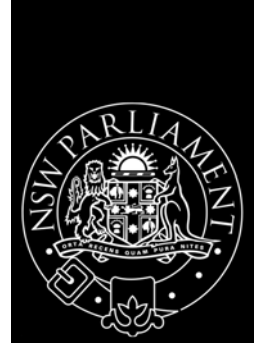


LEGISLATIVE ASSEMBLY



# Standing Committee on Natural Resource Management (Climate Change)

Climate Change and Natural Resource Management in New  
South Wales

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## Terms of Reference

The Legislative Assembly Standing Committee on Natural Resource Management (Climate Change) was established on 21 June 2007 to inquire into issues of sustainable natural resource management with particular reference to the impact of climate change and, in particular, to report on the following terms of reference:

- (a) The likely consequences of human-induced climate change on land (including salinity), water and other natural resources;
- (b) Options for ensuring ecologically sustainable natural resource use, taking into particular account the impacts of climate change;
- (c) Approaches to land and water use management practices on farms and other natural resource management practices, having regard in particular to the role of such practices in contributing to climate change or as a tool in helping to tackle climate change;
- (d) The effectiveness of management systems for ensuring that sustainability measures for the management of natural resources in New South Wales are achieved, having particular regard to climate change; and
- (e) The likely consequences of national and international policies on climate change on natural resource management in New South Wales.





## Chair's Foreword

I am pleased to present this report to the House on behalf of the Standing Committee on Natural Resource Management (Climate Change). This is the Committee's first major report against its terms of reference.

The mandate of this Committee is to inquire into issues of sustainable natural resource management with particular reference to the impacts of climate change. This means that the Committee is interested in the management of natural resources including land, water, native vegetation, biodiversity forestry, coastal protection and the marine environment and how these are likely to be affected by climate change.

This is an extremely broad brief especially for such a dynamic area of scientific research and policy development.

The Committee was only established in June last year, just before major recent developments in national and international climate research and policies. For instance, in November 2007, the Intergovernmental Panel on Climate Change launched its fourth assessment report that unequivocally identified the effects of human-induced climate change. In December, Australia ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change, committing the nation to legally enforceable levels of greenhouse gas emissions. The Federal Government has committed to a long term emissions target of 60 per cent emission cuts by 2050, a mandatory renewable energy target of 20 per cent by 2020 by and the adoption of a national emissions trading scheme in 2010.

These developments will have major repercussions for natural resource managers in New South Wales.

This report is the result of the Committee's first major inquiry to address two of its terms of reference in detail by examining:

- the likely consequences of human-induced climate change on land (including salinity), water and other natural resources; and
- the likely consequences of national and international policies on climate change on natural resource management in New South Wales.

Of necessity, the findings and recommendations that come out of this inquiry also relate to some of the other terms of reference relating to options for ensuring ecologically sustainable natural resource use and approaches to land and water use. However, this report is very much an initial survey of the available material in these areas. Some of these, such as options for protecting the State's coastal resources or water management, are likely to be the subject of future inquiries. The major national climate change policy development of the Carbon Pollution Reduction Scheme will be examined in more detail in a separate inquiry of the Committee into emissions trading schemes.

As part of this inquiry the Committee has taken evidence and briefings from a broad range of academics, state and local government officials, key interest groups and the general public. The Committee has also undertaken a number of site visits within New South Wales and Victoria.

Chair's Foreward

Members of this Committee come from a diverse range of backgrounds and do not have specific expertise in climate change. We do, however, have a responsibility to draw on all the resources of the community, industry and experts to inform the decision-making process. This report attempts to interpret some of the information available about the science and technology, looks at what the governments at national, state and local levels and a wide range of industry, community and non-governmental groups are doing, and makes some suggestions for future work to meet the extraordinary challenges that climate change may make to our way of life.

I would like to thank all the groups and individuals who made submissions to this inquiry and the secretariat for preparing this report.

David Harris MP  
Chair

## List of Findings and Recommendations

The Committee considers that there is real evidence that global climate change will affect natural resource management in New South Wales.

It considers that all levels of government should work in partnership with the community to improve the ability of the State to adapt to changes.

The Committee notes that considerable scientific resources are already being deployed to research many aspects of climate change adaptation and mitigation and to adapt possible solutions to an Australian context. The Committee believes it is essential that the Government and scientists work together to prioritise the identification of gaps in knowledge that will lead to policy instruments that preserve agricultural productivity, biodiversity and the coastal environment in a low emissions future.

Many participants in this inquiry thought it was important for natural resource managers and local governments to have up to date information on the local impacts of climate change. The Committee notes that, in recent months, the Department of Environment and Climate Change has been preparing summaries of the impacts of climate change projections on a regional basis. This initiative should help provide natural resource managers with credible reliable expert advice of the particular problems of their regions. However, as the science is rapidly evolving, the Committee suggests that the Department of Environment and Climate Change commit to continue providing plain English information on updated scientific information for a general audience as it becomes available.

**Recommendation 1:** In order to assist natural resource managers and the community understand the potential impacts of climate change, that the Department of Environment and Climate Change commit to providing plain English information on updated scientific information for a general audience as it becomes available.

The Committee notes that natural resource managers are concerned about the impacts of climate change on the availability of water and that NSW Government is investigating the potential impacts on water availability of climate change in both rural and metropolitan areas. It trusts that plans for water usage will be updated to take the findings of this work into account on an ongoing basis.

The Committee notes that there are likely to be significant impacts on forestry activity of national climate change policies but these are not known yet in any detail.

**Recommendation 2:** As part of developing an adaptation strategy for climate change that cannot be avoided, that the Government consider supporting research into mapping the soil characteristics in New South Wales to improve knowledge amongst natural resource managers of the suitability of particular areas for particular land uses.

The Committee notes that there are many projects underway at Federal and State level to identify adaptation strategies for the agricultural sector.

List of Findings and Recommendations

**Recommendation 3:** That the Government make every effort to engage the agricultural sector in communicating appropriate strategies for adapting to climate change such as by building on the expertise of the Catchment Management Authorities.

The Committee notes the particular pressures on the fishing industry caused by increasing development are likely to be compounded by the impacts of climate change and trusts that the Department of Primary Industries and the Department of Environment and Climate Change continue to develop policies that reflect the most recent scientific research on marine environment management.

The Committee notes the importance of local government in making planning decisions that may be affected by future impacts of climate change.

**Recommendation 4:** That the Department of Environment and Climate Change and the Department of Planning facilitate the completion of mapping of coastal vulnerability as quickly as possible and communicate that information to affected local councils in order to assist with developing local planning instruments.

**Recommendation 5:** That the Department of Environment and Climate Change consider the need to establish monitoring of coastal erosion.

**Recommendation 6:** That the Department of Planning provide improved guidelines to local government about planning for climate change

**Recommendation 7:** That the Department of Planning consider the best methods of informing property owners about the risks of the impact of climate change such as by including accurate information about climate change risk on building certificates issued under section 149 of the *Environmental Planning and Assessment Act 1979*.

The Committee notes that local government plays an important role in managing natural resources and development controls.

**Recommendation 8:** Any changes in climate change policies that impose obligations on local government include a consideration of any costs for implementation.

The Committee notes that the Government currently reports on improvements in greenhouse gas mitigation and environmental performance in its State Plan reporting, however, there may be merit in improving the level of scrutiny across the relevant state and local government agencies.

**Recommendation 9:** That the Government consider how to monitor the implementation of climate change policies by local councils such as by appointing a body similar to the Natural Resources Commission for this purpose.

**Recommendation 10:** That the Government consider adopting a system for monitoring the consideration of climate change in planning decisions.

The Committee considers that the natural resource management framework could be strengthened if there was greater prominence given to Ecologically Sustainable Development (ESD) in relevant legislation. However, without detailed implementation

strategies, legislative change is unlikely to be effective. It is unclear what level of effort would be required to embed such amendments in the State's natural resource management framework.

**Recommendation 11:** That the Government investigate the merits of strengthening the recognition of ESD principles by amending the relevant legislation to make it a primary consideration.

The Committee is pleased to note that private sector companies like Bluescope Steel understand the contribution roofing materials can make to reducing the urban heat island effect.

**Recommendation 12:** That the Department of Environment and Climate Change and the Department of Planning consider the urban heat island effect in developing guidelines for planning Greenfield developments including incorporating vegetation and strategies to improve the level of use of roofing materials that reflect a significant amount of solar radiation.

**Recommendation 13:** That the Department of Planning amend the BASIX guidelines to include specific reference to the benefits of choosing roofing material with solar reflective properties (rather than simply lighter colours) for addressing the urban heat island effect.

**Recommendation 14:** That the Department of Environment and Climate Change promote the use of roofing material with reflective properties by:

- Offering domestic and residential builders incentives to use such materials; and/or
- Providing information to consumers about the energy efficiency benefits of "cool roofs"

**Recommendation 15:** The Committee considers that there are benefits in enhancing the biodiversity of degraded landscapes and the Government should consider developing policies to enable the recognition of plantings made for this purpose in future carbon accounting schemes.

The Committee notes that research into the merits of increasing soil carbon is underway by scientists around the world as well as in New South Wales agencies and considers this may be a valuable way of increasing the productivity of agriculture and the biodiversity of agricultural land. In the longer term, if the science is sufficiently developed, it may be possible to recognise the efforts of carbon farming in mitigating the effects of climate change in emissions trading schemes should acceptable ways of measuring the carbon cycle be developed.



## Chapter One - The Inquiry Process

- 1.1 The Committee was appointed on 21 June 2007 to inquire into issues of sustainable natural resource management with particular reference to the impact of climate change.

### Submissions

- 1.2 In October 2007, the Committee called for submissions on its terms of reference and received 44 responses from a broad range of industry, government and scientific groups and the general public. A list of these submissions is included at Appendix One.

### First Inquiry

- 1.3 On the basis of these submissions, the Committee decided that its first major inquiry would be to address two of its terms of reference in detail by examining:
- The likely consequences of human-induced climate change on land (including salinity), water and other natural resources; and
  - The likely consequences of national and international policies on climate change on natural resource management in New South Wales.

### Inquiry into Emissions Trading Schemes

- 1.4 In March 2008, the Committee commenced a second inquiry on the impact of emissions trading schemes on natural resource management in New South Wales.
- 1.5 Although this report does not avoid the topic entirely, the report of that inquiry will include more detailed information on the design and impact of emissions trading schemes on natural resource management.

### Hearings

- 1.6 As part of the two inquiries being conducted, the Committee took evidence from a broad range of academics, state and local government officials, key interest groups and the general public. It held hearings in Sydney on 11 April, 16 May, 18 June and 31 October 2008. A list of witnesses is in Appendix Two and transcripts are available on the Committee's website.

### Visits of Inspection

- 1.7 The Committee also undertook a number of site visits to learn more about projects to reduce the impacts of climate change on natural resource management. In November 2007, the Committee visited some of the State's major mining operations in the Hunter Valley to examine low emission technologies for coal. The Committee also visited the CSIRO's Newcastle Energy Centre and a solar power facility at Liddel.
- 1.8 In May 2008, the Committee examined the potential impacts of climate change on the Hawkesbury River. These impacts include increased salinity from reduced water flow, higher numbers of weeds and reduced stocks of fish. The Committee was pleased to note that the Hawkesbury-Nepean Catchment Management Authority has been working with the eminent scientist Professor Bruce Thom to develop a local plan to

The Inquiry Process

address climate change. In examining the potential impacts, they are attempting to maintain the complexity of the ecosystem because complex systems are more resilient to pressure so that there is more capacity in such systems for creatures to find a new niche.

- 1.9 In June 2008, the Committee visited a demonstration project of carbon dioxide geosequestration at the Otway Basin Project in Victoria at the invitation of the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC). Around a hundred thousand tonnes of carbon dioxide will be injected and stored deep underground to test the feasibility of the technology before it is adopted more broadly. A key feature of this project is that the site will be carefully monitored for several years to determine how permanent a storage solution this is.
- 1.10 In November 2008, the Committee visited the central western region of New South Wales to investigate the potential for agriculture to mitigate climate change by storing carbon in soil. The Committee met with members of the Central West Catchment Management Authority in Orange then travelled to the Cumnock area to meet the Little River Landcare Group and inspect a property. The Committee then attended Carbon Farming Expo and Conference in Orange.

## Briefings

- 1.11 The Committee arranged a series of private briefings with key stakeholders to learn about their activities. On 5 November 2007, the Committee learnt about carbon capture and storage as a climate change mitigation strategy from the NSW Minerals Council. Greening Australia informed the Committee about the impact of climate change and the urban heat island effect on the same day. On 29 November 2007, the Committee met the Housing Institute of Australia and the Climate Institute.
- 1.12 The Committee received a briefing from the European Investment Bank on the Bank's investments in renewable energy projects in the Pacific region on 18 June 2008.
- 1.13 Representatives of BlueScope Steel discussed the water and energy efficiency techniques they deployed in a new production facility with the Committee on 25 June 2008. They also explained the principles of "cool roofing" and how both energy efficiency of buildings and the urban heat island effect could be improved if roofing products that reflected a greater proportion of sunlight were chosen.



## Chapter Two - The Impacts of Climate Change in New South Wales

- 2.1 This Chapter briefly explains the scientific theory behind climate change, discusses the observed effects of climate change and then considers views on the projected potential impacts of climate change on natural resource management in New South Wales.

### The Scientific Basis of Climate Change

- 2.2 “Climate change” is defined by the United Nations Framework Convention on Climate Change (UNFCCC) as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.”<sup>1</sup>
- 2.3 Climate change is caused by the enhanced greenhouse effect. Certain gases in the atmosphere absorb and emit radiation at wavelengths within the spectrum of infrared radiation emitted by the planet’s surface, the atmosphere and clouds. These “greenhouse gases” include water vapour, carbon dioxide, nitrous oxide, methane, ozone and several artificial gases such as halocarbons and chlorine and bromine containing substances.<sup>2</sup> Greenhouse gases essentially trap the radiation as heat in the lower parts of the earth’s atmosphere and warm the earth’s surface in a similar way to a greenhouse heating an enclosed area. Without this layer of gases, the earth’s temperature would average -18°C rather than the current average of 14°C.<sup>3</sup>
- 2.4 However, since the Industrial Revolution, this greenhouse effect has been enhanced by a higher concentration of greenhouse gases in the atmosphere. This means that the amount of radiation reflecting back onto the Earth is greater and, in theory, the temperature of the planet is higher. Scientists attribute this increased concentration to “anthropogenic”, or human-induced causes, such as burning fossil fuels and land use change.
- 2.5 The earth’s climate is a highly variable and complex system but scientists consider that increasing the global average temperatures even slightly can have widespread and disruptive consequences for the world’s weather patterns.

### Intergovernmental Panel on Climate Change

- 2.6 In recent decades, meteorologists have been investigating the potential impacts of anthropogenic climate change with increasing urgency and growing certainty. There has been a huge international effort to collect information about the level of greenhouse gas emissions, to map the history of the world’s climate and to project how it is likely to change under different emissions scenarios.
- 2.7 The peak scientific body in this field is the Intergovernmental Panel on Climate Change (IPCC). It was founded in 1988 by the World Meteorological Organisation and the United Nations Environment Program. The IPCC has issued four assessment

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<sup>1</sup> Article 1.2 *United Nations Framework Convention on Climate Change*  
[[http://unfccc.int/essential\\_background/convention/background/items/1349.php](http://unfccc.int/essential_background/convention/background/items/1349.php)]

<sup>2</sup> PMSEIC Independent Working Group 207 *Climate Change in Australia*, p.51

<sup>3</sup> S. Smith, *The Science of Climate Change*, NSW Parliamentary Library Research Service, 2006, p.2

reports on the potential impacts of climate change and options for limiting these in 1990, 1995, 2001 and 2007.

## Observed Effects of Climate Change

- 2.8 The Panel's Fourth Assessment Report found that concentrations of carbon dioxide, the most important greenhouse gas, in the atmosphere had increased from 280 parts per million (ppm) in 1750 to 379 ppm in 2005. This is a much greater concentration than the natural range over the past 650,000 years.<sup>4</sup>
- 2.9 The Panel considered that there was unequivocal evidence of a warming planet with an increased average temperature of 0.76°C (+/- 0.18°) from 1906 to 2005 and oceans increasing in level by 1.8 mm per year on average from 1961 to 2003. Eleven of the twelve years from 1995 to 2006 were among the twelve warmest years since reliable records began in 1850. Observations have also shown widespread melting of snow and ice, changes in rainfall, ocean salinity and wind patterns and increased incidence of extreme weather events including drought, heavy rain, heat waves and the intensity of cyclones.<sup>5</sup>

## Attributing a Cause to Climate Change

- 2.10 In particular, in this report, the Panel was more confident than in the previous three assessments reports in attributing the causes of these changes to human activity noting:
- Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities;
  - Greenhouse gas emissions due to human activities have grown since pre-industrial times with an increase of 70% between 1970 and 2004;
  - Most of the observed increases in global average temperatures since the mid-20<sup>th</sup> century can, with a high degree of certainty, be attributed to increases in the concentration of greenhouse gases caused by human activity;
  - Human activity is very likely to have contributed to sea level rises in the second half of the 20<sup>th</sup> century and may have contributed to changes in wind patterns, increased extreme temperatures and increased the risk of heat waves, drought and heavy storms; and
  - Human activity may have contributed to observed changes to many physical and biological systems.<sup>6</sup>

## Projected Effects of Climate Change

- 2.11 The IPCC attempted to predict future climate change based on a number of different scenarios with varying levels of greenhouse gas emissions. It projected that under most of these scenarios there is likely to be a further 0.2°C increase in temperature over the next two decades. Even if emissions of greenhouse gases were to be kept at the same level as they were in 2000, there would be a 0.1°C increase per decade. Continued emissions at or above the current rates would cause further warming and

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<sup>4</sup> IPCC, *Climate Change 2007, The Physical Science Base. Contribution of Working Group I of the Fourth Assessment Report of the IPCC, Summary for Policy Makers*, p.2

<sup>5</sup> *ibid.*, p.5, p.7

<sup>6</sup> IPCC, *Climate Change 2007: Synthesis Report Summary for Policy Makers*, pp.5-6

lead to many changes in the global climate that are highly likely to be larger than observed in the twentieth century.<sup>7</sup>

- 2.12 However, the Panel noted that scientific modelling finds it more difficult to predict with any certainty the likely temperature further into the future because there are so many variables including the extent of attempts to reduce global emissions and the level at which atmospheric greenhouse gases are stabilised. By 2100, the Panel projected increases under different scenarios for an average temperature increase of 1.8°C (with a likely range of 1.1°C to 2.9°C) or 4.0°C (with a range of 2.4°C to 6.0°C).<sup>8</sup>
- 2.13 The Panel's report included projections of global sea level rises under the different emissions scenarios of between 18 and 59 centimetres by 2100 but stressed that these models excluded consideration of rapid changes in the flow of ice and that some important effects driving sea level rise are not clearly understood yet.<sup>9</sup>
- 2.14 This uncertainty in projections makes it more difficult to assess the likely effects of changes particularly at regional and local levels. However, the IPCC report projects that in Australia:
- By 2020 there may be significant loss of biodiversity in some ecologically rich sites such as the Great Barrier Reef;
  - By 2030 water security problems are likely to intensify in southern and eastern Australia;
  - By 2030 agricultural and forestry production is likely to decline over much of southern and eastern Australia due to increased drought and fire; and
  - By 2050 ongoing coastal development and population growth in some areas are likely to exacerbate risks from sea level rise and increased severity and frequency of storms.<sup>10</sup>

## Is Climate Change Real?

- 2.15 Climates are complex systems and it is difficult for non-experts to differentiate between the competing claims of scientific certainty. There is also a level of tension in the policy debate between the need for certainty about the level of problems and the need for responses to commence so as to maximise the mitigation of adverse climate change impacts.
- 2.16 A central tenet of national and international environmental policies is the "precautionary principle". This suggests that, where there are threats of serious or irreversible damage, lack of perfect knowledge of the extent of a problem should not be used as a reason to postpone actions. However actions can be hard to justify especially where they are expensive or require significant change. The challenge for governments is to assess this complex field of science to develop effective and affordable policies.
- 2.17 The Committee understands that there is a wealth of information disputing the reality of climate change. Occasional events seeming to dispute the trend can be used as evidence to refute the idea of global warming. For instance, in 2008 meteorologists

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<sup>7</sup> IPCC, *Climate Change 2007: Synthesis Report Summary for Policy Makers*, p.7

<sup>8</sup> IPCC, *Climate Change 2007, The Physical Science Base. Contribution of Working Group I of the Fourth Assessment Report of the IPCC, Summary for Policy Makers*, pp.12-13

<sup>9</sup> IPCC, *Climate Change 2007: Synthesis Report Summary for Policy Makers*, pp. 7-8

<sup>10</sup> *ibid.*, p.11

reported that Sydney had its coldest August in 64 years.<sup>11</sup> Australia's first astronaut and geophysicist Dr Phil Chapman argued recently that another ice age was on its way because sunspot activity was at its lowest level in 11 years and there was a drop in temperature of 0.7 degree between January 2007 and January 2008.<sup>12</sup>

- 2.18 During a hearing on 16 May 2008, the Committee took evidence from Professor Andy Pitman, a professional climatologist and a lead author of the IPCC. He was asked to consider some of the views expressed by those disputing the trends to warming. He emphasised the complexity of climatic systems noting:

In terms of your suggestion "but we are not warming", there is no suggestion in the scientific community of a linear relationship between CO<sub>2</sub> and temperature. That means that if you increase CO<sub>2</sub> by this amount, you do not expect immediately a response in temperature of the same amount. It is about the long-term global trend in temperature, which is directly correlated with greenhouse gas emissions[.]<sup>13</sup>

- 2.19 He emphasised the importance of relying on peer-reviewed scientific literature rather than non-expert sources. In response to Dr Chapman's article about the impending ice age he noted:

There are a lot of myths. A couple of weeks ago there was a lovely piece in the *Australian* from Australia's astronaut who took a single January data point and a second January data point a year later, drew a line between them and said, "We were heading into an Ice Age." My seven-year-old said, "You cannot draw a straight line between two data points", yet it was published in the *Australian*. It is unbelievable. Unfortunately, opinion pieces do not have resolve around scientific credibility.<sup>14</sup>

- 2.20 The Committee asked whether the IPCC findings reflected the views of the international scientific community accurately. He replied:

There are people on the Intergovernmental Panel on Climate Change who have publicly raised doubts about some of the conclusions in the report. More have raised doubts to suggest that the Intergovernmental Panel on Climate Change has underestimated the threat, rather than overestimated. I am aware of, I think, one IPCC scientist who has queried what is in the report. It is a complete myth that more than one or so of the thousand or so scientists on the Intergovernmental Panel on Climate Change think the report is not a reasonable reflection of the state of the science.<sup>15</sup>

- 2.21 Later that day, the Committee heard from another lead author of the IPCC, Professor Colin Woodroffe of the University of Wollongong, who said that the panel employed a unique process of extensive peer and governmental review. He considered that the most recent assessment report was "as close as you can get or have ever got in terms of scientific consensus."<sup>16</sup>

- 2.22 The Committee notes that these IPCC reports are drafted by teams of hundreds of experts who are nominated by government and international organisations. These are then subjected to peer review by other experts and finally considered in plenary

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<sup>11</sup> "August was coldest in 64 years" Byron Kaye *The Daily Telegraph* - 01/09/2008  
[<http://www.news.com.au/dailytelegraph/story/0,22049,24272490-5006009,00.html>]

<sup>12</sup> "Prepare for new Ice Age, says scientist" *The Australian* - 23/04/2008  
[<http://www.theaustralian.news.com.au/story/0,25197,23584524-11949,00.html>]

<sup>13</sup> Professor Andy Pitman, Transcript of Hearing 16 May 2008, p.8

<sup>14</sup> *ibid.*, p.10

<sup>15</sup> *ibid.*, p.8

<sup>16</sup> Professor Colin Woodroffe, Transcript of Hearing 16 May 2008, p.53

sessions before being adopted.<sup>17</sup> This lengthy review process means that non-experts should have a high level of confidence that the matters included in reports reflect a scientific consensus of opinion.

