LEGISLATIVE ASSEMBLY

Standing Committee on Natural Resource Management (Climate Change)

Sustainably managing water under climate change

Report no. 7/54 – November 2010

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Committee terms of reference

The 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.

Inquiry terms of reference

On 2 December 2009, the Standing Committee on Natural Resource Management (Climate Change) resolved to inquire into issues of sustainable water management with particular reference to climate change impacts and, in particular, to report on the following terms of reference:

(a) The likely impact of climate change on the availability of water resources under different climatic scenarios;

(b) Approaches to the management of water resources by all water users including provision for environmental flows; and

(c) Best practice in water conservation and management.

Chair's foreword

It is becoming increasingly clear over time that our climate is changing, and that humans play a crucial role in shaping the environment they inhabit. New South Wales is particularly vulnerable to the effects of climate change, with the economic and social wellbeing of society being highly reliant upon an environment that is stable and manageable. It is likely that many parts of the state will become hotter, and suffer more extreme weather events more frequently, such as drought and floods. The importance of maintaining a safe and reliable supply of water cannot be understated, as water is at the very core of maintaining each and every one of our livelihoods.

It is therefore critical that we put in place appropriate management arrangements of our water resources that enable us to thrive under not only the current environmental conditions, but also to sustain these resources in the future under a range of potential climatic scenarios. For this reason, the Standing Committee on Natural Resource Management (Climate Change) undertook an inquiry into sustainable water management, with a particular emphasis on how climate change is likely to affect the availability and manageability of water in New South Wales.

Water supports key industries across the state, as well as households and delicate natural ecosystems. Throughout the course of the inquiry, the committee has been pleased to observe the considerable efforts being made in a range of applications across the state to become more efficient, most particularly in agriculture and mining. It is clear that the economic, social and environmental benefits of each and every water user in New South Wales making every effort to consume this precious resource more wisely are substantial and far-reaching.

The commitment of New South Wales irrigators to making their operations more sustainable under difficult climatic conditions has been particularly impressive. The committee was able to visit various agricultural properties in New South Wales and compare practices in this state with those in the Ord River Irrigation Area in Western Australia. Irrigators in New South Wales have exhibited a higher level of efficiency in water management through the use of innovative methods and technological advancements, allowing them to produce more from less water. Through their outstanding initiative, New South Wales farmers have managed to provide their local communities with greater economic prosperity.

This inquiry has come at a time of great change in water management practices in not only New South Wales, but Australia. The committee notes the significant changes that are currently underway as part of the Murray-Darling Basin Plan and recognises that water management is a critical and often difficult issue. Regardless of the outcome of the Basin Plan, it is evident that water management will remain a key issue for the foreseeable future at least. However, through effective regulation and management, combined with a proactive commitment from individuals and private enterprise, water can be a resource that sustains us all under any climatic eventuality.

I would like to thank the individuals and organisations that have taken a keen interest in this inquiry. There are numerous people who have supported the work of the committee by

making submissions, providing evidence at public hearings and hosting delegations of the committee during its visits of inspection.

I would like to extend special thanks to the current and previous committee members for their commitment and contribution to this important inquiry. In particular, I wish to offer my sincere thanks to the former Chair of the Committee, Ms Noreen Hay MP.

Finally, I wish to express my gratitude to the committee secretariat for their professional support and dedication to the work of the committee.

Matt Brown MP
Committee Chair

List of recommendations

Abbreviations

ABS	Australian Bureau of Statistics
BOM	Bureau of Meteorology
CICL	Coleambally Irrigation Co-operative Limited
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CWAG	Critical water advisory group
DECCW	Department of Environment, Climate Change and Water
EDO	Environmental Defender's Office
EPL	Environmental Protection Licence
GL	gigalitre (1 gigalitre = 1,000,000,000 litres)
GVIAP	Gross value of irrigated agricultural production
IGVA	Industry gross value added
IPCC	Intergovernmental Panel on Climate Change
MDB	Murray-Darling Basin
MDBA	Murray-Darling Basin Authority
ML	megalitre (1 megalitre = 1,000,000 litres)
NOW	New South Wales Office of Water
NRM	Natural resource management
NWI	National Water Initiative
ORIA	Ord River Irrigation Area
PEO Act	*Protection of the Environment Operations Act 1997*
WMA	*Water Management Act 2000*
WSP	Water sharing plan

Chapter One - The inquiry process

1.1 The Standing Committee on Natural Resource Management (Climate Change) was appointed on 21 June 2007 to inquire into issues of sustainable natural resource management with particular reference to the impact of climate change. In late 2009 the committee became concerned about the likely impacts of climate change on water availability and management in New South Wales. On 2 December 2009 the committee resolved to conduct an inquiry into issues of sustainable water management with particular reference to climate change impacts.

Submissions

1.2 On 2 December 2009 the committee called for submissions on the inquiry's terms of reference. The committee received thirty-seven submissions from individuals, agricultural industry associations, environmental and conservation organisations, local government authorities and a whole-of-government response from the New South Wales Government. A list of submissions is reproduced in Appendix One. Copies of the submissions are available from the committee's website.[1]

Hearings

1.3 The committee conducted two public hearings in Sydney on 10 May 2010 and 14 May 2010. The committee received evidence from a range of irrigation and mining associations, environmental organisations and New South Wales Government representatives. A list of witnesses who appeared at the hearings is reproduced in Appendix Two. Transcripts of the hearings and responses to questions on notice are available from the committee's website.

Visits of inspection

1.4 The committee undertook two visits of inspection as part of its inquiry. Between 20 and 23 July 2010 a delegation of the committee travelled to Western Australia where they visited the Ord River and Perth. The delegation inspected agricultural water management practices and heard about research on the likely impacts of climate change on agriculture. At the Ord River the committee met with representatives from the Ord-East Kimberley Expansion Project, the Department of Water, the Ord Irrigation Cooperative, Shire Wyndham East Kimberley and Pacific Hydro Limited. In Perth, the committee met with representatives from the CSIRO and the Perth Region NRM. Further information on the visit is included in Appendix Three.

1.5 On 25 and 26 August 2010 a delegation of the committee travelled to Coleambally and Orange in New South Wales to inspect best practice water management in agriculture and mining. In Coleambally the delegation met with representatives from Coleambally Irrigation Co-operative Limited. In Orange, the committee met with representatives from the Central NSW Councils, Cadia Valley Operations and visited a local landholder involved with the Central West Catchment Management Authority. Further information on the visit is included in Appendix Three.

[1] <www.parliament.nsw.gov.au/climatechange>

Scope of the report

1.6 In establishing the scope of the inquiry, the committee initially drafted broad terms of reference to address the wide range of issues relating to sustainable water management across New South Wales. During the course of the inquiry, it became apparent that water management issues in rural and regional communities were of significant concern. The committee therefore decided to focus on sustainable water management in rural and regional areas rather than metropolitan water management.

1.7 The committee also notes the significant developments in water management currently occurring within the Murray-Darling Basin. These developments, in particular the Murray-Darling Basin Plan, involve the Commonwealth Government and the Basin states. The background and current status of the Basin Plan is discussed further in Chapter Three. While these reforms, and the Basin Plan, will significantly affect water management across much of New South Wales, it is not the intention of the committee to comment on the development process or content of the Basin Plan. The committee notes that there are avenues for consultation associated with the Basin Plan and does not intend to comment on or participate in that process.

1.8 As a result, the issues addressed in this report are confined to the water management principles and framework currently in operation in New South Wales.

Chapter Two - Impacts of climate change on water resources

Current New South Wales climate

2.1 The climate of New South Wales is highly variable both spatially and temporally. Temperature and rainfall vary greatly across the state, with four dominant climatic zones across New South Wales, as illustrated in Figure 1. Eastern New South Wales lies largely within the temperate climatic zone with smaller areas of the subtropical zone in the north east, while west of the Great Diving Range lies within the grassland and desert zones.

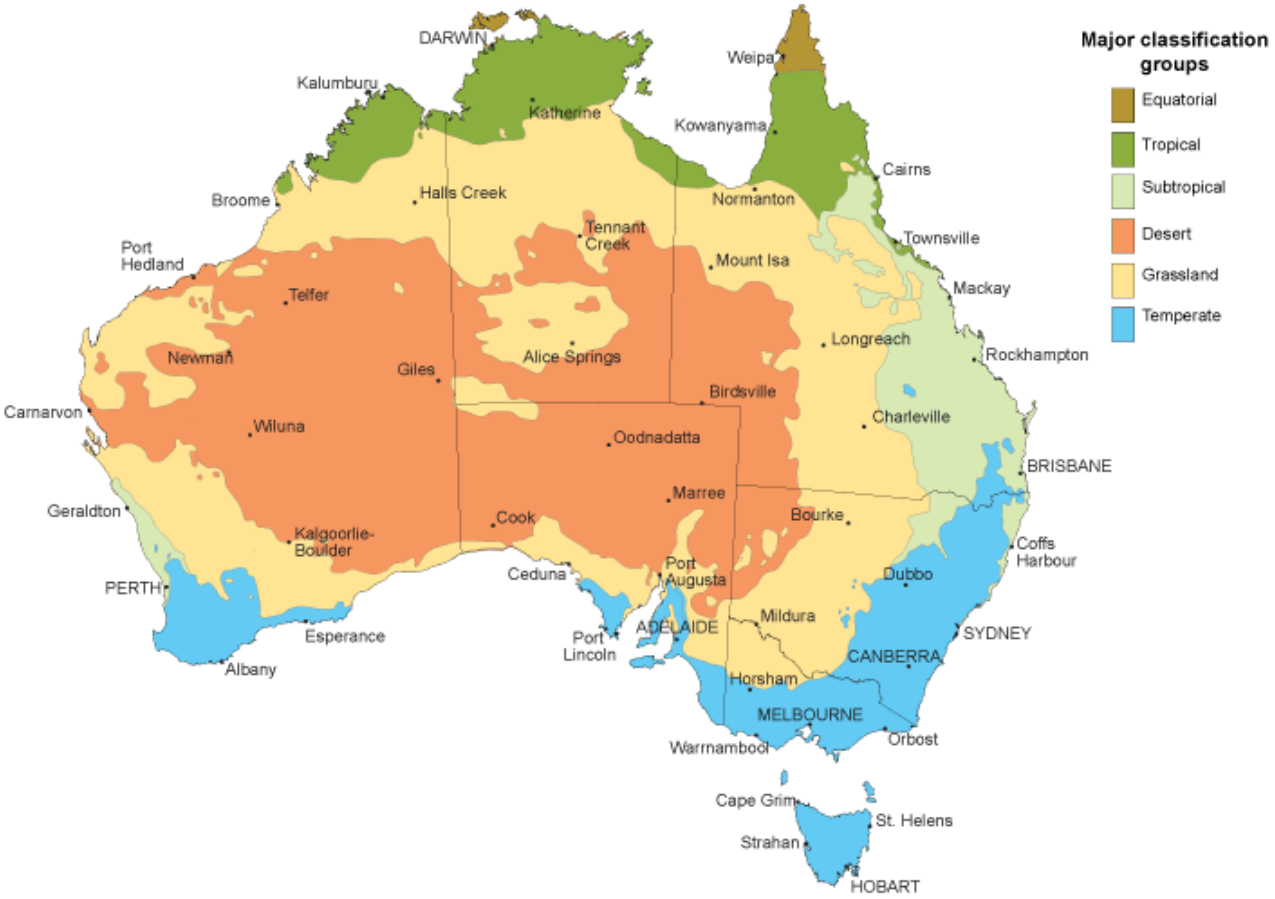

Figure 1 - Major climate zones across Australia (using Köppen's major classifications)[2]

2.2 Rainfall across New South Wales varies significantly in both the annual amount and seasonality. Annual average rainfall across New South Wales varies from less than 200 mm in the north-west to more than 1,800 mm along the north-east cost,[3] as illustrated in Figure 2.

[2] BOM, *Climate classification maps*, viewed 6 October 2010, <http://www.bom.gov.au/jsp/ncc/climate_averages/climate-classifications/index.jsp?maptype=kpngrp>

[3] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 21

Figure 2 - Average annual rainfall across Australia[4]

2.3 The seasonality of rainfall also varies across New South Wales, as illustrated in Figure 3. Rainfall in the south of the state comes predominantly from cold fronts and low pressure systems traversing south-eastern Australia during winter. A large area within central New South Wales receives a reasonably even distribution of summer and winter rainfall as moist onshore winds depositing precipitation on the Great Diving Range dominate the rainfall pattern. The north-east of the state is dominated by summer rainfall and relatively dry winters. The north-west of the state experiences the most variable rainfall with most rainfall coming from irregular, high intensity rainfall events.[5]

[4] BOM, *Average annual, seasonal and monthly rainfall*, viewed 6 October 2010, <http://www.bom.gov.au/jsp/ncc/climate_averages/rainfall/index.jsp>

[5] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 21

Figure 3 - Major seasonal rainfall zones across Australia[6]

2.4 Average annual temperatures across New South Wales are generally mild, as illustrated in Figure 4. Temperatures along the coast are generally mild all year round as they are moderated by the effect of the ocean and afternoon sea breezes. In contrast, the north-west regularly experiences very high temperatures (above 35 °C) during summer. In winter, cold snaps regularly lead to inland frosts and snowfall on the alps and tablelands.[7]

[6] BOM, *Climate classification maps*, viewed 6 October 2010, <http://www.bom.gov.au/jsp/ncc/climate_averages/climate-classifications/index.jsp?maptype=seasgrpb>

[7] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 22

Figure 4 - Average annual daily mean temperature across Australia[8]

2.5 In addition to this spatial variability, many areas of New South Wales are prone to strong temporal climate variability. Across Australia the inter-annual and longer term decadal variability of temperature and rainfall is extremely high and generally more extreme than elsewhere on the planet.[9] New South Wales experiences extremes in climate from seasonal to inter-annual to multi-decadal scales due to the combined effects of the El Niño-Southern Oscillation, the Southern Annular Mode and the Indian Ocean Dipole.[10] For example, annual rainfall in New South Wales between 1900 and 2009 has varied from a low of 302.68 mm in 1944 to a high of 908.45 mm in 1950, as illustrated in Figure 5.

