energy Innovation Fund. The adaptation pillar is aimed at improving the understanding of climate change impacts and preparing policy responses to such impacts. The international engagement pillar is aimed at helping to shape an international response to climate change.

26. In its NC4, Australia has identified a range of cross-sectoral PaMs, including a number of international climate partnerships to reduce GHG emissions multilaterally and bilaterally. The Low Emissions Technology Demonstration Fund supports industry-led projects to demonstrate the commercial viability of new technologies or processes in a technology-neutral way; its expected mitigation impact appears to be low (or is still unknown). The Greenhouse Gas Abatement Programme (GGAP) leverages private sector investment in activities or technologies which reduce GHG emissions or enhance sinks. Its estimated mitigation impact in 2010 is 6.1 Mt CO<sub>2</sub> eq. The Greenhouse Challenge Plus Programme is designed to help industry to reduce its emissions, integrate climate issues into business decision-making and accelerate the uptake of energy efficiency; its estimated mitigation effect in 2010 is 15.8 Mt CO<sub>2</sub> eq. Local Greenhouse Action integrates a number of pre-existing programmes in order to engage cities, communities, and households more wholeheartedly in climate action over the longer term; by 2010 it is expected to contribute mitigation equivalent to 0.4 Mt CO<sub>2</sub> eq.

27. In its new government policy, Australia identifies the ETS as the central mechanism in its cross-sectoral policy framework. In addition, the need for ongoing additional (“complementary”) to the ETS measures is recognized, emphasizing that “complementarity” still needs to be defined exactly. An approach is being developed to assess whether existing PaMs complement the expected ETS, for example to verify whether existing programmes address clear market failures which are likely to continue after the introduction of emissions trading or which may be necessary to prepare for emissions trading. For this purpose, the Department of Finance and Deregulation has initiated a strategic review of Commonwealth climate change measures (the Wilkins Review), aimed at ensuring that existing climate change programmes are efficient, effective and complement the forthcoming ETS. In addition, the new government policy represents a move away from the traditional costing of election commitments, as it relies increasingly on the ETS to identify the most cost-effective abatement opportunities and suggests adherence to complementarity principles as a major criterion for additional future policies in order not to dampen the ETS price signal.

28. The ERT anticipated that the process initiated by the new Government would give the signals needed for a comprehensive and effective climate policy. The new Government has put the significance and scale of climate change high in its policy priorities by adopting a strong longer-term reduction target and providing a clear policy framework with an ETS as the central mitigation policy tool, supplemented by complementary and transitional measures. Guidance is being provided on how to achieve this target – domestically through strong nationwide PaMs and the harmonization of existing PaMs, and internationally through engagement in multilateral negotiations and the continuation of various partnerships, and through technology support. The Government is currently working at different levels to provide more specific details on how to approach the overarching environmental goals, but many elements still need to be specified over the next few months in order to render this guidance more accessible. In addition to work by the new Commonwealth Government and its predecessor (for example, the previous government’s Task Group on Emissions Trading), work undertaken by State and Territory Governments (for example, through the National Emissions Trading Taskforce), the Wilkins Review of Commonwealth climate change measures, the COAG Climate Change and Water Working Group and the Garnaut Climate Change Review will be taken into account during this process.

29. The Garnaut Climate Change Review was commissioned in April 2007 by the then leader of the opposition and the premiers and chief ministers of all States and Territories. After the elections it was converted into a joint Commonwealth-State project, and is expected to provide important contributions to the specification of Australia’s new climate policy. Representing an independent review of Australia’s climate policy, the Garnaut Climate Change Review aims to examine the impacts of climate change on Australia’s environment and economy and at recommending medium- to long-term policies and policy frameworks. To provide the best possible outcomes, the review’s work is linked with modelling work of the academic sector and the Department of Treasury modelling exercise that will provide the Government’s official firm medium-term emissions projections, a ‘trajectory’ that would be consistent with the longer term emissions target.

30. The ERT noted that the current situation is very complicated and challenging, as most of the policy details relating to the new Government's overall policy framework need to be determined over the next few months. Among the issues under discussion are details of the ETS, the identification of a medium-term trajectory to put Australia on track for its 2050 reduction target, and the identification of complementary PaMs, which may also imply a partial or complete phasing-out of existing measures. The latter issue is particularly challenging because of a potential change in the role of State and Territory Governments which has been triggered by the new Commonwealth Government, and the resulting need for coordination between the different governments. Given the time schedule and the complexities to be dealt with, the ERT considered the upcoming policy developments as a challenge, but was confident that Australia will be in a position to make appropriate decisions as it had clearly recognized the critical issues, that is, the need for a carbon price (to be achieved through ETS), the need for complementary measures to overcome other energy market barriers, and the need for solid data support to the ETS (being implemented through the National Greenhouse and Energy Report Act 2007).

31. Overall, the ERT noted an impressive transition in Australia's overall policy framework since the NC4 was submitted, and had a very positive impression of Australia's new approach towards PaMs, supported by well-organized institutional developments.

### **B. Policies and measures in the energy sector**

32. Between the base year 1990 and 2005, the share of CO<sub>2</sub> in the total Australian GHG emissions remained at 72 per cent, whereas the proportions of the other gases in the overall amount changed only slightly. However, there was a significant change in the source of emissions: the share of the energy sector in total national GHG emissions increased from 56 per cent to 71 per cent, and the share of the non-energy sectors decreased accordingly, driven by a decline in emissions from the LULUCF sector (the share of LULUCF in total national GHG emissions declined from 19 per cent to about 4 per cent, see table 2). The energy sector is thus increasingly responsible for a large share of Australia's GHG emissions. This corresponds to an increase of 38 per cent in sectoral GHG emissions, mainly driven by an increase in the stationary energy and transport parts of the energy sector (+44.5 per cent and +30.1 per cent, respectively).

33. **Energy demand.** The significant increase in emissions from stationary energy is due to a strong increase in electricity demand driven by strong population growth and economic growth, which is particularly marked in energy-intensive industries (for example, metals processing driven by the commodities boom) and the resources sector (for example, continued electrification of the sector and economic restructuring). Strong growth in transport emissions has been driven mainly by an increase in road transport (which is responsible for about 88 per cent of overall transport emissions); most road transport is inter-city transport, given Australia's very urbanized situation.

34. **Energy supply.** The high emissions in the electricity sector reflect the heavy reliance on brown and black coal: about 85 per cent of electricity is produced from domestic coal (share unchanged since 1990). Over the same period fugitive emissions from oil and gas, taken together, decreased by almost 19 per cent, mainly driven by decreases in fugitive emissions from natural gas triggered by improvements in transmission and distribution networks and progress in reducing venting and flaring, whereas fugitive emissions from both coal and oil increased. The trend in fugitive emissions could, however, not outweigh the increases in emissions stemming from electricity generation and transport.

35. Australia has presented a wide set of PaMs for the energy sector in its NC4, including policies at Commonwealth, State and Territory level, as well as energy market reform. The policies are aimed at developing low emissions and renewable technologies and improving end-use energy efficiency. Each policy is briefly but clearly explained. However, some uncertainty remains about the actual impact of the group of policies outlined, particularly the measures aimed at technology support and those initiated by States and Territories. The ERT expects that the ongoing revision of the policy framework will provide more clarity on which PaMs will continue to exist, with due regard to the complementarity principle.

36. **Emissions trading scheme.** The NC4 describes a State regulatory measure, the New South Wales Greenhouse Gas Abatement Scheme (GGAS), as the single most effective measure in terms of expected GHG mitigation impact (18.1 Mt CO<sub>2</sub> eq in 2010). This scheme started in 2003 and is the world's first mandatory ETS, requiring electricity retailers to meet mandatory GHG reduction targets for GHG emissions from electricity production and use. The scheme is designed as a baseline and credit system, meaning that participants have to reduce the emissions to an agreed benchmark to achieve the NSW State-wide benchmark of reducing per capita emissions to 7.27 tonnes by 2007. This is a 5 per cent reduction below the 1990 level. Surrendering abatement certificates bought from low-emission electricity generators, demand-side abatement, carbon offset through "sinks", or mitigation activities carried out on site, can be used to offset excess emissions. The scheme gave rise to much debate on emissions trading at State and Territory level, and most importantly initiated the thinking about nationwide emissions trading. Given the recent policy developments, this scheme is likely be aligned/integrated with the emerging nationwide ETS. It should be noted that the abatement of 18.1 Mt CO<sub>2</sub> eq claimed by the NSW Government for GGAS is a gross figure. The NC4 outlined that there was an overlap of 13.5 Mt CO<sub>2</sub> eq between this measure and other measures. According to the latest greenhouse emission projections the 'net' abatement is 4.7 Mt CO<sub>2</sub> eq.

