Likely impacts of greenhouse gas emissions from the Alpha Coal Mine

Expert Report to the Land Court by Professor David J. Karoly
School of Earth Sciences, University of Melbourne, VIC 3010

Summary

Greenhouse gas emissions from burning fossil fuels have caused most of the observed increase in global-average temperature over the last fifty years and will lead to even greater climate change during the remainder of this century, with many adverse impacts on human and natural systems. The cumulative emissions of carbon dioxide from an activity are critical to determining the change in global-average temperature and the magnitude of the associated impacts. The greenhouse gas emissions from the proposed Alpha Coal Mine and from burning the coal extracted from this mine will be a significant partial contributor to the future impacts of climate change in Queensland, including sea level rise, ocean acidification, and increases in heat waves, with associated loss of life, damage to infrastructure and loss of biodiversity, particularly on the Great Barrier Reef.

Author's Expertise

1. I am a Professor of Atmospheric Science in the School of Earth Sciences and the Australian research Council Centre of Excellence for Climate System Science at the University of Melbourne. I have a Bachelor of Science (Honours) degree in applied mathematics from Monash University and a Ph.D. in meteorology from the University of Reading, England. I am a Fellow of the American Meteorological Society and a Fellow of the Australian Meteorological and Oceanographic Society. I am a member of the Science Advisory Panel to the Australian Government's Climate Commission and a member of the Climate Change Authority, an independent statutory body established to provide advice to the Australian government on climate change and greenhouse gas emission reductions. I have more than thirty years of experience in studying climate variability and climate change, with expertise in identifying the causes of recent observed climate change, and its impacts. My experience includes being Co-Coordinating Lead Author of the chapter on "Detection of Climate Change and Attribution of its Causes" in the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2001. In addition, I was a Lead Author on the chapter "Assessment of observed changes and responses in natural and managed systems" in the Fourth Assessment Report of the IPCC in 2007. My summary curriculum vitae is attached as Appendix A.

Instructions and Purpose of Report

2. I am responding to a request from the Environment Defenders Office (Qld) Inc (EDO) to provide my expert opinion in relation to climate change issues associated with the proposed Alpha Coal Mine development in Queensland. The EDO is acting for Coast and Country Association of Queensland Inc. (CCAQ) in the Queensland Land Court proceedings MRA082-13 & EPA083-13 Objection to Mining lease and Environmental Authority for Alpha Coal Mine.

3. My instructions, received in a letter from the EDO dated 18 April 2013, were:

   "2.1 You are instructed to review this letter and the EIS Documents provided in your brief of documents.

2.2 Once you have, please prepare a report which addresses the following questions:
   a) What contribution, if any, will the proposed mine project make to climate change?
   b) Is it possible to attribute the consequences of any particular activity to the phenomenon of climate change? If so, how?
   c) Is it possible to identify any likely consequences of climate change globally, nationally and/or for Queensland? If so how are they to be identified and what are they?

2.3 In addressing these questions you should be careful to explain what you mean (or how you define) the notion of climate change and how you say it occurs. You should also explain the causes of climate change and any contributing factors to the process of climate change.

2.4 You are also instructed to review the following documents from the case of *Xstrata Coal Queensland Pty Ltd & Ors v. Friends of the Earth - Brisbane Co-Op Ltd & Ors, and Department of Environment and Resource Management [2012] QLC 013*:
   a) The final judgment of the Land Court, in particular the factual findings made by the Court at paragraphs [551] and [552];
   b) The closing submissions of Xstrata, in particular paragraphs [28] to [34];
   c) The report of Professor Ian Lowe to the Queensland Land Court;
   d) The report of Dr Malte Meinshausen to the Queensland Land Court;
   e) The report of Professor Ove Hoegh-Guldberg to the Queensland Land Court;
   f) The transcript of the cross examination of Professor Ian Lowe and Dr Meinshausen;

2.5 Once you have reviewed this material you are asked to address the following questions:
   a) Do you agree with the Court's finding at paragraph 551 that the attribution of environmental consequence to any specific project would be speculative and unscientific?
   b) Are you familiar with the work of Dr Meinshausen?
   c) Do you agree with the Court's findings that, owing to the concession made by Professor Lowe, the work of Dr Meinshausen should be rejected?"