- 2.23 On the balance of probabilities the Committee considers it more likely that internationally recognised climatologists know more about the effects of slight changes to climatic systems than non-experts. As Professor Pitman noted:

This is not a science problem anymore. The global warming science is done and dusted.<sup>18</sup>

- 2.24 Even allowing for the precautionary principle, the scientific evidence is overwhelmingly in support of the need for urgent action.

## Climate Change in New South Wales

- 2.25 According to best scientific estimates available in early 2008 and cited by the CSIRO in its submission, under the most likely scenarios of moderate to high emissions is a temperature increase of 0.6-1°C for the southern parts of New South Wales and 1.0 to 1.5°C for the northern parts. By 2070, estimates are less certain but range from 1.5 to 5°C depending on the level of emissions being produced. Rainfall is projected to decrease in a range of 2 to 5 per cent by 2030 and 5 to 20 per cent by 2070.<sup>19</sup>

- 2.26 The Committee acknowledges that Australia has an extremely variable climate but changes such as these will alter weather and rainfall patterns. Heatwave and storm events are predicted to increase in intensity and frequency. In coastal areas, storm damage will be worse because increased sea levels which will cause coastal erosion and flood damage. Inland areas will also be affected: in a submission to this inquiry, the Minister for Lands informed the Committee that the Western Division, or 42% of the area of the state, remains extremely vulnerable to potential desertification as a result of climate change.<sup>20</sup>

- 2.27 The Committee understands that there is a level of urgency in establishing what may happen in particular areas so that an appropriate level of response can be planned. This is complicated by the way climate predictions are made on a global or large-scale basis. Mr Chris Davis stated in his submission that:

The scientific reality is that, while we can have large scale modelling that gives us global and regional parameters and target, there is complexity in carbon fluxes at local scales. This makes local carbon budgets hard to predict especially when the global climate models predict only regional trends.<sup>21</sup>

- 2.28 Another important reason for understanding the local impacts of climate change is that some areas are most vulnerable to such changes because they are less resilient or have lower levels of capacity to adapt. Professor Andy Pitman described the change in emphasis in recent years:

In climate science we traditionally said it will warm by a certain amount. We are now looking at vulnerability. There are places that can warm by five degrees and it will not matter much and there are other places that can warm by two degrees and that will have a catastrophic effect. It all depends on the nature of the environment. Out in

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<sup>17</sup> S. Smith, *The Science of Climate Change*, NSW Parliamentary Library Research Service, 2006, p.3

<sup>18</sup> Professor Andy Pitman, Transcript of Hearing 16 May 2008, p.6

<sup>19</sup> Submission 18, p.2

<sup>20</sup> Submission 35, p.1

<sup>21</sup> Submission 31, p.2

The Impacts of Climate Change in New South Wales

Western Sydney, for example, there is considerable vulnerability because of the way the climate operates. We try to minimise that vulnerability using air conditioning. But then we introduce more vulnerability because if, under extreme heat stress like that we saw in Europe in 2003, the grid fails, we have substantially exacerbated that vulnerability because we have tuned the people living there into having air conditioning. So, the more we build an environment dependent on air conditioning, for example, the more vulnerable they are should the air conditioning break down. We are building more and more threshold vulnerabilities into our environments. That is not a good idea.<sup>22</sup>

- 2.29 The Committee notes that there is also a high level of concern within the community about what climate change could mean for particular areas. For instance the Natural Resources Advisory Committee pointed out that the science is complex and in many cases the local effects on natural resources are unknown. The science tends to become less certain in its predictions in moving from general to specific areas, especially as climate change impacts are interacting with the consequences of land use changes and fossil fuel use.<sup>23</sup> At a public hearing, Ms Pamela Green, member of the Council and Chair of the Southern Highlands Catchment Management Authority, noted that farming communities were particularly frustrated by the lack of local and practical solutions:

Currently, their comments to me are, "Don't tell us there's climate change and that emissions trading is coming; we know that. Tell us what we can do." So there is a high level of awareness, but not necessarily engagement, or understanding what the solutions are.... There is still such a lot of complexity and lack of good information about that that people are still feeling very confused about it on the ground.<sup>24</sup>

- 2.30 A similar view was expressed by Professor Colin Woodroffe of the University of Wollongong:

We stress that it is important that governments continue, and indeed expand, the current funding available for research and monitoring activities related to the condition of the State's natural resources, because the consequences of climate change are likely to be substantial, but remain difficult to predict in precise terms. There are limits to the extent to which science will be able to provide information about the precise extent of changes that will occur and the type of management and policy options that could be applied. This situation demands an adaptive management approach.

Absolutely critical to understanding the likely consequences of human-induced climate change on land, water and other natural resources in New South Wales, and how to best manage these resources under conditions of climate change, is to project with the best possible precision how average and extreme temperatures and precipitation will change in each region of this State. It is important to separate the short-term conditions of the current drought over the past five or six years from the longer-term effects that climate changes will bring.<sup>25</sup>

- 2.31 The Committee is aware that in recent months the Department of Environment and Climate Change has been working to improve the level of knowledge about the local impacts of climate change by producing regional specific summaries of the potential impacts for seven regions across the state. These are readily available on the Department's website and express potential impacts in plain English in terms of the potential changes in four seasons in rainfall, impact on temperature, agriculture and biodiversity.

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<sup>22</sup> Professor Andy Pitman, Transcript of Hearing 16 May 2008, p.3

<sup>23</sup> Submission 39, p.3

<sup>24</sup> Ms Pamela Green, Transcript of Hearing 31 October 2008, p.3

<sup>25</sup> Professor Colin Woodroffe, Transcript of Hearing 16 May 2008, p.47

- 2.32 The Committee understands that significant scientific effort has been devoted to refining the available climate modelling against local historical weather patterns to demonstrate the impacts at a local scale. Full scientific studies will be published in due course.<sup>26</sup>
- 2.33 This initiative should help provide natural resource managers with credible reliable expert advice of the particular problems of their regions. However, as the science is rapidly evolving, the Committee suggests that the Department of Environment and Climate Change commit to providing plain English information on updated scientific information for a general audience as it becomes available.

### **Natural Resource Management**

- 2.34 “Natural Resource Management” refers to the sustainable management of such natural resources as land, water, soil and living things for the social, economic and environmental interests of current and future generations. Under the *Natural Resources Commission Act 2003*, natural resources are defined to include water, native vegetation, salinity, soil, biodiversity, coastal protection and marine environment.
- 2.35 The Committee understands that the potential impacts of climate change may add another layer of uncertainty and complexity to the task of those managing natural resources which may already be under stress. For instance, climate change could potentially reduce the amount of water available to all users of particular river systems. Planning for the fair allocation of the water resource needs to consider the competing interests of irrigators, industry, domestic use, recreational use and the environment.
- 2.36 The following sections examine some of the impacts of climate change on particular aspects of natural resources. The Chapter concludes with three case studies showing how the impacts of climate change add a further layer of complexity to the decision-making of natural resource managers.

### **Water Resources and Salinity**

- 2.37 The CSIRO submission noted that across New South Wales there are already considerable pressures on water quality and quantity. The NSW Government submission noted that there is considerable scientific debate about the effect of climate change on rainfall patterns. The most likely estimate was an overall reduction in rainfall below three per cent by 2030 and between five and 7.5 per cent by 2070. However, there is likely to be considerable changes in the pattern of rainfall and these changes will vary between different areas of the State. For instance it is estimated that there will be significant reduction in rainfall in the southwest of the State in the seasons when it normally was most prevalent. On the other hand, projections indicate an increase in summer rainfall in the northern coastal parts of the State.<sup>27</sup>
- 2.38 An overall reduction of rainfall will mean that less water is available in the future, especially if higher average temperatures increase the rate of evaporation but, as the NSW Government submission noted, it is hard to be precise about the specific levels of water available in particular areas because other factors such as the amount of

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<sup>26</sup> Briefing from Ms Jenny McAllister, DECC, October 2008, Climate Change Action Forum paper

<sup>27</sup> Submission 40, p.3, Briefing from Ms Jenny McAllister, DECC, October 2008, Climate Change Action Forum paper

vegetation and the intensity of rainfall affect the amount of water reaching streams.<sup>28</sup> The CSIRO submission noted that in general, however, hydrologists estimate that every one per cent reduction in rainfall leads to a two per cent reduction in stream flow.<sup>29</sup>

2.39 What water is available may have its quality compromised by increased salinity although the CSIRO submission stated that climate change might only add slightly to this problem. The major cause of increased salinity is the removal of native vegetation and rising water tables.<sup>30</sup> Ways to reduce salinity include revegetation with deep-rooted plants in suitable areas and engineering works to intercept salt including saline groundwater pumping, interception drains and disposal basins.<sup>31</sup>

2.40 A representative of the Western Sydney Regional Organisation of Councils told the Committee that research has shown that by 2025 the available potable water in Western Sydney will be needed for domestic use rather than industrial use or environmental flows. He suggested that the Government needed to investigate alternative water supplies from rainwater, stormwater retention or recycling in order to meet the needs of the community, industry and the environment.<sup>32</sup>

### Soil Erosion

2.41 Projected changes in rainfall patterns may also increase soil erosion if more rain falls in large storms.<sup>33</sup> This would increase run off and reduce amount of vegetation that can be supported.

### Agriculture

2.42 Agriculture is a significant industry in New South Wales producing around \$7.3 billion in commodities in 2007.<sup>34</sup> The level of productivity is highly dependent on the availability of adequate water and the favourability of conditions in particular seasons. The CSIRO advised the Committee that agriculture is highly vulnerable to climate change. The projected drying trend in southeastern Australia is likely to make agriculture more difficult. Particular impacts include:

- Reduced production of certain crops owing to reduced water supply and increased temperatures making some areas less suitable for them;
- A southward drift of certain pests;
- Increased bushfire risks from higher temperatures and drier conditions;
- Reduced dairy production from higher temperatures;
- Increased heatwaves may hamper crop production and cause stress among livestock;
- Increased number and intensity of storms; and
- Agriculture in more marginal areas may no longer be sustainable.

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<sup>28</sup> Submission 40, p.3

<sup>29</sup> Submission 18, p.3

<sup>30</sup> *ibid.*, p.4

<sup>31</sup> *ibid.*, pp.4-5

<sup>32</sup> Mr Colin Berryman, Transcript of Hearing 11 April 2008, p.62

<sup>33</sup> Professor Colin Woodroffe, Transcript of Hearing 16 May 2008, p.52

<sup>34</sup> Australian Bureau of Statistics, *7501.0 - Value of Principal Agricultural Commodities Produced, Australia, Preliminary, 2006-07*



- Conversely, higher temperatures may also increase the range of crops available to be grown so long as irrigation water is available. For instance cotton and sugarcane could be grown further south.<sup>35</sup>
- 2.43 The CSIRO noted that adaptation strategies could be incremental. These are extensions or enhancements of existing activities aimed at managing climate variability which can offer financially viable adaptations at the farm level. But there is a limit to incremental adaptation and for some regions and industries, transformational change will be required.<sup>36</sup> For instance the capacity of different soils to store water and supply nutrients controls the suitability of land for different uses and the large cropping areas in the State cannot simply relocate to the eastern areas with more water because most soils on slopes and tablelands are less fertile.<sup>37</sup>
- 2.44 However, the New South Wales Government submission to the Committee noted that dryland broadacre croppers have always experienced considerable variations in climate and have developed systems for coping with variability. The Department of Primary Industries encouraged farmers to develop comprehensive continuous-improvement Environmental Management Systems to manage their risks. The submission considered that, while the industry was vulnerable to climate change impacts, practitioners had the experience to adapt relatively quickly to changes. Irrigators might also need to “be more flexible in the ways they use available land and water to generate income.”<sup>38</sup>

## Native Vegetation and Biodiversity

- 2.45 The CSIRO submission noted that there is a wealth of scientific evidence that climate change is already affecting many species, most obviously through the timing of life cycle events such as early flowering of plants and migration of birds and through shifts in population to areas where the temperatures are lower.
- 2.46 Ecosystems are highly complex interactions between species and the environment. Climate change is likely to exacerbate the impacts of many threats to species including threats of habitat loss or degradation, invasive species and altered stream flow. Different studies have shown that there is a great deal of variety in the impacts on individual species or habitats and it is difficult to predict the specific details, however, the NSW Government submission to the Committee highlighted the risks of climate change to marginal ecosystems such as in alpine areas and estuaries. The Government submission also noted that increased levels of atmospheric carbon dioxide may change the distribution of some plant species and reduce biodiversity in semi-arid and arid zones.<sup>39</sup>
- 2.47 Professor Colin Woodroffe of the University of Wollongong noted that the degree of vulnerability of particular species of native vegetation to continued high temperatures was not fully understood. He suggested that this could lead to increased mortality and make these areas more vulnerable to invasion by exotic species.<sup>40</sup> The CSIRO submission suggested that species that are already marginal and vulnerable are

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<sup>35</sup> Submission 18, p.2

<sup>36</sup> *ibid.*, p.v

<sup>37</sup> *ibid.*, p.6

<sup>38</sup> Submission 40, p.13, p.17

<sup>39</sup> Submission 18, p.5

<sup>40</sup> Professor Colin Woodroffe, Transcript of Hearing 16 May 2008, p.48

likely to be less able to compete with those that are able to adapt so it is likely that pests and weeds will be increasing problems.<sup>41</sup>

### **Bushfires**

2.48 The number and intensity of bushfires are predicted to increase in parts of New South Wales because of the increase in temperature and changes in rainfall patterns. Professor Ross Bradstock of the University of Wollongong told the Committee that the eastern half of the state was likely to be more subject to bushfires than in the past but increased drought might make some of the western parts less prone to bushfires because less grass would grow. He indicated that the effects of increased carbon dioxide on plant growing regimes was being researched but stressed that bushfire frequency was the result of the interaction of a high number of factors that are as yet not fully understood.<sup>42</sup>

### **Coastal and Estuarine Protection**

2.49 As noted above, the Fourth Assessment Report of the IPCC included a highly qualified estimate that global sea levels could rise by between 18 and 59 centimetres by 2100. More recent estimates from the CSIRO based on the later analysis of local ocean currents suggest that the rise in sea level off the coast of New South Wales may be 40 centimetres by 2050 and 90 centimetres by 2100.<sup>43</sup>

2.50 This means that coastal areas will be subject to erosion of beaches and increasing incursions by seawater into low lying lands. This will have significant effects on ecosystems such as wetlands as well as beach conditions. Other risks include damage to property and infrastructure and industries such as oyster farming. A submission from Professor Bruce Thom of the Wentworth Group of Concerned Scientists noted that a common response to owners of property near beaches would be to build protective barriers but this could increase the loss of sand. He cited estimates by the insurance industry that more than 200,000 properties in New South Wales could be affected by rising sea levels and inundation.<sup>44</sup>

2.51 A representative of the Western Sydney Regional Organisation of Councils told the Committee that rising sea levels also affected the level of rivers and increased the likelihood of flooding. The salinity of rivers was also likely to increase as salt water would move further upstream.<sup>45</sup>

### **Marine Environment**

2.52 It is likely that the acidity of oceans will increase with higher levels of carbon dioxide. This will affect the biodiversity of marine ecosystems because it will be more difficult for creatures such as molluscs and corals to form shells.<sup>46</sup>

2.53 The New South Wales Government submission noted that in general increased temperatures will benefit the aquaculture of most fish and crustaceans except for

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<sup>41</sup> Submission 18, p.9

<sup>42</sup> Professor Ross Bradstock, Transcript of Hearing 16 May 2008, pp.48-49, Submission 40, pp.4-5

<sup>43</sup> Robert Goodman, Department of Environment and Climate Change "Sydney Region Adaptation" Presentation to Climate Change Action Plan Workshop, 28 October 2008

<sup>44</sup> Submission 12, p.1

<sup>45</sup> Mr Colin Berryman, Transcript of Hearing 11 April 2008, p.63

<sup>46</sup> Submission 40, p.5

trout. But it also noted that the oyster industry would be affected by rising sea levels causing more salt water to intrude into estuaries.<sup>47</sup>

- 2.54 Mrs Mary Howard, a member of the Hawkesbury-Nepean Catchment Management Authority's Board, noted that the river was already under pressure from competing users of resources including irrigators and increased residential development and any additional pressure that reduced the level of water flowing would affect the productivity of the fishing industry in the Hawkesbury-Nepean estuary by hampering migratory species. Reduced freshwater flow combined with discharge from sewage treatment plants is increasing the number of weeds growing in the river. Higher water temperatures then increased the likelihood of outbreaks of blue green algae.<sup>48</sup>

### Case Study: Urban Heat Island Effect

- 2.55 The Committee heard a great deal of evidence about how the impacts of climate change in western Sydney were likely to be much worse than otherwise because of the urban heat island effect and the challenges this could present to natural resource manager in the area.
- 2.56 Built-up areas tend to have higher temperatures than surrounding rural areas because hard surfaces such as asphalt, concrete and roof tiles retain higher levels of heat than vegetation. Additional heat is also generated by vehicles, industry and domestic appliances such as water heaters and air conditioners.
- 2.57 Higher temperatures in these areas are not in themselves evidence of climate change. For instance the IPCC Fourth Assessment Report noted that urban heat island effects are genuine but these are localised and have negligible impact over the global average temperature increase.<sup>49</sup> Professor Andy Pitman told the Committee that while such effects are not included in global climate change models, the urban heat island effect would cause major cities to heat the environment more than global warming would. This would exacerbated other stresses from global warming and air pollution particularly in western Sydney:

As you know we are putting the major population growth centres in Western Sydney. The further you go from the ocean the more warming we will get under global warming. The further you head west the hotter it is anyway and because of the nature of the geometry of the Sydney Basin we get a Los Angeles style recirculation of the atmosphere over Sydney. If we put cars and industry out there we have a recycling of air pollution....In the Sydney Basin if you wanted to locate a population in the most vulnerable region possible for global warming and urban heat island and air pollution you would put them in Western Sydney.<sup>50</sup>

- 2.58 Mr Tim Beshara, Science Manager for Greening Australia pointed out that over the past 40 years, temperatures in western Sydney have risen dramatically with the number of days over 35°C each year increasing by more than 250 per cent.<sup>51</sup> The effect could increase average temperatures by between 1 and 3°C in addition to the 2 to 6°C increase that projections show might result from global warming. He

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<sup>47</sup> *ibid.*, p.13

<sup>48</sup> Submission 33, pp. 13-15

<sup>49</sup> IPCC *Climate Change 2007, The Physical Science Base. Contribution of Working Group I of the Fourth Assessment Report of the IPCC, Summary for Policy Makers*, p.5

<sup>50</sup> Professor Andy Pitman, Transcript of Hearing 16 May 2008, pp.1-2

<sup>51</sup> Mr Tim Beshara and Dr David Butcher, Transcript of Hearing 11 April 2008, p.1

encouraged the Committee to consider ways of reducing the impact of this effect through changes in urban design and increasing levels of vegetation.<sup>52</sup>

2.59 The Committee considers that there is merit in considering the urban heat island effect in planning communities and will discuss this issue further in Chapter Five.

### **Case Study: Mapping Vulnerability to Climate Change in Sydney Coastal Councils**

2.60 The Committee heard about an interesting demonstration project to assess the potential impacts of climate change by mapping the relative levels of vulnerability in different Sydney coastal local government areas.<sup>53</sup> As part of the Commonwealth's National Climate Change Adaptation Program, the Sydney Coastal Council Groups has worked with the CSIRO in collaboration with the University of the Sunshine Coast on an assessment of the 15 local government areas in the group to the following impacts of climate change:

- Extreme heat and human health effects;
- Sea level rise and coastal hazards;
- Extreme rainfall and stormwater management;
- Bushfire; and
- Natural ecosystems and assets.