37. **Energy efficiency.** A major focus of PaMs in the energy sector is on improving energy efficiency. A range of energy efficiency measures has been adopted for industrial, commercial and residential energy users, the responsibility for which is spread across various government agencies. Much of Australian energy efficiency policy is delivered cooperatively by Commonwealth, State and Territory Governments through the National Framework on Energy Efficiency, which funds a range of measures. In the context of large industrial energy users, the Energy Efficiency Opportunities programme has been implemented to stimulate large energy-using businesses to take a more rigorous approach to energy management. The NC4 estimates the mitigation impact of this measure as 0.8 Mt CO<sub>2</sub> eq in 2010. Its potential is demonstrated by recent developments: in 2008, this programme covered more than 200 of Australia's largest energy users, who are responsible for 60 per cent of Australia's business energy use and about 45 per cent of total energy end use.

38. In the context of commercial and residential energy users, an important measure is the National Appliance and Equipment Energy Efficiency Programme, which mandates comparative energy labelling and minimum energy performance standards for domestic appliances, commercial products and industrial equipment. Its mitigation impact in 2010 was estimated at 7.9 Mt CO<sub>2</sub> eq, but a strong election commitment by the new Government is likely to strengthen this measure. In addition, the introduction of mandatory energy efficiency standards for residential and commercial buildings, supplemented by action to improve Building Code Australia, has led to significant progress in the buildings sector; the NC4 estimates the mitigation impact in 2010 at 3.5 Mt CO<sub>2</sub> eq.

39. **Renewables.** Another important element in Australia's strategy to reduce emissions in the energy sector is the renewable energy target. The new Government has committed itself to ensuring that 20 per cent of Australia's electricity supply comes from renewable energy sources by 2020. To deliver on this commitment, the Government will establish an expanded national Renewable Energy Target (RET) scheme; it will build upon the existing MRET scheme that places a legal liability on wholesale purchasers (retailers and large users) of electricity in States and Territories to contribute proportionately to achieving the target. The estimated mitigation impact of the existing MRET scheme in 2010 is 6.6 Mt CO<sub>2</sub> eq; however, it is estimated that the expanded RET will mitigate 10.4 Mt CO<sub>2</sub> eq in 2010. The RET will bring the existing and proposed State and Territory RET schemes into a single national scheme with a legislated target of 45 000 GW-hours in 2020. The ERT considered this development as the continuation of a success story in Australia's policy on renewables. Indeed, the new policy will improve upon a scheme, the MRET, that was already promising, particularly because it was implemented through a system of tradable certificates.

40. **Transport.** In the NC4, the main nationwide measure relating to transport is the National Average CO<sub>2</sub> Emissions Target. The proposed target is 226 g CO<sub>2</sub>/km, but this has not yet been agreed by the Government. The developments over recent years indicate a consistent downward trend, which, however, is probably strongly influenced by external factors such as technological progress in the transport industry, the general increase in fuel costs and a wider range of available vehicle types. A new package of measures is currently being designed to strengthen Australia's PaMs in transport, including a nationwide transport plan (Australian Transport Council – National Transport Plan).

41. The ERT considered the new policy framework centred around a carbon signal and complementary measures as an important step forward in Australia's climate policy, and for the energy sector in particular. The ERT welcomed the emphasis on measures aimed at improving energy efficiency, which are critical complements in overcoming barriers which impede the natural uptake of cost-effective energy-efficiency measures. The ERT also considers the 20 per cent target for renewables as an important complementary measure, which can be helpful in developing low-carbon technologies and reducing Australia's dependence on coal.

42. The ERT noted that the estimated mitigation effect of the PaMs in transport appears to be small compared to the large contribution this sector has made to the growth in Australia's GHG emissions. The new package of measures that are under preparation appears to respond to this point.

### C. Policies and measures in other sectors

43. In 2005, emissions from non-energy sectors taken together amounted to only 29 per cent of the total GHG emissions, compared to 44 per cent in 1990. Between 1990 and 2005, GHG emissions from industrial processes (including solvent and other product use), agriculture, LULUCF and waste taken together decreased by more than 31 per cent (by 70.2 Mt CO<sub>2</sub> eq), mainly driven by a strong reduction of emissions from land clearing. GHG emissions from industrial processes increased by 16.2 per cent, driven by increased emissions from synthetic gases or hydrofluorocarbons (HFCs). These increases were partly compensated for by a decrease in emissions from the waste sector (by 12.6 per cent), achieved through the increased capture of CH<sub>4</sub> in the context of solid waste disposal. More importantly, emissions from LULUCF showed a notable decrease (74.9 per cent). This trend is mainly driven by the strong decline in emissions from land clearing triggered by State-level measures and the increase in sinks (forest lands are estimated as a sink of 47 Mt CO<sub>2</sub>). Emissions from agriculture slightly increased (by 2.5 per cent), driven by higher N<sub>2</sub>O emissions from nitrate fertilizers (98.9 per cent) which have, since the 1980s, been increasingly used in the context of large-scale broadacre cropping.

44. **Industrial processes.** In 1990, industrial processes were responsible for emissions of 25.3 Mt CO<sub>2</sub> eq, including CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>). This amount is 5 per cent of total GHG emissions. Maintaining the share of 5 per cent, industrial processes contributed 29.4 Mt CO<sub>2</sub> eq in 2005 (an increase of 16 per cent), demonstrating that this is a fast-growing sector, particularly for fluorinated gases. Indeed, the increase was strongly due to synthetic GHGs, as HFCs increased by almost 300 per cent over this period.

45. Two major policies are used to reduce emissions from industrial processes. The Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 and its amendments are aimed at minimizing emissions of synthetic GHGs by, inter alia, implementing end-use regulations and import-export controls while improving the environmental performance of the so-called Montreal Protocol industries. It is estimated that this policy will have a mitigation impact of 3.5 Mt CO<sub>2</sub> eq in 2010 (this amount has been revised downwards from an expected 4.7 Mt CO<sub>2</sub> eq impact in the NC4, as a result of revised leakage rates). In addition, the Best Practice Management of SF<sub>6</sub> programme, initially aimed at developing handling guidelines, but then broadened to include all aspects of SF<sub>6</sub> management in the electricity supply industry, is estimated to provide abatement of 0.3 Mt CO<sub>2</sub> eq in 2010. Finally, elements of the Greenhouse Challenge Plus programme, which target compulsory partnerships between

the Government and industry, are expected to have a mitigation impact of 4.1 Mt CO<sub>2</sub> eq in 2010. Currently, Australia is undertaking a study to identify opportunities for further abatement in this sector.

46. **Agriculture.** Agriculture is an important sector in Australia's economy in terms of its contribution to GDP and exports, as well as in the context of social development at regional level. Indeed, agriculture covers about 57 per cent of Australia's land area and involves a range of industries. It is responsible for about one third of the country's exports and about 3 per cent of its GDP. In 1990, the agriculture sector was responsible for 87.7 Mt CO<sub>2</sub> eq, corresponding to 17 per cent of Australia's total GHG emissions. In 2005, agriculture contributed 89.8 Mt CO<sub>2</sub> eq, or 16 per cent of total GHG emissions. Even though on the whole there have not been many changes in emissions from agriculture, there are some interesting sub-trends: emissions from manure management increased by 72 per cent, partly compensated for by a 30 per cent decline in emissions from rice production due to increasingly scarce water availability; emissions from agricultural soils increased by more than 16 per cent due to fertilizer use; emissions from savanna burning increased by more than 30 per cent; and emissions from the burning of agriculture residues increased by almost 39 per cent.

47. The Greenhouse Action in Regional Australia programme is aimed at building capacity to enhance forest sinks and reduce emissions from agriculture by supporting research and development and partnerships with agricultural industries. This policy is expected to provide mitigation of 0.6 Mt CO<sub>2</sub> eq in 2010. The previous Australian Government, in collaboration with the State and Territory Governments, established a National Agriculture and Climate Change Action Plan, focused on adaptation, mitigation, research and development, and awareness and communications. Recently, the new Government has launched Australia's Farming Future, a programme which recognizes the effects experienced by primary industries due to climate change, and includes policies and measures to promote sustainable agriculture.