4. In preparing my statement, I have considered the following documents:

(1) Initial Advice Statement to the Coordinator General (Application) (18/09/2008)
(2) Final Terms of Reference for EIS (01/06/2009)
(3) EIS Volume 1 (20/12/2010)
    Section 00 Executive Summary
    Section 01 Introduction
    Section 02 Description of the Project
(4) EIS Volume 2 (20/12/2010)
    Section 01 Introduction
    Section 02 Description of the Project

The following EIS documents, which are relevant to climate change:

(1) EIS Volume 6 Appendix C Climate and Climate Change and GHG (20/12/2010);
(2) EIS Volume 2 Section 14 GHG & Climate Change (20/12/2010);

(3) EIS Volume 3 Section 14 Greenhouse Gas Emissions (20/12/2010); and
(4) EIS Volume 2 Appendix Q Coal Mine Greenhouse Gas (20/12/2010).

The following documents from the case of *Xstrata Coal Queensland Pty Ltd & Ors v. Friends of the Earth - Brisbane Co-Op Ltd & Ors, and Department of Environment and Resource Management [2012] QLC 013*:

(1) The report of Professor Ian Lowe to the Queensland Land Court;
(2) The report of Dr Malte Meinshausen to the Queensland Land Court;
(3) The report of Professor Ove Hoegh-Guldberg to the Queensland Land Court;
(4) The transcript of the cross examination of Professor Ian Lowe and Dr Meinshausen;
(5) The closing submissions of Xstrata; and
(6) The final judgment of the Land Court.

The Expert Report to the Land Court by Dr Chris Taylor (30/5/2013)

5. I acknowledge that I have been instructed on an expert's duty in accordance with rule 426 of the *Uniform Civil Procedure Rules 1999* governing experts in the Land Court and having understood and discharged that duty. No instructions were given or accepted to adopt, or reject, any particular opinion in preparing my report.

Evidence

6. This statement addresses the connection between human-related emissions of greenhouse gases into the atmosphere, the associated global climate change observed over the last century and projected future climate change, and some of the impacts of human-caused climate change. A peer-reviewed book chapter on this topic written by me was published in 2009[i]. This statement provides an updated assessment on relevant scientific studies and describes the causal link between greenhouse gas emissions from the proposed Alpha Coal Mine and from the coal extracted from the mine and some likely future impacts from those emissions, particularly in Queensland.

Climate change and its impacts

7. Comprehensive assessments of climate change are prepared by the Intergovernmental Panel on Climate Change (IPCC), an independent agency established in 1988 by the World Meteorological Organization and the UN Environment Program. These objective assessments consider the latest scientific, technical and socio-economic literature produced worldwide relevant to the risk of human-induced climate change, its observed and projected impacts, and options for adaptation and mitigation.

8. The Fourth Assessment Report of the IPCC was written by hundreds of scientists, reviewed by thousands of scientists and more than a hundred governments, then approved unanimously by all the governments and released in 2007. This four volume assessment is available from the IPCC web site www.ipcc.ch. The next assessment report from the IPCC is not due to be completed until 2014. The IPCC Working Group I volume on the science of climate change[ii] was the internationally accepted assessment in 2007. Independent assessments by the Australian Academy of Science, the US National Academy of Sciences and the US Climate Change Science Program reached the same conclusions as the IPCC.

9. The Synthesis Report from the IPCC Fourth Assessment Report summarises the basic science of climate change. I agree with, and rely on, that basic science and I don't expect the basic science to be in dispute so will not elaborate on further in this report but can do so for the Court at trial if required[iii].

10. The IPCC conclusions on climate change science in 2007 were[ii]:

    - "Warming of the climate system is unequivocal";
    - "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations";
    - "The best estimate of the increase in global average surface temperature in the 2090s relative to the 1990s for a high emission scenario is 4.0°C (likely range is 2.4°C to 6.4°C)";
    - "Anthropogenic warming and sea level rise would continue for centuries due to the time scales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized".

    It is appropriate to consider a high emission scenario for future climate change as global greenhouse gas emissions since 1990 have been at or above the highest emission scenario considered by the IPCC[v].