[8] BOM, *Australian climate variability & change: Average maps*, viewed 12 November 2010, <http://www.bom.gov.au/cgi-bin/climate /change/averagemaps.cgi?map=tmean&season=0112>

[9] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 24

[10] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 22

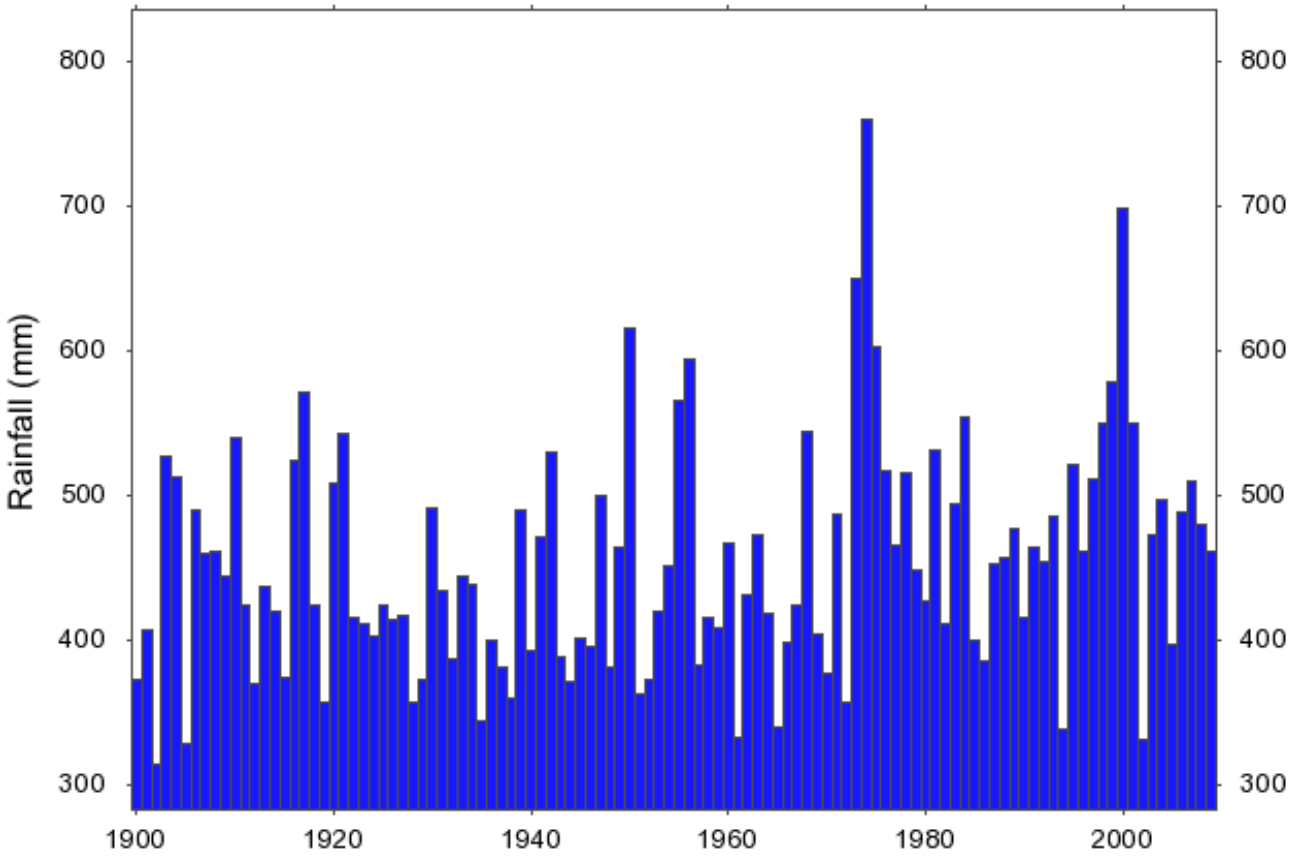

Figure 5 - Annual rainfall in New South Wales between 1900 and 2009[11]

2.6 Recent observations of climate in New South Wales indicate changes are occurring beyond this natural variation. The New South Wales Government stated in its submission:

> Although there is natural variability in the climate, there is consensus among climate scientists that the rate and magnitude of climate change that NSW is currently experiencing are outside the expected range of this natural variability.[12]

Climate change and its impacts

2.7 In a previous report the committee noted that the majority of the Australian and international scientific community agrees that increases in greenhouse gas concentrations from human activities have enhanced the effects of the natural greenhouse effect and have already resulted in substantial global warming since the mid-20th century.[13] The New South Wales Government's submission to this inquiry concurs:

[11] BOM, *Australian climate variability & change: time series graphs*, viewed 6 October 2010, <http://www.bom.gov.au/cgi-bin/climate/change/timeseries.cgi?graph=rain&area=nsw&season=0112&ave_yr=0>

[12] Submission 31, NSW Government, p. 3

[13] Standing Committee on Natural Resource Management (Climate Change), *Impacts of emissions trading schemes on natural resource management*, Report no. 4/54, Parliament of New South Wales, Legislative Assembly, Sydney, 2009, p. 4

> Significant increases in average global temperatures have been observed over the last half century. The vast majority of climate scientists accept that human activity is the primary cause of these changes.[14]

2.8 This report does not intend to examine the merits of the science of climate change. There are increasing numbers of scientific studies assessing the impacts of climate change. The committee has noted in a previous report that considerable scientific resources are already being deployed to research many aspects of climate change impacts, mitigation and adaptation in New South Wales.[15]

2.9 As such, the committee does not intend to conduct an extensive review of scientific evidence regarding the likely impacts of climate change globally and across Australia. The committee notes that further information on the impacts of climate change globally is available in the Intergovernmental Panel on Climate Change's (IPCC) report *Climate Change 2007: The Physical Science Basis*.[16] Additionally, further information on the likely impacts of climate change in Australia can be found in *Climate Change in Australia: Technical Report 2007* prepared by the CSIRO and the Bureau of Meteorology (BOM).[17]

2.10 The committee notes there are a number of reputable scientists and organisations who conduct research and modelling on climate change projections. As it is not the intention of this report to review the scientific merits of climate change models and projections, the committee has decided to refer largely to the work conducted by the New South Wales Government for its *NSW Climate Impact Profile*[18] and the CSIRO for its Sustainable Yields Projects.[19]

Impacts of climate change on water resources

2.11 The impacts of climate change are likely to increase the challenges associated with water management. Ms Rachel Walmsley, Policy Director for the Environmental Defender's Office, explained to the committee:

> [T]here is clear scientific evidence that water-based ecosystems in New South Wales, which are already under threat from overextraction and reduced flows, will be further strained by climate change. Climate change poses a significant challenge to water management, as it will intensify the difficult task of returning ecosystems to sustainable levels of water extraction.[20]

[14] Submission 31, NSW Government, p. 3

[15] Standing Committee on Natural Resource Management (Climate Change), *Climate change and natural resource management in New South Wales*, Report no. 3/54, Parliament of New South Wales, Legislative Assembly, Sydney, 2008, p. ix

[16] IPCC, *Climate Change 2007: The Physical Science Basis – Contribution of Working Group I to the Fourth Assessment Report of the IPCC*, S Solomon, D Qin, M Manning, Z Chen, M Marquis, KB Averyt, M Tignor & HL Miller (eds), Cambridge University Press, Cambridge & New York, 2007

[17] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007

[18] DECCW, *NSW Climate Impact Profile,* Sydney, 2010

[19] CSIRO, *Water Availability in the Murray-Darling Basin: A report from CSIRO to the Australian Government*, Australia, 2008

[20] Ms Rachel Walmsley, Transcript of hearing, 14 May 2010, p. 1

2.12 As discussed in paragraph 2.5, Australia's water resources are particularly vulnerable to the impacts of climate change as Australia already experiences a significant level of natural variability in its climate.[21]

2.13 The availability of water resources will be affected by a combination of climate change impacts on temperature, precipitation and evaporation. Water resources, particularly at a local level, will further be affected by the environmental responses to climate change impacts such as run-off, droughts, flooding and soil conditions. The following paragraphs discuss each of these climate change impacts and the effect they are predicted to have in New South Wales.

Temperature

2.14 Although there is natural variability in temperatures across New South Wales, as discussed in paragraph 2.4, current trends indicate that the average annual temperature in New South Wales has already been increasing at an accelerating rate since the mid-1990s.[22] This pattern is illustrated in Figure 6 which shows the average annual temperature anomalies, or departure from the 1961-1990 average, in New South Wales from 1910 to 2009. The submission from the New South Wales Government further explains:

> The annual average temperature rise was around 0.1 °C per decade during 1950–80 and since 1990 it has been about 0.5 °C per decade, a five-fold increase. Since record-keeping began in 1910, the warmest year for NSW was 2007, at 1.1 °C above the 1961–90 NSW average temperature. All years from 1997 to 2008 were warmer than average, with 2008 marking the 12th consecutive year with above-average temperatures, an unprecedented sequence in the historical records. These changes are outside the natural climate variability and are 'very likely' (>90% probability) the result of increased greenhouse gas emissions from human activities.[23]

[21] Submission 31, NSW Government, p. 3

[22] Submission 31, NSW Government, p. 3

[23] Submission 31, NSW Government, pp. 3-4

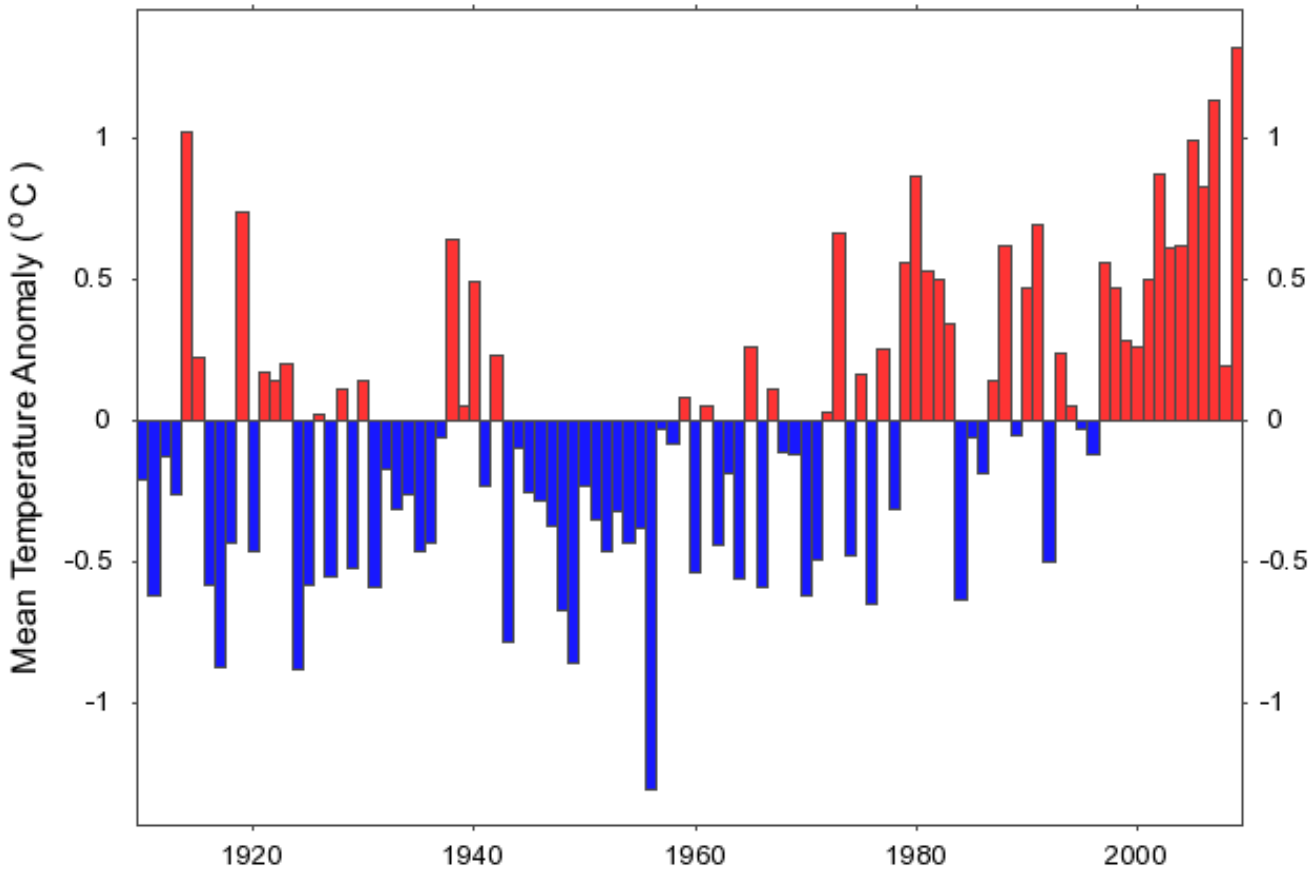

Figure 6 - Annual mean temperature anomaly in New South Wales between 1910 and 2009[24]

2.15 The latest IPCC report states that all models of climate change impacts predict that increases in global mean surface air temperature will continue over the 21st century.[25]

2.16 The CSIRO and BOM predict that by 2030 temperatures in Australia will rise on average by 1.0 °C, with warmings of around 0.7-0.9 °C in coastal areas and 1.0-1.2 °C inland.[26] Later in the century warming is largely dependent on the assumed level of emissions. By 2050 a low emissions future is likely to see an increase in temperature of 1.2 °C while a high emissions scenario could see an increase in temperature of 2.2 °C. By 2070 these figures have increased further with a best estimate of temperature increases of 1.8 °C under a low emissions scenario and 3.4 °C under a high emissions scenario.[27]

[24] BOM, *Australian climate variability & change: time series graphs*, viewed 6 October 2010, <http:// www.bom .gov.au/cgi-bin/climate/change/timeseries.cgi?graph=tmean&area=nsw&season=0112&ave_yr=0>

[25] IPCC, *Climate Change 2007: The Physical Science Basis – Contribution of Working Group I to the Fourth Assessment Report of the IPCC*, S Solomon, D Qin, M Manning, Z Chen, M Marquis, KB Averyt, M Tignor & HL Miller (eds), Cambridge University Press, Cambridge & New York, 2007, p. 749

[26] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 53

[27] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 57

2.17 New South Wales is expected to become hotter, with the whole state experiencing higher maximum and minimum temperatures in all seasons.[28] Significant increases in minimum temperatures are expected across much of New South Wales, particularly in the north and east. The *NSW Climate Impact Profile* further states:

> The greatest increases in maximum temperatures are projected to occur in the north and west of the state…Winter and spring maximum temperatures are expected to rise by around 2-3 °C across much of northern NSW by 2050.[29]

2.18 Further information on the predicted changes to temperature for each of the State Plan regions in New South Wales can be found in Table 1.