2.61 This study considered the environmental factors as well as the demographic and socioeconomic characteristics of residents to show which parts of the local government areas were likely to find it most difficult to adapt to the impacts based on their level of exposure, sensitivity and adaptive capacity. This report found that there were certain climate change vulnerability "hot spots" particularly in relation to storm events and ecosystem protection. However, vulnerability could be limited to certain areas. The report highlighted the importance of socio-economic, demographic and human agency factors in determining vulnerability as these could be as important, if not more important, in determining the risk of harm.

2.62 This report is a starting point for developing local climate change risk plans for each local government area.<sup>54</sup>

2.63 In its submission to this inquiry, the Sydney Coastal Councils Group highlighted the benefits of this study in providing reliable information to the local government planners about the potential impacts of climate change and enhancing their capacity to implement and monitor adaptation strategies in such areas as infrastructure, health and biodiversity. The submission noted that climate change should be addressed at a regional level and there should be a linkage between these issues and the long term strategic planning of councils however there are also limitations on local government's ability to respond.<sup>55</sup> In Chapter Four, various policy solutions to these limitations are canvassed.

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<sup>52</sup> *ibid.*, p.3

<sup>53</sup> Submission 27, pp.2-3

<sup>54</sup> Preston B.L. et al 2008 *Mapping Climate Change Vulnerability in the Sydney Coastal Councils Group* prepared for the Department of Climate Change and the Sydney Coastal Councils' Group, pp.1-3

<sup>55</sup> Submission 27, p.4

## Case Study: Managing Natural Resources in the Hawkesbury-Nepean Catchment

- 2.64 On 23 May 2008, a delegation of the Committee inspected the lower reaches of the Hawkesbury River from Windsor to Wisemans Ferry with representatives of the Hawkesbury-Nepean Catchment Management Authority (HNCMA). During the visit, the group developed an understanding of the impacts of climate change and climate change policies on the catchment and the implications for the catchment managers.
- 2.65 That part of the catchment is characterised by residential, agricultural, fishing, recreational and light industrial activity. These uses sometimes conflict and add to pressure on the catchment. For instance, the delegation was shown examples of bank erosion where cattle had access to the river. Fencing reduced this but the best way of restoring banks requires revegetation. Reeds provide a good habitat for fish but caravan park occupants tend to dig up native reeds because they prefer bare sandy beaches. In the estuary powerboat racing and anchors from recreational boats can damage sea grass beds that provide habitat for fish.
- 2.66 The Hawkesbury River provides high value prawns and squid but the industry is under pressure because of poor water quality caused by drought and residential development. Outbreaks of blue green algae compromise the safe human consumption of prawns from the river. The industry is particularly concerned by the impacts of the fresh water discharges from the proposed new sewage treatment plant at Brooklyn.
- 2.67 The potential impacts of climate change were addressed in the Catchment Management Plan and the HNCMA is working with Professor Bruce Thom on what they should be doing next. In examining the potential impacts, the HNCMA is working to maintain the complexity of the ecosystem because complex systems are more resilient to pressure. There is more capacity in such systems for creatures to find a new niche. For instance, saltmarsh is vulnerable to rising sea levels because it cannot survive inundation. The HNCMA is identifying marshes with flat land (rather than rocky escarpments behind it) as priorities for protection because these areas would provide a potential retreat for saltmarsh flora and fauna.
- 2.68 The HNCMA noted that it deals in an environment of regulatory complexity. It has no power to compel landowners to do the right thing about managing the riverbanks. Several agencies have regulatory control over parts of the catchment including local government,<sup>56</sup> NSW Maritime and the Department of Environment and Climate Change.<sup>56</sup>

### Conclusion

- 2.69 The Committee considers that there is strong scientific evidence that greenhouse gas emissions from human causes are likely to cause global climate change. It is very likely that the projected impacts of climate change are likely to present significant challenges to natural resource managers in New South Wales.

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<sup>56</sup> Record of meeting between delegation of the Committee and HNCMA, 23 May 2008



## Chapter Three - The Climate Change Policy Framework

- 3.1 This Chapter briefly describes the sectors contributing to greenhouse gas emissions. It then describes the development of climate change policies that affect natural resource management in New South Wales. It outlines international and national policies on climate change and describes relevant State policies and programs. It concludes with a case study of emerging technology of carbon capture and storage.
- 3.2 In general, climate change policies adopt a twofold strategy: firstly, to mitigate the effects of climate change by such things as reducing energy use and finding less emissions intensive activities and, secondly, by adapting to the effects of climate change that cannot be avoided. Both sides need research into the impacts of climate change.
- 3.3 The Committee has heard that climate change is a global problem. All levels of government and community need to work together to reduce its potential effects and to adapt to changed conditions. Policies should be based on the best scientific research and be developed with the involvement and agreement of the community and industry.

### Problem Identification - Current Levels of Emissions

- 3.4 Climatologists predict that unless the growth in emissions of greenhouse gases is reversed, there is a risk of catastrophic and irreversible climate change. Despite international commitments to produce fewer emissions, the rate of growth in emissions has increased fourfold since the year 2000 largely because of increased manufacturing in China and India.<sup>57</sup>
- 3.5 The most recent estimates based on emissions from 2006 indicate that Australia produces 576 million tonnes of CO<sub>2</sub>-e.<sup>58</sup> Of this New South Wales produced 160.0 million tonnes, or 28 per cent.<sup>59</sup>
- 3.6 While Australia only contributes around 1.2 per cent of the estimated global emissions of 49 Gigatonnes of CO<sub>2</sub>-e per year,<sup>60</sup> it is one of the highest per capita emitters of greenhouse gases. This is largely because of the high level of reliance on fossil fuel for power generation. The Department of Environment and Climate Change noted that New South Wales has per capita emissions of 23 tonnes of CO<sub>2</sub>-e per year compared to the average for industrialised nations of 13 tonnes per person per year.<sup>61</sup>
- 3.7 The main sources of greenhouse gas emissions are described in the table below:

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<sup>57</sup> Global Carbon Project (2008) *Carbon budget and trends 2007*, [www.globalcarbonproject.org, 26 September 2008]

<sup>58</sup> "Carbon dioxide equivalent:" this term is used to standardise the warming potential of the various greenhouse gases.

<sup>59</sup> Department of Climate Change, *State and Territory Greenhouse Gas Inventories 2006*, June 2008

<sup>60</sup> IPCC, *Climate Change 2007: Synthesis Report Summary for Policy Makers*, p.5

<sup>61</sup> NSW DECC [http://www.climatechange.gov.au/inventory/stateinv/index.html]

**Table 1: National and NSW Greenhouse Gas emissions by Sector 2006**

	<b>Australia</b>	<b>New South Wales</b>	
		<b>Emissions (Mt CO<sub>2</sub>-e)</b>	<b>% Contribution to National Emissions</b>
<b>Total Net Emissions</b>	<b>576.0</b>	<b>160.0</b>	<b>27.8%</b>
<b>Sectors/Key Subsectors</b>			
<b>ENERGY SECTOR</b>	<b>400.9</b>	<b>115.5</b>	<b>28.8%</b>
• Stationary Energy	<b>287.4</b>	77.9	27.1%
○ Electricity Generation	<b>198.1</b>	59.3	29.9%
• Manufacturing and Construction	<b>47.2</b>	9.4	19.9%
• Other Sectors	<b>19.4</b>	4.4	22.5%
• Transport	<b>79.1</b>	21.9	27.7%
• Fugitive Fuels	<b>34.5</b>	15.8	45.8%
<b>INDUSTRIAL PROCESSES</b>	<b>28.4</b>	<b>11.4</b>	<b>40.0%</b>
<b>AGRICULTURE</b>	<b>90.1</b>	<b>18.2</b>	<b>20.2%</b>
• Livestock	<b>62.8</b>	14.4	23.0%
• Other Agriculture	<b>27.3</b>	3.8	13.8%
<b>LAND USE, LAND-USE CHANGE AND FORESTRY</b>	<b>40.0</b>	<b>9.0</b>	<b>22.6%</b>
• Afforestation and Reforestation	<b>-23.0</b>	-1.8	7.9%
• Land Use Change (Deforestation)	<b>62.9</b>	10.8	17.2%
<b>WASTE</b>	<b>16.6</b>	<b>5.8</b>	<b>35.2%</b>

(Source: Department of Climate Change 2008 *Australia's National Greenhouse Accounts 2006 State and Territory Greenhouse Gas emissions* p.17)

## International Policies Relevant to Australia

3.8 Australia participates in international negotiations to develop a global response to climate change. It is a party to the United Nations Framework Convention on Climate Change. It is also a member of the Asia-Pacific Partnership on Clean Development and Climate and has a number of bilateral and other international climate change partnerships.<sup>62</sup>

<sup>62</sup> N. Markovic and N.Fuller *Background Note: Climate Change Negotiations* Parliamentary Library, Parliament of Australia August 2008. The following section draws from the background note unless otherwise stated.



## United Nations Framework on Climate Change

3.9 The United Nations Framework Convention on Climate Change (UNFCCC) is a treaty establishing an overall framework for international efforts to reduce the concentration of greenhouse gases in the atmosphere. It was adopted in May 1992 and came into force on 21 March 1994. 192 countries have ratified the treaty so far. Its objective is:

... to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner.<sup>63</sup>

3.10 It also provides that:

Parties should take precautionary measures to anticipate, prevent or minimise the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.<sup>64</sup>

3.11 Developed countries are required to maintain national greenhouse gas inventories of the six main greenhouse gases, to report annual emissions of greenhouse gases and adopt national policies on mitigating climate change by limiting emissions and protecting and enhancing greenhouse gas sinks.

3.12 Under the Kyoto Protocol to the UNFCCC, which came into force in 2005, developed nations including Australia have legally binding greenhouse gas emissions reduction targets. These are an average of 5.2 per cent below 1990 levels over the first commitment period 2008–2012. Australia was able to negotiate an emissions target of 108 per cent of its 1990 emissions. Australia did not ratify the Protocol until December 2007 but is likely to meet the target largely because of reductions in land clearing.

3.13 International negotiations are now under way to develop an agreement following the expiry of the first commitment Kyoto Protocol in 2012 with efforts to include developing nations such as India and China.

## Asia-Pacific Economic Cooperation

3.14 The Asia-Pacific Economic Cooperation (APEC) organisation also has made a commitment to address member nations' contribution to climate change by introducing programs relating to energy investment and trade, energy efficiency, energy technology, transport emissions and alternative fuels. In 2007, APEC adopted a Declaration on Climate Change, Energy Security and Clean Development which called for a post-Kyoto international climate change agreement to reduce greenhouse gases.

## Asia-Pacific Partnership on Clean Development and Climate

3.15 The Asia-Pacific Partnership on Clean Development and Climate was established in 2006. It consists of large, fast growing economies that are responsible for around half the world's emissions including Australia, Canada, China, India, Japan, the Republic

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<sup>63</sup> UNFCCC [<http://unfccc.int/resource/docs/convkp/conveng.pdf> ]

<sup>64</sup> *ibid.*

of Korea and the United States. The group was established to address the challenges of climate change, energy security and air pollution in a way that encourages economic development and reduces poverty.<sup>65</sup> This partnership was probably of more importance for Australia prior to its ratification of the Kyoto Protocol but in June 2008 Australia committed to continued engagement with the group for such things as improving energy efficiency in member countries.<sup>66</sup>

## National Policies

3.16 Australia's climate change policies have changed since it ratified the Kyoto Protocol in December 2007. The Government has committed to a long term emissions reduction target of 60 per cent reduction by 2050. Much effort is being expended implement the new national polices of a national emissions trading scheme called the Carbon Pollution Reduction Scheme and the Mandatory Renewable Energy Target of sourcing 20 per cent of national energy requirements from renewable sources by 2020. These commitments are interacting with existing policies on the national framework for adaptation and tied to a comprehensive effort to research and understand the local impacts of climate change.<sup>67</sup>

### Carbon Pollution Reduction Scheme

- 3.17 In 2007, Professor Ross Garnaut was commissioned to examine the economic impacts of climate change and to provide advice on the design of a national emissions trading scheme. The Federal Government produced a draft outline of the design of the proposed Carbon Pollution Reduction Scheme in a Green Paper in July 2008. The final design of the scheme should be released by the end of 2008 and the scheme is scheduled to commence from 1 July 2010.
- 3.18 The Green Paper proposes a national "cap and trade" scheme imposing limits on the total amount of emissions from most sectors of the economy with the exception of the two most important natural resource management sectors: forestry and agriculture. The Green Paper suggests that forestry activities be covered on an "opt in" basis so that industry participants could choose whether particular operations should be included in the scheme and whether they would be responsible for acquiring permits for reductions in carbon. It states that the Government has decided that there too many unresolved issues about accounting methodologies for agricultural activities for it to be included at this stage and proposes the earliest this sector could be included in the scheme would be 2015. It deferred a final decision about including agriculture until 2013. However, a consequence of this deferral is that the Government does not consider it worthwhile to develop offset credits for agricultural activities in the meantime because it is likely to be too administratively complex to do this for such a short time.<sup>68</sup>

### Mandatory Renewable Energy Target

3.19 The Federal Government has adopted a target of 20 per cent of electricity to be from renewable energy sources by 2020. This should lead to the production of 45,000 gigawatt hours of electricity from renewable sources such as solar, wind and

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<sup>65</sup> APPCDM [[http://www.asiapacificpartnership.org/Translated%20Versions/Fact\\_Sheet\\_English\\_Aug08.pdf](http://www.asiapacificpartnership.org/Translated%20Versions/Fact_Sheet_English_Aug08.pdf)]

<sup>66</sup> N. Markovic and N.Fuller *Background Note: Climate Change Negotiations* Parliamentary Library, Parliament of Australia August 2008.

<sup>67</sup> Submission 40, p.19

<sup>68</sup> Department of Climate Change *Carbon Pollution Reduction Scheme Green Paper* July 2008, pp.18-19

geothermal generation each year. The rules for the scheme are still being established but the intention is that these sources contribute to meeting Australia's future targets for the reduction of greenhouse gas emissions. The national scheme should provide a market incentive to accelerate development of renewable energy sources and assist industry by bringing existing state-based targets into a single, national scheme.<sup>69</sup>

### National Framework for Adaptation

3.20 These new policies build on existing national policy development in assessing vulnerability to climate change and developing adaptation strategies. In April 2007, a national framework for adaptation to climate change was adopted by the Council of Australian Governments. This framework includes actions to assist the sectors and regions most vulnerable to climate change such as agriculture, biodiversity, fisheries, forestry, coast and water resources. The work is being progressed through various ministerial councils.<sup>70</sup>

### Research and Development

3.21 The Federal Government contributes funding to climate change research and development both through its own agencies and through universities. In early 2008, a National Climate Change Research Facility was established to lead the academic community on inter-disciplinary research on adapting to climate change to assist decision makers.<sup>71</sup> In September 2008, the Prime Minister announced that the Government would contribute \$100 million to establishing a global research institute for researching carbon capture and storage technology with the possibility of ongoing support of a further \$100 million annually.<sup>72</sup>

### New South Wales Government Policies

3.22 The New South Wales Government has established climate change policies across the whole of Government and works with the States and Territories and the Federal governments in various intergovernmental councils on national policy development.

3.23 Prior to the adoption of a national emissions reduction target, the New South Wales Government committed to limiting emissions in 2025 to the level of those on 2000 and reducing them by 60 per cent by the year 2050.<sup>73</sup>

3.24 As part of meeting this target, in 2005, the Government launched the *NSW Greenhouse Plan*. This aimed to raise awareness of climate change issues in the community and to achieve a better understanding of climate change impacts on New South Wales. It also proposed solutions to limit the growth of emissions, to enhance the establishment of offsets, such as plantation forests, and to work towards placing the State on an emissions reductions path to avoid dangerous climate change. Strategies encouraged industry to take up new opportunities for low emissions goods

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<sup>69</sup> Department of Climate Change "The Australian Government's Renewable Energy Target: Fact Sheet" [<http://www.climatechange.gov.au/renewabletarget/publications/fs-ret.html>]

<sup>70</sup> Department of Climate Change [<http://www.climatechange.gov.au/impacts/about.html>]

<sup>71</sup> *ibid.*

<sup>72</sup> "Australia funds carbon capture institute" Sydney Morning Herald 19 September 2008, [<http://news.smh.com.au/national/australia-funds-carbon-capture-institute-20080919-4jj2.html>]

<sup>73</sup> NSW Greenhouse Office, *NSW Greenhouse Plan*, p.5

The Climate Change Policy Framework

and services. Finally, it proposed to work with other governments towards a global solution to climate change.<sup>74</sup>

- 3.25 The New South Wales Greenhouse Gas Abatement Scheme (GGAS) established the world's first mandatory emissions trading scheme in 2003. It aims to reduce greenhouse gas emissions associated with the production and use of electricity to develop and encourage activities to offset the production of these emissions. The scheme requires electricity retailers and some large electricity customers to meet mandatory targets for reducing or offsetting the emission of greenhouse gases from the production of the electricity they supply or use.
- 3.26 In 2006, the Government recognised climate change as a significant policy priority for the State by including "Clean air and progress on greenhouse gas reduction" as a target in the State Plan.<sup>75</sup>

### Response to Recent Changes in National Policies

- 3.27 During 2008, the New South Wales Government has been working to update its policies in relation to climate change in accordance with an agreement at the Council of Australian Governments in December 2007 to develop an effective national response to climate change including a single emissions trading scheme with a nationally consistent set of measures to support the scheme and a national cooperative approach to adaptation to climate change.<sup>76</sup>
- 3.28 As part of ensuring that policies are nationally consistent, the Government has commissioned the Independent Pricing and Regulatory Tribunal (IPART) to review the State's current climate change mitigation policies and measures. IPART has been asked to ensure that these measures continue to be efficient and effective and that they are likely to complement rather than conflict with the proposed national emissions trading scheme.<sup>77</sup>
- 3.29 In March 2008, the then Minister for Climate Change and the Environment, the Hon Verity Firth MP, announced that a new Climate Change Action Plan would be developed.<sup>78</sup> This would start with an analysis of the best available scientific information on the projected impacts of climate change on each of the regions in the State Plan. The Committee heard that officers of the Department of Environment and Climate Change would present this information to local communities as the first step of a consultative process for a new plan.<sup>79</sup>
- 3.30 The Committee notes that regional consultations were conducted on the development of the Climate Change Action Plan during October and November 2008. A number of Committee members were able to attend their local consultation sessions and the Committee as a whole received a briefing on the process on 22 October 2008. The plan is likely to be completed in mid-2009.

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<sup>74</sup> *ibid.*, p.19

<sup>75</sup> Submission 40, p.16

<sup>76</sup> *ibid.*, p.1

<sup>77</sup> NSW Review of Climate Change Mitigation Measures Terms of Reference, [<http://www.ipart.nsw.gov.au/timetables.asp#CLIMATE> ]

<sup>78</sup> Mr Ben Cubby "Global warming effects tackled in state plan" Sydney Morning Herald 10 March 2008 [<http://www.smh.com.au/news/environment/global-warming-effects-tackled-in-state-plan/2008/03/09/1204998283793.html>]

<sup>79</sup> Mr Simon Smith, Transcript of Hearing 11 April 2008, p25

- 3.31 The Department of Environment and Climate Change administers the recently announced Climate Change Fund which will spend \$340 million to provide practical assistance to reduce greenhouse gas emissions including:
- Rebates for residents to install solar and gas hot water;
  - Support for renewable energy development;
  - Funding for businesses to install water and energy saving features; and
  - Installing rainwater tanks and improved energy efficiency in schools.<sup>80</sup>
- 3.32 The Department of Energy and Water is currently working on developing rules for an Efficiency Trading Scheme which is due to commence in 2009. This will impose obligations on electricity producers to adopt more energy efficient practices and to help meet the State's economy wide energy savings target.<sup>81</sup>
- 3.33 In April 2008, the Government introduced legislation to establish a \$100 million Clean Coal Fund and a Clean Coal Council to support research and development for carbon capture and storage technology.<sup>82</sup>

### Relevant Agencies

- 3.34 Key agencies of relevance to natural resource management include the Department of Environment and Climate Change, the Department of Primary Industries, the Department of Energy and Water, the Natural Resources Commission and the Catchment Management Authorities. The following table summarises each agency's responsibilities and the information they have provided to the Committee about their activities in relation to climate change.

Agency	Role Current Climate Change Activity
Department of Environment and Climate Change	<p>Lead agency for environment protection and climate change policy.</p> <p>Leading the development of the Climate Change Action Plan including developing climatic scenarios and projections for 2030 based on State Plan regions.</p> <p>Delivering initiatives under NSW Greenhouse Plan including research on the impacts on the climate change on health, threatened species, aquatic ecosystems, bushfires, conservation planning, invasive species, coastal impacts and water supply and demand.</p>
Department of Primary Industries	<p>Leads policy and program development for agriculture, forestry, fishing and minerals.</p> <p>The Department's role is to improve our scientific understanding of climate change, identify and develop mitigation and adaptation strategies. The Department worked to ensure this knowledge was</p>

<sup>80</sup> Submission 40, p.10

<sup>81</sup> NSW Government *NSW Energy Efficiency Trading Scheme Discussion Paper* 2008, p.1, p.4

<sup>82</sup> Ms Sue Ern Tan, Transcript of Hearing 11 April 2008, p.52

considered in the policy development process and communicated to industry stakeholders.<sup>83</sup>

Key current projects include:

- Research into such areas as:
  - New plant varieties for agriculture and forestry;
  - The effect of enhanced carbon dioxide on plant growth;
  - The effect of climate change on fisheries;
  - The benefits of increasing carbon storage in soil with biochar;
  - Measuring the level of carbon that can be stored in soil;
  - Reducing methane emissions from ruminant livestock; and
  - Potential sites for carbon geosequestration.
- Preparing the *NSW Invasive Species Plan 2008-2015*.
- Developing advice for farmers and natural resource managers on risk management and adaptive strategies for farming systems.

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Department of Lands

Administers lands titles throughout the State and manages Crown Land holdings.