48. **Land use, land-use change and forestry.** In 1990, the LULUCF sector was responsible for emissions of 99.1 Mt CO<sub>2</sub> eq, or 19 per cent of Australia's total GHG emissions. This share has since been reduced significantly, and in 2005 LULUCF contributed only 24.9 Mt CO<sub>2</sub> eq or 4 per cent of total emissions. This trend has been induced by a combination of strong reductions in land-use change and a simultaneous increase in CO<sub>2</sub> removals by forests. This is a promising development, given that forestry is an important sector in Australia's economy, generating 1 per cent of GDP and AUD 2 billion in exports annually. In the context of land-use change, extensive land clearing has taken place during the 20<sup>th</sup> century, largely for agricultural development. However, since 1990 substantial reductions can be observed due to regulatory, land management and economic influences.

49. Emissions from land clearing have been affected by commodity prices, climatic fluctuations and regulation. Two States with a sizable amount of land-clearing, Queensland and New South Wales, have adopted strong legislation to reduce land-use change emissions from the clearing of native vegetation and prevent further land clearing. The combined mitigation impact of these legislative changes in the two States is estimated in the NC4 to be 20.9 Mt CO<sub>2</sub> in 2010, anticipating that most of the abatement will take place in Queensland (17.5 Mt CO<sub>2</sub>).

50. A variety of further PaMs are in place to reduce LULUCF emissions, for example the Greenhouse Friendly Initiative, which provides for the approval of forest sink abatement projects. In addition, the legislation aimed at tax deductibility for carbon sink forests, currently before Parliament, will set incentives for businesses which establish forests for the purpose of carbon sequestration (a similar programme is already in use for plantations).

51. **Waste.** Emissions from waste (largely CH<sub>4</sub>) are a relatively small component of Australia's total GHG emissions. In 1990, the waste sector was responsible for 17.5 Mt CO<sub>2</sub> eq, or 3 per cent of total GHG emissions. Maintaining this share in a national context, waste contributed 15.3 Mt CO<sub>2</sub> eq in 2005. In Australia, State, Territory and local Governments have prime responsibility for waste management, so most PaMs are implemented at this level. This consequently implies that approaches to reduce and

capture CH<sub>4</sub> emissions from the waste sector vary across jurisdictions. The NC4 reports that the combined mitigation impact is estimated to be 9 Mt CO<sub>2</sub> eq in 2010, but provides only limited information on such activities. A positive recent development is a proposal from Western Australia on the collection of CH<sub>4</sub> at landfills, which will be discussed at the next Ministerial Council and could initiate discussion on a new nationwide approach.

52. The ERT welcomed the new policies that are currently being discussed and implemented in the non-energy sectors. Recognizing that the continued increase in productivity is inevitably linked to an increase in nitrates, and that the strengthened emphasis on sustainable agriculture and research and development is an important step in a more sustainable future, the ERT suggests envisaging further measures to tackle the increased N<sub>2</sub>O emissions in the context of agriculture. The ERT also encourages Australia to provide more detailed information on waste-related PaMs in its next national communication, and to consider opportunities for a more comprehensive, nationwide approach to deal with the high CH<sub>4</sub> emissions in the waste sector.

## **IV. Projections and the total effect of policies and measures**

### **A. Projections**

53. The GHG emission projections provided by Australia in the NC4 include ‘with measures’ and ‘without measures’ (or ‘business as usual’, BAU) projections until 2020, presented relative to actual inventory data for the preceding years. Projections are given on a sectoral basis, using the same categories as the ones adopted in the PaMs section, and on a gas-by-gas basis for CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs and SF<sub>6</sub>. Projections are also provided in an aggregated format for each sector as well as for a national total, using global warming potential (GWP) values. Combined emissions projections relating to fuel sold for use by ships and aircraft engaged in international transport are reported separately and not included in the national total.

54. By the time of the in-country visit, Australia had prepared and made available a new set of GHG projections, which are referred to here as 2007 projections.<sup>2</sup> The ERT noted with appreciation that Australia manages the transitions from one set of projections to another well, and supports clear and systematic accounts of the differences between the 2007 update and the projections published in the NC4 and NC3; this was of considerable help to the ERT during the review.

55. Table 4 and figure 1 provide a summary of GHG emission projections for Australia. The data in table 4 and figure 1 come from the 2007 update to the NC4 and indicate that Australia is currently on track to meet its commitment under the Kyoto Protocol. Note that the 2007 projections exclude the potential effect of emissions trading, because the introduction of an ETS is still under discussion and its impact on emissions cannot yet be estimated. Overall, it is projected that by 2010 Australian GHG emissions, calculated under the Kyoto Protocol accounting rules, would be about 8 per cent above the 1990 level, which corresponds to the Australian target under the Protocol. The major factor for emissions is the growth of GHG emissions from the energy sector, which is driven by continued strong economic and population growth; the growth of emissions from energy is alleviated considerably by decreasing emissions from deforestation, supported by policy measures at the Commonwealth, State and Territory level.

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<sup>2</sup> See DCC, 2008i (references are provided in the annex).

**Table 4. Summary of greenhouse gas emission projections for Australia**

	Greenhouse gas emissions (Tg CO <sub>2</sub> eq per year)	Changes compared to base year level (%)
Inventory data 1990 <sup>a</sup>	553.8	–
Inventory data 2005 <sup>a</sup>	582.8	5.4
Kyoto Protocol base year <sup>b</sup>	553.8	100.0
Kyoto Protocol target	598.1	108.0
Projections data for 1990	553.7 <sup>c</sup>	–
“Without measures” projections for 2010 <sup>a</sup>	685.6	123.8
“With measures” projections for 2010 <sup>a</sup>	598.1	108.0

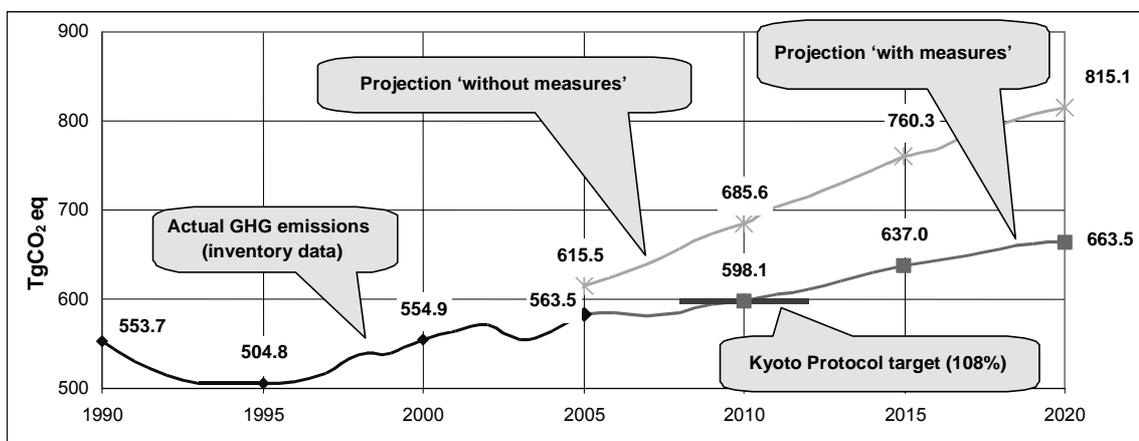
Note: The projections include CO<sub>2</sub> emissions/removals from land-use change and Kyoto Protocol forests.

<sup>a</sup> Data source: Projections data are as presented in *Tracking to the Kyoto Target 2007: Australia’s Greenhouse Emissions Trends 1990 to 2008–2012 and 2020*.

<sup>b</sup> Source: The Australian Initial Report under the Kyoto Protocol.

<sup>c</sup> There is a very small difference in 1990 data between the inventory and the projections because of a recent projections update.

**Figure 1. Greenhouse gas emission projections for Australia**



Abbreviation: GHG = greenhouse gas.

Note: The projections include CO<sub>2</sub> emissions/removals from land-use change and Kyoto Protocol forests.

Source: Australian Government, Department of Climate Change. 2008. *Tracking to the Kyoto Target: Australia’s Greenhouse Emissions Trends 1990 to 2008–2012 and 2020*.

56. At the time the NC4 was published, responsibility for producing the projections rested with the AGO. Currently it rests with the DCC. There has been continuity, across the transition, in the teams involved with projections. Those responsible for projections modelling have office space co-located with the GHG inventory team, and the two teams work closely together to maximize consistency. This sometimes involves the scaling of the projections to the most recent inventory total. The ERT noted that Parties often find this necessary because inventory and projections updates are not always simultaneous. Australia publishes annual projections, and each sector is updated at least every two years, and sometimes annually. Each update takes account of comments from the previous update and there is consultation with other government departments and expert stakeholders from relevant economic sectors during the preparation of the projections.