Table 1 - Projected temperature changes for each State Plan region in New South Wales[30]

Region	Projected temperature changes
Hunter	Temperatures are virtually certain to rise in all seasons.
Illawarra	Both minimum and maximum temperatures are expected to increase throughout the region, particularly in spring, autumn and winter.
North Coast	Average daily minimum and maximum temperatures are virtually certain to increase in all seasons.
New England/ North West	The climate is virtually certain to be hotter in all seasons, with the most substantial warming in spring and winter. Minimum temperatures are expected to increase more on the tablelands than on the plains, while maximum temperatures are projected to increase more in the west.
Riverina Murray	Average daily maximum temperatures are very likely to rise significantly in all seasons. Daily minimum temperatures are also likely to increase, but to a lesser extent than maximum temperatures.
Western	Average daily maximum temperatures are likely to rise substantially, with a moderate increase in minimum temperatures.
South East	Average daily maximum temperatures are likely to increase substantially in autumn, winter and spring, with a moderate increase in summer. Average minimum temperatures are very likely to increase moderately to substantially throughout the year, with greater increases in the east of the region than in the west.
Sydney/ Central Coast	The average daily maximum and minimum temperatures are virtually certain to increase moderately to substantially in all seasons.

Precipitation

2.19 Unlike changes in temperature, changes to precipitation are not directly influenced by increasing greenhouse gases in the atmosphere. Rather, precipitation will be affected by variations in the amount of water vapour stored in a warmer atmosphere and altered atmospheric circulation patterns (such as the expansion of the Hadley circulation).[31]

[28] Submission 31, NSW Government, p. 4

[29] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 26

[30] Source: DECCW, *NSW Climate Impact Profile*, Sydney, 2010, pp. 40-143

[31] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 65

2.20 However, similar to temperature trends, rainfall trends show a marked contrast between the first half of the 20th century and the period since 1950. The *Climate Change in Australia* report by the CSIRO and BOM explains the trend across Australia since 1950, which is illustrated in Figure 7:

> North-west Australia has seen an increase in annual rainfall over this period, amounting to more than 30 mm per decade across the north-west third of Australia and exceeding 50 mm per decade on parts of the north-west coast. In marked contrast, eastern and south-western Australia have become drier since 1950, with largest drying along the east coast exceeding 50 mm per decade.[32]

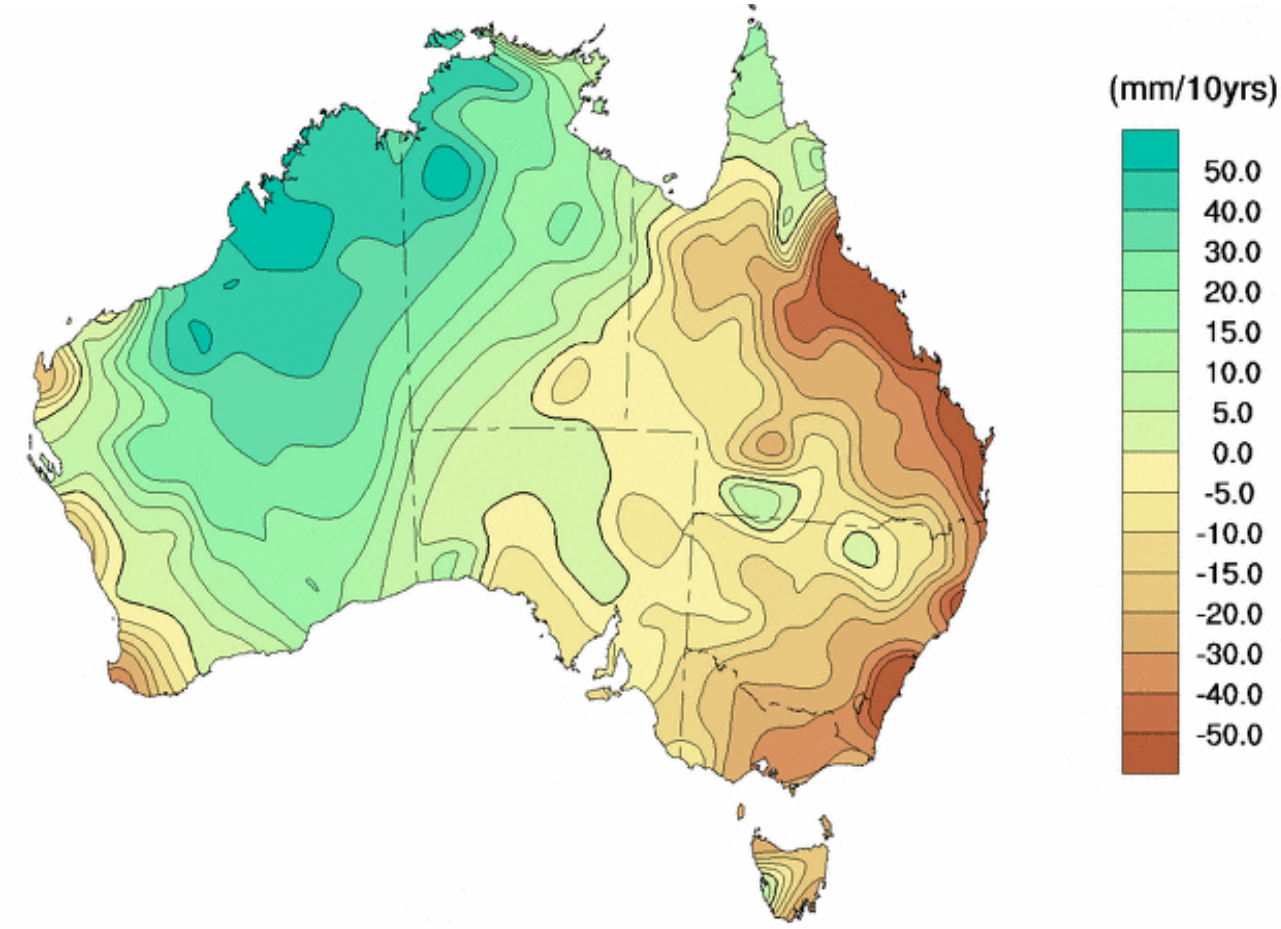

Figure 7 - Trend in annual total rainfall across Australia between 1950 and 2009[33]

2.21 It is estimated that by 2030 annual precipitation across Australia will have changed little in the far north, but will decrease by 2-5% elsewhere. Later in the century, projected precipitation changes are larger and more dependent on the emissions scenario.[34]

2.22 Between now and 2050 New South Wales will experience rainfall changes differently, as illustrated in Figure 8. Many parts of the state will experience a shift

[32] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 18

[33] BOM, *Australian climate variability & change: trend maps*, viewed 21 October 2010, < http://www. bom.gov. au/cgi-bin/climate/change/trendmaps.cgi?map=rain&area=aus&season=0112&period=1950>

[34] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 69

from winter-dominated rainfall to summer-dominated rainfall. The north-east of the state will experience a slight increase in summer rainfall, however, this appears to be within recorded levels of variability.[35]

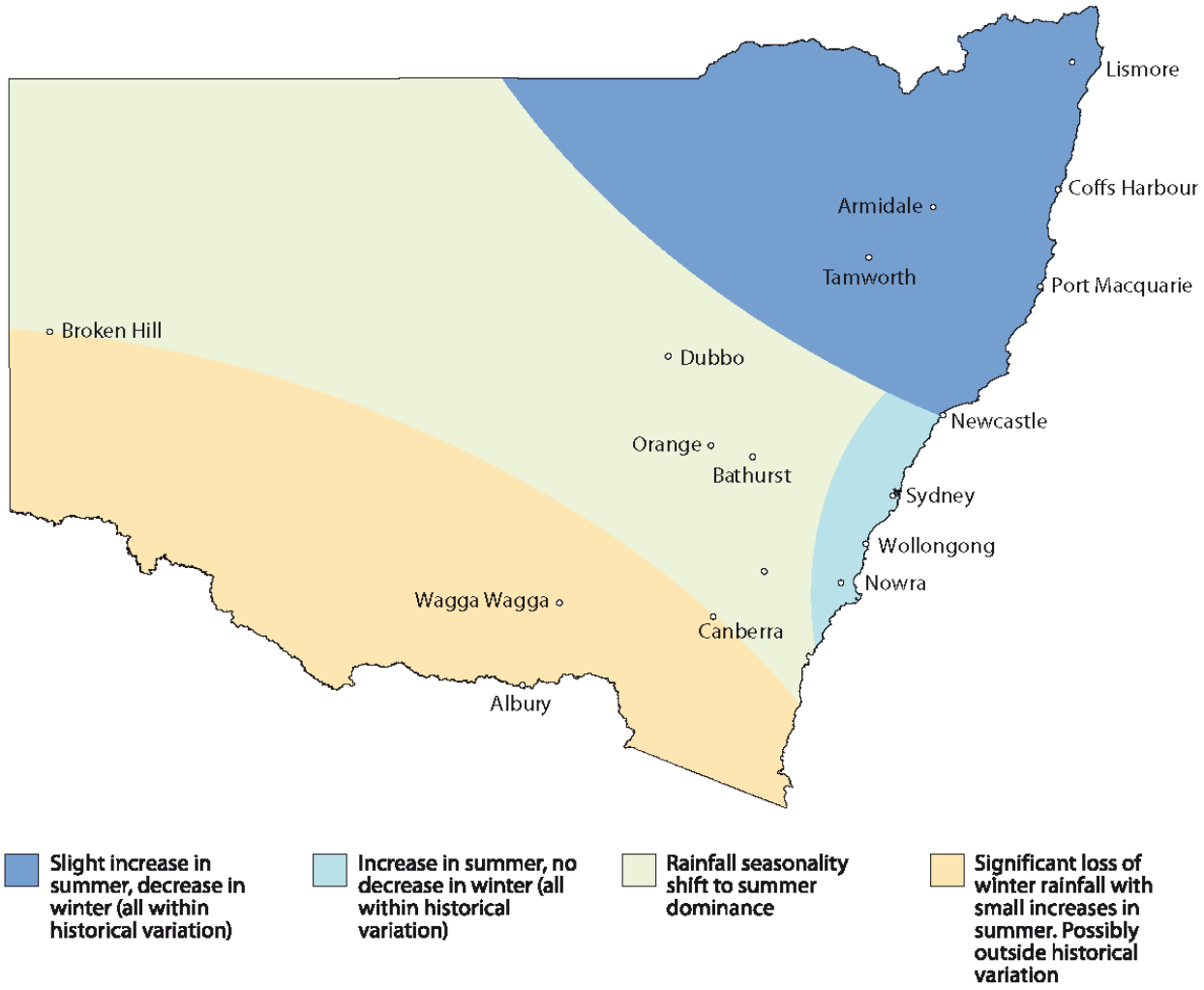

Figure 8 - Projected changes in rainfall in New South Wales to 2050[36]

2.23 In contrast, the south-west regions of the state are likely to experience a significant decrease in winter rainfall which is expected to be outside the variability observed in the historical record.[37] The *NSW Climate Impact Profile* explains:

> [T]he belt of westerly winds (sometimes referred to as the 'Roaring Forties' contract further south away from the Australian continent and into the Southern Ocean. This will result in weaker westerly winds over southern Australia. Cold fronts embedded in this westerly wind belt are a major source of reliable rainfall for NSW, especially in the south during the cooler months of the year. The reduced strength and frequency and southerly displacement of these westerly winds and their associated cold fronts is

[35] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 26

[36] Submission 31, NSW Government, p. 6

[37] Submission 31, NSW Government, pp. 6-7

likely to be the primary cause of significant decreases in rainfall in autumn, winter and spring in the south of the state by 2050.[38]

2.24 As well as changes to average precipitation, the character of daily rainfall may change, such as the frequency of wet days (or dry days), precipitation intensity (rain per rain-day) and the intensity of extreme precipitation (the highest 1% of precipitation events). Over the 21st century there will be increases in precipitation intensity and dry days suggesting that Australia will have longer dry spells interrupted by heavier precipitation events.[39]

2.25 Simulations of future snow conditions in the Australian Alps indicate that snow area, depth and duration are likely to decline.[40] Warmer conditions are likely to produce rainfall instead of snow at the higher elevations across New South Wales.[41]

2.26 Further information on how precipitation is likely to be affected across each region of New South Wales can be found in Table 2.

Table 2 - Projected precipitation changes in each State Plan region in New South Wales[42]

Region	Projected precipitation changes
Hunter	Rainfall is likely to decrease in winter, particularly in the west. Rainfall will increase in all other seasons, particularly in summer.
Illawarra	Summer rainfall is likely to increase substantially. Slight to moderate increase in autumn and spring rainfall. There is no significant trend in rainfall projections for winter.
North Coast	Spring rainfall is not expected to change. Summer and autumn rainfall is expected to increase slightly. Winter rainfall is expected to decrease slightly.
New England/ North West	Rainfall is likely to increase in summer, autumn and spring. In winter rainfall will decrease moderately.
Riverina Murray	Rainfall is expected to decrease by up to 50% in spring, autumn and winter, particularly in the south of the region. Rainfall is likely to increase moderately in summer.
Western	A moderate increase in rainfall is likely in summer over most of the region, with a substantial increase in the tablelands and central west. Moderate to substantial decreases are anticipated in winter. In spring and autumn, rainfall is likely to decrease slightly in the south-west of the region, with a slight increase in the north-west.
South East	Most of the region is likely to receive a substantial increase in summer rainfall, while winter rainfall is likely to decrease by up to 50%, with the decline likely to be greatest in the north and west of the region. A greater proportion of precipitation in the alps is likely to fall as rain rather than snow, because of higher temperatures. This change, combined with less rainfall in spring and winter is likely to result in a significant reduction in snow cover in the region.
Sydney/ Central Coast	Summer rainfall is likely to increase substantially, with smaller increases likely in autumn and spring. Winter rainfall is likely to decrease moderately.

[38] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 26

[39] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 73

[40] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 75

[41] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 26

[42] Source: DECCW, *NSW Climate Impact Profile*, Sydney, 2010, pp. 40-143

Evaporation

2.27 As New South Wales experiences higher temperatures, evaporation is also expected to significantly increase by 2050 across much of the state. Summer evaporation is likely to increase across the entire state, with central New South Wales particularly affected. This increase is likely to counteract the expected increases in summer rainfall, resulting in drier soil conditions, particularly in the west.[43]

2.28 Likewise, projected increases in rainfall across the north and east of the state in autumn and spring are likely to be offset by an increase in evaporation, which may result in drier soil conditions.[44]

2.29 Further information on how evaporation is likely to change across each region of New South Wales can be found in Table 3.