The Department is working on quantifying the issues and potential impact of climate change, initially in the coastal environment. It has also implemented a system of environmental covenants to provide extra protection to a range of conservation measures.<sup>84</sup>

Legislation was recently amended to enable leases to be issued on Crown Land which include the ability to sequester and trade in carbon from growing plants.<sup>85</sup>

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Department of Water and Energy

Responsible for water and energy policy.

Administers the Greenhouse Gas Reduction Scheme and proposed energy efficiency trading scheme.

Leading a review on the transition from the Greenhouse Gas Reduction Scheme to the new national emissions trading scheme.

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Department of Premier and Cabinet

Leads whole of government negotiations with other states and Commonwealth on developing national policies.

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IPART

Responsible for reviewing government charges for key utilities and services

Has been asked to review the current climate change mitigation

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<sup>83</sup> Submission 36, p.1

<sup>84</sup> Submission 35, p.1

<sup>85</sup> *ibid.*, p.2

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	<p>strategies to see if they overlap with federal policies with a view to recommending their continuation or removal.</p>
Catchment Management Authorities (CMAs)	<p>13 Statutory Authorities established in 2003 to prepare catchment action plans to address the priority natural resource management issues in their particular catchment.</p> <p>Deliver funding to landholders from state and federal programs.</p> <p>Engage with stakeholders through consultation and training on natural resource management issues.</p> <p>Under the Greenhouse Plan have investigated opportunities to manage a pool of carbon credits for landholders.</p> <p>Have developed information brochures on the impacts of climate change on each CMA based on CSIRO modelling.<sup>86</sup></p>
Natural Resources Commission	<p>Independent commission providing scientific basis for managing natural resources in the social, economic and environmental interests of the state.</p> <p>Recommends state-wide standards and targets for natural resource management.</p> <p>Audits the performance of the Catchment Management Authorities against catchment action plans.</p> <p>Can conduct reviews on natural resource issues at the Government's request.</p>
Natural Resources Advisory Council	<p>An independent advisory body reporting to the Minister for Climate Change and Environment representing a broad range of natural resource management stakeholders including CMAs, forestry, farming, fishing, environmental, Aboriginal, union and industry sectors.</p> <p>The Council advises on sustainable natural resource management and economic development and assists the Government to prioritise resources and strategies in this area.</p>

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(Source: unless otherwise stated, derived from Submission 40)

## Local Government

- 3.35 The Committee has also heard of the vital role that local government plays in managing natural resources and responding to the potential impacts of climate change on the ground. For instance, the submission from the Namoi Regional Organisation of Councils emphasised the role that local governments play in natural resource management and sustainable development. The Organisation noted that key environmental activities of councils include environmental conservation, waste

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<sup>86</sup> Mr Jim McDonald, Transcript of Hearing 11 April 2008, p.17

removal, water, sewerage, stormwater drainage and flood prevention, fire prevention and land use planning through the planning and development approval processes.<sup>87</sup>

- 3.36 The Committee is aware that some local councils, such as Penrith City Council, are extremely conscious of the potential effects of climate change. Penrith City Council has a well-developed sustainability reporting system, has implemented policies on energy and water efficiency and set an ambitious target of achieving carbon neutral in its operations. Penrith City Council also engages with the community to reduce the impacts of climate change at local level such as through the Sustainable Street program and the Schools Climate Change Challenge.<sup>88</sup>

## Scientific Research

- 3.37 Several submissions and witnesses to the Committee emphasised the need for policies to be based on high quality scientific research and pointed out gaps in the information at the time of writing.

- 3.38 For instance Professor Ross Bradstock of the University of Wollongong noted:

While there have been times in the past when we have experienced warmer and wetter conditions than at present, there is considerable concern that rapid climate change is taking us into a warmer and drier epoch—perhaps beyond the range experienced by many ecosystems over recent evolutionary timescales. This places considerable pressure on science to rapidly solve highly complex problems. I have hinted at a few of those. Needless to say, appropriate resources must be provided to meet the challenge. Equally, we need to up the ante in the way that we manage our natural ecosystems and the resources that they yield. A universal conclusion of the many reviews and assessments directed at effects of climate change is that our capacity to measure and monitor the effectiveness of management actions needs considerable improvement.<sup>89</sup>

- 3.39 Many of these gaps have been addressed subsequently by the completion of research projects. As noted above there has been a concerted effort at State and Federal levels to increase the amount of information about ways to address climate change.

- 3.40 There have also been partnerships between industry and the academic community to engage in research into particular aspects of climate change such as the Cooperative Research Centre for Greenhouse Gas Technologies and the Bushfire Cooperative Research Centre. Another collaborative research and development partnership between government and industry bodies is Managing Climate Variability. The program's research objectives are to: improve seasonal forecasting, provide tools and services for managing climate risk and increase adoption of climate risk management.<sup>90</sup>

- 3.41 The CSIRO recently established a National Research Flagship into Climate Adaptation that conducts research to minimise the economic, social and environmental impacts of climate change and identify any opportunities. Another

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<sup>87</sup> Submission 30, pp.2-3

<sup>88</sup> Standing Committee on Natural Resource Management (Climate Change) *Conference Report: 13<sup>th</sup> Annual Conference of Public Works and Environment Committees of Australian Parliaments 2008*, p.10

<sup>89</sup> Professor Colin Bradstock, Transcript of Hearing 16 May 2008, p.49

<sup>90</sup> Environment Business - August 13th, 2008 Page 6 of 29  
[<http://news.envirocentre.com.au/eb/newsletterfull.php?issue=267&key=604> 18/08/2008]



CSIRO Flagship called “Water for a Healthy Country” is researching the effect of climate change on water supplies.<sup>91</sup>

- 3.42 Some of these bodies work with government and industry to implement the results of their research on a large scale. These scientific initiatives not only inform the policy debate: a scientific breakthrough could lead to radical changes in the way greenhouse gas emissions are managed. For instance, if research on carbon capture and storage from coal-fired power plants is shown to be commercially viable, this could delay the replacement of existing facilities that might be required under future emissions reductions targets.

### Case Study - Carbon Capture and Storage

- 3.43 The Committee heard a great deal of evidence about the potential benefits for mitigation of the effects of climate change through innovative carbon capture and storage technologies. Essentially, this refers to capturing emissions from burning fossil fuels, compressing them, then injecting them deep underground where the gas reacts with geological formations.
- 3.44 In 2005, the Intergovernmental Panel on Climate Change’s issued a *Special Report on Carbon Capture and Storage* which considered that if appropriate sites were chosen and effective injection systems, sealing technologies and monitoring systems were used:
- It is very likely the fraction of stored CO<sub>2</sub> retained is more than 99% over the first 100 years.
  - It is likely the fraction of stored CO<sub>2</sub> retained is more than 99% over the first 1000 years.<sup>92</sup>
- 3.45 The use of these technologies is experimental in Australia at this stage and they are extremely expensive and the Committee was warned by Professor Andy Pitman that, unless the potential for leakage was reduced to almost zero, they would have little benefit in mitigating climate change.<sup>93</sup> The Committee from Ms Rachel Walmsley of the Environmental Defenders Office that the precautionary principle and cumulative impacts of such technologies should be considered in selecting the use of these technologies over other mitigation measures.<sup>94</sup>

### Carbon Storage<sup>95</sup>

- 3.46 The Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC), an organisation consisting of groups of academics, industry and government bodies, is conducting a comprehensive research program into all aspects of carbon capture and storage.
- 3.47 A delegation of the Committee visited the CO2CRC’s Otway Basin demonstration carbon storage project in June 2008. This project was launched in April 2008 and is the first full scale Australian demonstration of the feasibility of storing greenhouse gases in natural geological formations. Around 100,000 tonnes of carbon dioxide will

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<sup>91</sup> Submission 18, p.1

<sup>92</sup> IPCC *Special Report on Carbon Dioxide Capture and Storage* 2005, p.246

<sup>93</sup> Professor Andy Pitman, Transcript of Hearing 16 May 2008, pp.3-4

<sup>94</sup> Ms Rachel Walmsley, Transcript of Hearing 16 May, p.13

<sup>95</sup> Unless otherwise stated, the following is drawn from personal discussions between the Committee and members of the CO2CRC

be compressed to a supercritical liquid state and then injected deep underground and stored in the porous rock in a disused gas well. Because liquid carbon dioxide is quite buoyant, the well needs to be capped by an impermeable layer of rock to prevent gas escaping. The carbon dioxide should eventually react chemically with the surrounding rock and become calcium carbonate.

- 3.48 The CO2CRC plans to experiment with injecting gas into less porous types of rock to assess their relative capacity to store gas.
- 3.49 A key feature of the project is the long term monitoring to assess the permanence of storage. Geophones and seismic phones have been installed to test whether the carbon dioxide is behaving as expected. Water and air quality are also being tested. As noted above, the Intergovernmental Panel on Climate Change has defined a good carbon dioxide storage site as somewhere where less than one per cent of stored gas will leak into to the next rock strata over 1,000 years and the CO2CRC is confident that it will exceed this standard of permanence.
- 3.50 Preliminary work has been conducted by the New South Wales Government to identify suitable sites for similar carbon storage projects in this State, including in the Gunnedah and Sydney basins. The Department of Primary Industries indicated that their research has identified 16 sites of potential interest.<sup>96</sup>
- 3.51 Ms Sue Ern Tan of the New South Wales Minerals Council noted that ideally it would be better to identify appropriate sites in New South Wales rather than transport compressed gas. There is however discussion of developing a system of national pipelines including:
- carbon hubs where all the carbon that is captured from the power generation areas, like the Hunter and the Central Coast and the western coal fields in New South Wales, get transported to a central hub, where they then get piped off and stored somewhere, once we discover this geological site.<sup>97</sup>

### **Carbon Capture**

- 3.52 As carbon dioxide capture can be up to 80 per cent of the cost of geosequestration, the CO2CRC is also investigating ways to reduce these costs by selecting the best process for gas separation and removal. This has led to innovative techniques to reduce costs and resulted in several patents. Two Victorian demonstration projects will show how to remove carbon dioxide from brown coal generation under various low cost options.
- 3.53 There are techniques to capture carbon dioxide emissions both before and after burning fuel by physical and chemical processes by altering the pressure and temperature of gas, liquid and solid streams. For instance, before combustion, carbon dioxide can be extracted from natural gas and coal can be turned to gas from which the carbon dioxide can be extracted. Pre-combustion capture is more efficient than post-combustion capture because burning fuel leads to a diffuse stream of gas which must be caught and condensed before the carbon dioxide can be separated. The CO2CRC scientists estimate that post combustion-capture would consume between 25 and 30 per cent of a power station's output and pre-combustion capture is likely to require only 10 per cent.

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<sup>96</sup> Mr Rick Fowler, Transcript of Hearing 11 April 2008, p.47

<sup>97</sup> Ms Sue Ern Tan, Transcript of Hearing 11 April 2008, p.54

### Other Projects

- 3.54 In October 2008, a post-combustion carbon capture plant was commissioned at a power station at Hazelwood in Victoria with a capacity for 15,000 tonnes per year. This will not capture all of the emissions which are around 18,000 tonnes per year.
- 3.55 In June 2008 a pilot post-combustion carbon capture device was installed at Munmorah Power Station in New South Wales. This is designed to capture up to 5,000 tonnes of carbon dioxide in the pilot phase. The \$150 million cost of this project is equally funded by the coal industry and the State and Federal Governments. Ms Tan of the New South Wales Minerals Council told the Committee that, when complete, this project would potentially be the first time a combined carbon dioxide capture and storage device was retrofitted to an existing power station.<sup>98</sup>

### Broader Applications

- 3.56 The CO2CRC believes wide-scale implementation of geosequestration from stationary emissions sources such as power stations could capture up to 300 million tonnes of carbon dioxide in Australia.
- 3.57 Ms Tan stressed that many of the carbon storage solutions are not new in themselves but have never been tested before in Australia. She cited an example of Sleipner in Norway where more than a million tonnes of CO<sub>2</sub> has been captured and stored 1,000 metres beneath the ocean floor each year since 1996. This has been monitored since 2000 and no leakage has yet been found. Scientists estimate that this particular rock formation had the capacity to store the entirety of European carbon emissions made over the next 600 years and were confident that they would remain underground for millions of years. She suggested that what is needed at this point is to produce a fully integrated capture and storage system from a power station to a storage site.<sup>99</sup>
- 3.58 Ms Tan argued that given the importance of coal as an energy source, the development of low emission technology was vital as part of a suite of measures to mitigate climate change.<sup>100</sup> They can help meet the growing global need for energy at a time when renewable energies are not sufficiently developed to fill in the gaps. She suggested that these technologies were of particular importance to New South Wales where coal mining is a multi-billion dollar export business that employs 13,000 people. Ms Tan advocated the need for investment in low emission technology as well as for national policies for an emissions trading scheme.<sup>101</sup>

### Timing of Availability

- 3.59 One of the criticisms of carbon capture and storage is that it may take several decades to be commercially viable which is far too late to help prevent irreversible climate change. Ms Tan told the Committee that with the accelerated research programs being funded by industry and government it was likely that these technologies would be broadly available by 2017.<sup>102</sup>

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<sup>98</sup> *ibid.*, p.51, CO2CRC brochure "CCS Activity in Australia 2008"

<sup>99</sup> Ms Sue Ern Tan, Transcript of Hearing 11 April 2008, p.51, p.54

<sup>100</sup> *ibid.*, p.51

<sup>101</sup> *ibid.*, p.50

<sup>102</sup> *ibid.*, p.54

### **Research Funding**

- 3.60 The Committee also heard from the New South Wales Minerals Council that the coal industry has committed \$1 billion voluntarily to this research in the Coal21 Fund. The New South Wales Government has established a \$100 million Clean Coal Fund.<sup>103</sup>
- 3.61 The Committee notes that industry, academics and State and Federal governments are committing significant resources to developing these technologies.

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<sup>103</sup> *ibid.*, pp.51-52

## Chapter Four - Effect of Climate Change Policies on Natural Resource Management

- 4.1 National and State climate change policies have been designed to assist natural resource managers maintain biodiversity, cope with the impacts of climate change and adopt mitigating practices.
- 4.2 This Chapter provides a brief description of how the existing and developing policies are likely to affect the various natural resource sectors and suggests some areas that could be improved.
- 4.3 The Committee notes that the major national policy to mitigate emissions is the Carbon Pollution Reduction Scheme. The design of the scheme is not finalised so its impacts are not known at this stage and are only discussed in the most general terms. These will be addressed in the Committee's other forthcoming report on emissions trading schemes.

### Need for Credible Scientific Basis for Policies

- 4.4 The Committee notes that the changes in climate change policy at the Federal level have lent new urgency to the research and development tasks. Mr Austin Whitehead of the Department of Primary Industries noted that:

One of the concerns between such a rapidly evolving policy debate is the lag between policy and Government priority now and the research, and then making sure that research has the time to be able to be conducted and then reported on.<sup>104</sup>

- 4.5 Robust scientific research takes time. The Department told the Committee about the progress of a number of extremely interesting and relevant projects that would not be completed until 2010. Mr Rick Fowler estimated that up until recently they had considered the scientific efforts were ahead of the policy development process but this lead was lost with the changes in Federal policy.<sup>105</sup>

- 4.6 Professor Colin Woodroffe of the University of Wollongong stressed that:

It is important that governments continue, and indeed expand, the current funding available for research and monitoring activities related to the condition of the State's natural resources, because the consequences of climate change are likely to be substantial, but remain difficult to predict in precise terms. There are limits to the extent to which science will be able to provide information about the precise extent of changes that will occur and the type of management and policy options that could be applied. This situation demands an adaptive management approach.<sup>106</sup>

### Need for Wide Adoption and Cooperation

- 4.7 As Mr Chris Davis of the University of Technology, Sydney pointed out, mitigation and adaptation strategies will need to be widespread to be effective and every feasible management intervention will be needed to reach emissions reduction targets.<sup>107</sup>

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<sup>104</sup> Mr Austin Whitehead, Transcript of Hearing 11 April, p.42

<sup>105</sup> Mr Rick Fowler, Transcript of Hearing 11 April, p.48

<sup>106</sup> Professor Colin Woodroffe, Transcript of Hearing 16 May 2008, p.47

<sup>107</sup> Submission 31, p.2, p.3

- 4.8 Mr Davis emphasised the need for scientific input into climate change policy development and there is likely to be much debate about management intervention in modified landscapes. These issues need to be resolved before major policy decisions are made that might have less than ideal outcomes. But:
- in light of emerging knowledge, rapid change and inherent uncertainties, the application of adaptive management principles to natural resource management will be needed. While protagonists may well demand certainty, an element of flexibility and nimbleness will be necessary.<sup>108</sup>
- 4.9 Ms Caroline Palmer of the University of Technology, Sydney noted that in Australia there is a lot of scientific knowledge but this has not been translated into action in improving the landscape. She identified a gap in the ability of managing institutions in implementing solutions in the social and political environment.<sup>109</sup> This is consistent with the views expressed by other groups. For instance a submission from the NSW Business Chamber noted that the business community is unlikely to be aware of the extent of increased costs for utilities such as gas, electricity and water as the price for comes to reflect the true costs of the resource more closely. The Chamber suggested that businesses would respond by making more efficient use of inputs but there needed to be education and assistance programs to prepare businesses to tackle climate change and to “outline the benefits of decoupling economic prosperity from emissions growth and practical measures to achieve this”.<sup>110</sup>
- 4.10 The Committee has heard that there needs to be integration and cooperation between agencies and science. The submission of the NSW Rural Fire Service noted that but climate change could lead to an increase in the number and intensity of bushfires, affect the ability of the Service to fight these fires and increase the amount of property damaged by fires. As well as using the research performed by the Bushfire Cooperative Research Centre in its planning work, the Service has participated in much research on the impacts of climate change and the risks of bushfires to biodiversity, ecosystem services and human settlement. In 2007 the Service released *Planning for Bush Fire Protection* which considered the impacts of differing fire weather scenarios. This work aims to improve the resilience of communities to the impacts of future fires.<sup>111</sup>
- 4.11 The CSIRO submission noted that adaptation of natural resource management to climate change is hindered by a lack of underlying information about resource availability and suggested that the information systems within New South Wales are poorly organised.<sup>112</sup>
- 4.12 The CSIRO submission argued that across all natural resource management policy areas, climate change should become part of the mainstream. In order to enhance communication of industry-specific and region-specific information, these policies need to be supported by effective climate data collection, distribution and analysis. There needs to be capacity to respond flexibly through research and development and capacity-building in particular industries and regions.<sup>113</sup>

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<sup>108</sup> Submission 31, p.2

<sup>109</sup> Ms Caroline Palmer, Transcript of Hearing 16 May 2008, p.45

<sup>110</sup> Submission 25, p.3

<sup>111</sup> Submission 32, pp.2-4

<sup>112</sup> Submission 18, p.v

<sup>113</sup> *ibid.* p.8

- 4.13 The Committee notes that the Department of Environment and Climate Change appears to be working to bring the community and natural resource managers into the policy development process with its consultative processes for the new Climate Change Action Plan. Mr Simon Smith, Deputy Director General of the Department, explained:

Our intention is to help prepare that by getting out into the regions, presenting the best regionalised information we have been able to obtain on what changes are forecast for different regions of New South Wales, to enlist local leaders in convening conversations with their regional communities, looking to what are the opportunities, which are different in each sector, what are the threats, which are different in each region of New South Wales and helping to facilitate the whole community incorporate those risks and opportunity into what they are already doing, into their mainstream business.

That is something we are very much looking forward to and the agricultural sector, lots of smart people in there who are already thinking about these things, we will keep on working with Primary Industries to feed across as much information as we have available on the nature of the scheme and the opportunities that exist for agriculture.<sup>114</sup>

- 4.14 Many participants in this inquiry thought it was important for natural resource managers and local governments to have up to date information on the local impacts of climate change. The Committee notes that in recent months the Department of Environment and Climate Change has been preparing summaries of the impacts of climate change projections on a regional basis. This initiative should help provide natural resource managers with credible reliable expert advice of the particular problems of their regions. However, as the science is rapidly evolving the Committee suggests that the Department of Environment and Climate Change commit to continue providing plain English information on updated scientific information for a general audience as it becomes available.

**Recommendation 1:** In order to assist natural resource managers and the community understand the potential impacts of climate change, that the Department of Environment and Climate Change commit to providing plain English information on updated scientific information for a general audience as it becomes available.

## Water Management

- 4.15 The allocation of water usage rights has been a contentious area in recent decades because of concerns about competition for finite resources between different users, over-allocation of licences in some areas, reduction in environmental flows leading to degradation of wetlands and in some areas lack of supplies for domestic uses. Climate change impacts exacerbate the already extremely variable availability of water.
- 4.16 Under the national reforms relating to water, New South Wales has allocated licences for rural water use on the basis of local water sharing plans. These determine extraction levels based on the level of available water. Water licences provide secure access to water when it is available and where appropriate are tradeable assets. The Government submission noted that this system should lead to water being used for the most economically productive purposes. Urban water supplies are managed under a Metropolitan Water Plan.<sup>115</sup>

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<sup>114</sup> Mr Simon Smith, Transcript of Hearing 11 April 2008, p.23

<sup>115</sup> Submission 40, pp.6-8

- 4.17 Mr Barry Irvin, Chairman of Bega Cheese discussed the different needs of coastal agricultural irrigators to inland irrigators where the majority of coastal streams are unregulated and there are few storage facilities but much water from storm events travels to the sea. Irrigators are competing with increasing populations in urban areas. He suggested that there should be:
- an integrated plan to address climate change with a specific focus on water management. This should take into account the forecast of future needs for agricultural, industrial and urban/rural residential use so that water supply authorities and governments have accurate information on which to base decision making as well as to reduce the chances of conflict between those competing for the resource.<sup>116</sup>
- 4.18 The NSW Business Chamber recommended retaining the water trading system, increasing transparency in the water approval system, taking a national approach to water management and offering transitional assistance to water users.<sup>117</sup>
- 4.19 The CSIRO submission noted that it was important for adaptation strategies to include the risk of climate change on both the demand and supply sides and suggested that market mechanisms be expanded for rural activities to increase water use efficiency. Water efficiency can be increased through shifts to drip irrigation or channel lining. Government policies can reduce the risk to future water supplies by limiting the construction of new farm dams and regulating drawing on fresh groundwater.<sup>118</sup>
- 4.20 Ms Rachel Walmsley of the Environmental Defenders Office noted that the laws governing water management were likely to need to be changed to take into account the projected changes in the availability of water as a result of climate change:
- It has been estimated that by 2030 surface water availability will decrease by up to 11 per cent with longer periods between inundation events, and then in other areas there actually will be increased rainfall—there will be flood events. So, it is very variable. I think the current approach of water law setting long-term extraction targets based on historical data is not realistic in this time of increased variability. So, just how we approach water law, for example, we need to focus more on sustainability and flexibility to accommodate these different impacts in different areas.<sup>119</sup>
- 4.21 Ms Sue Ern Tan of the New South Wales Minerals Council emphasised the importance of water security for mining operations and advocated the investigation of alternative water sources such as effluent water. For instance, mining operations in Orange and Blayney use recycled water. The mining industry is concerned that these sorts of arrangements need to be negotiated on a mine by mine basis and considered there may be a case for the State Government to develop a broader policy in this area.<sup>120</sup>
- 4.22 The Committee notes that the Government submission indicates that much research is underway to investigate the potential impacts on water availability of climate change in both rural and metropolitan areas<sup>121</sup>. It trusts that plans for water usage will be updated to take the findings of this work into account on an ongoing basis.