57. Projections are made on a sectoral basis using a combination of top-down and bottom-up models, and the sectoral results are added up to give the national total. In most cases, several models are involved per sector and the results are averaged. This approach has the advantage of introducing an element of automatic cross-checking in the process, although it complicates the relationship between the individual models and the average result. The individual models may be run in-house by the DCC but usually the work is done by external consultants selected by a tendering process. PaMs are, where possible, modelled as an integral part of the ‘with measures’ scenario, which helps to ensure consistency.

58. There is no uniform set of external drivers used for the modelling. This may reduce the risk of systematic bias introduced by specifying the drivers, and means that the spread of model results, if fully representative, captures the range of future uncertainty relating to the uncertainties linked to both the modelling process and the drivers. The approach is consistent with the UNFCCC reporting guidelines for the preparation of national communications, according to which Parties may use any models or approaches they choose in conjunction with a clear explanation. An alternative approach, which the ERT suggested for consideration for future projections, would be for modellers to use a particular set of drivers and ranges associated with them. The differences between models could still be used to assess uncertainties due to the modelling process, or if appropriate there could be a separate assessment by Monte Carlo analysis using a reduced order model. The different sources of uncertainty could be combined using the error propagation equation. The common set of drivers and assumptions could also be used for evaluating the effect of policies and measures. This would facilitate a consistent approach to cost effectiveness ranking which could facilitate the efficient design of future policy packages needed to meet the ambitious policy targets currently under discussion. The ERT understands that the reference case being developed by the Garnaut Climate Change Review will in fact be used as an input to long-term policy development and believes that this will increase consistency.

59. In discussions, Australia noted that the Monte Carlo approach to the treatment of uncertainty is currently used by only two Parties. Australia noted that it was not clear that the use of the Monte Carlo approach would increase understanding of projections uncertainty, and that New Zealand has recently stopped using the approach. Australia noted that the situation in Australia is similar to that in New Zealand, which outlined in 2007 that “there is debate as to whether the Monte Carlo method is a suitable tool for modelling emissions projections uncertainty for New Zealand, because of the limited number of modelled projections and because there are unknown factors such as the result for LULUCF where the end result will have a dominant effect on the final net position”.<sup>3</sup>

60. The 2007 projections update is accompanied by supporting sectoral documentation which explains the projections methodologies, quantitative information on drivers, results, and the effects of measures. These reports are very useful, although, in the ERT’s view they are not fully methodologically transparent. However, references are provided to further supporting documentation.

61. **Stationary combustion** is the biggest single sector, accounting for 51 per cent of net emissions in 2005. The 2007 update estimates that the ‘with measures’ projection will be about 55 per cent above the 1990 level, without including any allowance for emissions trading. About 70 per cent of the emissions in 2005 are linked to electricity generation. The projections for this sector were made by three organizations (the Australian Bureau of Agricultural and Resource Economics (ABARE), ACIL Tasman and the Centre of Policy Studies in conjunction with McLennan Magasanic Associates). These organizations used separate general equilibrium (top-down) models for the economy as a whole, in combination with detailed (bottom-up) models of the energy sector. General equilibrium modelling was used because of the importance of global macroeconomic conditions to projecting electricity demand and fuel market impacts in the Australian economy. The detailed modelling divides the energy sector into seven subsectors and 20 end uses. There is probabilistic representation of power station dispatch. The BAU projection and the ‘with measures’ central case are based on the modellers’ best estimates of key variables BAU and ‘with measures’, respectively. High and low scenarios are provided relative to the ‘with measures’ central case. These were generated by using percentage point variations up or down, relative to central case assumptions. The percentage point variations (although not the central case assumptions) were provided by the DCC.

62. **Agriculture** was responsible for about 16 per cent of Australian net emissions in 2005 and the ‘with measures’ projection for 2010 is estimated in the 2007 review to be about 6 per cent above the 1990 level. The ‘with measures’ projection is a composite of modelling by ABARE and by the Centre

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<sup>3</sup> New Zealand Ministry for the Environment (2007), *Projected Balance of Emissions Units During the First Commitment Period of the Kyoto Protocol* (p.14).

for International Economics (CIE). The ABARE model is a profit-maximizing model of Australian agriculture allowing for competition for resources including land. The projections from both ABARE and the CIE take into account both the current historically based allocation system and expectations of rising prices of water in the relevant (essentially localized) markets. The CIE model has specific representation of world demand for meat, grain and dairy products. The models are used to produce projected activity data which can be used with the inventory method to project emissions from livestock and crop production and waste disposal. Non-CO<sub>2</sub> emissions from savanna burning, which are particularly uncertain because of dependence on rainfall, are separately modelled by the DCC. ABARE, CIE and the DCC all provide sensitivity analyses and the composite results are the average of ABARE and CIE, plus the DCC for savanna burning for the central, high and low cases.

63. **Transport** accounted for about 15 per cent of emissions in 2005, and the 2007 update estimates that transport emissions in 2010 will be some 42 per cent above the 1990 level if existing measures are taken into account. The 2007 projections are the average of separate bottom-up projections by the Bureau of Transport and Regional Economics and the Apelbaum Consulting Group. The BAU projection and the 'with measures' central case are based on the modellers' best estimates of key variables BAU and 'with measures', respectively. High and low scenarios are provided relative to the 'with measures' central case. These were generated by using percentage point variations up or down relative to central case assumptions about travel demand, fuel efficiency and fuel prices. The sensitivity is  $\pm 5$  per cent in 2010 increasing to  $\pm 20$  per cent in 2020. The sensitivity range is much larger than the difference between the BAU and 'with measures' projections. The bottom-up models include representation of the vehicle stock and can therefore be linked to inventory estimates. Freight and passenger transport are disaggregated into urban and long-distance demand. Until the NC4, transport projections were based on top-down as well as bottom-up models; the ERT notes that this is likely to have reduced the range of projected demand. The NC4 contains aggregate projections for emissions from fuel for international aviation and maritime transport, which roughly double over the period 1990 to 2010. The disaggregated emissions, provided during the review, show a 32 per cent increase in international aviation between 2005 and 2010 and a 0.6 per cent increase in emissions relating to international marine transportation. The ERT noted that the emission trend for the latter is likely to be determined by the global demand for commodities.

64. **Fugitive emissions** accounted for about 6 per cent of the total Australian emissions in 2005 and the 2007 update anticipates an increase of some 27 per cent in emissions 'with measures' over the period 1990 to 2010. Projections for fugitive emissions from coal mining are derived from projected production data from Barlow Jonker Pty Ltd (BJPL) combined with estimates of mine gassiness from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Energy Strategies Pty Ltd (ESPL). 'With measures' projections take account of projects to utilize and flare coal mine CH<sub>4</sub>. Projected emissions from abandoned mines are included. High and low 'with measures' projections depend on coal production ranges. The BJPL estimates assume that the price of Australian coal will continue to be competitive and do not assume the carbon price that may be introduced. The ERT noted that fugitive emissions are constrained by production and port capacity. Oil and gas fugitive emissions projections depend on bottom-up modelling by ESPL. Emissions are mainly from extraction and leakage from gas distribution systems. Projections take account of individual projects and the properties of specific production fields and coal mines (in the case of coal bed CH<sub>4</sub>). The 'with measures' range for fugitive emissions from oil and gas production and distribution depends on assumptions about project start-up, use of geosequestration and venting rates.

65. **Industrial processes** accounted for some 5 per cent of Australian emissions in 2005, and the 'with measures' projection anticipates an increase of about 48 per cent over the period 1990 to 2007. The projections are from bottom-up modelling by Burnbank Consulting, based on historical trends on production and import data, and industry advice on changes in plant capacity. The 'with measures' projection has ranges driven by uncertainties associated with production data, emission factors, the

impact of policies, the timing and extent of substitution of ozone-depleting substances with HFCs, and the development of new chemicals and technologies.

66. **Waste sector** emissions were about 3 per cent of national total emissions in 2005, and, ‘with measures’, are projected to fall by about 14 per cent between 1990 and 2010. Emissions from solid waste disposal are estimated by DCC analysis based on the inventory methodology using population growth and waste produced per capita based on historical trends, in conjunction with analysis by Hyder Consulting (HC). This covers waste diversion and CH<sub>4</sub> capture rates, disaggregated to the State and Territory level. The range of ‘with measures’ scenarios is driven by the assumptions that improvements in organic diversion rates occur as planned, or within two years or within five years of the original time-frame, and that CH<sub>4</sub> capture rates remain at current levels, continue to improve in line with current trends, or reach 85 per cent by 2020 with all landfills for settlements of over 20,000 people subject to CH<sub>4</sub> capture. These assumptions are based on a database of Australian landfills compiled by HC, plus a review by HC of available data on gas capture for flaring and power generation. In 2005 emissions from wastewater were about 28 per cent of those due to solid waste disposal. These were projected by the DCC using the inventory method with waste arising driven by population and industrial projections. There are allowances for connection to mains drainage, chemical oxygen demand and the percentage of waste anaerobically treated, and the percentage of CH<sub>4</sub> captured. These drivers vary according to State and Territory and are consistent with the data used for GHG inventory.