11. The IPCC conclusions in 2007 on the impacts of climate change from the Synthesis report were[iii]:

    - "Anthropogenic warming over the last three decades has likely had a discernible influence at the global scale on observed changes in many physical and biological systems"
    - "Some systems, sectors and regions are *likely* to be especially affected by climate change"
    - "Some people (such as the poor, young children and the elderly) can be particularly at risk"

12. Specific impacts of climate change in Australia noted by the IPCC in 2007 include[iii]:

    - "By 2020, significant loss of biodiversity is projected to occur in some ecologically rich sites, including the Great Barrier Reef and Queensland Wet Tropics."
    - "By 2030, water security problems are projected to intensify in southern and eastern Australia"
    - "By 2030, production from agriculture and forestry is projected to decline over much of southern and eastern Australia due to increased drought and fire."

13. In 2011, the Climate Commission, established as an independent body by the Australian Government, released its report *The Critical Decade*[iv] on climate science, risks and

responses for Australia. The key messages from that report are:

- "There is no doubt that the climate is changing. The evidence is overwhelming and clear."
- "We are already seeing the social, economic and environmental impacts of a changing climate."
- "It is beyond reasonable doubt that human activities – the burning of fossil fuels and deforestation – are triggering the changes we are witnessing in the global climate."
- "This is the critical decade. Decisions we make from now to 2020 will determine the severity of climate change our children and grandchildren experience."

14. The Climate Commission in June 2013 released a report *Critical Decade 2013* providing a comprehensive update on climate change science, risks and responses[v]. Key conclusions for impacts in Queensland are "a decline in environmental values including the Wet Tropics and Great Barrier Reef" and "nationally, the combined value of commercial, light industrial, transport and residential buildings at risk from a sea-level rise of 1.1 m is approximately $226 billion (2008 replacement value)".

15. One of the systems likely to be most affected by climate change is low-lying coastal areas, due to the threat of sea level rise and increased risk from extreme weather events[iii]. A comprehensive assessment of climate change risks to Australia's coasts was prepared by the Department of Climate Change in 2009[vi]. Key findings for Queensland were that:

    - "Between 35,900 and 56,900 residential buildings in Queensland may be at risk of inundation from a sea-level rise of 1.1 metres, the second highest number for any state in Australia."
    - "The current replacement value of the residential buildings at risk is between $10.5 billion and $16 billion." (2008 dollars)

16. Other climate change impacts in Queensland affecting human and natural systems[v] are summarised in the figure on the next page and include:

    - The number of heat-related deaths is expected to increase significantly throughout the 21st century
    - Tropical cyclones are likely to become more intense but are not likely to increase in number
    - The geographic region suitable for the transmission of dengue fever is expected to expand southwards along the Queensland coast and into northern New South Wales over this century
    - Plants and animals in the high altitude areas of the Wet Tropics are especially vulnerable to climate change with this particular environment likely to disappear by 2070

QUEENSLAND

Population: 4,584,600
Capital: Brisbane
Area: 1,730,648 km²

Tropical cyclones are likely to become more intense but are not likely to increase in number (IPCC, 2012).

Many Torres Strait Islands are already vulnerable to flooding, but rising sea levels will worsen this risk. Sea level in the Torres Strait region has been rising at double the global average, at approximately 6 mm per year (Suppiah et al., 2011).

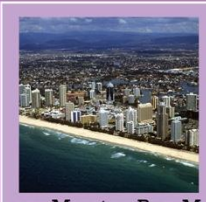
Climate change poses multiple, serious threats to the Great Barrier Reef (Johnson and Marshall, 2007; Hoegh-Guldberg, 2012). Sea surface temperature 1-2°C above the average summer maximum (based on the period 1985-93, excluding 1991-92) can cause mass coral bleaching (Hoegh-Guldberg et al., 2007) and lower growth rates (De'Ath et al., 2009). If high temperatures (2-3°C above normal) are prolonged or persistent (more than eight weeks) bleached corals will die in increasing numbers. Corals and other marine organisms are also likely to be affected by ocean acidification, rising sea levels, increasing coral diseases and physical damage from any intensification in tropical cyclones (Veron et al., 2009).

Plants and animals in the high altitude areas of the Wet Tropics are especially vulnerable to climate change with this particular environment likely to disappear by 2070 (Williams et al., 2012). Many species in this region are already at the limits of their range and face high rates of extinction from rising temperature and potential reductions in rainfall (Shoo et al., 2011). Animals such as the mahogany glider and lemur-like ringtail possum and many bird species could lose a large portion of climatically-suitable habitat (Steffen et al., 2009; Garnett et al., 2013).

Tourism contributes about $17.5 billion to the state's economy and directly employs about 124,000 (TQ, 2013). A decline in environmental values including the Wet Tropics and Great Barrier Reef and cultural values such as the Gold Coast could result in decreased tourist numbers.