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<sup>116</sup> Submission 23, p.5

<sup>117</sup> Submission 25, pp.3-4

<sup>118</sup> Submission 18, p.8

<sup>119</sup> Ms Rachel Walmsley, Transcript of Hearing 16 May 2008, p.14

<sup>120</sup> Ms Sue Ern Tan, Transcript of Hearing 11 April 2008, pp.52-53

<sup>121</sup> Submission 40, pp.7-8



## Forestry

- 4.23 Depending on the final design of the national Carbon Protection Reduction Scheme, there is potential for the amount of forestry to be increased because of recognition of the carbon credits sequestered in timber. The draft policy in the Green Paper proposes that forestry activities be included on an optional basis.
- 4.24 The NSW Farmers' Association and others have expressed concern that policies that encourage the development of carbon offsets through plantation forestry on cleared land may reduce the availability of agricultural land and reduce the availability of water for existing users unless they are carefully regulated.<sup>122</sup> This issue will be discussed in more detail in the Committee's planned report on emissions trading schemes. The Committee does not propose to address the issue in this report in much detail beyond noting that Mr Warwick Ragg of Australian Forest Growers considered that this scenario was unlikely to eventuate:

In respect of water, we of course do not deny that trees use water. We think some of the debate about water use of trees is drastically overstated. Clearly, there are other enterprises that use more water, perhaps for less economic return. You take which scientist you like and put him on the table to support your case. We are not yet convinced by ABARE's modelling that says there are going to be 40 million hectares of forest established for carbon only, that it is in any way likely. We, as an industry, are focused on plantation establishment signatories to the Plantations for Australia: The 2020 Vision, which contemplates the establishment of up to three million hectares by 2020. We are just over halfway now, and that started in 1997.

We cannot see where the economic value is in carbon-only plantings, unless it is in very low rainfall areas and very low land cost. Arable land in Australia is a finite resource. I would have thought, without being a market or an analyst, that it is unlikely that there is going to be sufficient economic value in a carbon-only crop to sustain large tracts of land being taken out of agricultural production.<sup>123</sup>

- 4.25 Mr Ragg also noted forestry operations could also be affected by policies promoting the use of renewable energy as forestry residue products could be used as a source of material for biomass generation. He noted that a trial plant in northern New South Wales is attempting to extract ethanol from wood. He considered that the sector could benefit from establishing markets for biodiversity and integrating the establishment of forests in agricultural landscapes both to offset agricultural greenhouse gas emissions and as a source of material for biomass fuel.<sup>124</sup>
- 4.26 The Committee notes that there are likely to be significant impacts on forestry activity of national climate change policies but these are not known yet in any detail.

## Agriculture

- 4.27 Witnesses from The NSW Farmers' Association noted that existing climate change policies had already had significant impact on agriculture. As noted above, Australia is on target to meet the agreed emission target under the Kyoto Protocol largely because of reductions in land clearing. Mr Jock Laurie noted that the costs of the decisions at the State and Federal level to end broad scale land clearing had been

<sup>122</sup> eg Mr David Eyre and Mr Jock Laurie, Transcript of Hearing 11 April 2008, p.32, Mr Tim Beshara *op cit*, p.5, Mr Jim McDonald, *op cit*. p.12

<sup>123</sup> Mr Warwick Ragg, Transcript of Hearing 16 May 2008, pp.32-33

<sup>124</sup> *ibid.*, pp.31-32

borne by individual farmers. Mr David Eyre pointed out that there was no reference to compensation to farmers for meeting the cost of Australia meeting its emission targets.<sup>125</sup>

4.28 Other climate change policies will affect the sector as well. Even if agriculture is not included in a national emissions trading scheme at this stage, there are likely to be flow on effects such as increases in the price of fertiliser. Increases in the price of fuel would also affect the sector disproportionately because of the reliance on transport to cover the long distances between agricultural production areas and markets.<sup>126</sup>

4.29 If agriculture is included in an emissions trading scheme in the longer term, agricultural practices are likely to need to change to reduce overall emissions from the sector in the most economically feasible method. For instance a major component of agricultural greenhouse gas emissions is the methane produced by cattle. The final Garnaut Review Report suggested using kangaroos as an alternative source of meat. Scientists are investigating changes to diet or vaccines that could lower the level of methane cattle produce.<sup>127</sup>

### Adaptation

4.30 As noted in Chapter Two, the agricultural sector is highly vulnerable to the effects of climate change and significant research is underway to improve the amount of information about how primary producers can adapt their practices to cope with a changed environment.

4.31 The CSIRO argues for more research and development into climate change adaptation for agriculture as the potential benefits outweigh the costs by a factor in the order of 100.<sup>128</sup> In particular the CSIRO submission contended that there was lack of reliable information about the type and distribution of soil in New South Wales. This hampered land use planning and the prevented regional assessment of land use options under a changed climate. In Western Australia and South Australia there is sufficient information on the distribution of soil and land resources for robust assessments of the likely impacts of climate change. This is not possible in New South Wales yet because of a lack of investment in natural resource information.<sup>129</sup>

**Recommendation 2:** As part of developing an adaptation strategy for climate change that cannot be avoided, the Government consider supporting research into mapping the soil characteristics in New South Wales to improve knowledge amongst natural resource managers of the suitability of particular areas for particular land uses.

4.32 The CSIRO submission suggests that industry groups should participate in this research and development so that their key concerns can be dealt with, their expertise can be used and the research can lead to improved capacity in agricultural communities. Active adaptation management will need all involved to be confident that the climate is changing, be motivated to change to avoid risks, have effective

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<sup>125</sup> Mr Jock Laurie, David Eyre, Transcript of Hearing 11 April pp.32-33

<sup>126</sup> Mr Jock Laurie, Transcript of Hearing 11 April 2008, p.29

<sup>127</sup> *ibid.* p.39, Garnaut Review *Final Report* 2008 p.540 Mr Austin Whitehead and Mr Rick Fowler, Transcript of Hearing 11 April 2008, pp.41-42

<sup>128</sup> Submission 18, p.6

<sup>129</sup> *ibid.* pp.v-vi

technologies to enable changed practices, have support during transition phases including for changes to transport and market infrastructure.<sup>130</sup>

- 4.33 The CSIRO submission identified several priority adaptation strategies for agricultural sectors, noting that regions in the mid latitudes had many potential options in terms of crop types and animals from other climatic zones so long as there was adequate water:

<b>Priorities for climate change adaptation strategies for Australian agricultural sectors</b>
<b><i>Cropping</i></b>
Develop risk amelioration approaches (eg zero tillage and other minimum soil disturbance techniques, retaining residue, extending fallow, row spacing, planting density, staggering planting times, erosion control) and controlled traffic approaches Research and revise soil fertility management on an ongoing basis Alter planting schedules to be more opportunistic depending on environmental conditions, climate and markets Further develop warning systems for likelihood of very hot days, drought, and high erosion potential Select appropriate varieties e.g. for heat shock resistance, drought tolerance, resistance to new pest and diseases
<b><i>Livestock industries</i></b>
Research and promote greater use of strategic resting of paddocks Develop safe carrying capacities on a regional basis Modify timing of mating based on seasonal condition Develop water use efficiency strategies to manage potentially lower water availability Select for cattle lines with greater thermoregulatory control
<b><i>Horticulture</i></b>
Change varieties so they are suited for future conditions and re-assess industry location Research on altering management to change bud burst et in fruit trees
<b><i>Water resources</i></b>
Increase monitoring of water use in terms of production and climate rather than area Develop tools that enhance crop choice to maximise efficiency and profit per unit of water Build climate change into integrated catchment management, relevant strategic policies and new infrastructure Incorporate climate change into long-term water sharing agreements
<b><i>Pests, pathogens and parasites</i></b>
Systematically map vulnerability of plants and animals to endemic and exotic pests, pathogens and parasites Select animal breeds and plant varieties resistant to pests, pathogens and parasites already in Australia Strengthen quarantine measures within Australia and at entry points.

(Adapted from Table 1 Submission 18, p.7)

<sup>130</sup> Submission 18, pp.6-7

- 4.34 The Committee considers that this list of measures would assist the agricultural sector in adapting to the impacts of climate change. It notes that it is consistent with many of the key projects being undertaken by researchers in Federal agencies, the Department of Primary Industries and bodies such as Catchment Management Authorities.
- 4.35 The Committee trusts that the priorities for adaptation are developed in consultation with the agricultural sector and information about the results of research are communicated effectively through appropriate stakeholder engagement. This is important because the Committee has heard that farmers can be resistant to new techniques unless they are shown the benefits.
- 4.36 Ms Pamela Green of the Natural Resources Advisory and Chair of the Southern Rivers Catchment Management Authority told the Committee about the importance of building trust with farming communities to encourage them to change their practices in response to climate change. The CMAs are highly effective at this approach:

I believe we are the tool that can deliver this type of major mind shift in the community. The way we do that is by understanding how practice change comes about. All of this is all about people. The end result is the change in management of our natural resources. But the work with communities starts with intensive work with individuals. You build up relationships and trust. You then enable people to form small groups; they have peer-group learning. I am sure you are aware of this sort of process. It is key to getting the long-term shift in people's minds that is needed to address this issue. We are really up to the stage where we are moving into adaptation. There are probably very small amounts of mitigation we can carry out, but we need to adapt, particularly agricultural practices, to continue to be able to be self-sufficient in Australia over time.<sup>131</sup>

**Recommendation 3:** That the Government make every effort to engage the agricultural sector in communicating appropriate strategies for adapting to climate change such as by building on the expertise of the Catchment Management Authorities.

### **Mitigation - Biosequestration**

- 4.37 There is a possibility that in the longer term national policies may be developed to recognise the mitigation of climate change by storing carbon dioxide in soil. This is discussed in the next chapter.

### **Mitigation - Renewable Energy**

- 4.38 Agriculture currently contributes to renewable energy through ethanol production. It is likely that with the adoption of a Mandatory Renewable Energy Target this market could increase. There may be a risk of crowding out food production unless appropriate price signals are maintained.
- 4.39 The Government Submission noted that the introduction of a national Mandatory Renewable Energy Target would provide opportunities for land managers to derive income from the siting of wind farms. There is likely to be an increased number of these constructed in the next few years as part of meeting the target.<sup>132</sup>
- 4.40 Mr Simon Smith of the Department of Environment and Climate Change emphasised to the Committee that there were real opportunities for agricultural producers might arise from national climate change policies in this area:

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<sup>131</sup> Ms Pamela Green, Transcript of Hearing 31 October 2008, p.4

<sup>132</sup> Submission 40, p.19

There will be demand for wind, which may be located on rural landholder's land, as you would know. There is likely to be a demand for biomass as we move to new technologies for alternative fuels, there will be demand for other types of biomass products rather than conventional food crops, and these are the most promising areas for fuels. It is much better to use woody materials that do not compete with food to produce fuel, in my view.<sup>133</sup>

- 4.41 However, Mr David Eyre of NSW Farmers' Association was critical that there were no current incentives under the renewable energy schemes for small communities to adopt renewable energy and remove themselves from the grid because the point of obligation to adopt renewable energy under the proposed scheme falls on the large energy suppliers rather than individuals. He suggested that there could be a two tiered energy economy with regional communities or farms receiving abatement credits for producing their own energy from renewable sources.<sup>134</sup>
- 4.42 The Committee notes the concerns of the NSW Farmers' Association in the implementation of renewable energy policies.

### **Native Vegetation and Ecosystems**

- 4.43 The Committee notes that State and Federal policies have encouraged the preservation of native vegetation and ecosystems in both public lands such as national parks and on private land. Managers of these natural resources need to include consideration of the implications of climate change in future policies.
- 4.44 As noted above, a large contribution to meeting Australia's emissions targets under the Kyoto Protocol was by reductions in land clearing. In New South Wales this was done through the *Native Vegetation Act 2003* which imposed strict limits on land use decisions on private land. In a submission to the Committee, the Wilderness Society expressed concern that there has not been adequate monitoring of the implementation of these limitations and suggested that there was no evidence that land clearance rates have reduced.<sup>135</sup> The Committee notes that the Government has committed to improving the amount and condition of native vegetation in the State under the State Plan and will be producing regular updates on status of native vegetation.<sup>136</sup> It trusts that these are based on a reliable analysis on data on land clearing.
- 4.45 The Committee notes that the science in relation to developing adaptation strategies is evolving. A submission from the CSIRO provided a useful analysis of the factors that should be considered in developing adaptation policies for preserving native flora and fauna. These should accommodate changes in species and ecosystems rather than prevent change because ecological communities will change as different species respond to climate change in various ways. There will be many changes that will be hard to predict at the species level and which ones are most important from a management perspective. The submission suggests focussing on managing general and unpredictable changes in species and ecosystems. Climate change will interact with existing threats and it may be more useful to consider it in this context rather than as a separate threat.

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<sup>133</sup> Mr Simon Smith, Transcript of Hearing 11 April 2008, p.22

<sup>134</sup> Mr Jock Laurie, Transcript of Hearing 11 April 2008, p.32

<sup>135</sup> Submission 9, p.2

<sup>136</sup> NSW Government *State Plan – A New Direction for New South Wales, 2007 Update*, E4

- 4.46 This means that, when preparing management plans, there should be no assumption that species and ecosystems should be static but there should be an understanding of “acceptable” change. The submission considered it to be important to preserve both a large area of habitat as well as a high level of diversity. This diversity will increase the chances that more species can adapt to a changed climate. By focussing on the habitat characteristics there would be a more strategic and effective basis for protecting as many species in the long term than using criteria based on individual species. By improving their understanding of these threats, managers will be able to respond in ways that minimise losses in biodiversity.
- 4.47 The CSIRO submission considered that natural resource management and conservation programs should be coordinated to improve management at landscape and regional scales and based on evidence. The submission noted that while having connections between different sections of native habitat might help some species adapt to climate change, these connections could encourage colonisation of competitors, pathogens, predators and fire so isolated patches of habitat were also valuable.<sup>137</sup>
- 4.48 The Committee considers these points should be considered by managers of natural landscapes. The Committee notes that, in the face of climate change, the Government could choose to provide incentives to landholders to preserve particularly valuable areas of remnant vegetation. There is already a voluntary system of environmental covenants under which landholders commit to the preservation of areas of land. The Government has also developed policies in relation to “biobanking” where an area of land of high ecological value is preserved to “offset” the environmental impacts of a development somewhere else. An extension of that process could generate stewardship payments for landholders according to Ms Rachel Walmsley of the Environmental Defenders Office:
- I am on the Biodiversity Banking Ministerial Reference Group so we are talking about biodiversity credits there. There have been conversations about how that will fit with any future carbon credits and whether farmers will be able to get a carbon credit and a biodiversity credit for their remnant bush. So long as they are robust offsets and robust credits, we think it would be great if the incentive payments could go to farmers to manage these co-benefits.<sup>138</sup>
- 4.49 In the future policies might be developed to derive environmental stewardship payments from the value of carbon stored in the native vegetation. These could provide a revenue stream for landholders and an incentive to preserve vulnerable areas.<sup>139</sup>

## Marine Environment and Fishing Industry

- 4.50 Marine environments are managed by establishing policies in relation to fishing of certain species and by protecting areas in marine parks and to manage fisheries resources.
- 4.51 Scientific research has shown that the marine environment is vulnerable to climate change because higher temperatures increase the acidity of the water and change the way ocean currents operate. These two impacts are likely to reduce the

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<sup>137</sup> Submission 18, pp.9-10

<sup>138</sup> Ms Rachel Walmsley, Transcript of Hearing 16 May, p.19

<sup>139</sup> Submission 18, p.11

distribution of commercial fisheries and alter the biodiversity of the marine environment.

- 4.52 Mrs Mary Howard noted that in the Hawkesbury-Nepean estuary the needs of commercial fishers were competing with recreational fishers and environmental protection. She asked that the economic contribution of fishing be given greater prominence in planning the use of river resources.<sup>140</sup>
- 4.53 The Committee notes the particular pressures on the fishing industry caused by increasing development are likely to be compounded by the impacts of climate change and trusts that the Department of Primary Industries and the Department of Environment and Climate Change continues to develop policies that reflect the most recent scientific research on marine environment management.

### Coastal Protection

- 4.54 The State and local governments have significant power to mitigate the potential impacts of coastal incursions caused by climate change by preventing developments in coastal areas considered vulnerable or that could increase impacts on other landowners.
- 4.55 There are two relevant issues: lack of information about specific areas of vulnerability and legal uncertainty about how councils should act.
- 4.56 For instance, in a submission to this Committee, the Gosford City Council called on the Department of Environment and Climate Change to provide firm projections of sea level rise for the next 25, 50 and 100 years and then forward this information to the Department of Planning.<sup>141</sup> A representative of the Western Sydney Regional Organisation of Councils told the Committee that member councils are also concerned about the impacts of rising ocean levels on developments near rivers and on floodplains. There needed to be a greater level of information for inland councils as they “do not want to approve developments on land which is going to be a metre underwater in a hundred years time.”<sup>142</sup>
- 4.57 Mr Geoffrey Withycombe of the Sydney Coastal Councils Group noted that in the future councils may have to make difficult decisions about rezoning land from residential to “open space” if it is considered too vulnerable to the impacts of climate change. This is a complex issue that will also affect existing developments and infrastructure. Reliable data is essential to support these difficult planning decisions.<sup>143</sup>
- 4.58 Once again, the science of climate change projections is complex and affected by a number of factors such as changes in currents, erosion patterns and uncertainty about the amount of sea level rise that can be expected. Professor Colin Woodroffe of the University of Wollongong described a project he had been involved with in mapping the vulnerability of the national coastline that focussed on identifying those parts of the coast most vulnerable to the effects of climate change. He considered that more research was needed to integrate this with an understanding of the patterns of coastal erosion and sand deposition. He considered that research showed

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<sup>140</sup> Submission 33, p.19

<sup>141</sup> Submission 38, p.1

<sup>142</sup> Mr George Campbell, Transcript of Hearing 11 April 2008, p.63

<sup>143</sup> Mr Geoffrey Withycombe, Transcript of Hearing 16 May 2008, pp.40-41

that careful management of beaches, dunes and their vegetation could assist in adaptation but it was very important to establish monitoring programs.<sup>144</sup>

- 4.59 Mr Withycombe described a demonstration project by the Department of Planning on high-resolution laser scanning of the landscapes (called LIDAR) and noted that this could provide extremely valuable information about the elevation of the coastal zone. He stressed that councils need access to that information quickly in order to develop strategic plans for development. He suggested that additional funding of \$12 million could complete the assessment for the whole state so that councils could accurately predict areas vulnerable to sea level rise:

We have some development proposals already in existence, and for the future, around our estuaries and our coastal lagoons, which inevitably will be inundated in future climate change. Without that level of data in the modelling, how will we make wise investments for the future? It is a really significant issue.<sup>145</sup>

- 4.60 The Committee notes the importance of establishing and maintaining high quality projections of the impacts of climate change on areas prone to coastal erosion and increased flooding as a result of climate change. This information needs to be based on the highest quality information and updated as circumstances change. Local government is unlikely to have the resources to undertake this resource on its own.

**Recommendation 4:** That the Department of Environment and Climate Change and the Department of Planning facilitate the completion of mapping of coastal vulnerability as quickly as possible and communicate that information to affected local councils in order to assist with developing local planning instruments.

**Recommendation 5:** That the Department of Environment and Climate Change consider the need for establishing monitoring of coastal erosion.

- 4.61 The Committee has heard that local government would benefit from improved State planning guidelines to implement the planning consequences of climate change.
- 4.62 The Sydney Coastal Councils Group described a project with the Environmental Defenders Office to research legislation to assess the relative levels of responsibilities and necessary actions of councils. This found that very few pieces of legislation mention climate change at all and these do not impose many obligations on councils. They are potentially open to liability only where it is not considered at all. Under the local government legislation, councils are indemnified if they develop and follow coastline and flood management plans under State policies in good faith.<sup>146</sup> However, the report concluded by stating that there was a clear case for the State Government to improve the level of guidance for councils so they could have more certainty about when they should act to protect coastal areas. The report considered that the Government should develop guidelines building on the existing *NSW Coastal Policy and Coastal Protection Manual* to enable councils to set benchmarks for

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<sup>144</sup> Professor Colin Woodroffe, Transcript of Hearing 16 May 2008, p.48

<sup>145</sup> Mr Geoffrey Withycombe, Transcript of Hearing 16 May 2008, p.38

<sup>146</sup> *ibid.*, p.37



addressing coastal hazards. These guidelines should ensure that councils take a consistent approach to sea level rise in planning decisions.<sup>147</sup>

- 4.63 The Sydney Coastal Councils Group advocated the development of guidance such as model policies and programs that councils could adopt. They suggested providing a regional approach on issues so councils could work collectively and ensure that all players are working together in partnership including government, utilities, education and business.<sup>148</sup>
- 4.64 Mr Geoffrey Withycombe of the Sydney Coastal Councils Group also expressed particular concern about the need to disclose risks accurately to the community so that if there are changes in the distribution of a flood zone, people can make appropriate plans.<sup>149</sup> Professor Bruce Thom suggested that consideration of climate change risk be included in building certificates issued by local councils under section 149 of the *Environmental Planning and Assessment Act 1979*. The Committee considers it is important of property owners to be aware of the potential impacts of climate change and considers that the Department of Planning should consider the most appropriate manner of conveying reliable information.