67. **Land-use change and forestry** emissions under Kyoto Protocol accounting were estimated to be some 9 per cent of national emissions in 2005, made up of emissions from land-use change equal to about 13 per cent of the national total, and removals equal to about 4 per cent. Projections are made using the National Carbon Accounting System, which is being developed according to policy priorities. Projections are currently available for activities under Article 3, paragraph 3, of the Kyoto Protocol and for managed forests; these projections are under review pending the adoption of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The ERT noted that projections should include prescribed burning and wildfires in these forests. Between 1990 and 2010, under ‘with measures’ assumptions, emissions from land-use change and forestry are projected to fall by some 83 per cent, due to a fall in land-use change emissions of about 68 per cent, and an increase in forestry removals from afforestation and reforestation activities. The effect of measures in 2010 is estimated to account for a reduction of about 35 per cent below BAU in emissions due to land-use change, resulting from a bottom-up assessment by the DCC of the effect of legislation in Queensland and New South Wales. Removals due to forests accountable under Article 3, paragraph 3, of the Kyoto Protocol are disaggregated into softwood, hardwood and native plantings, and central, high and low scenarios are estimated based on observations covering the period 1990–2005. Total forest removals are estimated on the basis of the National Plantation Inventory (for plantations), and State and Territory estimates of areas of native forest. The ERT noted that total forest removals may be reviewed when remote sensing data become available, and that emission and removal estimates for land use and land-use change other than land clearing and forestry are not estimated. The projections used for Kyoto Protocol accounting purposes cover above and below ground biomass, deadwood, litter and soils; forestry accounting under the Convention currently covers all pools except soils.

## **B. Total effect of policies and measures**

68. The NC4 presents the estimated and expected total effects by sector of implemented and adopted PaMs in accordance with the ‘with measures’ definition, compared to a situation without such PaMs. The information is presented in terms of GHG emissions avoided or sequestered, by gas (on a CO<sub>2</sub> eq basis), see table 5. The ‘with measures’ projection diverges from the BAU projection in 1995 and the effect of measures is tabulated by sector in 2010 and 2020. The 2007 update shows ‘with measures’ and BAU projections, and hence the total estimated effect of PaMs graphically up until 2020, and in summary tabular form with detailed information in the supporting sectoral documentation.

**Table 5. Projected effects of implemented and adopted policies and measures in 2010**

	Effect of implemented and adopted measures (Tg CO <sub>2</sub> eq)	Relative value (% of base year emissions)
Energy (without transport, including fugitive emissions)	44.8	8.1
Transport	2.2	0.4
Industrial processes	9.2	1.7
Agriculture	0.6	0.1
Land-use change and forestry	18.0	3.3
Waste	9.0	1.6
Not sectorally allocated	1.1	0.2
<b>Total</b>	<b>84.9</b>	<b>15.3</b>

*Data source:* Australia's fourth national communication.

*Note:* The effect of implemented and adopted policies and measures is defined as the difference between the BAU and 'with measures' scenarios.

69. The ERT noted that the total effect of measures was calculated to allow for overlap between measures, and that overlap was assessed for each measure. The ERT agreed with this approach, but noted that the total effect of overlapping measures can often be assessed best by considering the measures together. Overlap may be a particular issue for Australia because of the combination of measures at Commonwealth level and at the level of the States and Territories. The ERT noted from additional information provided by Australia that the 2007 update resulted in some changes to the estimated effect of measures in 2010, and that a review of all the PaMs is currently under way.

### C. Projections summary

70. In summary, and noting that the LULUCF sector is under development, the ERT believes that the projections are fair and (taking into account some normalization necessitated by inventory updates) consistent with the emissions inventory, which is subject to separate review. The projections are a mixture of top-down and bottom-up estimates. This is a pragmatic response to the way in which the Australian economy can be expected to respond, not only to internal drivers, but also to global economic conditions. The response to the global economy is conditioned by global demand and also by domestic infrastructural constraints, and this is recognized in the modelling. The ERT noted that the approach to projections is consistent with the UNFCCC guidelines and suggested that use of a consistent set of drivers and a probabilistic approach to uncertainty assessment could be considered.

## V. Vulnerability assessment, climate change impacts and adaptation measures

71. In its NC4 and during the in-country visit, Australia has provided the required information on the expected impacts of climate change in the country and on adaptation options in many sectors and regions identified as vulnerable, as well as an outline of the action taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation. Table 6 summarizes the information on vulnerability and adaptation to climate change in Australia.

72. Australia's climate is changing and increasing temperatures, sea level rise, changing rainfall patterns and more frequent and extreme weather events are becoming more likely. Historical global changes have been mirrored in Australia where average temperatures have increased by about 0.7°C since 1910 (AGO, 2003). Precipitation in Western Australia and along Australia's east coast has declined steadily since the mid-20<sup>th</sup> century, whereas precipitation has increased in the north-west. The NC4 even reported that the south-west of Western Australia has already experienced a 15 per cent decrease in rainfall since the mid-1970s and that the general circulation models project further reductions in rainfall in the region, mainly in winter and spring, as well as an increase in temperature. The projections suggest that the majority of Australia may warm by 0.4–2.0 °C by 2030 and by up to 6 °C by 2070, with slightly less warming near the coast (this may result in more evaporation and hot days and fewer cold nights). There has also been an increase in extreme rainfall events throughout Australia, particularly during winter.

**Table 6. Summary of information on vulnerability and adaptation to climate change**

Vulnerable area	Examples/comments/adaptation measures reported
Agriculture and food security	<p><b>Vulnerability:</b> Reduction in production due to projected rises in temperature, decrease in rainfall, increase in extreme events</p> <p><b>Adaptation:</b> Changes in agricultural practices: improvement in the variety of cultivated crops and in farm management practices through provision of tools and incentives</p> <p><b>Specific projects/actions in place:</b> National Agriculture and Climate Change Action Plan: assist Australian primary industries to adapt and respond to climate change (over four years from July 2008), support and provide primary sectors with the tools and measures necessary for them to effectively adapt to climate change and prepare for an emissions trading scheme</p>
Biodiversity and natural ecosystems	<p><b>Vulnerability:</b> Changes in species diversity, distribution, size, behaviour and abundance, interactions between species and threats to biodiversity (e.g. arrival of new species), loss of habitat</p> <p><b>Adaptation:</b> Landscape and habitat protection, triage, management of bush fires, measures to prevent invasions of alien species and habitat loss, improved management of targeted species</p> <p><b>Specific projects/actions in place:</b> Australia's National Biodiversity and Climate Change Action Plan developed in 2004 and to be reviewed once its Australia national biodiversity strategy is revised in early 2009</p>
Coastal zones	<p><b>Vulnerability:</b> Inundation from changed wave conditions, ecosystem vulnerable to sea level rise and increase in sea surface temperatures, changes in frequency, intensity of storms and cyclones, impacts on oil and gas infrastructures, impacts on river system dynamics and management practices, impacts on fisheries and communities, increased erosion, destruction of infrastructures</p> <p><b>Adaptation:</b> Planning and management for coastal zones, flood defence measures, measures to improve water quality and reduce other pressures</p> <p><b>Specific projects/actions in place:</b> National Coastal Vulnerability Assessment to Climate Change: development of a nationally consistent classification of geomorphology around Australia and creation of a line containing a range of attributes that is accessible through geographic information systems to allow the rapid identification of the segments of the shoreline that are susceptible to erosion or slumping; provision of all levels of government with access to elevation mapping appropriate to the scale of assessment</p>
Human health	<p><b>Vulnerability:</b> Mortality and morbidity rise in hot weather, changes in disease patterns, spread of vectors</p> <p><b>Adaptation:</b> Improve alert systems for detecting outbreaks of vector-borne diseases; educate residents about disease risks, precautions and symptoms, control of disease vectors including elimination of breeding sites of disease vectors</p> <p><b>Specific projects/actions in place:</b> The Australian Government's National Incident Room is in place to manage emerging infectious diseases and functions as a national coordination centre for disease outbreaks</p>
Water resources, water supply	<p><b>Vulnerability:</b> Significant reduction in water availability, decrease or increase in stream flow depending on the region due to decline or increase in rainfall; water shortages. Water resources would be affected in terms of quantity and quality</p> <p><b>Adaptation:</b> Increase the efficiency and productivity of water use, address previous over-allocation, set sustainable limits on water extraction, diversify water sources, improve institutional and government decision-making processes</p> <p><b>Specific projects/actions in place:</b> National Water Initiative (2004) including "improve security of access to water for production and for the environment"; National Plan for Water Security (2007) comprising, for example, "funds for upgrading irrigation infrastructure and buying back over-allocated water"; future steps (2008) include "further strengthen water markets", "integrated management of water"</p>
Buildings	<p><b>Vulnerability:</b> Changes in building heating/cooling costs, increased risk of damage from bushfires, changes in the frequency of wind, rain, hail, flood, storm events and damage potentially resulting in cyclone damage and destruction due to changes in wind intensity, higher rates of building deterioration and associated maintenance costs</p> <p><b>Adaptation:</b> Management of infrastructures with a lifetime greater than 50 years, design for staged construction to allow future climate change to be taken into account, implementation of dune restoration programmes as appropriate</p> <p><b>Specific projects/actions in place:</b> Adjustment of building standards and practices in response to likely climate change impacts, especially in areas highly vulnerable to climate change</p>