Table 3 - Projected evaporation changes in each State Plan region in New South Wales[45]

Region	Projected evaporation changes
Hunter	Evaporation during spring is likely to increase substantially. Slight to moderate increases in evaporation are likely in summer and autumn. In winter, evaporation is likely to increase moderately in the north-east, but decrease slightly in the south-west.
Illawarra	Increased evaporation is likely to increase by up to 50% in summer and spring, with slight to moderate increases in autumn and winter.
North Coast	Evaporation is likely to increase moderately during summer, spring and autumn. A slight to moderate increase is expected in winter.
New England/ North West	Evaporation is likely to increase in all seasons, particularly in spring, when an increase of up to 50% is anticipated in the west of the region.
Riverina Murray	Evaporation is likely to increase substantially during summer throughout the region. Spring evaporation is likely to remain unchanged in the south of the region, while increasing by up to 50% in the north, with a slight to moderate increase also likely in autumn. In winter, evaporation is likely to decrease moderately to substantially, particularly in the north of the region.
Western	Evaporation is likely to increase substantially during spring and summer, with an increase of more than 50% likely in the north-west of the region during spring. In autumn, evaporation is likely to increase most in the west, with smaller increases likely in the east. In winter, a slight increase in evaporation is likely in the north-east of the region, while the south-western areas are likely to experience a moderate decrease.
South East	Evaporation is likely to increase moderately in the north of the region during spring and throughout the region during summer. There is no clear pattern in projections for autumn and winter.
Sydney/ Central Coast	Evaporation is likely to increase moderately during spring and summer. There is no clear pattern in projections for autumn and winter.

[43] Submission 31, NSW Government, p. 6

[44] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 31

[45] Source: DECCW, *NSW Climate Impact Profile*, Sydney, 2010, pp. 40-143

Run-off

2.30 The combination of climate change impacts on temperature, rainfall, extreme events and evaporation are likely to affect run-off. Mr David Harriss, Commissioner of the New South Wales Office of Water, commented that southern New South Wales is likely to see a significant decrease in winter rainfall, which:

> will have a significant impact on run off and it is the run off that flows into our water storages and into our rivers, which becomes available for extraction for commercial purposes and also is essential for the health and productivity of our river systems for the natural as well as commercial values.[46]

2.31 One of the major impacts of reduced rainfall in southern and eastern Australia has been a reduction in surface water available for storage. In fact, in other catchments in Australia monitoring has demonstrated that decreased rainfall resulted in even larger proportional declines in inflows to the water supply system and the relative proportion of inflow decline rises as drier conditions persist.[47]

2.32 In New South Wales there is likely to be a 5% decrease in the mean annual run-off for the whole of the state.[48] The *NSW Climate Impact Profile* explains this trend:

> [A] shift in the seasonality of run-off patterns is virtually certain, with significantly more summer run-off (up to about 20% increase) and significantly less winter run-off (up to about 25% decrease). The projections also indicate some minor increases in autumn run-off and moderate to significant decreases in spring run-off.[49]

2.33 Annual run-off is dependent on the relative contribution of run-off from each season. In line with changes to the rainfall discussed above, northern New South Wales (which is dominated by summer rainfall) will experience a slight increase in mean annual run-off while the southern regions (which are dominated by winter rainfall) will experience a moderate to significant decrease in mean annual run-off.[50]

2.34 Further information on how run-off is likely to be affected across each region of New South Wales can be found in Table 4.

Table 4 - Projected run-off changes in each State Plan region in New South Wales[51]

Region	Projected run-off changes
Hunter	A minor increase in total annual run-off is about as likely as not. Substantial changes in run-off depths and the magnitude of high flows are very likely in summer as a result of projected changes in rainfall, and current levels of low flows are likely to be slightly less frequent.
Illawarra	Average annual run-off will be about as likely as not to increase slightly and some redistribution in run-off across the seasons is likely. A moderate decrease in run-off is likely in spring, whereas a substantial increase is likely in summer.

[46] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 1

[47] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 20

[48] Submission 31, NSW Government, p. 6

[49] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 34

[50] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 34

[51] Source: DECCW, *NSW Climate Impact Profile*, Sydney, 2010, pp. 40-143

North Coast	Substantial increases in run-off depths and the magnitude of high flows are very likely in summer. A moderate decrease in run-off depths is likely in spring.
New England/ North West	Substantial increases in run-off depths and the magnitude of high flows are very likely in summer. A moderate decrease in run-off depths is likely in spring and winter. A minor increase in annual run-off is likely, mainly because of the summer rise.
Riverina Murray	Moderate to substantial decreases in average run-off depth in spring and winter are predicted, but summer run-off is likely to increase moderately. A minor increase is projected for autumn. A minor decrease in annual run-off is about as likely as not.
Western	A minor increase in average annual rainfall is about as likely as not and run-off is likely to be redistributed across the seasons, with increases in summer and autumn and decreases in spring and winter.
South East	A decrease in spring rainfall is very likely to cause a substantial decrease in average spring run-off across the region. An increase in summer rainfall is very likely to cause a substantial increase in average summer run-off and a moderate increase in the magnitude of high flows. Overall, there is likely to be a slight decrease in average annual run-off.
Sydney/ Central Coast	Some redistribution of run-off across the seasons is likely, with increases in summer and autumn and decreases in winter and spring. A substantial increase in summer run-off is very likely throughout the region, and a minor decrease in average annual run-off is about as likely as not.

Drought

2.35 The last 5-10 years mark one of the most severe droughts in Australia's history, with this period starting with the onset of the 2002 El Niño event. Over this time very low rainfall was experienced across eastern Australia, with record low rainfall in key catchment areas of the Murray and Darling Rivers and water catchments for Sydney, Canberra and Melbourne.[52]

2.36 As discussed in paragraph 2.24 it is predicted that the future precipitation regime in Australia will have longer dry spells interrupted by heavier precipitation events. Under the impacts of climate change drought occurrence is projected to increase over most of Australia. This projection takes into account any projected deficiencies in rainfall, increases in evaporation and the interaction between rainfall and the moisture holding capacity of soils.[53]

2.37 Across New South Wales the severity and duration of droughts will be affected differently. As part of the *NSW Climate Impact Profile*, the Department of Environment, Climate Change and Water identified the changes in droughts for each region across New South Wales, as summarised in Table 5.

[52] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 19

[53] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, p. 83

Table 5 - Projected drought changes in each State Plan region in New South Wales[54]

Region	Projected drought changes
Hunter	The average of the four modelled results indicates that short-duration droughts are about as likely as not to become more severe, and medium and long-term droughts are as likely as not to be less severe.
Illawarra	The average of the four modelled results indicates that short-duration droughts are about as likely as not to become more severe, and medium and long-term droughts are about as likely as not to be slightly less severe.
North Coast	The average of the four modelled results indicates that short-duration droughts are likely to become more severe, and medium and long-term droughts will be about as likely as not to remain similar to current conditions.
New England/ North West	The average of the four modelled results indicates that short-duration droughts are likely to become more severe, and medium and long-term droughts are about as likely as not to be slightly less severe.
Riverina Murray	Short, medium and long-duration droughts are all likely to become more severe due to a projected decrease in run-off during these periods.
Western	The modelled run-off totals show significant variation. There are not clear patterns about whether short, medium or long-duration droughts are going to be more or less severe. The averaged results indicate there will be about as likely as not no significant change compared to current drought severity.
South East	Short, medium and long-duration droughts are all likely to become more severe. The model results mostly indicate an increase in severity, with averaged results indicating that there is likely to be around a 5% decrease in total run-off during droughts.
Sydney/ Central Coast	The average of the four modelled results indicates that short-duration droughts are likely to become more severe, and medium and long-term droughts are about as likely as not to be slightly less severe.

Flooding

2.38 Changes to extreme events (such as precipitation intensity) have the potential to increase flood frequency with significant implications for river flow and water quality. As discussed in paragraph 2.24, it is predicted that the future precipitation regime in Australia will have longer dry spells interrupted by heavier precipitation events. Additionally, extreme precipitation will become more intense across Australia, except where mean precipitation declines substantially.[55]

2.39 Under climate change flooding behaviour in New South Wales is virtually certain to change. Across New South Wales increases in the intensity of flood-producing rainfall are likely to affect flood behaviour. However, catchment conditions at the time of the rainfall events (soil moisture conditions and levels of major water storages) will influence the degree of changes.[56]

2.40 In the lower portions of coastal floodplains, the combination of sea level rises and catchment-driven flooding is virtually certain to increase flood frequency, height and

[54] Source: DECCW, *NSW Climate Impact Profile*, Sydney, 2010, pp. 40-143

[55] CSIRO & BOM, *Climate Change in Australia: Technical Report 2007*, CSIRO, 2007, pp. 73-74

[56] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 34

extent. Additionally, as sea levels rise, the low, mid and high tide levels are virtually certain to rise resulting in larger areas of low-lying land around coastal waterways being exposed to more frequent tidal inundation.[57]

Murray-Darling Basin

2.41 The Murray-Darling Basin (MDB) is defined by the catchment areas of the Murray and Darling Rivers and their many tributaries. It comprises twenty-three river valleys and extends over one million square kilometres, covering approximately 14% of the Australian mainland and three-quarters of New South Wales.[58]

2.42 The MDB has a varied landscape, from semi-arid ephemeral river systems in the north to highly regulated river systems in the south fed by the Australian Alps. As a consequence there is a range of climatic and natural environments across the MDB: from the rainforests of the cool eastern uplands, the temperate mallee country of the south-east, the inland sub-tropical areas of the north, to the hot, dry semi-arid lands of the western plains.[59] The extent and variation across the MDB means that the impacts of climate change are likely to be felt differently across the MDB.

2.43 In 2006, the then Prime Minister and Basin state Premiers commissioned the CSIRO to report on sustainable yields of surface water and groundwater within the MDB. The Murray-Darling Basin Sustainable Yields Project report was released in October 2008 and provided assessment for the eighteen regions that comprise the MDB.[60]

2.44 The results of the project indicated that by 2030 surface water availability across the entire MDB is expected to decline. The median reduction in surface water availability across the MDB is 11%. The north of the MDB would experience a 9% decline, while the south of the MDB would experience a 13% decline. The reduction would be greatest in the south-east of the MDB where the majority of the runoff is generated and where the impacts of climate change are expected to be greatest.[61]

2.45 This reduction in surface water availability would result in a decline of total surface water use by 4% overall under current water sharing arrangements. The impact on surface water use varies across regions from a maximum reduction of 10% in Wimmera to a 2% increase in the Barwon-Darling (due to increased irrigation demand under a warmer climate).[62]

2.46 Current water sharing arrangements in the MDB would generally protect consumptive water users from much of the anticipated impacts of climate change with the majority of the surface water declines being borne by the environment. A notable exception is the Gwydir region as the current water sharing plan would see the consumptive and non-consumptive water share affected to a similar degree.[63]

[57] DECCW, *NSW Climate Impact Profile*, Sydney, 2010, p. 34

[58] MDBA, *Guide to the proposed Basin Plan*, 2010, p. 13

[59] MDBA, *Guide to the proposed Basin Plan*, 2010, p. 13

[60] CSIRO, *Water Availability in the Murray-Darling Basin: A report from CSIRO to the Australian Government*, 2008, p. 4

[61] CSIRO, *Water Availability in the Murray-Darling Basin: A report from CSIRO to the Australian Government*, 2008, p. 8

[62] CSIRO, *Water Availability in the Murray-Darling Basin: A report from CSIRO to the Australian Government*, 2008, p. 8

[63] CSIRO, *Water Availability in the Murray-Darling Basin: A report from CSIRO to the Australian Government*, 2008, p. 8

2.47 The CSIRO notes that the hydrological impacts of the MDB remain uncertain. This uncertainty is expected to reduce in the coming years with improvements in climate change science.[64]

South-west Western Australia

2.48 During its visit of inspection to Western Australia, a delegation of the committee had the opportunity to meet with Dr Don MacFarlane, the Portfolio Coordinator of the Water for a Healthy Country Flagship within the CSIRO.

2.49 Dr MacFarlane explained some of the work the CSIRO had recently completed on water yields and demands in south-west Western Australia as part of the Sustainable Yields Project, similar to the project undertaken for the MDB.

2.50 Some of the key findings of the project were:

- South-west Western Australia has experienced significant climate change since the mid-1970s, which has impacted on surface water and groundwater yields.
- The climate in the region is predicted to get hotter and drier by 2030.
- Surface water modelling has indicated that future yields are likely to be on average 24% lower by 2030.
- A median future climate is expected to decrease summer and winter runoff by 20-30%.
- Significant gaps between water yields and demand are expected to occur by 2020 in areas where surface water resources are used for irrigation.
- Groundwater modelling has indicated that future yields are likely to be on average 2% lower by 2030.[65]

2.51 Dr MacFarlane explained how the results for the south-west Western Australia Sustainable Yields Project differed from the results of the MDB project. These results are outlined in Table 6.

Table 6 - Key findings of the CSIRO Sustainable Yields Projects[66]

Attribute	Murray-Darling Basin	south-west Western Australia
Mean historic streamflow	23,417 GL/yr	3,411 GL/yr
Projected change in rainfall from historical	-3% (+8% to -13%)	-7% (-1% to -14%)
Projected change in streamflow under climate change	-9% (+16% to -33%)	-25% (-10% to -42%)
Mean historic surface water use	11,327 GL/yr	299 GL/yr

[64] CSIRO, *Water Availability in the Murray-Darling Basin: A report from CSIRO to the Australian Government*, 2008, p. 8

[65] CSIRO, *Water in south-west Western Australia: Factsheet 4*, 2009, pp. 2-3

[66] Source: D MacFarlane, *Sustainable Yields Projects and lessons from SWWA since 1975*, presentation to the Standing Committee on Natural Resource Management (Climate Change), 23 July 2010

Projected change in surface water yield under climate change and current development	-4% (+3% to -21%)	-24% (-4% to -49%)
Mean historic groundwater use	1,795 GL/yr	864 GL/yr
Projected change in groundwater yield under climate change and current development	Small impacts relative to future abstractions	-2% (+2% to -7%)
Projected change in environmental indicators	Major impacts on flow regimes, flows to lower lakes. Environment takes major share of impacts.	20-30% reduction in runoff. Risk of adverse impacts on groundwater dependent ecosystems.
Potential unconstrained water demands	Not modelled	+35% (+10% to +57%)

Chapter Three - Legislative framework

3.1 This chapter outlines the history of water management in New South Wales. It also provides an overview of the legislative framework in which water resources in rural and regional New South Wales are managed.