The number of heat-related deaths is expected to increase significantly throughout the 21st century, depending on the level of warming (Bambrick et al., 2008).

By 2030, average temperature is expected to have risen by 1°C compared to 1990 levels (CSIRO and BoM, 2007). Temperature rises are very likely to be greater in inland areas than coastal regions (CSIRO and BoM, 2007).



Between 35,900 and 56,900 residential buildings may be at risk of inundation from a sea-level rise of 1.1 m – the second highest number of residential buildings at risk of any state in Australia (DCC, 2009). Local government areas most at risk are Moreton Bay, Mackay, the Gold Coast, Fraser Coast, Bundaberg and the Sunshine Coast (DCC, 2009).

Image sources (clockwise from top). Inundation at Saibai Island, Torres Strait: Torres Strait Regional Authority; Great Barrier Reef: Great Barrier Reef Marine Park Authority; Gold Coast: Tourism Australia; Wet Tropics: Tourism Australia.

www.climatecommission.gov.au

Reproduced from *The Critical Decade 2013: Climate change science, risks and responses*

- Reduced water availability and increased frequency of droughts, affecting agricultural production.

- Multiple serious threats to the Great Barrier Reef through both increasing water temperatures and increasing ocean acidification due to higher atmospheric concentrations of carbon dioxide.

17. Given the long time (many hundreds of years to thousands of years) for natural processes in the earth system to remove carbon dioxide that has been added to the carbon cycle due to human activity, such as burning fossil fuels or land clearing, all anthropogenic emissions of carbon dioxide into the atmosphere lead to a net increase in carbon dioxide concentrations in the atmosphere[ii,iii]. Hence, it is the cumulative emissions of carbon dioxide from human activity over time that determine the increase in carbon dioxide concentrations, the resulting increase in global mean temperature and the associated climate change[ii].

18. This led to the concept of irreversible climate change for the next millenium due to carbon dioxide emissions from human activity this century, introduced by Solomon and coauthors in 2009[vii]. Global temperatures and sea level will not fall significantly from their peaks for at least a millennium due to greenhouse gas emissions this century.

19. As a consequence, it is the cumulative emissions over the life of any source which are most relevant to climate change impacts, rather than the annual emissions.

20. The important role of cumulative emissions of carbon dioxide and other long-lived greenhouse gases from human activity in determining the increase of global mean temperature has been highlighted in the 'budget approach' described in the *Critical Decade* report in 2011[iv] and in section 4.2 of the updated *Critical Decade 2013* report[v]. The concept of the carbon budget for future global warming is based on the direct relationship between the cumulative emissions of carbon dioxide over a specific time period ie 2000 to 2050, and the resulting increase in global mean temperature, as described by Meinshausen et al. (2009)[viii]. Meinshausen estimated that limiting cumulative emissions of carbon dioxide from human activity to less than 1000 billion tonnes over the period 2000 to 2050 would be required to have a 75% likelihood of global mean temperature changes remaining below 2°C above pre-industrial levels.

21. At the meeting of the UN Framework Convention on Climate Change in Cancun in 2010, all participating countries, including Australia, agreed to take urgent action to limit increases in global-mean temperature to less than 2°C above pre-industrial levels. Rogelj and coauthors in 2011[ix] showed that an early peak in global emissions before 2020 followed by steep reductions are needed to have a good chance of not exceeding this temperature target. Current international emission reduction commitments are not sufficient to ensure this temperature target is not exceeded.

22. The Climate Commission *Critical Decade 2013*[v] report reached the following key conclusions on burning fossil fuels and the links between coal mining and climate change.

    - "Most of the available fossil fuels cannot be burned if we are to stabilise the climate this century."

- "The burning of fossil fuels represents the most significant contributor to climate change."

- "From today until 2050 we can emit no more than 600 billion tonnes of carbon dioxide to have a good chance of staying within the 2°C limit."

- "Based on estimates by the International Energy Agency, emissions from using all the world's fossil fuel reserves would be around five times this budget. Burning all fossil fuel reserves would lead to unprecedented changes in climate so severe that they will challenge the existence of our society as we know it today."

- "It is clear that most fossil fuels must be left in the ground and cannot be burned."

- "Storing carbon in soils and vegetation is part of the solution but cannot substitute for reducing fossil fuel emissions."