Sources: NC4, presentations and documentation provided to the ERT during the in-country visit.

73. Many Australian sectors and systems are highly vulnerable to climate change. In the NC4, Australia reported that it uses a risk management framework whose components include exposure, sensitivity, adaptive capacity, adverse implications and potential benefits to identify the priority sectors and regions. As a result, Australia has identified agriculture, biodiversity, buildings and settlements, water supply and energy as priority sectors and areas requiring urgent attention, and the regions of Cairns and the Great Barrier Reef, the Murray-Darling Basin and the south-west of Western Australia as high priority regions with respect to vulnerability and adaptation. Tourism, health, fisheries and forestry also require some attention. However, Australia reported in its NC4 that research into the impacts of climate change and adaptation options on identified sectors and regions was still at an early stage. For example, some impacts of climate change on water supply are described, but it is not clear in the NC4 what the expected impacts are and what concrete actions are taken with regard to adaptation in agriculture (which is important to the economy of Australia), biodiversity, and the energy sector.

74. During the in-country visit, Australia provided a large amount of new information and additional documentation with regard to current and future activities on climate change vulnerability and adaptation. The ERT was able to see that many new research studies have been conducted covering climate change modelling and analysis of climate change impacts. Climate change scenarios have also been formulated, which have become a basis for vulnerability assessment and long-term policy response. The Government of Australia already provides information and tools to help communities (for example, farmers) to change their practices. But further action on adaptation in many sectors and regions is required and the research provides a basis for the formulation and implementation of such action.

75. As noted already in this report, the overall climate change policy of Australia is framed along three pillars: reducing Australia's GHG emissions, helping to shape a global solution, and adapting to the unavoidable impacts of climate change. The fact that adaptation is one of the pillars shows the importance which the Government attaches to adaptation. The ERT was impressed by the involvement of the Australian Government in adaptation issues and by the functioning of the coordination mechanism led by the COAG<sup>4</sup> to accelerate the implementation of the National Climate Change Adaptation Framework (NCCAF) adopted in 2007, which sets the direction for government action on adaptation from 2007 to 2012 and aims at building understanding and adaptive capacity, and at reducing sectoral and regional vulnerability. Key elements of the NCCAF include the National Climate Change Action Plans for vulnerable sectors and regions such as the Great Barrier Reef Climate Change Action Plan, the National Biodiversity and Climate Change Action Plan, the National Water Initiative (2004) and the National Plan for Water Security (2007). The ERT appreciates that Australia takes adaptation to climate change seriously and allocates sufficient resources, both human and financial, to address vulnerability and adaptation.

76. Australia is integrating climate change considerations into its aid programme with a particular focus on the Pacific, by delivering climate change projects and supporting the climate change-related activities of global and regional organizations. These projects include the Vulnerability and Adaptation Initiative and the Kiribati Adaptation Project. Australia will strengthen climate change adaptation efforts through its International Climate Change Adaptation Initiative, which is discussed in more detail below.

77. Given the great number of adaptation activities being implemented, the ERT recommends that Australia provide more information in its next national communication on institutional arrangements and coordination mechanisms in place to address adaptation to climate change.

## **VI. Financial resources and transfer of technology**

78. In its NC4, Australia describes the measures taken to give effect to its commitments under Article 4, paragraphs 3, 4 and 5, of the Convention; this information was updated and considerably extended during the in-country visit. The information reported in the NC4 is brief, but it covers all issues on which information is required under the Convention.

### **A. Financial resources**

79. Australia has been supporting activities relating to climate change through multilateral channels including the Global Environment Facility (GEF), the World Bank, United Nations agencies, and other organizations. It has also provided financial assistance to multiple regional institutions such as the Asia-Pacific Network on Climate Change, and has devoted financial resources to climate change projects under bilateral climate change partnerships with countries such as China and South Africa. The NC4 indicated that AUD 184 million have been provided to the GEF pursuant to Article 4, paragraph 3, of the Convention; of this amount, AUD 68 million have been provided in new and additional funding after the NC3 submission in 2002. Since the NC4, further new and additional financial resources have been

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<sup>4</sup> The Council of Australian Governments (COAG) includes representatives of the national (Commonwealth) government as well as representatives of State and Territory Governments.

provided to the GEF, including AUD 59.8 million to the fourth replenishment of the GEF in 2006. These funds bring the total amounts provided to the GEF to AUD 244 million since its inception in 1991, and AUD 128 million in new and additional funding after the NC3 submission in 2002.

80. Australia reported tables 3, 4, 5 and 6 of the UNFCCC reporting guidelines as tables 7.1, 7.2, 7.3 and 7.4 of the NC4. The reporting covers the years 1996/97 to 2003/04 and, as was clarified during the review, the information in table 4 of the UNFCCC reporting guidelines (table 7.2 of the NC4) refers to total national contributions and not only to climate change activities. Table 7 below summarizes information on financial resources provided by Australia.

81. The Australian Government will invest AUD 150 million over three years through its International Climate Change Adaptation Initiative, with AUD 35 million in 2008–2009 to meet high priority climate adaptation needs in vulnerable countries in the region. The primary geographic emphasis of the programme will be Australia's neighbouring island countries, but targeted policy and technical assistance will also be available to other countries. The assistance aims to support these countries in their efforts for a better understanding of, and to reduce their vulnerability to, climate change through long-term sea level data collection, climate monitoring, vulnerability studies, institutional strengthening, capacity-building and technology transfer. Another example is Australia's International Forest Carbon Initiative (with a focus on cooperation with Indonesia and Papua New Guinea), under which AUD 200 million have been allocated for an effort to demonstrate that reducing emissions from deforestation can be part of an effective international response to climate change.

**Table 7. Summary information on financial resources**

Official development assistance (ODA)	AUD 1,973.1 million in 2003/04; AUD 2,198.1 million in 2004/05; AUD 3,155.3 million (estimated) in 2007/08
CDM under the Kyoto Protocol	AUD 2.9 million for the national strategy studies, designed to enhance understanding of the clean development mechanism under the Kyoto Protocol
Climate-related support programmes	Australia supports multilateral, bilateral and regional climate-related programmes and projects
Contributions to the GEF	Since 1991, AUD 184 million, including AUD 68.2 million for the third GEF replenishment (for the 2003–2006 period)
Pledge for the fourth GEF replenishment	AUD 59.8 million (for the 2006–2010 period) bringing the total contribution to the GEF of AUD 244 million
Contribution to United Nations entities	AUD 2.3 million, from year 1996/97 to year 2003/04
Funding agencies	Australian Agency for International Development (AusAID); Department of Climate Change; Department of Resources, Energy and Tourism
Other (bilateral/multilateral)	Australia supports multilateral assistance and overseas aid programmes (both bilateral and regional). For overseas aid programme, since 1996/97, the Australian Agency for International Development has invested AUD 279 million and new and additional AUD 119 million from the third national communication

*Abbreviations:* CDM = clean development mechanism, GEF = Global Environment Facility, JI = joint implementation; AUD = Australian dollar.

82. The ERT noted that climate-related funding is now available from three agencies: the Australian Agency for International Development, the Department of Climate Change and the Department of Resources, Energy and Tourism. These agencies provide assistance within their areas of responsibility and cooperate closely to ensure that funding is provided efficiently and without duplication.

83. As possible reporting improvements, the ERT suggests that for its next national communication Australia:

- (a) Include information on the different funding agencies and the specific scope of each of them;
- (b) Add tables listing the activities supported per funding agency and per year.