History of water management in New South Wales

3.2 Over recent years governments at both the federal and state level have introduced reforms and initiatives that have significantly shaped the management of water resources in rural and regional New South Wales. Key issues which have guided the reforms include the management of the Murray-Darling Basin (MDB) and the implementation of reforms set by the Council of Australian Governments (COAG).[67]

3.3 The key reforms are discussed briefly below. For a more detailed discussion on the reforms and initiatives introduced over previous years see NSW Parliamentary Library Research Service's *Water: Regulatory Frameworks in Rural NSW*.

Murray-Darling Basin Agreement

3.4 The Murray-Darling Basin Agreement was signed by the Commonwealth, New South Wales, Victorian and South Australian governments in 1992. Queensland became a signatory to the agreement in 1996 and in 1998 the Australian Capital Territory joined through a Memorandum of Understanding. The agreement was given legislative effect by all parties.

3.5 The purpose of the Murray-Darling Basin Agreement was to:

> promote and co-ordinate effective planning and management for the equitable efficient and sustainable use of the water, land and other environmental resources of the Murray-Darling Basin.[68]

3.6 The agreement also established the Murray-Darling Basin Ministerial Council, the Murray-Darling Basin Commission and the Community Advisory Committee. Together, these organisations formed the Murray-Darling Basin Initiative, established to co-ordinate the effective planning and management of the MDB.

3.7 In June 1995 the Murray-Darling Basin Ministerial Council resolved to introduce an interim cap on water diversions from the MDB. The following year in December 1996 the Ministerial Council confirmed that the cap on water diversions would be permanent. The cap in New South Wales was defined as:

> the volume of water that would have been diverted under 1993/94 levels of development.[69]

Council of Australian Governments agreement

3.8 At its February 1994 meeting COAG agreed that:

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[67] NSW Parliamentary Library Research Service, *Water: Regulatory Frameworks in Rural NSW*, Briefing Paper 4/2010, p. 1

[68] *Murray Darling Basin Agreement*, cl 1. The *Murray Darling Basin Agreement* is contained in Schedule 1 of the *Water Act 2007* (Cwlth).

[69] Murray-Darling Basin Ministerial Council, *Setting the Cap: Report of the Independent Audit Group*, 1996, p. 3

> action needs to be taken to arrest widespread natural resource degradation in all jurisdictions occasioned, in part, by water use and that a package of measures is required to address the economic, environmental and social implications of future water reform.[70]

3.9 To this end, COAG endorsed a strategic framework to achieve an efficient and sustainable water industry. The COAG agreement included several measures such as:

- The adoption of pricing regimes based on the principles of consumption-based pricing, full-cost recovery and desirably the removal of cross-subsidies which are not consistent with efficient and effective service, use and provision.
- Implementing comprehensive systems of water allocations or entitlements backed by separation of water property rights from land title and clear specification of entitlements in terms of ownership, volume, reliability, transferability and, if appropriate, quality.
- Formal determination of allocations or entitlements to water, including allocations for the environment as a legitimate user of water.
- The use of water to maximise its contribution to national income and welfare.
- The development by individual jurisdictions of the necessary institutional arrangements, from a nature resource management perspective, to facilitate trade in water, with the proviso that in the Murray-Darling Basin the Murray-Darling Basin Commission be satisfied as to the sustainability of the proposed trading transactions.
- The institutional separation of the roles of water resource management, standard setting and regulatory enforcement and service provision.[71]

3.10 In accordance with this agreement, the New South Wales Government introduced a number of water policy reforms and initiatives in 1995, 1997 and 1999. These reforms culminated in the release of the White Paper, *A proposal for updated and consolidated water management legislation for New South Wales* in December 1999 and the subsequent passing of the *Water Management Act 2000* (WMA) on 8 December 2000.[72]

3.11 The objects and principles of the WMA reflect the COAG water policy reforms and consolidated the previous policy reforms. The WMA is one of the key pieces of legislation that govern water management in New South Wales. Provisions of the WMA are discussed in detail from paragraph 3.27.

National Water Initiative

3.12 In June 2004 COAG agreed to a *National Water Initiative* (NWI) which complemented and extended the 1994 COAG water reform framework.[73] The NWI was signed in recognition of:

> the continuing national imperative to increase the productivity and efficiency of Australia's water use, the need to service rural and urban communities, and to ensure

[70] COAG, *Water Resource Policy*, COAG Communiqué, Attachment A, 25 February 2004, [1]

[71] COAG, *Water Resource Policy*, COAG Communiqué, Attachment A, 25 February 2004

[72] NSW Parliamentary Library Research Service, *Water: Regulatory Frameworks in Rural NSW*, Briefing Paper 4/2010, p. 3

[73] COAG, *Intergovernmental Agreement on a National Water Initiative*, 25 June 2004, [4]

> the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction.[74]

3.13 The overarching objective of the NWI was to reach a nationally compatible market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes.[75]

3.14 At the same time a *Murray-Darling Basin Intergovernmental Agreement* was signed.[76] Parties to the Agreement agreed to provide $500 million in recognition of the need to address over allocation of water resources and achieve environmental objectives in the MDB.

National Plan for Water Security

3.15 In January 2007 the Commonwealth Government released the *National Plan for Water Security*, a $10 billion program intended to improve water efficiency and address over-allocation of water in rural Australia.

3.16 The plan foreshadowed new governance arrangements for the MDB and, in conjunction with the NWI, formed the basis for the *Water Act 2007* (Cwlth).[77]

Agreement on Murray-Darling Basin Reform

3.17 At the March 2008 COAG meeting a *Memorandum of Understanding for Murray-Darling Basin Reform* (MOU) was signed.[78] The MOU progresses the objectives of the NWI and foreshadowed the creation of an intergovernmental agreement for reform in the MDB.

3.18 On 3 July 2008 the *Intergovernmental Agreement on Murray-Darling Basin Reform* was signed. The Agreement was a commitment to implement the reforms necessary to meet the current needs of the MDB and in the long-term to protect and enhance its social, environmental and economic values.[79]

3.19 The Agreement outlines a number of mechanisms to achieve its stated objectives. Notably this includes the referral of relevant state powers to the Commonwealth to make the necessary amendments to the *Water Act 2007* (Cwlth) to enable the Murray-Darling Basin Plan to be developed. It also provides for the transfer of powers and functions from the existing MDB agencies to the new Murray-Darling Basin Authority (MDBA), the new Ministerial Council, the Basin Officials Committee and the Basin Community Committee.[80]

3.20 Implications of this agreement are discussed further from paragraph 3.66.

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[74] COAG, *Intergovernmental Agreement on a National Water Initiative*, 25 June 2004, [5]

[75] COAG, *Intergovernmental Agreement on a National Water Initiative*, 25 June 2004

[76] Parties to the Agreement are the Commonwealth of Australia and the governments of New South Wales, Victoria, South Australia and the Australian Capital Territory.

[77] *A National Plan for Water Security*, 25 January 2007, p. 3. See also Mr Malcolm Turnbull, Commonwealth, House of Representatives, *Parliamentary Debates (Hansard),* No. 11, 8 August 2007, p. 5

[78] Signatories to the Memorandum of Understanding are the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory.

[79] COAG, *Intergovernmental Agreement on Murray-Darling Basin Reform*, 3 July 2008, [17]

[80] COAG, *Intergovernmental Agreement on Murray-Darling Basin Reform*, 3 July 2008, [14]

Water Act 1912

3.21 Prior to the passage of the WMA (which is discussed further from paragraph 3.27), the *Water Act 1912* governed the planning and management of water in New South Wales. Having been passed in the early years of the 20th century, the *Water Act 1912* was considered inadequate to appropriately respond to the emerging challenges associated with water management. As stated in the Second Reading Speech to the WMA:

> The Water Act, the main water legislation, has served its purpose but is not now adequate for today's needs. Today we have a major irrigation industry in place and there are many new water management challenges that could never have been envisaged in those early days.[81]

3.22 The WMA repealed the majority of the *Water Act 1912*, however, in areas of New South Wales where water sharing plans (WSPs) have not commenced the *Water Act 1912* still governs the issue of new water licences and the trade of water licences and allocations.[82]

3.23 Ms Sue-Ern Tan, the Deputy Chief Executive Officer for the New South Wales Minerals Council, explained to the implications of this to the committee:

> Because of the way the water is managed at the moment in New South Wales we have some of our mines still operating under water licences granted by the Office of Water under the Water Act 1912 and then obviously the water sharing plans which we are moving towards, but not all of them are in place.[83]

Protection of the Environment Operations Act 1997

3.24 The *Protection of the Environment Operations Act 1997* (PEO Act) is the primary environmental protection legislation in New South Wales. The Act establishes licensing requirements for specified activities and creates a number of offences concerning air, noise and water pollution. In the sphere of water management, the PEO Act is concerned with water *quality* whilst the WMA is concerned with water *quantity*.[84]

3.25 Under the PEO Act the Department of Environment, Climate Change and Water is responsible for the issuing of Environment Protection Licences (EPLs). The Act specifies certain activities which require an EPL.[85] Generally the specified activities involve heavy or high polluting industries. Examples of such activities include agricultural processing, irrigated agriculture, extractive activities and mining for minerals.

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[81] Mr Richard Amery, New South Wales, Legislative Assembly, *Parliamentary Debates (Hansard),* Thursday 22 June 2000, p. 7498

[82] NSW Parliamentary Library Research Service, *Water: Regulatory Frameworks in Rural NSW,* Briefing Paper 4/2010, p. 16. See also NOW website at http://www.water.nsw.gov.au/Water-Licensing/About-licences/Water-Act-1912/default.aspx

[83] Ms Sue-Ern Tan, Transcript of hearing, 10 May 2010, p. 17

[84] NSW Parliamentary Library Research Service, *Water: Regulatory Frameworks in Rural NSW*, Briefing Paper 4/2010, p. 16

[85] Schedule 1 of the PEO Act lists those activities which require an Environment Protection Licence.

3.26 Once granted, an EPL remains in force until it is suspended, revoked or surrendered,[86] however, each EPL is subject to review every five years.[87] Specific conditions can be attached to an EPL such as ongoing monitoring and reporting of certain activities, mandatory environmental audits and waste management conditions.[88]

Water Management Act 2000

3.27 The WMA was the culmination of a number of water management policies and reforms between 1995 and 1999. The Act draws upon the principles contained within the 1994 COAG Agreement, with particular emphasis given to ecologically sustainable development. As stated in the Second Reading Speech:

> The Water Management Bill 2000 is to be the pivotal legislative mechanism for protecting and managing water. It will provide for the protection, conservation and ecologically sustainable development of the waters of New South Wales. The Act provides for explicit, strategic decisions for protection of water for the environment. Achieving this protection at the front line embraces the key concept of water management being achieved through a community/government partnership. It provides for community-based planning through representative committees and their work is to be supported by the expertise, resources and information of government agencies.[89]

Objects and principles

Objects

3.28 The principal object of the WMA is to provide for the 'sustainable and integrated management of the water sources of the state for the benefit of both present and future generations.'[90] The WMA also makes provision for a number of particular objectives. They include:

- to apply the principles of ecologically sustainable development
- to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality
- to recognise and foster the significant social and economic benefits to the state that result from the sustainable and efficient use of water, including:
  - benefits to the environment
  - benefits to urban communities, agriculture, fisheries, industry and recreation
  - benefits to culture and heritage
  - benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water
- to recognise the role of the community, as a partner with government, in resolving issues relating to the management of water sources

[86] PEO Act, s 77(1)

[87] PEO Act, s 78(1)

[88] PEO Act, Part 3.5, ss 65-76

[89] Mr Richard Amery, New South Wales, Legislative Assembly, *Parliamentary Debates (Hansard),* Thursday 22 June 2000, p. 7499

[90] WMA, s 3

- to provide for the orderly, efficient and equitable sharing of water from water sources
- to integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna
- to encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water uses
- to encourage best practice in the management and use of water.[91]

Principles

3.29 In addition to the objects underlying the WMA, the Act contains a number of water management principles that 'must be recognised and embedded in each plan.'[92] The management principles are of both a general and specific nature. They broadly concern:

- the protection and restoration of water sources, floodplains, dependent ecosystems, and habitats[93]
- protecting animals, plants, geographical and other features of indigenous significance and geographical and other features of other major cultural, heritage or spiritual significance[94]
- protecting and enhancing water quality[95]
- minimisation of the cumulative impacts of water licences and approvals[96]
- maximisation of the social and economic benefits to the community[97]
- application of the principles of adaptive management.[98]

Environmental water

3.30 The reforms to water management throughout the 1990's were largely driven by an increasing awareness of widespread natural resource degradation.[99] It was becoming apparent that a new framework for water management was required to 'maintain the environmental health of the state's water.'[100] Drawing upon the 1994 COAG commitments to ecologically sustainable development, the WMA contains provisions aimed at protecting water for the environment.