The contribution of the Alpha Coal Mine to climate change and associated impacts

23. The proposed Alpha Coal Mine will be a major coal mine in Queensland, providing a significant new contribution to Australian coal exports to global markets.

24. As a consequence of the facts discussed in paragraphs 17 to 19, it is the cumulative emissions of the proposed Alpha Coal Mine over the life of the mine which are most relevant to climate change impacts, rather than the annual emissions.

25. In his expert report[x], Dr Taylor calculated the scope 3 greenhouse gas emissions from the transport and burning of coal produced from the mine as 1.83 billion tonnes CO_2-e (page 12). Emissions from the burning of coal accounts for 98.7% of these emissions. According to his calculations, the total scope 1, 2 and 3 emissions associated with the Alpha Coal mine are 1.86 billion tonnes CO_2-e, of which the burning of coal accounts for 97.1%.

26. Dr Taylor noted that these calculations were based on the assumption that the mine will produce 839.6 Mt of coal over the 30-year life of the mine. This figure is one of the range of estimates of product coal in the EIS. Taking the highest run-of-mine (ROM) coal stated in the EIS (i.e. 1.543 billion tonnes from EIS, Appendix Q, Attachment 1, Table 3) and applying the highest wash yield ratio stated in the EIS (i.e. 78% from EIS Volume 2 - Section 2, Project Description, p2-32) gives 1.204 billion tonnes of product coal. Using this figure of product coal with Dr Taylor's formula (1.204 x 24.3 x 88.43 / 1000) gives emissions of 2.59 billion tonnes CO_2-e from burning the coal from the mine.

27. For the purposes of this report, I have adopted the estimates provided by Dr Taylor but the actual scope 1, 2, and 3 emissions will vary accordingly if the total amount of coal produced from the mine is greater.

28. Given the direct link from human-caused emissions of carbon dioxide to climate change and sea level rise, the carbon dioxide emissions from the Alpha Coal Mine will be a significant partial contributor to the future impacts of climate change in Queensland, such as sea level rise, loss of biodiversity, increases in heat waves and increases in bushfires.

For example, the combined scope 1-3 emissions over the 30-year life of the mine would comprise about 0.3% of the cumulative global emissions of 600 billion tonnes of CO_2 remaining, as described in paragraphs 20 to 22 above, to have a good chance of remaining below the global agreed target of warming less than 2°C.

Land Court findings Xstrata Coal case

29. There is a significant and rapidly growing body of scientific research attributing some specific impacts of climate change to human-caused emissions of greenhouse gases, including references in my book chapter referred to in paragraph 6, and in the recent analysis of a number of extreme events in 2011, published in 2012[xi]. In a recent study published in June 2013[xii], my colleague and I have shown that human emissions of greenhouse gases have increased the chances of record high summer temperatures across Australia, such as in 2013, by at least five times compared with natural variability alone.

30. I am familiar with the work of Dr Meinshausen. His report "Contribution of the Wandoan Coal Mine to climate change and ocean acidification" to the Land Court in the Xstrata case represents a sound scientific analysis of the role of carbon dioxide emissions from the Wandoan coal mine. His analysis and findings on the impacts of carbon dioxide emissions from a coal mine are relevant to this case.

31. I have reviewed the report by Professor Lowe to the Land Court and his testimony in the Xstrata case. His opinion that it would be 'speculative and unscientific' to attribute any specific impacts to any specific greenhouse gases appears to have been referring to specific molecules of carbon dioxide, as he was in his evidence referring to photons of UV radiation and melanoma. He stated that the emissions from that coal mine should be seen as contributing to the cumulative impacts of climate change. Hence, his testimony does not rebut or contradict the evidence from Dr Meinshausen.

32. I do not agree with the closing submissions to the Land Court by Xstrata Coal that the findings by Dr Meinshausen should be discounted or rejected. That statement is based on an incorrect interpretation of the evidence from Professor Lowe.

33. I do not agree with the Land Court finding in the Xstrata Coal case that the attribution of environmental consequence to any specific project would be speculative and unscientific.

34. I have provided clear evidence in paragraphs 7 to 28 above of the role of greenhouse gas emissions from the Alpha Coal mine and from burning the coal extracted from this mine as a significant partial contributor to the future impacts of climate change in Queensland, including sea level rise, ocean acidification, and increases in heat waves, with associated loss of life, damage to infrastructure and loss of biodiversity, particularly on the Great Barrier Reef. This is based on the synthesis of a number of peer-reviewed scientific studies.