## **B. Transfer of technology**

84. In its NC4, Australia has provided details of measures taken by the public sector to promote, facilitate and finance the transfer of technology, and to support the development and enhancement of endogenous capacities and the environmentally sound technologies of developing countries. These measures mostly relate to the transfer of environmentally sound technology (relating to renewable energy and pollution control); in addition, Australia has described actions for assisting the developing countries in the region to improve governance and capacity-building with respect to environmental issues, including energy efficiency and climate change. The ERT noted that technology transfer activities are well structured, with an overall focus on “win-win” solutions as a means to make projects efficient and sustainable.

85. The transfer of technology is pursued by means of international technology agreements,<sup>5</sup> the work of the Australia/China Joint Coordination Group on clean coal technology, the work of the Asia-Pacific Partnership on Clean Development and Climate, and projects and programmes of the Australian Centre for International Agricultural Research. The Asia-Pacific Partnership, which comprises Australia, Canada, China, India, Japan, the Republic of Korea and the United States of America, was launched to facilitate the development, deployment and transfer of cleaner and more efficient technologies to enable deep cuts in global GHG emissions. This partnership has become a key element of Australian efforts to support technology development and transfer. Australia has invested AUD 100 million in the Asia-Pacific Partnership over a period of five years, and these funds are now fully allocated to a total of 64 projects.

86. The ERT noted that Australia’s NC4 does not contain detailed information on the criteria for project selection and on success or failure stories in technology transfer projects, although the ERT recognizes the difficulties faced by Parties in obtaining reliable information on outcomes, especially because an uptake of a clean technology is unpredictable and can take many years. During the review, the ERT was informed that projects are selected to fit the local or national circumstances of the recipient developing countries and that follow-up of the projects and programmes is provided.

87. The ERT encourages Australia to include in its next communication, to the extent feasible, information on the involvement of the private sector in the transfer of technology, for the purposes of improving clarity and transparency; it also suggests that Australia provide information on the criteria (technical, economic and environmental) applied for the selection of technology transfer projects, information on the follow-up of these projects, and, where feasible, on success and failure stories, using table 6 from the UNFCCC reporting guidelines.

## **VII. Research and systematic observation**

88. The NC4 provides information on Australia’s actions relating to research and systematic observation. This addresses both domestic and international activities. The latter include activities undertaken by the Intergovernmental Panel on Climate Change (IPCC), the World Climate Programme, the International Geosphere-Biosphere Programme, the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), the Global Terrestrial Observing System, the Global Atmosphere Watch, and the Global Earth Observation System of Systems. Australia’s contribution includes the provision of information from observations, membership of international coordinating bodies, the development and construction of satellite hardware, and the provision of ground stations for the reception of satellite data and satellite orbit determination. The NC4 also reflects action taken to

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<sup>5</sup> The key partnerships are Methane to Markets, the Carbon Sequestration Leadership Forum, the International Partnership for the Hydrogen Economy, the Renewable Energy and Energy Efficiency Partnership, and the technology agreements of the International Energy Agency. Participants are both developed and developing countries.

support related capacity-building in developing countries. Australia provides summary information on its GCOS activities.

89. Australia provides information about the framework in which research and systematic observation is conducted. The general policy is described, as are some institutional arrangements and the distribution of responsibilities. The Party also provides information on funding of research and systematic observation. The information reported is sufficient to conclude that Australia has implemented a large number of activities and put a great deal of effort into the national and global climate observing system. It addresses different plans implemented at national level (such as the Australian Climate Change Science Programme, which is the key element in climate change research) and the involvement of Australia in international collaboration in systematic observation, including meteorological and atmospheric, oceanographic, terrestrial and space-based observations.

90. Several organizations contribute to research on, and the systematic observation of, the climate in Australia, including the Australian Antarctic Division, the Australian Bureau of Meteorology, the Australian Ocean Data Centre, CSIRO, the National Tidal Facility, universities and other federal, State and private organizations. The Bureau of Meteorology maintains relations with international networks such as GCOS and GOOS by providing the focal point and secretariat for Australia, and is responsible for meteorological, terrestrial and space-based observations. CSIRO, which is Australia's major national research agency, is involved in various climate research activities, such as climate science and the mitigation of, and adaptation to, climate change.

91. Australia has an impressive history in terms of research and has engaged actively in climate change science since the mid-20<sup>th</sup> century. Australia has made praiseworthy efforts in research on physical and biogeochemical climate processes, the relationship between the ENSO and Australian rainfall, ocean carbon storage, improved climate modelling systems, and techniques which can help to identify weather fronts which are likely to lead to extreme rainfall, in order to understand regional and local weather and climate, as well as key drivers of climate change in the country. Australia has put a great deal of effort into conducting research on regional climate change projections, climate variability and extreme events both nationally and through international collaboration. The results of such efforts are reflected in thorough scientific reports<sup>6</sup> and in the presentation on the Australian Climate Change Science Program given during the in-country visit. The ERT also noted that substantial research has also been conducted into vulnerability and adaptation with regard to all vulnerable sectors in Australia.<sup>7</sup>

92. Moreover, the Australian Government has spent a considerable amount of money on research into renewable energy and low emission technology development, and into energy in general (research conducted by CSIRO), with a view to reducing GHG emissions to half of the 1990 level by 2050 and doubling the efficiency of the nation's new energy generation, supply and end use.

93. Based on the information provided, the ERT believes that Australia is well advanced in research and systematic observation and plays an important role at international level.

94. Several plans, programmes and activities are implemented to maintain and operate ground- and space-based climate observing systems. These include the in-situ observing networks and the space-based observing systems which provide real-time data for weather prediction and forecasting, and continuous measurements over long periods of time on climate-related information.

95. Australia has provided successful support to developing countries in the Asia-Pacific region where the state of climate observational networks and systems is poor. The support concerns many areas, such as the provision of technical advice and assistance to improve climate data management and

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<sup>6</sup> Such as Neville Nicholl. 2008. *Australian Climate and Weather Extremes: Past, Present and Future*. See also the list of references in the annex.

<sup>7</sup> See, for example, Voice, M., Harvey, N. and Walsh, K. (Editors), 2006; DCC, 2008l and AGO, 2007c (references are provided in the annex).

monitoring capabilities, building awareness of the importance of climate observation, and the implementation of activities to reduce deficiencies in climate observation networks and systems.

96. The ERT would have appreciated more detail on the organization of research, given the large number of ongoing activities and the relatively complex system of research coordination. During the in-country visit, Australia explained the existing research coordination mechanism and future actions which are planned in order to strengthen coordination. The ERT recommends that Australia include more on research and systematic observation in its fifth national communication, especially with respect to institutional arrangements and national and international cooperation of research activities.

### **VIII. Education, training and public awareness**

97. In its NC4, Australia has provided information on its actions relating to education at different levels and on professional training and public awareness, as required by the UNFCCC reporting guidelines. The ERT noted that the text of the relevant NC4 chapter is brief, but allows a clear understanding of the main issues.

98. As reported in the NC4, educational activities relating to climate change are based on the National Action Plan for Environmental Education, set up in 2000. The key organizational elements established to implement this plan are the National Environmental Education Council, the National Environmental Education Network and the Australian Research Institute in Education for Sustainability within Macquarie University. These organizations have been active in education and public awareness with regard to climate change, and many projects have been implemented addressing either energy efficiency (such as the Solar Cities programme) or GHG emissions (such as the Local Greenhouse Action project), or both (such as the One Stop Green Shop).

99. The Australian Sustainable Schools Initiative (AuSSI) is a key programme which incorporates the climate change issue, as part of sustainability issues, into formal primary and secondary education in the country. Under this programme, schools define and undertake measures to improve environmental sustainability which result in measurable reductions in waste generated, in water and energy used, in benefits to biodiversity and in improved water quality. AuSSI is a learning-through-action programme and uses a whole-of-school approach; it has resulted in notable environmental, economic, educational and social outcomes. The Australian Government devoted AUD 2 million to the first four years of AuSSI, and these funds were complemented by contributions from State and Territory Governments. The NC4 also includes information on materials developed for use in the schools as part of education about the environment, such as TravelSmart Australia and the Resource Book on Energy, and information on other school programmes, such as the Solar in Schools Initiative.

100. During the review, the ERT received information on the development of a new action plan – the National Action Plan for Education for Sustainable Development which will allow the incorporation of climate change issues into the curricular requirement of various courses.