[91] WMA, s 3(a)-(h)
[92] Mr Richard Amery, New South Wales, Legislative Assembly, *Parliamentary Debates (Hansard),* Thursday 22 June 2000, p. 7502
[93] WMA, s5(2)(a)-(b)
[94] WMA, s5(2)(b) and (e)-(f)
[95] WMA, s5(2)(c)
[96] WMA, s5(2)(d)
[97] WMA, s5(2)(g)
[98] WMA, s5(2)(h)
[99] COAG, *Water Resource Policy*, COAG Communiqué, Attachment A, 25 February 2004
[100] NSW Department of Infrastructure, Planning and Natural Resources, *NSW Water Reforms: A secure and sustainable future*, Ministerial statement, August 2004 at p. 2

3.31 The WMA defines two different types of environmental water:

- Planned environmental water is water committed by management plans for fundamental ecosystem health or other specified environmental purposes. Planned environmental water cannot be used for any other purpose.
- Adaptive environmental water is water committed by the conditions of access licences for specified environmental purposes, either generally or at specified times or in specified circumstances.[101]

3.32 Water management plans are required to contain provisions for the identification, establishment and maintenance of planned environmental water (environmental water rules).[102] Adaptive environmental water must also be provided for in water management plans.[103]

3.33 Planned environmental water must be reserved in a WSP in at least two of the following ways:

- by reference to the commitment of the physical presence of water in the water source
- by reference to the long-term average annual commitment of water as planned environmental water
- by reference to the water that is not committed after the commitments to basic landholder rights and for sharing and extraction under any other rights have been met.[104]

3.34 The New South Wales Office of Water (NOW) further explained:

> Planned environmental water is expressed in different ways for different plans. For example the physical presence of water may be expressed in a regulated plan through an environmental contingency allowance, or in an unregulated plan through the specification of cease to pump rules. The long term average annual commitment to the environment is a function of the long-term average annual extraction limit, which in turn is the outcome of the sharing rules in the plan. Water that is not committed may be represented through accounting rules or available water determinations which limit the take of water.[105]

3.35 The environmental water rules which are applied in the development of water management plans are based on twelve broad river flow objectives:

- protect natural water levels in pools of creeks and rivers and wetlands during periods of no flow
- protect natural low flows
- protect or restore a proportion of moderate flows, 'freshes' and high flows
- maintain or restore the natural inundation patterns and distribution of floodwaters supporting natural wetland and floodplain ecosystems
- mimic the natural frequency, duration and seasonal nature of drying periods in naturally temporary waterways

[101] WMA, s 8(1)(a)-(b)
[102] WMA, s 8(2)
[103] WMA, s 8(4)
[104] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 7
[105] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 7

- maintain or mimic natural flow variability in all rivers
- maintain rates of rise and fall of river heights within natural bounds
- maintain groundwater within natural levels, and variability, critical to surface flows or ecosystems
- minimise the impact of in-stream structures
- minimise downstream water quality impacts of storage releases
- ensure river flow management provides for contingencies
- maintain or rehabilitate estuarine processes and habitats in developing water management plans.[106]

3.36 At its hearing on 14 May 2010, Mr Michael Murray, Chief Executive Officer of the Gwydir Valley Irrigators Association, explained to the committee how the environmental flow rules applied in the Gwydir Valley:

> Below the dam wall any flows that enter into the system, the first 500 ML a day have to flow through to the Gwydir wetlands…Once the flows exceed 500 ML a day, the share of those flows can be shared 50:50 between irrigators and the environment. If there is a flow of, say, 2,500 ML a day coming down the river, the first 500 will be set aside straight to the wetlands; the remaining 2,000 can be divided between irrigators and environment. If you get to the stage where you turn on every pump in the Gwydir Valley—approximately 20,000 ML is the maximum amount that can be extracted from the valley in any one day—so once flows exceed 40,500 a day, the environment actually gets a greater share. Looking back over the longer term, certainly the average amount of water that goes to the environment from those below dam flows is round about 75%. Over the last decade that percentage would be less, given the fact that we have only had relatively small flows and there have been very few opportunities where the flows in the Gwydir Valley have exceeded 40,000 a day, although it does actually happen occasionally, and we would like it to happen a lot more.[107]

3.37 Table 7 below provides examples of some of the environmental water rules used in the development of water management plans in New South Wales.

[106] NOW, *Environmental rules for* rivers, viewed 1 October 2010, <http://www.water.nsw.gov.au/Water-Management/Water-sharing/Environmental-rules/Rivers/default.aspx>

[107] Mr Michael Murray, Transcript of hearing, 14 May 2010, p. 12

Table 7 - Examples of environmental flow rules under water sharing plans[108]

Environmental flow rule	Purpose	Valleys where rule applies
Diversion limits	Precludes increases in the total volume of water extracted	All regulated rivers
End-of-system flow	Requires a certain minimum flow to be retained at the downstream end of the river, below the areas where major extraction occurs	Hunter, Murrumbidgee, Namoi
Transparent dam release	Requires all reservoir inflows occurring at certain times to be passed immediately downstream, as though no dam were present	Murrumbidgee
Translucent dam release	Requires part of a reservoir inflow to be passed immediately downstream	Lachlan, Macquarie
High flow access	Limits pumping and/or total extractions when reservoirs spill or high flows enter flow-regulated rivers from unregulated tributaries	Gwydir, Hunter, Lachlan, Namoi
Environmental allowances	Creates a 'bank' of reservoir water to be used for specific environmental purposes, such as flushing blue-green algal blooms, reducing salinity or supporting bird-breeding events	Gwydir, Hunter, Lachlan, Macquarie, Murray, Murrumbidgee

3.38 The water management principles specified in the WMA also act to prioritise the protection and provision of water for the environment. Section 5(3) of the WMA provides:

> (3) In relation to water sharing:
>
> (a) sharing of water from a water source must protect the water source and its dependent ecosystems, and
>
> (b) sharing of water from a water source must protect basic landholder rights, and
>
> (c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).

3.39 The above water management principle conveys that when sharing water, priority should be given to the protection of the water source and its dependent ecosystem.[109] It is relevant to note that many of the water sources in New South Wales are also subject to the MDB cap on surface water extractions.

Water management plans

3.40 Part 3 of the WMA details the types of water management plans available and the procedures for their preparation and amendment where necessary. Water management plans may be developed on any aspect of water management, however, the Act makes specific reference to the areas of water sharing, water

[108] DECCW, *State of the Environment 2009*, Sydney, p. 170

[109] NSW Parliamentary Library Research Service, *New Water Management Legislation in NSW: A Review*, Briefing Paper 8/2000 at p. 8

source protection, drainage management and floodplain management.[110] To date the only water management plans that have been developed are WSPs. Please note that any reference to 'the Minister' refers to the Minister for Water.

Preparation and procedures

3.41 The WMA establishes management committees which have as one of their functions the preparation of water management plans.[111] Membership of a management committee must comprise persons who represent the following interests:

- environmental protection
- water users
- local councils
- catchment management authorities
- aboriginal persons
- relevant government departments
- other interests as required.[112]

3.42 Water management plans must be consistent with the state Water Management Outcomes Plan and any other state environmental policy.[113] In addition, when formulating a draft management plan, the management committee must give due regard to the socio-economic impacts of the proposals considered for inclusion in the plan, and the provisions of any relevant catchment management action plan.[114]

3.43 Water management plans must contain the following components:

- a vision statement
- objectives consistent with the vision statement
- strategies for reaching those objectives
- performance indicators to measure the success of those strategies.[115]

3.44 The general aims and objectives of a draft water management plan must be provided to certain persons and bodies including each local council within the water management area, each catchment management authority, each holder of an access licence or approval in respect of the land and such other persons at the Minister's discretion.[116]

3.45 The WMA also specifies that draft water management plans are required to be exhibited publicly. Interested persons can make a submission concerning the draft WSP to the Minister during a period of at least forty days after public exhibition.[117]

[110] WMA, s 15(1)(a)
[111] WMA, s 14(2)(a)
[112] WMA, s 13(1)(a)-(h)
[113] WMA, s 16
[114] WMA, s 18(1) and (1A)
[115] WMA, s 35(1)
[116] WMA, s 36(2)
[117] WMA, s 38

3.46 Upon completion of the requirements under the WMA for a draft water management plan, the Minister must obtain concurrence from the Minister for Climate Change and the Environment before the plan can be finalised.[118]

Duration, amendment and suspension

3.47 Water management plans have effect for a ten year period.[119] The Minister is required to review the water management plan after five years for the purpose of ascertaining whether its provisions remain adequate and appropriate for ensuring effective implementation of the water management principles.[120] The five year review is to be conducted in consultation with the Minister for Climate Change and the Environment.[121] A management plan that deals with water sharing may be extended for a further ten years on the recommendation of the Natural Resources Commission.[122]

3.48 A water management plan may be amended by a subsequent management plan which is made in accordance with the Act.[123] The WMA also provides the Minister with the ability to amend a management plan if:

- it is in the public interest
- in such circumstances, in relation to such matters and to such extent as the plan provides
- the amendment is required to give effect to a decision of the Land and Environment Court.[124]

3.49 Section 49A of the WMA provides that if satisfied there is a severe water shortage in relation to a particular water source or management area, the Minister may suspend the operation of a water management plan. The Minister must obtain the concurrence of the Minister for Climate Change and the Environment. An order to suspend a water management plan cannot be made within a twelve month period of a prior suspension order, unless the Minister is satisfied that there is no need to amend the water management plan.

3.50 At one of its hearings, Mr David Harriss, Commissioner of NOW, explained to the committee the context in which water management plans had been suspended:

> [W]here we believed there was a severe water shortage, and that was where we could not guarantee supply under current arrangements for urban use, town water supply in particular, we would suspend those plans and make alternative arrangements consistent with the Act and the priorities for supply under the Act.[125]

[118] WMA, s 41(2)
[119] WMA, s 43(1)
[120] WMA, s 43(2)
[121] WMA, s 43(3)
[122] WMA, s 43A
[123] WMA, s 42
[124] WMA, s 45(1)
[125] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 6

Critical water advisory groups

3.51 Where WSPs have been suspended it has been New South Wales Government practice to establish critical water advisory groups to advise the government on the best way to manage the water resources. Mr Harriss told the committee:

> [W]e have established in the southern valleys during this drought in particular, critical water advisory groups. They have included water users, local government and industry advisors who have been set up to advise the Office of Water and the Minister on issues relating to the distribution of the available water in severe water shortages.[126]

3.52 The groups play an advisory role and make recommendations to the Minister. Mr Harriss further explained:

> [C]ritical water advisory groups do not make management decisions, they provide advice only. It is the role of the government and the New South Wales Office of Water by delegation to make those decisions about the application and distribution of water.[127]

Water sharing plans

3.53 As stated above, WSPs have been the only type of water management plan developed under the WMA and have been the primary mechanism used to manage and plan water in New South Wales. Mr Harriss explained to the committee:

> We have developed water sharing plans which look at protecting the environment and the fundamental health of the environment, but then provide the rules for allocating water between industries and commercial uses, and also provide the rules that allow for water trade; so that we can meet our requirements under the national water initiative to allow water trade to enable water to move to its highest value use, subject to operational and physical constraints.[128]

3.54 Specifically, the WMA details a number of core and additional provisions for WSPs. The core provisions include:

- the establishment of environmental water rules and provisions relating to adaptive environmental water for the area or water source
- the identification of requirements for water for extraction under access licences
- the establishment of access licence dealing rules for the area or water source
- the establishment of a bulk access regime for the extraction of water under access licences, having regard to the rules and requirements referred above.[129]

3.55 NOW outlined the steps involved in developing a WSP:

- Classification of water sources: This is the first step in developing water sharing rules for each water source. The classification assists in determining the optimal balance between extraction and protection of water for each water source and guides the indicative rules developed by the interagency regional panels for inclusion in the plans.
- The classification is based on a range of information needed to assess socioeconomic risk and values such as the magnitude of extractions, and another range of information needed to assess environmental risk and values such as asset

[126] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 3

[127] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 3

[128] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 2

[129] WMA, s 20(1)(a)-(e). Section 20 sets out further core provisions relating to the bulk access regime.

identification, watering needs, priority areas and water dependent ecosystems with a focus on threatened species.

- Review of draft rules by the agency panels to recommend rules for each water source.
- Targeted consultation on the draft rules.
- Review of comments received during targeted consultation by the interagency regional panels. This informs the development of the draft plan rules that are placed on public exhibition. Public exhibition of the draft rules.
- Review of comments from public exhibition by the agency panels. This informs the development of the draft plan submitted for approval for making.
- Submission of draft plan for Ministerial approval to be made and commenced.
- Minister for Water seeks the Minister for Climate Change and the Environment's concurrence to make the plan and, if concurrence is provided, the plan is gazetted and commenced.[130]

3.56 Each WSP includes rules on how water is to be shared within the catchment. NOW explained how these water sharing rules are developed and potentially amended following consultation:

> In developing water sharing rules the Interagency Regional Panels undertake an initial classification of the water sources which considers the environment and socioeconomic values of the water and the risks of extraction to these values. This classification guides the initial rules considered by the Panel e.g. if a water source has low environmental values and a high socio-economic dependence on the water extracted the rules would be less stringent (and therefore have less impact on users). In developing appropriate rules consultation can highlight impacts that may not have been identified by the Panel. This information is used to inform any appropriate amendment to the draft water access rules.[131]

3.57 To date forty-six WSPs have been developed with five of these currently suspended.[132] The WSPs developed so far cover approximately 90% of water extraction in New South Wales with the remainder due to be completed by the end of 2012.[133] A full list of WSPs that have been developed and their current status is provided in Table 8.

Table 8 - List and status of water sharing plans in New South Wales[134]

Water sharing plan	Status
Adelong Creek	Commenced 1 July 2004
Alstonville Basalt Plateau Groundwater Source	Commenced 1 July 2004
Apsley River	Commenced 1 July 2004
Bellinger River Area Unregulated and Alluvial Water Sources	Commenced 1 July 2008

[130] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 1

[131] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 5

[132] NOW, *Plans commenced*, viewed 4 November 2010, <http://www.water.nsw.gov.au/default.aspx?FolderID=96>

[133] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 2

[134] NOW, *Plans commenced*, viewed 4 November 2010, <http://www.water.nsw.gov.au/default.aspx?FolderID=96>

Castlereagh River above Binnaway	Commenced 1 July 2004
Central Coast Unregulated Water Sources	Commenced 1 August 2009
Coffs Harbour Area Unregulated and Alluvial Water Sources	Commenced 1 August 2009
Commissioners Waters	Commenced 1 July 2004
Coopers Creek	Commenced 1 July 2004
Dorrigo Plateau Surface Water Source and the Dorrigo Basalt Groundwater Source	Commenced 1 July 2004
Gwydir Regulated River	Commenced 1 July 2004
Hunter Unregulated and Alluvial Water Sources	Commenced 1 August 2009
Jilliby Jilliby Creek	Commenced 1 July 2004
Kangaroo River	Commenced 1 July 2004
Karuah River	Commenced 1 July 2004
Kulnura Mangrove Mountain Groundwater Source	Commenced 1 July 2004
Lachlan Regulated River	Commenced 1 July 2004 Suspended 1 July 2004 Critical water planning
Lower Gwydir Groundwater	Commenced 1 October 2006
Lower Lachlan Groundwater	Commenced 1 February 2008
Lower Macquarie Groundwater	Commenced 1 October 2006
Lower Murray Groundwater	Commenced 1 November 2006
Lower Murrumbidgee Groundwater	Commenced 1 October 2006
Lower North Coast Unregulated and Alluvial Water Sources	Commenced 1 August 2009
Macquarie and Cudgegong Regulated Rivers	Commenced 1 July 2004 Suspended 27 July 2007
Mandagery Creek	Commenced 1 July 2004
Murrumbidgee Regulated River	Commenced 1 July 2004 Suspended 10 Nov 2006 Critical water planning
NSW Border Rivers Regulated River Water Source	Commenced 1 July 2009
NSW Great Artesian Basin Groundwater Sources	Commenced 1 July 2008
NSW Murray – Lower Darling Regulated Rivers	Commenced 1 July 2004 Suspended 10 Nov 2006 Critical water planning
Ourimbah Creek	Commenced 1 July 2004 Suspended 22 December 2006 Recommenced 9 April 2010
Paterson Regulated River	Commenced 1 July 2007
Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources	Commenced 1 July 2010
Phillips Creek, Mooki River, Quirindi Creek, and Warrah Creek Water Sources	Commenced 1 July 2004

Regulated Hunter River Water Source	Commenced 1 July 2004 Suspended 29 December 2006 Recommenced 20 February 2009
Rocky Creek, Cobbadah, Upper Horton and Lower Horton	Commenced 1 July 2004
Stuarts Point Groundwater Source	Commenced 1 July 2004
Tarcutta Creek	Commenced 1 July 2004
Tenterfield Creek	Commenced 1 July 2004
Tomago Tomaree Stockton Groundwater Source	Commenced 1 July 2004
Toorumbee Creek	Commenced 1 July 2004
Upper and Lower Namoi Groundwater	Commenced 1 November 2006
Upper Billabong	Commenced 1 July 2004
Upper Brunswick River	Commenced 1 July 2004
Upper Namoi and Lower Namoi Regulated River	Commenced 1 July 2004
Wandella Creek	Commenced 1 July 2004
Wybong Creek	Commenced 1 July 2004 Suspended 18 August 2006

Access licences

Categories

3.58 Under the WMA it is an offence to take water from a water source without an access licence or take water in a way not authorised by an access licence.[135] The WMA establishes a range of different water access licences. They include:

- regulated river (high security) access licences
- regulated river (general security) access licences
- regulated river (conveyance) access licences
- unregulated river access licences
- aquifer access licences
- estuarine water access licences
- coastal water access licences
- supplementary water access licences
- major utility access licences
- local water utility access licences
- domestic and stock access licences
- such other categories of access licence as may be prescribed by the regulations.[136]

[135] WMA, s 60A(1) and (3)

[136] WMA, s 57(1). Section 57(2) provides that subcategories of any category of access licence may be prescribed by regulation.