**Recommendation 6:** That the Department of Planning provide improved guidelines to local government about planning for climate change.

**Recommendation 7:** That the Department of Planning consider the best methods of informing property owners about the accurate risks of the impact of climate change such as by including accurate information about climate change risk on building certificates issued under section 149 of the *Environmental Planning and Assessment Act 1979*.

## Local Government

- 4.65 The Namoi Regional Organisation of Councils asked that the inquiry recognise the role played by local government in managing natural resources sustainably. The submission argued that climate change mitigation and adaptation should be “comprehensively coordinated” between Federal, State and local government, business and industry. However the group also stressed the financial and staff constraints under which local government operates and considered that the costs of these programs should be carried by the Federal Government and not become another burden for local government. Currently there is funding available for projects but councils do not have the resources to develop projects.<sup>150</sup>
- 4.66 The Macarthur Regional Organisation of Councils echoed these views in a submission to the Committee, noting that the member councils were committed to working as a group to establish and implement measures to limit the factors contributing to climate change. The Organisation was particularly concerned about identifying sources of funding for riparian rehabilitation.<sup>151</sup>

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<sup>147</sup> Environmental Defenders Office and Sydney Coastal Councils Group *Planning for Climate Change: An Assessment of Australian and NSW Legislation and Government Policy Provisions relating to Climate Change relevant to Regional and Metropolitan Coastal Councils*, February 2008, pp.37-38

<sup>148</sup> Mr Geoffrey Withycombe, Transcript of Hearing 16 May 2008, p.39

<sup>149</sup> *ibid.*, pp.40-41

<sup>150</sup> Submission 30, p.2

<sup>151</sup> Submission 28, pp.1-2

4.67 The Committee notes that local government plays an important role in managing natural resources and development controls. It recommends that any potential cost implications are considered prior to the imposition of any additional statutory responsibilities on this level of government.

**Recommendation 8:** Any changes in climate change policies that impose obligations on local government include a consideration of any costs for implementation.

### Improvements to Current Natural Resource Management Framework

4.68 The Committee has heard that there may be gaps in the consideration of environmental factors generally and climate change in particular in developing policies that may or may not be directly related to climate change. Issues included a lack of prominence of environmental factors in planning legislation and a lack of monitoring of the implementation of decisions.

4.69 For instance the Western Sydney Regional Organisation of Councils was extremely concerned about the impact of climate change on new populations that are forecast to move in to western Sydney over the next few decades under current State Government plans. It is not clear that appropriate levels of consideration have been given to the environmental impacts of this growth. They consider that all new planning proposals should be subject to a full environmental climate change assessment.<sup>152</sup>

4.70 Mr Geoff Withycombe of the Sydney Coastal Councils Group advocated the inclusion of natural resource management targets in planning processes and for the Government to provide guidance to councils about the conflicts between planning and natural resource management where policies are inconsistent.<sup>153</sup>

4.71 Professor Bruce Thom of the Wentworth Group of Concerned Scientists noted that there does not seem to be any independent reviewing of the implementation of natural resource management and land use planning climate change policies by local councils. The Natural Resources Commission has power to audit the performance of CMAs against the Natural Resource Standards but these are not the major authorities in relation to coastal land use planning which is jointly handled by the Department of Environment and Climate Change, coastal councils and the Departments of Lands and of Planning.<sup>154</sup>

4.72 Mrs Mary Howard noted that the Hawkesbury-Nepean Catchment Management Authority's Action Plan is linked to targets which are independently audited. She recommended that all New South Wales agencies be subject to the same standards and targets so that there is consistency in application of these standards across the whole catchment.<sup>155</sup>

4.73 Mr Colin Berryman of the Western Sydney Regional Organisation of Councils recommended appointing an independent sustainability commissioner to assess and monitor the environmental impacts of proposals:

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<sup>152</sup> Mr George Campbell, Transcript of Hearing 11 April 2008, pp.58-59

<sup>153</sup> Mr Geoff Withycombe, Transcript of Hearing 16 May 2008, p.38

<sup>154</sup> Submission 12, p.2

<sup>155</sup> Submission 33, p.17

It certainly needs an independent voice and resources to both monitor the activities of government and non-government agencies and resources to identify new opportunities around developing sustainability practices and contribute to the sustainability debate. So a combination of review of what has gone wrong and a capacity building role, but an independent one.<sup>156</sup>

- 4.74 The Committee notes that the Government currently reports on improvements in greenhouse gas mitigation and environmental performance in its State Plan reporting, however, there may be merit in improving the level of scrutiny across the relevant State and local government agencies.

**Recommendation 9:** That the Government consider how to monitor the implementation of climate change policies by local councils such as by appointing a body similar to the Natural Resources Commission for this purpose.

**Recommendation 10:** That the Government consider adopting a system for monitoring the consideration of climate change in planning decisions.

- 4.75 The Environmental Defenders Office urged the strengthening of recognition of Ecologically Sustainable Development (ESD) principles by putting them at the forefront of legislation:

**Mr GERARD MARTIN:** Given that most of what we do is framed under our legislation and, therefore, the legislation has to be effective, in your submission you talk about 60 pieces of New South Wales legislation including ESD on paper but much of it not being enacted rigorously. Can you give a few examples of some omissions?

**Ms WALMSLEY:** That is right. While a standard definition of ESD is included in over 60 pieces of legislation, some of those Acts just say that a decision maker must have regard to ESD, or it is one of a number of factors that is taken into account; it is not the overriding factor. So, for ESD to be better implemented it would require strengthening of the legislation to make sure that decision making was in accordance with the principles of ESD, not just as a factor to have regard to, because then it can easily be dismissed by the decision maker. Whereas we are saying that there will be long-term benefits if you factor it in properly at the decision-making stage.

**Mr GERARD MARTIN:** So, we would have had to be a lot more prescriptive about it. Would you do that through the regulations that go with it?

**Ms WALMSLEY:** It can be done relatively simply, with the wording in the legislation. Instead of having "have regard to ESD" you could have "in accordance with ESD", and operationalise that. Within natural resource legislation you could say, "the key consideration" or "this part of the Act must be implemented in accordance with ESD". You just need to strengthen the language, so it has flow-on effects. It needs to be a priority strategy.<sup>157</sup>

- 4.76 The Committee considers that the natural resource management framework could be strengthened if there was greater prominence given to ESD principles in relevant legislation. However, without detailed implementation strategies, legislative change is unlikely to be effective. It is unclear what level of effort would be required to embed such amendments in the State natural resource management framework.

<sup>156</sup> Mr Colin Berryman, Transcript of Hearing 11 April 2008, p.61

<sup>157</sup> Ms Rachel Walmsley, Transcript of Hearing 16 May 2008, p.16

**Recommendation 11:** That the Government investigate the merits of strengthening the recognition of ESD principles by amending the relevant legislation to make it a primary consideration.

## Chapter Five - Some Other Approaches

- 5.1 This Chapter discusses some of the other approaches for adapting or mitigating the impacts of climate change raised with the Committee which are not currently part of national and international policies.

### Reducing the Urban Heat Island Effect

- 5.2 In Chapter Two, the Committee noted that the effects of climate change would be exacerbated in urban areas because of the urban heat island effect. In western Sydney this could increase average temperatures by between 1°C and 3°C, in addition to projected increases from climate change of between 2°C and 6°C.
- 5.3 The Committee heard from Mr Tim Beshara, Science Manager from Greening Australia, that the current policies of the New South Wales Government did not address this issue even though this was the area in which the State Government could be most effective in showing leadership and providing planning advice to local government rather than trying to influence international policy development.<sup>158</sup>
- 5.4 He noted that there are plans for an additional 1.2 million people to live in Sydney by 2030. If new developments address the heat island effect the rise in local temperatures could be minimal.<sup>159</sup>
- 5.5 The Committee understands that the solutions to reducing the urban heat island effect are increased vegetation and fewer heat reflecting surfaces. In Brisbane there is a policy of replanting suburban trees as a way of addressing the effect. Greening Australia advises that it is however far more cost effective to introduce such policies at the planning stage rather than retrofit them.<sup>160</sup>
- 5.6 Greening Australia would like to undertake large-scale revegetation projects in western Sydney and is currently involved in the Greening Western Sydney program with local and State government agencies.<sup>161</sup>
- 5.7 Mr Beshara noted that internationally there are incentives for commercial premises to use lighter coloured roofs but here the building industry follows consumer preferences for darker roofs.<sup>162</sup>
- 5.8 On 25 June 2008, the Committee held a meeting with representatives of BlueScope Steel, manufacturers of construction materials, to discuss their understanding of the issue. BlueScope explained the concept of “cool roofs” that were designed to reflect high levels of solar radiation. These provided superior insulation within buildings but also reduced the amount of heating in the air outside and in combination with vegetation could reduce the effects of the urban heat Island effect.
- 5.9 BlueScope Steel had produced a range of materials in darker colours which also had high levels of solar reflectivity. It suggested that the current rules for sustainable building index (BASIX) should be amended to incorporate the benefits of cool roofs.<sup>163</sup>

<sup>158</sup> Mr Tim Beshara and Dr David Butcher, Transcript of Hearing 11 April 2008, p.3

<sup>159</sup> Mr Tim Beshara, Transcript of Hearing 11 April, p.2

<sup>160</sup> *ibid.*, p.3

<sup>161</sup> Mr Colin Berryman, Transcript of Hearing 11 April 2008, p.61

<sup>162</sup> Mr Tim Beshara and Dr David Butcher, Transcript of Hearing 11 April 2008, pp.7-8

<sup>163</sup> Submission 42, p.1

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- 5.10 The Committee notes one of the ways in which a building can comply with the BASIX rules is by selecting a lighter coloured roof.<sup>164</sup> This could be amended to include a broader consideration of solar reflectivity without necessarily requiring a lighter colour. These guidelines are designed to improve the sustainability of building and reduce their energy use. There may be merit in amending them to incorporate specific references to addressing the urban heat island effect.
- 5.11 The Committee is pleased that the commercial sector is aware of the importance of energy efficiency and has worked to produce a product that meets both consumer preferences and enhanced solar reflectivity.
- 5.12 The Committee encourages the Departments of Environment and Climate Change and of Planning to consider the urban heat island effect in planning Greenfield developments.

**Recommendation 12:** That the Departments of Environment and Climate Change and the Department of Planning consider the urban heat island effect in developing guidelines for planning Greenfield developments including incorporating vegetation and strategies to improve the level of use of roofing materials that reflect a significant amount of solar radiation.

**Recommendation 13:** That the Department of Planning amend the BASIX guidelines to include specific reference to the benefits of choosing roofing material with solar reflective properties (rather than simply lighter colours) for addressing the urban heat island effect.

**Recommendation 14:** That the Department of Environment and Climate Change promote the use of roofing material with reflective properties by

- Offering domestic and residential builders incentives to use such materials and/or
- Providing information to consumers about the energy efficiency benefits of “cool roofs”

## Restoring Biodiversity

- 5.13 Mr Tim Beshara of Greening Australia informed the Committee that restoring native vegetation had the twofold benefit of drawing carbon dioxide from the atmosphere and making existing landscapes more resilient to the impacts of climate change.<sup>165</sup> The Organisation advocates the benefits of increasing vegetation cover to 30 per cent as these types of landscapes tend to have higher water and soil quality, more native species, lower salinity and be more resilient to the impacts of climate change than areas with less vegetation. Mr Tim Beshara cited CSIRO research that agricultural land was just as productive with 30 per cent vegetation as with the current average of five per cent.<sup>166</sup>
- 5.14 The Committee notes that the final report of the Garnaut *Climate Change Review* noted that biosequestration by restoring degraded arid zone grazing land to its

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<sup>164</sup> “BASIX about the indices” factsheet  
[[http://www.basix.nsw.gov.au/information/common/pdf/basix\\_indices.pdf](http://www.basix.nsw.gov.au/information/common/pdf/basix_indices.pdf)]

<sup>165</sup> Mr Tim Beshara, Transcript of Hearing 11 April 2008, p.2

<sup>166</sup> *ibid.*, p.2

original mulga based vegetation could remove 250 million tonnes of carbon dioxide from the atmosphere each year for several decades.<sup>167</sup>

- 5.15 Mr Daniel Williams, Principal Environmental Scientist for consultants GHD explained that, in Western Australia, many carbon biosequestration sites have been set up by mining companies as monoculture eucalyptus plantations but there were problems with this approach:
- Working with their [DEC] and also Greening Australia, we started to come up with a feeling that that totally conflicts with a sustainable landscape or a functioning landscape that is going to have to adapt to climate change, and to adapt to climate change, I do not think I need to describe to anyone here, but we need the opportunity for plants and animals to move north and south as well as east and west, and *eucalyptus nitens* plantations are not going to provide those opportunities on a landscape scale.<sup>168</sup>
- 5.16 He advocated an approach used by Greening Australia to restore degraded landscapes such as in its Gwandanaland project in northwest Western Australia where the Organisation is attempting to protect a biodiversity hotspot. The Committee appreciates that existing New South Wales biobanking regulations and environmental covenants do not address revegetation. Mr Williams suggested that there were opportunities to use existing and emerging policies to improve sustainable landscapes. For instance he suggested that valuable remnant landscapes could be linked by forestry or by biodiverse plantings that also allow some agricultural activity.<sup>169</sup>
- 5.17 NSW Farmers' Association saw benefits of biodiversity conservation as part of an integrated approach to natural resource and environmental management so long as there was a partnership approach with landholders. Witnesses cited the example of problems with implementing the native vegetation legislation regime in the Walgett area that were resolved with subsequent negotiation between landholders and officials to deliver environmental goals in a more flexible manner.<sup>170</sup>
- 5.18 Greening Australia sees the prospect of an emissions trading scheme as an opportunity to obtain funding for landscape restoration on a broad scale by providing a value for the carbon stored in plants. The Committee notes that there are difficulties in measuring biodiversity rather than the more straightforward accounting of carbon stored in plantation forests.
- 5.19 Greening Australia advocated the development of an environmental benefit index for plantations so that the relative merits of biodiverse plantings can be compared to monoculture. This is a complex process as it would need to be site specific and include a range of environmental measures such as salinity, water and biodiversity impacts.<sup>171</sup> The Committee notes that Professor Garnaut's *Climate Change Review* also considered that there was merit in creating market-based instruments for such values as biodiversity and abatement of salinity.<sup>172</sup>

**Recommendation 15:** The Committee considers that there are benefits in enhancing the biodiversity of degraded landscapes and the Government should consider developing

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<sup>167</sup> Garnaut Review *Final Report 2008* p.543

<sup>168</sup> Mr Daniel Williams, Transcript of Hearing 18 June 2008, p.10

<sup>169</sup> *ibid.*, p.11

<sup>170</sup> Mr Jock Laurie and Mr David Eyre, Transcript of Hearing 11 April 2008, pp.36-37

<sup>171</sup> Mr Tim Beshara and Dr David Butcher, Transcript of Hearing 11 April 2008, p.4

<sup>172</sup> Garnaut Review *Final Report 2008*, p.551

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policies to enable the recognition of plantings made for this purpose in future carbon accounting schemes.

## Carbon Farming – Sequestering Carbon in Soil

- 5.20 The Committee has heard much evidence about the potential for biosequestration of carbon in soil as a way of mitigating climate change from such organisations as NSW Farmers' Association and Mr Michael Kiely of the Carbon Coalition Against Global Warming. Mr Kiely was particularly passionate about the biodiversity and productivity benefits of improving the levels of carbon stored in soil but he was also advocating financial incentives for farmers under an emissions trading scheme.<sup>173</sup>
- 5.21 Soil organic carbon can be lost by clearing native vegetation, erosion, cropping, overgrazing, leaving fields fallow after harvesting crops and by burning stubble.<sup>174</sup> The amount of carbon can be increased in the top layers of soil by not tilling crops, retaining stubble, rotating land use between crops and pasture, adding organic fertilisers and encouraging the growth of plants with long roots.<sup>175</sup> Even without recognition of the extra carbon for emissions trading purposes there are benefits of increasing the level of soil carbon because it improves soil's water retention capabilities and overall productivity.<sup>176</sup>
- 5.22 The following box contains a description by Mr Michael Kiely of the processes of increasing the levels of carbon in soil and the environmental and productivity benefits of this approach.

### Description of carbon farming by Mr Michael Kiely

We farm our grass like a gardener would tend his garden. We nurture the soil, we see the use of concentrated numbers of animals.... till the ground with the hooves of the animals, manure the ground, clean up the ground, and then six weeks later you have fresh pasture.

...

Mulching is a simple thing. We came out of the city 10 years ago and we did not know we were making a mistake when we were told that we could not grow topsoil. We just mulched and topsoil appeared. If it was there before us, we could not see it. The important thing is that bare earth is out. Bare earth emits carbon dioxide, kills the microbes, destroys the manufacturers of carbon.

Also, too much vegetation is unproductive of carbon. We do not slash, we mulch. You can see in the photographs that our mulch is beautiful, it is springy, and all the bugs underneath love it because they have a roof to keep out the sun. Our grass grows immediately. Pasture cropping was invented in the Central West of New South Wales by a man called Col Seis in Gulgong. It means direct drilling of an annual cereal such as oats or rye into dormant perennial pasture. You leave the pasture, you do not plough....It should be direct drilled, which is minimum tillage.

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<sup>173</sup> Mr Michael Kiely, Transcript of Hearing 16 May 2008, p.23

<sup>174</sup> NSW Department of Primary Industries *Primefact 735 Increasing Soil Organic Carbon of Agricultural Land*, 2008, p.3

<sup>175</sup> *ibid.*, p. 4, Garnaut Review *Final Report* 2008, p.548

<sup>176</sup> Mr David Eyre, Transcript of Hearing 11 April 2008, p.34



The crop comes up and you can harvest the crop, or feed the crop out—and what happens to the pasture is miraculous. You can triple the number of what we call "crowns", which are the neoperennial grasses. We use that technique to renovate pastures and it is good to give flocks a mixed diet rather than a monoculture, which we try to avoid at all times. We have tried other things. Nitro-humus, which is treated human biosolids. At the moment we are doing tests on natural fertilisers. We know that the big problem with nitrous oxide is superphosphate, we are not going to be able to use superphosphate. The natural fertiliser industry is not going to be ready for the demand, they still do not have their footprint calculated. We are trying to work with them to make them see some sense.

The results are there. We are not very scientific, we took a 50-metre strip through the length of a paddock and I photographed the perimeters of that strip. Restoring grassy woodlands is another. When the explorers found the great pasture lands they called them park lands because they were scattered with trees. The prevalence of trees is critical for the high carbon scores. Shade is needed for animals, and they are homes for bugs. Everyone needs a home. If you want microbiological life, and they are the manufacturers of carbon, you have to provide no cleaning up of fallen trees. Those fallen trees are the housing estates.

At the end I have biodiversity indicators. The magic of living on a farm that is going through its seventh or eighth year of carbon farming, that is when biodiversity starts to explode. Carbon takes a long run up, but when it kicks in it is like a hockey stick. Straight up. The first thing we noticed was a plague of spiders. But if you have a plague of one species in the food chain there has got to be movement everywhere else.

The birds increased, as did one of the spiders feeding on them. We are very proud of the return of the kangaroo grass, which is a very difficult grass to grow because it is easily abused. It hates being ploughed, it hates being overgrazed. Our CMA has it planted in its garden at the front of the building in Wellington—it is so precious. Two little wood swallows have come from Queensland; they should now be down so far this way. The diamond dove had not been seen for 10 years, and we keep our eyes pretty close to the ground.

For carbon farmers to be genuine they have to conduct biodiversity surveys and do so because a carbon farmer is given permission to respect the soil, whereas with industrial farming he would get up in the morning and ask, "I wonder what I can kill today". They spend most of their days killing things, instead of making them grow. That is basically in our submission.