101. The NC4 provides information on tertiary and university education activities, which are mainly oriented to professional training and extracurricular activities, such as the Green Step Programme, Australasian Campuses Towards Sustainability, and the Research Institute for Sustainable Energy.

102. The DCC designs and implements public-awareness-raising activities, including telephone hotlines and information on websites. In 2007, a one-month Climate Clever Campaign was organized which, according to the evaluation, was very successful in terms of the outreach and effect.<sup>8</sup> One important issue of this campaign was the follow-up procedure applied, which allowed those conducting the campaign to detect how well the public had reacted to it.

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<sup>8</sup> For example, one in three respondents saw the campaign on television, and many respondents indicated that the campaign made them more aware of energy use and climate change.

103. The NC4 provides some information on the actions implemented by NGOs in order to raise public awareness and understanding of the problem of climate change through research, lobbying, education and training, and media activities. The ERT met business and environmental NGOs during the in-country visit and noted that NGOs were supportive of the efforts of the new Government to deal with climate change issues. Environmental NGOs stated that there had been a major improvement in their relationship with the Government in recent months. Representatives of business NGOs noted that they recognized climate change as an important factor for business and considered it important to continue dialogue with the Government, from the industries' perspective, on climate change policy.

104. The ERT also met representatives of regional (State/Territory) authorities and noted a large number of climate-related actions implemented in the regions. All regions have policies addressing climate change, either directly (such as the greenhouse plan of New South Wales) or indirectly (such as targets for renewable energy and cogeneration in Western Australia). Regions have also been active in promoting public awareness of climate change, supporting nationwide programmes such as the AuSSI, and implementing their own actions, in particular with respect to energy use and the integration of climate change issues into primary and secondary education (for which the responsibility lies with States and Territories).

105. The ERT suggests that Australia may consider further actions to increase public awareness on climate change, such as expanding the AuSSI, increasing cooperation with local, State and Territory stakeholders, and strengthening relationships with environmental and business NGOs in order to increase the overall effectiveness of related activities.

## **IX. Conclusions**

106. Australia's GHG emissions for 2005 were estimated to be 27.1 per cent above its 1990 level excluding LULUCF, and 7.5 per cent above including LULUCF. GDP grew by 67.2 per cent over the same period. The greatest changes in emissions in the 1990–2005 period occurred for the energy sector (+38.0 per cent) and LULUCF (–74.9 per cent). Emission increases were driven by strong economic and population growth, extensive use of road transport and continued reliance on fossil fuels for primary energy supply; these factors outweighed improvements in the efficiency of energy supply and use. Net GHG emissions from LULUCF decreased primarily because of the decreased deforestation and increased CO<sub>2</sub> removal from land converted to forest; this helped to offset a large part of emission growth in other sectors. The current portfolio of policies, which is a complex combination of actions at Commonwealth, State and Territory level, is estimated to have reduced emissions in 2005 by about 5.5 per cent.

107. Australia became a Party to the Kyoto Protocol in March 2008 and expects, on the basis of current policies and projections in place, to meet its commitment for the first commitment period. Following a change in government in November 2007, a new climate strategy has been announced. This is based on three pillars: mitigation, adaptation, and international engagement. Extensive discussions with Australian experts during the in-country visit, complemented by a large number of additional documents provided by Australia, helped the ERT to understand the changes since the submission of the NC4 in December 2005. The ERT noted with interest that Australian climate change policy is undergoing a profound transition with a long-term target of reducing emissions by 60 per cent below 2000 levels by 2050, and important initiatives (involving COAG, the Wilkins Review, and the Garnaut Review) are in place to ensure rational, comprehensive coverage of policies, to introduce emissions trading, and to provide a long-term framework for policy development, with the possibility of going beyond the 60 per cent target. However, there is currently no commitment by the Government to go beyond 60 per cent. These are very significant developments, especially for an open, export-led economy with historically high fossil fuel dependence, and it will be important to use future national communications to share the experiences and lessons learned with other Parties and other stakeholders in the international climate change process.

108. According to the revised GHG projections provided to the ERT during the review, by 2010 Australian GHG emissions, calculated under the Kyoto Protocol accounting rules, would be about 8 per cent above the 1990 level, which corresponds to the Australian target under the Kyoto Protocol. Further growth in GHG emissions from the energy sector is projected, driven by continued strong economic and population growth; this growth will be alleviated considerably by the decreasing emissions from deforestation, supported by policy measures at Commonwealth, State and Territory level. The ERT noted that current policy developments in Australia (such as the identification of a medium-term emissions trajectory consistent with Australia's 2050 reduction target and the introduction of an ETS) are likely to result in another revision of GHG projections in the near future.

109. Australia has been supporting international activities relating to climate change and transfer of technology through multilateral channels, multiple regional institutions and programmes, and bilateral agreements and partnerships; Australia's assistance to Parties that are particularly vulnerable to the adverse effects of climate change is focused on the South Pacific small island developing States. The Asia-Pacific Partnership is a key element of Australian efforts to support technology development and transfer.

110. Australia's climate is changing and increasing temperatures, sea level rise, changing rainfall patterns and more frequent and extreme weather events are becoming more likely. Agriculture, biodiversity, buildings and settlements, water supply and energy are priority sectors and areas requiring urgent attention, and the regions of Cairns and the Great Barrier Reef, the Murray-Darling Basin and the south-west of Western Australia are high priority regions with respect to vulnerability and adaptation. Research has provided a basis for further action on adaptation in many sectors and regions.

111. Australia has put a great deal of effort into research on regional climate change projections, climate variability and extreme events, renewable energy and low-emission-technology development, and into energy research in general. The ERT believes that Australia is well advanced in climate-related research and systematic observation of climate and also plays an important role in international research.

112. In its NC4, Australia has provided information on its actions relating to education, training and public awareness. During the in-country visit, the ERT received a large amount of additional information on these topics, and met representatives of environmental and business NGOs, as well as representatives of State and Territory authorities. All this helped the ERT to understand the multiple and diverse actions to increase public awareness on climate change that are undertaken in Australia at all levels.

113. In summary, the ERT found the NC4, supplemented by the 2007 recent projections update, to be generally transparent, concise, consistent with the UNFCCC reporting guidelines and well supported by background material. For improving clarity and transparency, the ERT has the following recommendations for consideration by Australia when preparing future communications:

- Priority should, to the extent possible, be given to PaMs which have the most significant impact on GHG emissions and removals;
- Notwithstanding the excellent summary tables in the NC4, there should be more systematic information, as required by the UNFCCC reporting guidelines, on the type or types of policy or measure, the status of implementation of policies, planned policies, and PaMs that may lead to greater level of emissions, and on measures no longer in place;
- For future projections, an approach which specifies a consistent set of drivers plus ranges could potentially be considered;
- Projections in the LULUCF sector, available for activities under Article 3, paragraph 3, of the Kyoto Protocol and managed forests, should include prescribed burning and wildfires in these forests;

- Given the impressive range of activities under way, it would be useful to provide more information on measures to adapt to climate change including on institutional arrangements and coordination mechanisms;
- Australia should consider providing information on the different funding agencies and the specific scope of each of these, and adding tables listing the activities supported per funding agency and per year;
- There should be more detailed information on the range of research and systematic observation activities in the fifth national communication, especially with respect to institutional arrangements and national and international cooperation of research activities.

Annex

**Documents and information used during the review**

**A. Reference documents**

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications”. FCCC/SBSTA/1999/7. Available at <<http://unfccc.int/resource/docs/cop5/07.pdf>>.

“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol”. Decision 15/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>>.

“Guidelines for review under Article 8 of the Kyoto Protocol” Decision 22/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>>.

FCCC/IDR.3/AUS. Report on the in-depth review of the third national communication of Australia. Available at <<http://unfccc.int/resource/docs/2005/idr/eng/aus03.pdf>>.

FCCC/ARR/2007/AUS. Report of the individual review of the greenhouse gas inventory of Australia submitted in the year 2006. Available at <<http://unfccc.int/resource/docs/2007/arr/aus.pdf>>.

Fourth national communication of Australia. Available at <<http://unfccc.int/resource/docs/natc/ausnc4.pdf>>.

2007 GHG inventory submission of Australia. Available at <[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/3929.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/3929.php)>.

**B. Additional information provided by the Party**

Responses to questions during the review were received from Ms. Janet Wheeler of the Department of Climate Change. In addition to written answers to questions of the expert review team (ERT), a large amount of additional documentation was provided by Australia during the review, as listed; the list is structured by review topics.<sup>1</sup>

1. Policies and measures

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<sup>1</sup> This list does not include the presentations made by Australian experts during the in-country visit and Australia’s written answers to ERT questions. Only the major documents are listed.

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