3.59 Mr Harriss further explained:

> In New South Wales we have licensed entitlements and effectively they are divided into two types of entitlements. This is where we differ very significantly from other jurisdictions. We have a high security entitlement, which has typically been allocated for town water supplies, industry requirements, stock and domestic requirements, permanent plantings, whereby they need to have water every year, otherwise trees will die or there will be significant economic impacts. They constitute about 10-15% of our total water entitlements. Then we have a general security entitlement, which is more opportunistic. Effectively in dry years people would with general security entitlements will not get much water; in wet years they will get plenty of water. So New South Wales looks after its high needs industry and has a more opportunistic allocation of water whereby people get water for use in wet years and that is, quite frankly, very good policy. More water is used in wet years; less water is used in dry years.[137]

Prioritisation

3.60 The different categories of access licence have different levels of priority in relation to the water source. That is, certain access licences have a greater chance of receiving a water allocation than others. Section 58 of the WMA sets out these priorities. It is relevant to note that a water management plan may provide for different rules of priority.[138] The priorities are:

- local water utility access licences, major utility access licences and domestic and stock access licences have priority over all other access licences
- other than the access licences listed above, regulated river (high security) access licences have priority over all other access licences
- other than the access licences listed above, other access licences have priority between themselves as prescribed by the regulations
- supplementary water access licences have priority below all other licences.

3.61 In support of this prioritisation, Riverina Citrus submitted that the citrus industry in the Murrumbidgee continues to be successful and innovative largely due to the secure supply of water from its high security licences. They support the current practice of allocating water by hierarchy where high security licences have priority over general and supplementary licences. Riverina Citrus urged that the New South Wales Government maintain this highly successful hierarchy of allocation for economic and environmental reasons. They stated:

> The high security system also benefits our natural resources. The NSW Office of Water has a greater capacity to deliver water for environmental purposes when flows are allocated in a consistent, predictable manner… This is evidence by the 5% allocation taken off High Security licence holders specifically destined for the environment. The '5% for the Environment' for the life of the Water Sharing Plan was agreed by all stakeholders in the Murrumbidgee because of the greater likelihood the environment would ultimately benefit.[139]

[137] Mr David Harriss, Transcript of hearing, 10 May 2010, pp. 2-3

[138] WMA, s 58(3)

[139] Submission 8, Riverina Citrus, pp. 1-2

Available water determinations

3.62 Under the Act the Minister may make available water determinations.[140] Available water determinations are commonly referred to as water allocations and are generally made at the start of each water year on 1 July.[141] NOW indicates that if the water allocation is less than 100%, the Office will regularly review the allocation and when possible issue revised water allocations.[142] Available water determinations are made available by NOW in the form of a Register searchable by either water management area or access licence number.[143]

3.63 Mr Harriss explained:

> We make those available water determinations regularly during a water season. It is very market sensitive and we are very aware of the impact of that market sensitivity. Particularly in the southern valleys, we will make announcements at the same time on the same day in every month and we have convinced the other jurisdictions that they should do the same, because we now have twenty-four hour online water trading markets.[144]

3.64 Except in the circumstances where a water management plan has been suspended under section 49A of the Act, the rules of priority, specified in section 58 of the WMA and outlined above, apply to the making of an available water determination. The Minister must also apply the provisions of any bulk access regime; the provisions of any relevant management plan; and the provisions of any implementation program.[145]

3.65 Where a water management plan has been suspended, section 60(3) of the WMA outlines the following rules of distribution that apply to the making of an available water determination:

- First priority is given to:
  - the taking of water for domestic purposes by persons exercising basic landholder rights
  - the taking of water for domestic purposes or essential town services authorised by an access licence.
- Second priority is given to the needs of the environment**.**
- Third priority is given to:
  - the taking of water for stock purposes by persons exercising basic landholder
  - in the case of regulated rivers, the taking of water for purposes (other than domestic purposes) authorised by a regulated river (high security) access licence
  - the taking of water for the purposes of supply of commercial and industrial activities authorised by a major utility access licence or local water utility

[140] WMA, s 59

[141] NOW, *Water* availability, viewed 7 October 2010, <http://www.water.nsw.gov.au/Water-management/Water-availability/Water-availability/default.aspx>

[142] NOW, *Water* availability, viewed 7 October 2010, <http://www.water.nsw.gov.au/Water-management/Water-availability/Water-availability/default.aspx>

[143] See http://www.wix.nsw.gov.au/wma/DeterminationSearch.jsp?selectedRegister=Determination

[144] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 3

[145] WMA, s 60(1)

access licence, subject to the water made available being in accordance with any drought management strategy established by the Minister for that purpose

- the taking of water for the purposes of electricity generation authorised by a major utility access licence
- the taking of water for purposes authorised by a domestic and stock access licence or by persons exercising any other water rights in relation to stock
- the taking of water for purposes authorised by a conveyance access licence in connection with the supply of water for any other purpose or need referred to in this paragraph.

- Fourth priority is to be given to the taking of water for purposes authorised by any other category or subcategory of access licence.[146]

Water (Commonwealth Powers) Act 2008

3.66 In July 2008, New South Wales became a signatory to the Intergovernmental Agreement on Murray-Darling Basin Reform. Central to the Intergovernmental Agreement was assigning a basin-wide planning and management role to the Commonwealth. To this end, the signatory states made a commitment to enact legislation referring certain powers to the Commonwealth in accordance with section 51(xxxvii) of the Constitution.[147]

3.67 In New South Wales the *Water (Commonwealth Powers) Act 2008* was passed to refer the relevant state powers to the Commonwealth.[148] The referred powers enable the Commonwealth to make necessary amendments to the *Water Act 2007* (Cwlth). Such amendments cover the following matters:

- the transfer of current powers and functions of the Murray-Darling Basin Commission to the MDBA
- the strengthening of the role of the Australian Competition and Consumer Commission by extending the application of the water market rules and water charge rules
- enabling the Basin Plan to provide arrangements for meeting critical human water needs.[149]

Murray-Darling Basin Plan

3.68 A key element of the management and planning of the MDB is the preparation of the Basin Plan. Under Part 2 of the *Water Act 2007* (Cwlth) the MDBA has responsibility for the preparation of a whole-of-basin plan for the management of the Basin's water

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[146] WMA, s 60(3)

[147] Section 51(xxxvii) of the Constitution provides that the Commonwealth shall have the power to make laws for the peace, order, and good government of the Commonwealth with respect to matters referred to the Parliament of the Commonwealth by the Parliament or Parliaments of any state or states. A referral of powers was necessary under s 51(xxxvii) as the matters the Commonwealth sought to legislate on are not provided for under section 51 of the Constitution.

[148] The *Water (Commonwealth Powers) Act 2008* repealed the *Murray-Darling Basin Act 1992*. Governments in South Australia, Victoria and Queensland enacted equivalent Acts.

[149] COAG*, Intergovernmental Agreement on Murray-Darling Basin Reform*, 3 July 2008, p. 6. See also Mr Peter Garrett, Commonwealth, House of Representatives, *Parliamentary Debates (Hansard),* No 13, 25 September 2008, p. 8658

resources. The purpose of the Basin Plan is to provide for the integrated management of the MDB water resources.[150] It will:

- set and enforce environmentally sustainable limits on the quantities of water that may be taken from Basin water resources
- set MDB-wide environmental, water quality and salinity objectives
- develop efficient water trading regimes across the MDB
- set requirements for state water resource plans
- improve water security for all basin water uses.[151]

3.69 A central component of the Basin Plan will be the long-term average sustainable diversion limits for surface water and groundwater. This is the amount of water used for consumptive purposes (e.g. drinking water, industry, agriculture) after environmental needs have been met in accordance with the environmental water requirements of the *Water Act 2007* (Cwlth).[152]

3.70 The MDBA has outlined four stages to the development of the Basin Plan:

- Release of the Guide to the proposed Basin Plan (October 2010).
- Release of the proposed Basin Plan (late 2010 to early 2011).
- Release of the Basin Plan (late 2011).
- Implementation through state water resource plans (2012-2019).[153]

Guide to the proposed Basin Plan

3.71 The *Guide to the proposed Basin Plan* was released on 8 October 2010. It presents proposals about key decisions in the Basin Plan and exposes the data and thinking behind those ideas to public scrutiny.[154]

3.72 The guide proposes that an additional 3,000-4,000 gigalitres of surface water per year be allocated to the environment. The surface water sustainable diversion limit for the Basin as a whole would therefore be 9,700-10,700 GL/year. This represents a MDB average of 22-29% reduction in current diversion for consumptive purposes from all diversions.[155] The guide further outlines the proposed reductions to current diversion limits for surface water for each region within the MDB.

3.73 The guide further proposes that an aggregate reduction in groundwater extraction across the MDB of 186 GL/year is required to achieve an environmentally sustainable level of take for groundwater.[156] The guide further outlines the proposed reductions to current diversion limits for groundwater for each region within the Basin.

[150] *Water Act 2007* (Cwlth), s 20
[151] MDBA, *Fact sheet 6: Transitional and interim water resource plans*, 2010, p. 1
[152] MDBA, *Guide to the proposed Basin Plan*, 2010, p. xvii
[153] MDBA, *Guide to the proposed Basin Plan*, 2010, p. x
[154] MDBA, *Guide to the proposed Basin Plan*, 2010, pp. ix, x
[155] MDBA, *Guide to the proposed Basin Plan*, 2010, p. xxiii
[156] MDBA, *Guide to the proposed Basin Plan*, 2010, p. xxv

Next steps in developing the Basin Plan

3.74 Following the release of the *Guide to the proposed Basin Plan*, the MDBA responded to calls by regional communities for further analysis and more detailed projections of the social and economic effects of the Basin Plan by announcing that it will commission an expanded detailed social and economic study into the likely social and economic impacts of the proposed Basin Plan on local communities. This new study is scheduled to be completed by 15 March 2011.[157]

3.75 On 28 October 2010 the Minister for Regional Australia, Regional Development and Local Government and Minister for the Arts, the Hon Simon Crean MP, asked the Commonwealth House of Representatives Standing Committee on Regional Australia to inquire into and report on the impact of the Murray-Darling Basin Plan in Regional Australia. This committee, chaired by Mr Tony Windsor MP, invites submissions by 20 December 2010 and is scheduled to report its findings to the Commonwealth Parliament by the end of May 2011.[158]

3.76 The MDBA is accepting feedback throughout the process of release of the Guide, however, it has set the cut-off date as the end of November 2010 for feedback to be considered as input to the drafting of the proposed Basin Plan. The MDBA will consider these submissions, along with all other comments and feedback, to finalise the proposed Basin Plan. This will then be considered by the Murray-Darling Basin Ministerial Council, along with the MDBA's assessment of the socioeconomic implications of any reductions to current diversion limits.

3.77 Following this process, the proposed Basin Plan will be reviewed by the Commonwealth Water Minister. The Basin Plan will become law once the Minister has adopted it, which is expected to occur in late 2011.

Implementation of the Basin Plan

3.78 Implementation of the Basin Plan will primarily be via water resource plans prepared by the Basin states in accordance with the *Water Act 2007* (Cwlth). Each water resource plan must be either accredited or adopted by the Commonwealth Minister.[159]

3.79 Existing water resource plans (known in New South Wales as WSPs) currently operating in Basin states will continue until they expire. In New South Wales the expiry date for most plans is 2014. Once these plans expire, new plans must be prepared in accordance with the Basin Plan. This relationship is illustrated in Figure 9.