(Source Transcript of Hearing 16 May 2008, pp.25-26)

- 5.23 The Final Report of the Garnaut *Climate Change Review* noted that biosequestration in soil had the potential to store significant amounts of carbon. The report estimated that there was the potential for land used for crops to remove 68 million tonnes of carbon dioxide annually for between 20 and 50 years if changed practices were

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implemented on all 38 million hectares used for this purpose. Another 286 million tonnes could be stored each year on the 358 million hectares used as grazing.<sup>177</sup>

- 5.24 As noted above, Australia chose not to include soil carbon in its commitment to the Kyoto Protocol so such efforts would not be recognised under the current international carbon accounting rules. Mr David Eyre of the NSW Farmers' Association explained that the reasons for this choice were because the risk of losing carbon through drought or other natural causes were considered too high. He noted that similar concerns might prevent African countries from choosing to include soil in national emissions accounts.<sup>178</sup>
- 5.25 The Committee understands considerable effort is required to refine the tools for estimating the levels of carbon in soil and establishing permanence of storage on a similar basis to the 100 years required under the Kyoto Protocol for plantation forests. As Professor Mark Dangerfield of the Natural Resources Advisory Council told the Committee:
- We can look at a paddock and see better grass on it—and I have seen this in southern parts of the State, where a grazing system is put in place and the grass is now nice and tall and the paddocks look great—but there is still not a significant increase in soil carbon. One of the reasons for that is that the soil carbon at the surface does not respond as quickly as it does further down in the profile. That creates enormous measurement problems. Trying to put a spade in a claypan is pretty hard going. So getting measurements out in a way that is accountable and transparent will be one of the challenges. But, certainly, sequestration of carbon in soils is a huge issue and should not be ignored.<sup>179</sup>
- 5.26 Mr Rick Fowler of the Department of Primary Industries explained that there were significant complexities in developing a practical soil carbon accounting tool because there could be significant variations between, for example, the amount of carbon able to be stored in soil on opposite sides of the same valley. Clearly it is impractical to measure every paddock. The Department is currently conducting significant research into soil carbon accounting and what types of additives can be used to increase the capacity of the soil to store carbon.<sup>180</sup>
- 5.27 Different types of soils and climatic conditions lead to highly variable levels of ability to absorb and retain carbon. The Garnaut *Climate Change Review* noted that American studies have shown zero or minimum tillage increased carbon retention by 0.5 to 1.5 tonnes per hectare per year. An Australian study showed that in a high rainfall areas the same technique could store between 2.1 and 2.3 tonnes per hectare per year. Proponents of soil carbon told the review that growing perennial grasses at trial sites in New South Wales have added five to 10 tonnes per year and up to 20 to 30 tonne in very good soils.<sup>181</sup>
- 5.28 The Department of Primary Industries has been conducting long term trials of crop yield and soil health over 20 years under various patterns of crop rotation and stubble retention. No tillage saved 169 kg of carbon per hectare per year compared to traditional tillage. Stubble burning lost 108 kg per hectare per year. Rotating wheat

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<sup>177</sup> Garnaut Review *Final Report* 2008, p.543

<sup>178</sup> Mr David Eyre, Transcript of Hearing 11 April 2008, p.34

<sup>179</sup> Professor Mark Dangerfield, Transcript of Hearing 31 October 2008, p.3

<sup>180</sup> Mr Rick Fowler and Mr Austin Whitehead, Transcript of Hearing 11 April 2008, pp.45-46

<sup>181</sup> Garnaut Review *Final Report* 2008, p.549

under a no tillage regime with pasture increased carbon at 185 kg per year.<sup>182</sup> A Departmental trial of pastures sown with perennials and annuals was able to store 502 kg of carbon per hectare per year.<sup>183</sup>

- 5.29 However, the potential for storage depends on the type of soil, the local climate, the availability of water and historical management. For instance while a trial of sowing winter crops into dormant summer perennials protected the top soil and reduced the carbon loss, the strategy depended on year round rainfall.<sup>184</sup> More research is needed to estimate the levels of carbon that can be stored in particular types of soil with any degree of certainty.
- 5.30 Another risk is that soil carbon is lost easily. The NSW Farmers' Association advocated the development of a net farm carbon accounting system, or a balance sheet approach, so that if some carbon was removed it could be added somewhere else without affecting the overall total.<sup>185</sup> This sort of assessment tool would consider fluxes in the carbon cycle of farming activity.
- 5.31 Professor Dangerfield also noted that while the methods of increasing the level of carbon in soils was well understood, it was an entirely different challenge to make it worthwhile economically.<sup>186</sup> Mr David Eyre of NSW Farmers' considered that one way of doing this would be for the next international climate change agreements to distinguish between human-induced and natural soil carbon losses. Potentially this could create an economic incentive for communities to restore degraded agricultural land by rewarding them with carbon credits as part of an emissions trading scheme.<sup>187</sup> Professor Garnaut noted that these practices are only likely to be adopted on a broad scale if soil carbon was recognised in an emissions trading scheme.<sup>188</sup>
- 5.32 Mr Kiely characterised rural producers in his area as suspicious of changed practices unless they could see a real commercial benefit and some have resisted the efforts of the Catchment Management Authorities to provide funding for projects. However:
- We do not believe that you will ever get to them by putting on seminars and telling them this is going to improve their productivity. People who have never been on farms or look too citified do not come across as credible. But give them something to grow, like carbon, and give them a good return for it and you immediately have their attention. They do not care what they grow.<sup>189</sup>
- 5.33 As a final note of caution Mr Eyre of NSW Farmers' considered that
- [I]t can be done, and there is international movement building on this, but it would be crazy for Australian agriculture to leap into that until those rules are sorted out, even though the economic, the social and the environmental benefits of increasing soil carbon are obvious. It is actually a no brainer to do it, but there has to be genuine

<sup>182</sup> NSW Department of Primary Industries *Primefact 735 Increasing Soil Organic Carbon of Agricultural Land*, 2008, p. 4

<sup>183</sup> D Waters, NSW DPI, *Carbon Mythbusters: Soil Carbon Seminar*, p.39

<sup>184</sup> *ibid.*, p.41

<sup>185</sup> Mr David Eyre, Transcript of Hearing 11 April 2008 pp.34-35

<sup>186</sup> *ibid.*, p.3

<sup>187</sup> Mr David Eyre, Transcript of Hearing 11 April 2008, p.34

<sup>188</sup> Garnaut Review *Final Report* 2008, p.549

<sup>189</sup> Mr Michael Kiely, Transcript of Hearing 16 May 2008, p.24

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economic incentive to do it and there has to be no economic risk. Hence our caution in relation to the issue.<sup>190</sup>

- 5.34 The Committee notes that research into the merits of increasing soil carbon is underway by scientists around the world as well as in New South Wales agencies and considers this may be a valuable way of increasing the productivity of agriculture and the biodiversity of agricultural land. In the longer term, if the science is sufficiently developed, it may be possible to recognise the efforts of carbon farming in mitigating the effects of climate change in emissions trading schemes, should acceptable ways of measuring the carbon cycle be developed.

**Conclusion**

- 5.35 The Committee has reviewed the available evidence and considers that, while climate change has produced significant problems for natural resource managers, if all levels of government, scientists, industry and the community work together, it is more likely that the best possible solutions can be developed.

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<sup>190</sup> Mr David Eyre, Transcript of Hearing 11 April 2008, p.34

## Appendix One - Submissions

- 1 Mr Ken Green and Mr Graham Thomas
- 2 Ms Wendy Bunce
- 3 Environmental Defender's Office of New South Wales
- 4 Soroptimist International Griffith Inc
- 5 Mr Victor Eddy
- 6 Mr Drew Irwin
- 7 Border Rivers Gwydir Catchment Management Authority
- 8 Greening Australia
- 9 The Wilderness Society (Sydney) Inc
- 10 Mr Harry Houghton, Bog-a-duck Partnership
- 11 Professor Colin Woodroffe, University of Wollongong
- 12 Emeritus Professor Bruce Thom, Wentworth Group of Concerned Scientists
- 13 NSW Farmers' Association
- 14 CMA Chairs' Council
- 15 Mr Pat Edmondson
- 16 Mrs A Capel
- 17 Planning Institute of Australia (NSW Division)
- 18 CSIRO Climate Adaptation National Research Flagship
- 19 Murray Darling Association
- 20 Confidential
- 21 Institute of Foresters of Australia, Northern Branch, NSW Division
- 22 Armidale Air Quality Group
- 23 Mr Barry Irvin, Chairman Bega Cheese
- 24 Australian Forest Growers
- 25 NSW Business Chamber
- 26 Mr Michael Kiely, Convenor, Carbon Coalition Against Global Warming
- 27 Sydney Coastal Councils Group
- 28 Macarthur Regional Organisation of Councils (MACROC)
- 29 Western Sydney Regional Organisation of Councils (WESROC)
- 30 Namoi Regional Organisation of Councils
- 31 Mr Chris Davis, Sustainability Business Developer, University of Technology, Sydney
- 32 NSW Rural Fire Service
- 33 Mrs Mary Howard

Submissions

- 34 Ms Lyndall McCormack
- 35 The Hon Tony Kelly MLC, Minister for Lands
- 36 The Hon Ian Macdonald MLC, Minister for Primary Industries
- 37 NSW Irrigators Council
- 38 Gosford City Council
- 39 Natural Resource Advisory Council
- 40 NSW Government (The Hon Phil Koperberg MP (then) Minister for Climate Change and the Environment)
- 41 New South Wales Minerals Council
- 42 Bluescope Steel
- 43 Mr Mark Lamrock
- 44 Mr Sukhamay Gangopadhyay

## Appendix Two - List of Witnesses

### Friday, 11 April 2008

<b>Witness</b>	<b>Organisation</b>
Dr David Butcher, President Mr Tim Beshara, Science Manager	Greening Australia
Mr Jim McDonald, Chairman of Namoi Council Catchment Management Authority Ms Kerry Richardson, Manager Strategic Services	CMA Chair's Council
Mr Simon Smith, Deputy Director General	Department of Environment and Climate Change
Mr Jock Laurie, President Mr David Eyre, Senior Policy Manager	NSW Farmers' Association
Mr Austin Whitehead, Director of Water and Resources Policy Mr Rick Fowler, Policy Manager	Department of Primary Industries and NSW Forestry
Ms Sue-Ern Tan, Director Policy and Strategy	New South Wales Minerals Council
Councillor George Campbell, Spokesperson on the Natural Environment and Resources Mr Colin Berryman, Program Coordinator for the Natural Environment	Western Sydney Regional Organisation of Councils

### Friday 16 May 2008

Professor Andy Pitman	Climate Change Research Centre, University of NSW
Ms Rachel Walmsley, Policy Director Mr Robert Ghanem, Policy Officer	Environment Defenders Office (NSW)
Mr Michael Kiely	Carbon Coalition Against Global Warming
Mr Warrick Ragg	Australian Forest Growers
Mr Geoff Withycombe, Executive Officer	Sydney Coastal Councils

Standing Committee on Natural Resource Management (Climate Change)

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List of Witnesses

<b>Witness</b>	<b>Organisation</b>
Mr Christopher Davis, Sustainability Business Manager Ms Caroline Palmer, Director, Institute for Water and Environmental Resource Management	University of Technology, Sydney
Professor Colin Woodroffe, Coordinator Professor Ross Bradstock, Director, Centre for Environmental Risk Management of Bushfires	GeoQuest Research Centre University of Wollongong
Ms Leisl Baumgartner, Deputy Director General Dr David Hemming, Manager, Sustainable Energy	Department of Water and Energy
<b>Wednesday, 18 June 2008</b>	
Mr Daniel Williams, Principal Environmental Scientist Ms Michelle Larkin, Senior Environmental Scientist	GHD Consultants
<b>Friday, 31 October 2008</b>	
Mr Russell Ainley, Executive Director, Forests Products Association Ms Pamela Green, Chair, Southern Rivers Catchment Management Authority Associate Professor Mark Dangerfield, Environmental Consultant	Natural Resources Advisory Council



## Appendix Three - Visits of Inspection

### **Hunter Valley**

On 19 and 20 November 2007, a delegation of the Committee (Mrs Karyn Paluzzano MP and Mrs Cheryl Samuels) visited the Hunter Valley to learn about the operations of the coal mining industry and projects on renewable sources of energy. On 19 November they visited the Mt Owen Coal mine, the Bayswater power station and the John Marcheﬀ Solar Project at Liddell. On 20 November they inspected the Mandalong coal mine and visited the CSIRO Energy Centre which specialises in research on renewable energy.

### **Hawkesbury**

On 23 May 2008, a delegation of the Committee (Mrs Karyn Paluzzano MP, Mr Ray Williams MP and Ms Vicki Buchbach, Mrs Cheryl Samuels and Ms Kylie Rudd) inspected the condition of the lower reaches of the Hawkesbury Nepean River with senior members of the Hawkesbury-Nepean Catchment Management Authority to consider the possible effects of climate change on the river's health.

### **Otway Basin**

On 30 June 2008, a delegation of the Committee (Mr Michael Daley MP, Mr Thomas George MP, Mr Ray Williams MP and Ms Vicki Buchbach) travelled to southern Victoria examine the Otway Basin demonstration carbon capture and storage project and returned to Melbourne to meet Mrs Karyn Paluzzano MP and key members of the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC). The following day, Mrs Paluzzano, Mr Daley, Mr Williams and Ms Buchbach attended the opening of new offices for the CO2CRC and received a briefing on the full range of current and planned Australian research projects on carbon capture and storage.

### **Central West of New South Wales**

From 17 to 19 November 2008 a delegation of the Committee (Mr David Harris MP, Mr Gerard Martin MP, Mr Ray Williams MP and Dr Carolyn Littlefair) travelled to the Central West of NSW to learn about innovative land management practices to increase the amount of carbon in soil. On 17 November they met members and staff of the Central West Catchment Management Authority in Orange. They then travelled to the Reynolds family property "Geneffe" in the Cumnock region to meet the Little River Landcare Group and inspect modified farming practices. On 18 and 19 November, the delegation attended the Carbon Farming Expo and Conference in Orange to learn about techniques to improve the amount of carbon that can be stored in soil.



## Appendix Four - Extracts from Minutes

### Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 1)

10.30 am Wednesday 27 June 2007

Parliament House

#### Members Present

Mr Daley MP

Mr Williams MP

Mrs Paluzzano MP

Mr Oakeshott MP

Mr Martin MP

#### Apology

An apology was received from Mr Fraser MP.

#### Introduction

The Clerk of the Legislative Assembly opened the meeting and read the following extract from the Votes and Proceedings of Thursday 21 June 2007, entry 13 (10) –

Mr Aquilina moved, by leave:

“Committee on Natural Resource Management (Climate Change)

That:

- (1) A standing committee be appointed to inquire into issues of sustainable natural resource management with particular reference to climate change impacts and, in particular, to report on the following terms of reference:
  - (a) The likely consequences of human-induced climate change on land (including salinity), water and other natural resources;
  - (b) Options for ensuring ecologically sustainable natural resource use, taking into particular account the impacts of climate change;
  - (c) Approaches to land and water use management practices on farms and other natural resource management practices, having regard in particular to the role of such practices in contributing to climate change or as a tool in helping to tackle climate change;
  - (d) The effectiveness of management systems for ensuring that sustainability measures for the management of natural resources in New South Wales are achieved, having particular regard to climate change; and
  - (e) The likely consequences of national and international policies on climate change on natural resource management in New South Wales.
- (2) The committee consist of six members comprising:
  - (a) Three Government members (one of whom shall be the chair);
  - (b) Two Opposition members; and

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- (c) One independent member.
- (3) The members be nominated in writing to the Clerk of the Legislative Assembly by the relevant party leaders and the independent members respectively within seven calendar days of the passing of this resolution.
- (4) The committee have leave to make visits of inspection within the state of New South Wales and other states and territories of Australia, but not outside Australia.”

### **Membership**

The Clerk of the Legislative Assembly advised that he had received correspondence nominating the members of the Committee as: Mr Daley, Mr Martin and Mrs Paluzzano representing the Government; Mr Fraser and Mr Williams representing the Opposition; and Mr Oakeshott an independent.

### **Election of Chair and Deputy Chair**

Pursuant to Standing Order 282—

Resolved, on the motion of Mr Daley, seconded by Mr Williams:

That Mrs Paluzzano be elected Chair of the Committee.

Resolved, on the motion of Mrs Paluzzano, seconded by Mr Oakeshott:

That Mr Daley be elected Deputy Chair of the Committee.

### **Procedural Motions**

Resolved, on the motion (in globo) of Mr Daley, seconded by Mr Oakeshott:

1. That arrangements for the calling of witnesses and visits of inspection be left in the hands of the Chair and the Committee Manager to the committee.
2. That, unless otherwise ordered, witnesses appearing before the committee shall not be represented by any member of the legal profession.
3. That, unless otherwise ordered, when the committee is examining witnesses, the press and public (including witnesses after examination) be admitted to the hearing being conducted by the committee.
4. That persons having special knowledge of the matters under consideration by the committee may be invited to assist the committee.
5. That press statements on behalf of the committee be made only by the Chair after approval in principle by the committee or after consultation with Committee members.
6. That, unless otherwise ordered, access to transcripts of evidence taken by the committee be determined by the Chair and not otherwise made available to any person, body or organisation: provided that witnesses previously examined shall be given a copy of their evidence; and that any evidence taken in camera or treated as confidential shall be checked by the witness in the presence of the Committee Manager to the committee or another officer of the committee.
7. That the Chair and the Committee Manager to the committee be empowered to negotiate with the Speaker through the Clerk of the Legislative Assembly

- for the provision of funds to meet expenses in connection with advertising, operating and approved incidental expenses of the committee.
8. That the Chair be empowered to advertise and/or write to interested parties requesting written submissions.
  9. That upon the calling of a division or quorum in either House during a meeting of the committee, the proceedings of the Committee shall be suspended until the committee again has a quorum.
  10. That the Chair and the Committee Manager make arrangements for visits of inspection by the committee as a whole to undertake the entire itinerary.
  11. That pursuant to Standing Order 297, evidence, submissions or other documents presented to the committee which have not been reported to the House are not be disclosed or published by any Member or by any other person unless first authorised by the House or the committee.

### **General Business**

The Committee deliberated about staffing arrangements. The Chair was to write to the Speaker requesting funding for a committee secretariat and operations.

The Committee adjourned at 10.50 am until a date to be determined.

### **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 2)**

10.00 am Wednesday 26 September 2007

Parliament House

#### **Members Present**

Mrs Paluzzano MP (Chair)

Mr Martin MP

Mr Williams MP

Mr Daley MP

Mr Oakeshott MP

#### **Apologies**

An apology was received from Mr Fraser MP.

#### **Minutes**

Resolved, on the motion of Mr Martin, seconded by Mr Williams:

That the minutes of the meeting on 27 June 2007 be confirmed and published.

### **General Business**

The Committee deliberated about possible approaches for the conduct of its inquiry such as calling for submissions and advertising the terms of reference, identifying key stakeholders and individuals to make submissions and undertaking regional visits of inspection. It was agreed to advertise the terms of reference in full.

It was agreed that the Committee meet with the NSW Minerals Council and Greening Australia on 5 November 2007.

The Committee adjourned at 10.30 am until 10.00 am on Monday 5 November 2007.

Extracts from Minutes

**Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 3)**

10.00 am Monday 5 November 2007

Room 814/815 Parliament House

**Members Present**

Mrs Paluzzano MP (Chair)

Mr Martin MP

Mr George MP

Mr Williams MP

**Apologies**

Apologies were received from Mr Daley MP and Mr Oakeshott MP.

**Membership Change**

The Chair reported that on 16 October 2007, Votes and Proceedings no. 22, entry 15, Mr George was appointed to the committee in place of Mr Fraser, discharged.

**Minutes**

Resolved, on the motion of Mrs Paluzzano, seconded by Mr Martin:

That the minutes of the meeting on 26 September 2007 be confirmed and published.

**Deliberation**

The Chair raised with the Committee the possibility of holding a joint meeting with the Committee on Public Works and hosting the 13<sup>th</sup> Annual Conference of Parliamentary Public Works and Environment Committees to be held in Sydney in 2008.

The Chair also advised that the visit of inspection to the Hunter Valley mines would be held on the 19 and 20 November 2007, subject to the Speaker's approval.

**Briefings**

Briefing by Dr David Butcher, Chief Executive Officer and Mr Tim Beshara, Science Manager, of Greening Australia.

Briefing by Dr Nikki Williams, Chief Executive Officer, Ms Lancia Jordana, Director, External Affairs, Ms Rachelle Benbow, Manager, Environment Operations and Ms Georgina Beattie, Deputy Director, Environment and Community, of the NSW Minerals Council.

The Committee adjourned at 12.00 pm until 10.30 am on Thursday 15 November 2007.

**Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 4)**

11.00 am Thursday 29 November 2007

Room 814/815 Parliament House

**Members Present**

Mrs Paluzzano MP (Chair)

Mr Daley MP

Mr George MP

Mr Martin MP

**Apologies**

Apologies were received from Mr Oakeshott MP and Mr Williams MP.

### **Minutes**

Resolved, on the motion of Mr Martin, seconded by Mrs Paluzzano:  
That the minutes of the meeting on 5 November 2007 be confirmed and published.

### **Deliberation**

The Chair reported to the Committee on the Hunter Valley mine tour on 19 and 20 November 2007.

### **Briefings**

Briefing by Mr Suresh Manickam, Director, Media and Government Relations and Mr Wayne Gersbach, Executive Director, Residential Development Services, of the Housing Industry Association.

Briefing by Ms Nicolle Boele, Director, Strategic Projects of The Climate Institute.

The Committee adjourned at 1.15 pm until 10.00 am on Wednesday 27 February 2008.

## **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 5)**

10.10 am Thursday 28 February 2008

Room 1043 Parliament House

### **Members Present**

Mrs Paluzzano MP (Chair)

Mr Oakeshott MP

Mr Daley MP

Mr Martin MP

Mr Williams MP

### **Apologies**

Apologies were received from Mr George MP.

### **Minutes**

Resolved, on the motion of Mrs Paluzzano, seconded by Mr Martin:  
That the minutes of the meeting on 29 November 2007 be confirmed.

### **Submissions**

Resolved, on the motion of Mr Williams, seconded by Mr Oakeshott:  
That submissions numbered 1– 40 on the circulated list be published.

### **Deliberation**

The Chair raised with the Committee possible future inquiries and work programs. It was suggested that the Committee look into having two inquiries. The Committee agreed to have its first inquiry on carbon emissions trading schemes. The Committee also agreed to look at the Federal Government policy on climate change and carbon emissions. The Committee agreed to have the inquiries terms of reference established by the next meeting.

The Committee adjourned at 10.30 am until 11.00 am on Wednesday 5 March 2008.

Extracts from Minutes

**Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 6)**

11.10 am Wednesday 5 March 2008

Room 1254 Parliament House

**Members Present**

Mrs Paluzzano MP (Chair)

Mr Daley MP

Mr Martin MP

**Apologies**

Apologies were received from Mr George MP, Mr Oakeshott MP and Mr Williams MP.

**Minutes**

Resolved, on the motion of Mr Martin, seconded by Mr Daley:

That the minutes of the meeting on 28 February 2008 be confirmed.