Confirmation

I confirm the following:

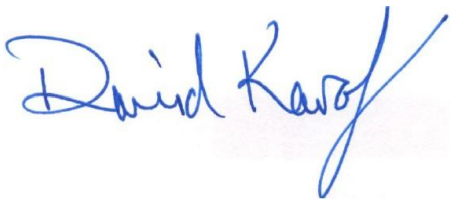
(a) the factual matters stated in this report are, as far as I know, true;

(b) I have made all enquiries that I consider appropriate;

(c) the opinions stated in this report are genuinely held by me;

(d) the report contains reference to all matters I consider significant; and

(e) I understand my duty to the court and have complied with the duty.



Professor David Karoly

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Appendix A: Summary CV
Professor David J. Karoly, University of Melbourne

Qualifications: BSc (Hons), Applied Mathematics, Monash Univ., 1976
PhD, Meteorology, Univ. of Reading, England, 1980

Current Appointment: Professor of Atmospheric Science, School of Earth Sciences and ARC Centre of Excellence for Climate System Science, University of Melbourne, 2012 – present.

Relevant employment history
Professor and ARC Federation Fellow, School of Earth Sciences, University of Melbourne, VIC (2007 –12)
Williams Chair Professor of Meteorology, University of Oklahoma, Norman, OK, USA (2003-07)
Professor of Meteorology and Head, School of Mathematical Sciences, Monash University, Melbourne, VIC (2001-02)
Director, Cooperative Research Centre for Southern Hemisphere Meteorology, Monash University, Melbourne, VIC (1995-2000)

Awards
Clarence Leroy Meisinger Award, American Meteorological Society (1993)
Norbert Gerbier-MUMM International Award, World Meteorological Org. (1998)
Fellow, American Meteorological Society (1998)
R.H. Clarke Lecture, Australian Meteorological and Oceanographic Society (2000)
Hamer Oration in Good Government, Melbourne (2009)
Fellow, Australian Meteorological and Oceanographic Society (2013)

Number of refereed publications (last 5 years): total 40 (2 books, 5 chapters, 33 journal)
Number of refereed publications (career): total 123 (7 books, 14 chapters, 102 journal,)

Internationally, Professor David Karoly is recognized as one of the two or three leading global experts on the dynamics of the large-scale atmospheric circulation in the Southern Hemisphere and its variability. He is also recognized as a world leader in the detection and attribution of climate change, particularly at regional scales. He was Co-Coordinating Lead Author for the chapter on detection of climate change and attribution of causes in the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), published in 2001. For the IPCC Fourth Assessment published in 2007, he was a Lead Author for the first chapter in Working Group II on assessment of observed changes and responses in natural and managed systems, a Review Editor for the chapter in Working Group I on attributing climate change, and a member of the Core Writing Team for the Synthesis Report. During 2003-06, he was a member of the US National Research Council's Climate Research Committee. Professor Karoly was also a Lead Author in the chapter on stratospheric changes and climate in the World Meteorological Organization/United Nations Environment Programme (WMO/UNEP) *Scientific Assessment of Ozone Depletion: 2010*. During 2011-2012, he was a member of the Joint Scientific Committee that provides oversight of the World Climate Research Programme (WCRP). Currently, Professor Karoly is a Review Editor for the IPCC Fifth Assessment Report on the chapter on Australasia in Working Group II report *Climate*

Change 2014: Impacts, Adaptation and Vulnerability, and a member of the Scientific Steering Committee for the WMO/UNEP *Scientific Assessment of Ozone Depletion: 2014.*

Nationally, Professor David Karoly leads a research group comprised of 3 research fellows and 5 PhD students at the University of Melbourne and in the Australian Research Council (ARC) Centre of Excellence for Climate System Science, supported by research funding from the ARC, the Australian Antarctic Division and the federal DIICCSRTE Collaborative Research Networks. He is active in outreach and communication on climate variability and climate change to government, business and community groups. He is a member of the Science Advisory Panel to the Australian Climate Commission and the Climate Change Authority, an independent statutory body that provides advice to the federal government on climate change, including greenhouse gas emission reduction targets. Professor Karoly was Chair of the Premier of Victoria's Climate Change Reference Group in 2008-09 and a member of the federal government's High Level Coordination Group on Climate Change Science during 2009-11.