**Inquiry into Emissions Trading Schemes**

Resolved, on the motion of Mr Daley, seconded by Mr Martin:

That the Terms of Reference for the inquiry into Emissions Trading Schemes be adopted and published.

**Draft Report on Conference Attendance**

The Committee considered the Chair's draft report entitled "Conference Attendance, 12<sup>th</sup> Annual Conference of Parliamentary Public Works and Environment Committees."

Resolved, on the motion of Mr Martin, seconded by Mr Daley:

That the Committee adopt the report and the Chair table the Report in the House.

**Deliberation**

The Chair discussed with the Committee possible conference activities and tours to Penrith Lakes and Katoomba. It was suggested that the conference participants spend half a day in Penrith and then travel to Katoomba for lunch.

The Committee adjourned at 11.22 am until 11.00 am on Wednesday 2 April 2008.

**Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 7)**

11.00 am Wednesday 2 April 2008

Room 1254 Parliament House

**Members Present**

Mrs Paluzzano MP (Chair)

Mr Daley MP

Mr Williams MP

Mr Martin MP

**Apologies**

Apologies were received from Mr Oakeshott MP and Mr George MP.

**Minutes**

Resolved, on the motion of Mr Martin, seconded by Mr Daley:



That the minutes of the meeting on 5 March 2008 be confirmed and published, subject to an amendment that Mr Williams was an apology.

### **Report on Conference Attendance**

Mr Williams provided the Committee with a briefing on his attendance at the International Parliamentary Conference on Climate Change, 26-30 November 2007 Houses of Parliament, London.

### **Hawkesbury River Inspection**

Mr Williams proposed a Committee visit of inspection to the Hawkesbury River to meet with CMA managers to discuss the degradation of the river.

Resolved, on the motion of Mr Martin, seconded by Mr Williams:  
That subject to members' availability, the Committee will undertake the site visit as soon as practicable.

### **Deliberation**

The Chair discussed with the Committee the upcoming hearings on 11 April and proposed 16 May.

The Chair discussed the visit by the Western Australian Public Administration Committee at Parliament House on 16 April and invited members to attend if available.

The Chair updated the Committee on the upcoming 13<sup>th</sup> Annual Conference of Public Works and Environment Committees of Australian Parliaments 23-25 July 2008.

The Committee adjourned at 11.26 am until 9.30 am Friday 11 April 2008.

## **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 8)**

9.15 am Friday 11 April 2008

Jubilee Room Parliament House

### **Members Present**

Mrs Paluzzano MP (Chair)

Mr Daley MP

Mr Martin MP

Mr Oakeshott MP

### **Apologies**

Apologies were received from Mr Williams MP and Mr George MP.

### **Minutes**

Resolved, on the motion of Mr Daley, seconded by Mr Martin:

That the minutes of the meeting on 2 April 2008 be confirmed.

### **Submissions**

Resolved on the motion of Mr Daley, seconded by Mr Oakeshott:

That submission number 41 by the New South Wales Minerals Council be published.

Extracts from Minutes

### **Hawkesbury River Visit of Inspection**

The Chair discussed with the Committee a date of 21 May for the Hawkesbury River visit of inspection.

Resolved, on the motion of Mr Oakeshott, seconded by Mr Martin:

That subject to members' availability, the Committee will undertake the site visit on 21 May 2008.

### **Visit of Inspection to Melbourne**

The Chair proposed a two-day visit of inspection to Victoria. The first day of the site visit to the Otway Basin Geosequestration Project outside of Warrnambool.

The second day of the visit to Melbourne to inspect the Council House sustainable building and to meet with the Victoria branch of the Minerals Council.

Resolved, on the motion of Mr Daley, seconded by Mr Martin:

That subject to members' availability, the Committee will undertake the site visits at the end of June.

**Public Hearing** The Chair opened the public hearing.

Dr David Butcher, Chief Executive Officer, and Mr Tim Beshara, Science Manager, of Greening Australia were sworn and examined.

Mr Beshara tabled aerial photographs to be included as part of his evidence.

Evidence completed, the witnesses withdrew.

Mr James McDonald, Chairman of Namoi Council Catchment Management Committee and incumbent of Catchment Management Authority Chair's Council was affirmed and examined.

Ms Kerryn Richardson, Manager of Strategic Services, Chair's Council was sworn and examined.

Ms Richardson tabled brochures on the impact of climate change on each catchment in New South Wales as part of her evidence.

Evidence completed, the witnesses withdrew.

At 11.00 am the Committee took a short adjournment and the public hearing resumed at 11.15 am.

Mr Simon Smith, Deputy Director General, New South Wales Department of Environment and Climate Change, was affirmed and examined.

Mr Smith tabled his presentation to be included as part of his evidence.

Evidence completed, the witness withdrew.

Mr Jock Laurie, President, NSW Farmer's Association was sworn and examined.

Mr David Eyre, Senior Policy Manager, of NSW Farmer's Association was affirmed and examined.

Evidence completed, the witnesses withdrew.

At 1.00 pm the Committee adjourned for lunch and the public hearing resumed at 2.00 pm.

Mr Austin Whitehead, Director, Water and Resources Policy, of New South Wales Department of Primary Industries was sworn and examined.

Mr Fowler, Policy Manager, New South Wales Department of Primary Industries was affirmed and examined.

Mr Whitehead tabled some documents from his presentation to be included as part of his evidence.

Evidence completed, the witnesses withdrew.

Ms Sue-Ern Tan, Director Policy and Strategy, New South Wales Minerals Council was affirmed and examined.

Evidence completed, the witness withdrew.

Councillor George Campbell, Spokesperson on the Natural Environment and Resources, and Mr Colin Berryman, Program Coordinator for the Natural Environment, Western Sydney Regional Organisation of Councils were affirmed and examined.

Evidence completed, the witnesses withdrew.

The Committee adjourned at 3.50 pm until 11.00 am Wednesday 7 May 2008.

### **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 9)**

11.00 am Wednesday 7 May 2008

Room 1043 Parliament House

#### **Members Present**

Mrs Paluzzano MP (Chair)                      Mr Martin MP

Mr Williams MP                                      Mr Daley MP

Mr Oakeshott MP

#### **Apologies**

Apologies were received from Mr George MP.

#### **Minutes**

Resolved, on the motion of Mr Daley, seconded by Mr Martin:

That the minutes of the meeting on 11 April 2008 be confirmed.

#### **Transcript of Public Hearing**

Resolved, on the motion of Mr Daley, seconded by Mr Martin:

That the transcript of 11 April 2008 public hearing be published.

#### **Submissions**

Resolved, on the motion of Mr Daley, seconded by Mr Oakeshott:

That submission number 1 by Ms Carol O'Donnell be published.

Documents related to 11 April 2008 Hearing

The members were provided with the following material from hearing witnesses, for members to note:

- Slides tabled by Department of Primary Industries;

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- Presentation made by Department of Environment and Climate Change;
- Further information on carbon pooling provided by the Catchment Management Authority Chairs Council; and
- Brochures on local impacts of climate change tabled by Catchment Management Authority Chairs Council.

### **Report on Meeting with Western Australian Public Administration Committee**

The Chair provided the Committee with a briefing on her meeting with the visiting Western Australian Public Administration Committee on 16 April 2008.

### **Deliberation**

The Chair discussed with the Committee the upcoming hearing on 16 May 2008.

The Chair discussed the upcoming Hawkesbury River visit of inspection 23 May 2008 that the Chair, Mr Williams, Mr Oakeshott and the Secretariat would attend if approved.

The Chair discussed the proposed visit of inspection to Melbourne, 30 June –1 July.

The Chair updated the Committee on the upcoming 13<sup>th</sup> Annual Conference of Public Works and Environment Committees of Australian Parliaments 23-25 July 2008.

The Committee adjourned at 11.18 am until 9.15 am Friday 16 May 2008.

## **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 10)**

9.15 am Friday 16 May 2008

Jubilee Room Parliament House

### **Members Present**

Mrs Paluzzano MP (Chair)

Mr Williams MP

Mr Oakeshott MP

Mr Martin MP

Mr Daley MP

### **Apologies**

Apologies were received from Mr George MP.

### **Minutes**

Resolved, on the motion of Mr Daley, seconded by Mr Oakeshott:

That the minutes of the meeting on 7 May 2008 be confirmed.

### **Submissions**

Resolved, on the motion of Mr Martin, seconded by Mr Daley:

That submissions 2 to 6 be accepted and published.

### **Deliberation**

The Chair discussed correspondence from the Housing Industry Association concerning energy and water saving schemes and rebates which will be copied for members at the next meeting.

The Chair confirmed arrangements for Hawkesbury River visit of inspection on 23 May.

### **Public Hearing**

The Chair opened the public hearing.

Professor Andy Pitman, Co-director, Climate Change Research Centre, University of New South Wales was affirmed and examined.

Evidence completed, the witness withdrew.

Ms Rachel Walmsley, Policy Director, Environmental Defenders Office, was affirmed and examined. Mr Robert Ghanem, Policy Officer, Environmental Defenders Office was sworn and examined.

Mr Ghanem undertook to provide the Committee with some further information in response to questions.

Evidence completed, the witnesses withdrew.

At 11.00 am the Committee took a short adjournment and the public hearing resumed at 11.15 am.

Mr Michael Kiely of the Carbon Coalition Against Global Warming was sworn and examined. Mr Kiely tabled a presentation on soil carbon in support of his evidence.

Evidence completed, the witness withdrew.

Mr Warwick Ragg, Chief Executive, Australian Forest Growers was sworn and examined.

Evidence completed, the witness withdrew.

Mr Geoff Withycombe Executive Officer, Sydney Coastal Councils group was sworn and examined.

In support of his evidence, Mr Withycombe tabled:

A report entitled 'A systems approach to regional climate change adaptation and strategy in a metropolis';

A facts sheet on valuing Sydney's beaches; and

A report entitled 'Coastal Council and Planning for Climate Change: An assessment of Australian and NSW legislation and government policy provisions relating to climate change relevant to regional and metropolitan coastal councils.'

Evidence completed, the witness withdrew.

At 1.00 pm the Committee adjourned for lunch and the public hearing resumed at 1.15 pm.

Mr Christopher Davis, Sustainability Business Manager, University of Technology, Sydney and Ms Caroline Palmer, Director, Institute for Water and Environmental Resource Management, University of Technology, Sydney were sworn and examined.

Mr Davis undertook to provide the Committee with some further information in response to questions.

Evidence completed, the witnesses withdrew.

Professor Colin Woodroffe, Coordinator, GeoQuest Research Centre, School of Earth and Environmental Sciences, University of Wollongong, was sworn and examined.

Professor Ross Bradstock, Director, Centre for Environmental Risk Management of Bushfires, University of Wollongong, was affirmed and examined.

Evidence completed, the witnesses withdrew.

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Ms Leisl Baumgartner, Deputy Director General, Department of Water and Energy, Dr David Hemming, Manager, Sustainable Energy, Department of Water and Energy were affirmed and examined.

The Chair departed the hearing and asked Mr Daley to act as Chair.

Evidence completed, the witnesses withdrew.

The Acting Chair closed the hearing at 2.45 pm.

The Committee adjourned until 11.00 am on 4 June 2008.

### **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 11)**

11.00 am Wednesday, 4 June 2008

Room 1254 Parliament House

#### **Members Present**

Mrs Paluzzano MP (Chair)

Mr Martin MP

Mr Williams MP

Mr George MP

Mr Oakeshott MP

#### **Apologies**

Apologies were received from Mr Daley MP.

#### **Minutes**

Resolved, on the motion of Mr Oakeshott, seconded by Mr Williams:  
That the minutes of the meeting on 16 May 2008 be confirmed.

#### **Hearing of 16 May 2008**

Resolved, on the motion of Mr Williams, seconded by Mr Oakeshott:  
That members agree to publish the corrected transcript.

The Committee noted copies of information provided by witnesses at the hearing and further information provided by witnesses from the University of Technology, Sydney.

#### **Deliberation**

The Committee noted correspondence from the Housing Industry Association concerning energy and water saving schemes and rebates.

The Chair discussed the report on the visit to the Hawkesbury River on 23 May and provided an update on forthcoming Committee activities.

The Committee noted recent developments in climate change research, policies and programs.

The Committee adjourned at 11.15 am until 11.00 am on 18 June 2008.

**Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 12)**

11.00 am Wednesday, 18 June 2008

Room 1043 Parliament House

**Members Present**

Mrs Paluzzano MP (Chair)

Mr George MP

Mr Martin MP

Mr Oakeshott MP

**Apologies**

Apologies were received from Mr Daley MP and Mr Williams MP.

**Minutes**

Resolved, on the motion of Mr George, seconded by Mr Martin:

That the minutes of the meeting on 16 May 2008 be confirmed.

**Deliberation**

The Chair updated the Committee on the arrangements for the upcoming site visit to Melbourne to be held on 30 June to 1 July 2008.

The Chair updated the Committee on the upcoming 13<sup>th</sup> Annual Conference of Public Works and Environment Committees of Australian Parliaments 23-25 July 2008.

The Committee noted recent developments in climate change research, policies and programs

**Briefing**

Mr Nigel Hall, Technical Adviser, European Investment Bank provided a briefing to the Committee on the work of the European Bank, particularly on its loans to renewable energy projects in the Pacific region.

**Public Hearing**

The Chair opened the public hearing.

Mr Daniel Williams, Principal Environmental Scientist, GHD, and Ms Michelle Larkin, Senior Environmental Scientist, GHD were affirmed and examined.

Mr Williams tabled two background briefing documents, a brochure about the development of a new suburb in the ACT called Crace and a publication entitled "Zero" in support of his evidence.

Evidence completed, the witnesses withdrew.

The Committee adjourned at 1.00 pm until 11.00 am on 25 June 2008.

**Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 13)**

11.00 am Wednesday, 25 June 2008

Room 1254 Parliament House

Extracts from Minutes

### **Members Present**

Mrs Paluzzano MP (Chair)

Mr Daley MP

Mr Oakeshott MP

Mr Martin MP

Mr George MP

Mr Williams MP

### **Minutes**

Resolved, on the motion of Mr Martin, seconded by Oakeshott:  
That the minutes of the meeting on 18 June 2008 be confirmed.

### **Hearing on 18 June**

Resolved, on the motion of Mr Oakeshott, seconded by Mr Martin:  
That members agree to publish the corrected transcript.

### **Deliberation**

The Chair updated the Committee on the arrangements for the upcoming site visit to Melbourne, 30 June to 1 July 2008.

The Chair updated the Committee on the upcoming 13<sup>th</sup> Annual Conference of Public Works and Environment Committees of Australian Parliaments 23-25 July 2008.

The Committee noted recent developments in climate change research, policies and programs

### **Briefing**

Mr Ross Davies, Business Advisor (Sustainability), Mr Brian Rooney, Manager, Western Sydney Paint Line and Mr Jamie Adams, Building Applications Engineer, BlueScope Steel, provided a briefing to the Committee on the water and energy efficiency benefits of the new COLORBOND steel paintline factory in Erskine Park and the energy efficiency of particular roof colours.

The Committee adjourned at 1.00 pm until 11.00 am on 25 June 2008.

## **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 14)**

11.00 am Wednesday 24 September 2008

Room 1254 Parliament House

### **Members Present**

Mrs Paluzzano MP (Chair)

Mr Harris MP

Mr Williams MP

Mr Martin MP

Mr George MP

Mr Piper MP

### **Welcome to New Members**

The Chair welcomed the new members of the Committee, Mr Harris and Mr Piper who were appointed that morning. Mr Harris was appointed to the Committee in place of Mr Daley. Mr Piper was nominated for the Committee in place of Mr Oakeshott.

### **Minutes**

Resolved, on the motion of Mr George, seconded by Mr Martin:



That the minutes of the meeting on 25 June 2008 be confirmed.

### **Deliberation**

The Committee noted the report on the visit to the CO2CRC's Otway Basin Project on 30 June 2008.

The Committee noted the recent developments in climate change research, policies and programs since the last Committee meeting and the summary of 'A Green Carbon Account for Australia's South-Eastern Eucalypt Forests, and Policy Implications'.

The Committee noted the consultation being undertaken by the Department of Environment and Climate Change on the Climate Change Action Plan across New South Wales.

### **Submission**

Resolved, on the motion of Mr Martin, seconded by Mr George:  
That submission 42 be accepted and published.

### **Visit of inspection**

The Committee discussed the invitations from the Central West Catchment Management Authority (CWCMA) and Mr Michael Kiely to examine carbon farming activities and attend the Carbon Farming Expo and Conference in Orange on 18-19 November 2008.

The Committee agreed as many members as wished should attend the conference and try and meet with the CWCMA and visit carbon farming activities over 2 days within the period of 17-20 November 2008.

### **Election of Chair and Deputy Chair**

Mrs Paluzzano resigned as Chair. The Committee noted the vacancy in the position of Deputy Chair.

The Committee Manager called for nominations for Chair.

Resolved, on the motion of Mr Martin, seconded by Mr Piper:  
That Mr Harris be elected Chair of the Committee.

The Committee Manager called for nominations for Deputy Chair.

Resolved, on the motion of Mr Harris, seconded by Mr Martin:  
That Mrs Paluzzano be elected Deputy Chair of the Committee.

The new Chair and the Committee thanked the outgoing Chair for her contributions.

Mrs Paluzzano made a brief statement about the work of the Committee.

The Committee adjourned at 11.35 am until 11.00 am on 22 October 2008.

## **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 15)**

11.00 am Wednesday 22 October 2008

Extracts from Minutes

Room 1254 Parliament House

**Members Present**

Mr Harris MP (Chair)  
Mrs Paluzzano MP  
Mr Piper MP

Mr Williams MP  
Mr Martin MP

**Apologies**

Apologies were received from Mr George MP.

**Minutes**

Resolved, on the motion of Mr Martin, seconded by Mr Piper:  
That the minutes of the meeting on 24 September 2008 be confirmed.

**Correspondence from Qenos**

Resolved, on the motion of Mr Piper, seconded by Mr Martin:  
That the Committee note the correspondence from Qenos in relation to the Carbon Pollution Reduction Scheme.

**Correspondence from Bluescope Steel**

Resolved, on the motion of Mr Martin, seconded by Mrs Paluzzano:  
That the Chair write to Bluescope Steel thanking them for the additional information provided in relation to the solar reflectivity of roofing.

**Deliberation**

The Committee noted the upcoming public hearings on 31 October and 10 November.

The Committee discussed the upcoming visit of inspection to examine carbon farming activities and attend the Carbon Farming Expo and Conference in Orange between 17-19 November 2008.

Resolved, on the motion of Mr Piper, seconded by Mrs Paluzzano:  
That the Committee note recent developments in climate change research, policies and programs.

**Briefing**

Ms Jenny McAllister, Director of the Climate Change, Policy and Programs Group in the Department of Environment and Climate Change, provided a briefing to the Committee on the development of the NSW Climate Change Action Plan.

The Committee adjourned at 11.55 am until 10.00 am on 31 October 2008.

**Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 16)**

9.55 am Friday 31 October 2008  
Jubilee Room Parliament House

**Members Present**

Mr Harris MP (Chair)

Mr Williams MP

Mr Martin MP

### **Apologies**

Apologies were received from Mrs Paluzzano MP, Mr Piper MP and Mr George MP.

### **Minutes**

Resolved, on the motion of Mr Martin, seconded by Mr Williams:

That the minutes of the meeting on 22 October 2008 be confirmed.

### **Deliberation**

The Chair updated the Committee on the arrangements for the upcoming site visit to Orange from 17 to 19 November, 2008.

The Committee noted that the proposed public hearing on 10 November was cancelled.

### **Public Hearing**

The Chair opened the public hearing.

Mr Russell Ainley, and Ms Pamela Green of the Natural Resources Advisory Council were sworn and examined. Associate Professor Mark Dangerfield of the Natural Resources Advisory Council was affirmed and examined.

Associate Professor Mark Dangerfield tabled two background briefing documents in support of the Natural Resources Advisory Council's evidence: a brochure titled 'Forests, Wood and Australia's Carbon Balance' which outlines the extent to which plantations and other wood products contribute to Australia's carbon balance; and a brief on the membership of the Natural Resources Advisory Council.

Evidence completed, the witnesses withdrew.

The Committee adjourned at 10.36am until 11.00 am on 12 November 2008.

## **Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 17)**

11.09 am Wednesday 3 December 2008

Room 1043 Parliament House

### **Members Present**

Mr Harris MP (Chair)

Mr Piper MP

Mr Williams MP

Mrs Paluzzano MP

Mr Martin MP

### **Apologies**

Apologies were received from Mr George MP.

### **Minutes**

Resolved, on the motion of Mr Martin, seconded by Mr Williams:

That the minutes of the meeting on 31 October 2008 be confirmed.

Extracts from Minutes

### **Public Hearing 31 October 2008**

Resolved, on the motion of Mr Piper, seconded by Mr Martin:

That the documents tabled by the Natural Resources Advisory Council on 31 October 2008 be noted.

Resolved, on the motion of Mrs Paluzzano, seconded by Mr Piper:

That the transcript of the public hearing on 31 October 2008 be published.

### **Submissions**

Resolved, on the motion of Mrs Paluzzano, seconded by Mr Piper:

That submissions 43 and 44 be accepted and published.

Recent developments in climate change research, policies and programs

The Committee noted the recent developments in climate change research, policies and programs since the last Committee meeting.

### **Visit of Inspection to Orange**

The Committee noted the report on the visit of inspection to Orange by a delegation of the Committee.

Resolved, on the motion of Mr Williams, seconded by Mr Martin:

That a copy of the DVD of the Carbon Farming Expo and Conference be purchased.

### **Draft Report**

The Committee considered the Chair's draft report entitled 'Climate Change and Natural Resource Management in New South Wales' and agreed on a number of amendments.

Resolved on the motion of Mrs Paluzzano, seconded by Mr Williams:

That the Committee adopt the amended report and it be tabled in the House by Mr Harris.

The Committee adjourned at 12.18 pm until 11.00 am on 4 March 2009.