[157] MDBA, *MDBA to commission further study of local community impacts*, Media release, 17 October 2010

[158] House of Representatives Standing Committee on Regional Australia, *Murray-Darling Basin Plan flows under Parliamentary scrutiny*, Media release, 28 October 2010

[159] *Water Act 2007* (Cwlth), s 54(2)(a) and (b)

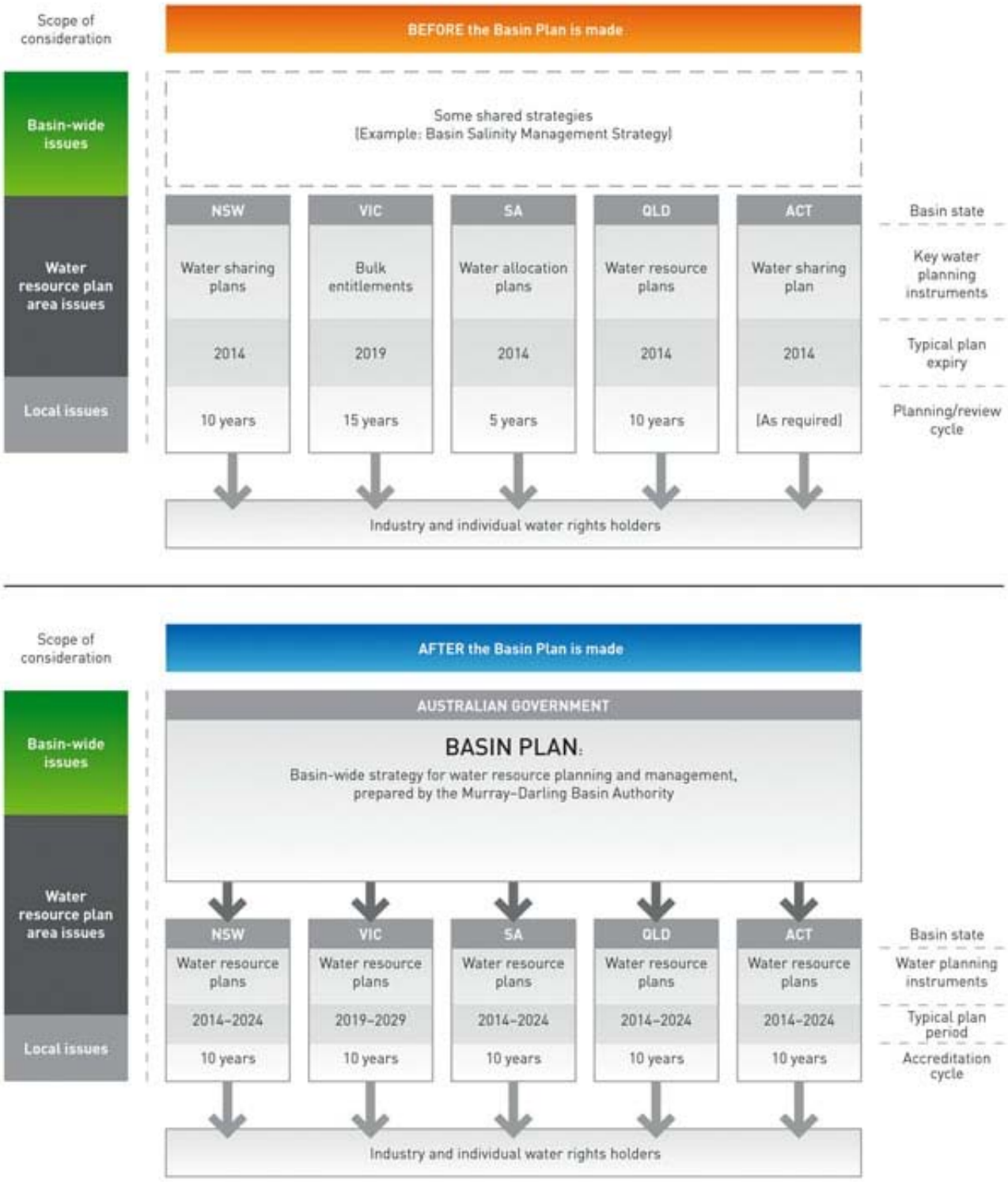

Figure 9 - Relationship of the water resource plans to the Murray-Darling Basin Plan[160]

[160] MDBA, *How the Basin Plan will affect us* all, viewed 29 September 2010, <http://www.mdba.gov.au/basin_plan/concept-statement/effects>

Chapter Four - Improving water management

4.1 During the course of the inquiry the committee received submissions and evidence from a number of inquiry participants who raised a range of water management issues. Examination of submissions received and evidence provided in public hearings highlighted four issues that were raised by the majority of inquiry participants: water sharing plans (WSPs), environmental flows, management arrangements during times of water shortages, and the integration of approval and reporting requirements.

Water sharing plans

Scientific basis for water sharing plans

4.2 The committee heard from a number of stakeholders regarding the scientific basis of WSPs. It was widely agreed that WSPs should be based on the latest ecological science and hydrological modelling.[161]

4.3 In giving evidence before the committee, the Environmental Defender's Office (EDO) raised concerns that this was not the case. Ms Rachel Walmsley, Policy Director of the EDO, told the committee:

> One of the issues we have in New South Wales with water sharing plans is that they have not always been based on the best available science and the best hydrological modelling.[162]

4.4 The NSW Young Lawyers Environmental Law Committee made similar observations. Drawing upon criticisms made by the National Water Commission, they submitted that:

> NSW had demonstrated sufficient progress in relation to ecological science, transparency and monitoring. This progress was in relation to new WSPs. However, it was acknowledged that little had been done to rectify the deficiencies in the 2004 WSPs.[163]

4.5 While appearing before the committee, Mr David Harriss, Commissioner of the New South Wales Office of Water (NOW), maintained that there already was a sound scientific basis for WSPs:

> [T]he plans are underpinned by an enormous amount of information. The Office of Water currently manages the biggest hydrometric network in Australia, which includes about 1500 monitoring sites and we are at the leading edge in water modelling. We have about 900 surface water gauging stations which are polled every day and even more so during flood events when we might have to work out what the heights are on a 15 minute basis.[164]

4.6 The committee heard from the EDO and the NSW Young Lawyers Environmental Law Committee that they maintain that WSPs should be amended and updated as

[161] Submission 13, Mr Ian Cohen MLC, p. 1; Submission 32, EDO, p. 3; Submission 34, NSW Young Lawyers, Environmental Law Committee, p. 6

[162] Ms Rachel Walmsley, Transcript of hearing, 14 May 2010, p. 3

[163] Submission 34, NSW Young Lawyers, Environmental Law Committee, p. 6

[164] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 2

soon as new scientific information becomes available.[165] This differs from the current situation, as outlined in the New South Wales Government submission:

> Water sharing plans have effect for 10 years, after which time they can be reviewed. It is during the review process that impacts associated with known changes in hydrology can be addressed.[166]

Conclusion

4.7 The committee trusts that NOW will continue to ensure that the latest available scientific information is incorporated in WSPs and that this information is updated when WSPs undergo their statutory review.

Connection of groundwater and surface water

4.8 The committee also heard concerns from some stakeholders that there was a lack of connectivity between groundwater and surface water in most WSPs.[167]

4.9 At one of its hearings, Mr Ian Cohen MLC, told the committee the problems this caused:

> By not ensuring that these two sources of water are managed in an integrated way, real threats to our water security will be perpetrated as natural recharge processes are impacted. Increased impacts from salinity will be experienced as groundwater is increasingly extracted to meet critical needs - a poor outcome not only for our environment, also for farmers, business owners and the wider community.[168]

4.10 Additionally, the EDO noted that a lack of connectivity between groundwater and surface water resulted in double counting. The EDO explained:

> Double counting occurs where the same water is subject to both a surface water and groundwater plan. The effect of this is that the same parcel of water is allocated to both groundwater and surface water users, which affects the security of environmental flows.[169]

4.11 It was suggested that one of the stumbling blocks to connectivity of all water sources was a lack of understanding. In response to a question taken on notice at a hearing, Mr Cohen explained:

> The fact that there are existing gaps in our knowledge of groundwater systems is highlighted by the following statement to be found on the National Centre of Groundwater Research and Training website itself: 'Groundwater is often called the forgotten resource. Despite the fact that groundwater accounts for over 30% of Australia's water consumption, we simply do not know enough about this vital water resource, and how to manage it.' Further, the work of the Centre also centres around 'the largely unexplored link between surface water and groundwater.'[170]

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[165] Submission 34, NSW Young Lawyers, Environmental Law Committee, p. 6; Ms Rachel Walmsley, Transcript of hearing, 14 May 2010, pp. 1-2

[166] Submission 31, NSW Government, p. 9

[167] Submission 32, EDO, p. 3

[168] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 8

[169] EDO, Response to questions taken on notice at hearing, 9 June 2010, p. 3

[170] Mr Ian Cohen MLC, Response to questions taken on notice at hearing, 21 May 2010, p. 1

4.12 To address this gap, it was suggested by both Mr Cohen and the EDO that the government undertake further research on groundwater systems.[171]

Conclusion

4.13 The committee finds that there is always scope to improve our understanding of both groundwater and surface water systems in New South Wales. A better understanding would have benefits for all water users. Additionally, the committee notes that as the impacts of climate change take hold it will be increasingly important to have sound, up-to-date scientific data on which to base decisions. As such, it is appropriate that the New South Wales Government continue to expand its understanding of groundwater and surface water systems, and their connectivity, to improve water management and planning.

RECOMMENDATION 1: The New South Wales Government continues to expand its understanding of groundwater and surface water systems, and their connectivity, to ensure that water management and planning is based on the best available science.

Adequacy for dealing with climate change

4.14 As discussed in Chapter Two, climate change is likely to have significant impacts on water resources as New South Wales becomes hotter, rainfall patterns change and droughts become more frequent and severe across much of the state. Climate change is therefore likely to make the management of water resources more challenging in the coming years.

4.15 The submission from Mr Cohen summed up the management challenge:

> Climate change will increase the regularity with which 'difficult' decisions about natural resources are made – decisions that inevitably prioritise certain objectives at the expense of others.[172]

4.16 As discussed in Chapter Three, WSPs are the primary mechanism used in New South Wales to manage and plan water resources. It is therefore essential that they are adequate to address the impacts of climate change on water resources.

4.17 Views from inquiry participants were mixed on the adequacy of the current water management regime with some commenting that the system is not robust enough to deal with the possible effects of climate change. Other inquiry participants observed that the system is working effectively and is well suited to deal with climate variability.

4.18 In support of the current framework, the New South Wales Government submitted that:

> the planning and management system for water in New South Wales is well suited to managing climate variability including climate change.[173]

[171] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 8; Ms Rachel Walmsley, Transcript of hearing, 14 May 2010, p. 1

[172] Submission 13, Mr Ian Cohen MLC, p. 1

[173] Submission 31, NSW Government, p. 8

4.19 Further, Mr Mark Moore, a Policy Analyst for the New South Wales Irrigators' Council, explained his support for the current management arrangements:

> Management structure in New South Wales is well suited to deal with the short-term impacts of climate variability. Available water determinations account for only the water coming into the system and allocate a volume or percentage against each licence. In this way only water that is available is used.[174]

4.20 However, some stakeholders considered that the current management framework was inadequate to cope with the impacts of climate change.[175] In particular, the EDO submitted that the number of WSPs in New South Wales that are currently suspended indicates that the water management regime 'is not robust enough to comprehensively address climate change impacts.'[176]

4.21 As indicated in Table 8, five WSPs are currently suspended. One of these, the Lachlan Regulated River WSP, has been suspended from the date it commenced (1 July 2004). Three other WSPs (Wybong Creek, Murrumbidgee Regulated River and NSW Murray – Lower Darling Regulated Rivers) have been suspended since 2006 and another (Macquarie and Cudgegong Regulated Rivers) since 2007.

4.22 The New South Wales Government submission acknowledged that not all WSPs were working as they should:

> The severity of drought conditions in some regions of NSW has meant that insufficient water has been available for some water sharing plans to operate effectively.[177]

4.23 To address this problem, it was suggested by a number of stakeholders that WSPs should be more adaptive and flexible.[178] This would enable the WSPs to operate in a range of climatic and water availability scenarios, including times of drought.

4.24 Mr Michael Murray, the Chief Executive Officer of the Gwydir Valley Irrigators Association told the committee:

> I think the key thing in managing water is to make sure you have water sharing plans that are flexible enough and developed in such a way that they can handle the range of climate results.[179]

4.25 In evidence before the committee, Mr Cohen further explained this concept:

> We need a management and planning approach that can be consistently applied to tightening resource scarcity through to times of resource abundance delivered by floods. If our planning approach does not have a level of resilience and an ability to withstand manipulation in circumstances of dire drought, then it would be equally inequitable under circumstances of water abundance.[180]

4.26 NOW has indicated that they are currently considering how WSPs may be developed to better deal with periods of severe water shortage. In response to supplementary questions on notice from the 10 May 2010 hearing, NOW gave an

[174] Mr Mark Moore, Transcript of hearing, 14 May 2010, p. 16

[175] Submission 20, Darling River Action Group, p. 3; Submission 32, EDO, p. 5

[176] Submission 32, EDO, p. 5

[177] Submission 31, NSW Government, p. 10

[178] Submission 23, Gwydir Valley Irrigators Association, p. 5; Submission 32, EDO, p. 3; Submission 34, NSW Young Lawyers, Environmental Law Committee, p. 6; Submission 35, Nature Conservation Council, p. 3

[179] Mr Michael Murray, Transcript of hearing, 10 May 2010, p. 12

[180] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 7

example of how they were attempting to make WSPs more flexible during water shortages:

> The most recent plan where such rules are being considered is the draft Greater Metropolitan Region where rules prescribing limited access during water shortage periods for surface water users are being proposed. Further discussion and consultation during the public exhibition period is required on the practicality and implementability of such rules.[181]

Conclusion

4.27 The committee is concerned by the number of WSPs that are suspended and the length of time some plans remain suspended. Notably, the Lachlan Regulated River WSP has been suspended since its commencement in 2004 and remains suspended despite the recent announcement that no region in New South Wales is currently in drought.

4.28 The committee finds that it would be highly beneficial for WSPs to be more flexible so that they can continue to operate within a broader range of climatic and water availability scenarios. Strengthening WSPs would result in fewer and shorter suspensions during drought conditions.

4.29 As discussed in Chapter Two, the impacts of climate change on water resources in New South Wales are likely to be complex. However, there remains uncertainty about the specific details and magnitude of projected climate change impacts. It is thus critical that WSPs are effective under future climatic conditions

RECOMMENDATION 2: The Minister for Water strengthens water sharing plans to ensure they are more flexible to allow for their continued operation during a greater range of water availability and climatic scenarios.

Environmental flows

4.30 Many inquiry participants recognised the importance of environmental flows for the long term health of riverine ecosystems. As expressed by the EDO:

> There is a clear need for the water management regime in NSW to prioritise environmental flows to ensure resilient ecosystems that can sustain a variety of uses and communities in the long-term.[182]

4.31 In evidence before the committee, Ms Walmsley expanded on the need for a longer term view of sustainability:

> There will not be the irrigation, the industrial use, unless you look after the ecological health of the system as your first priority. I think the approach of favouring projects because they generate high jobs and finance is understandable, but that is a very short-term solution if that particular industry is not sustainable because it is over extracted and a catchment can no longer support that industry—we would see that as short-term. You need to put in place measures now so what is approved in a

[181] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 3

[182] EDO, Response to questions taken on notice at hearing, 9 June 2010, p. 3

> catchment is sustainable long-term because you want those jobs to be sustainable too.[183]

4.32 The New South Wales Government asserted that despite drought conditions, large volumes of water have been returned to the environment by utilising WSP allocations and water recovery initiatives such as Riverbank, The Living Murray and the Commonwealth Environmental Water Holder.[184]

4.33 As the New South Wales Government stated in their submission:

> Since the mid-1990's, water reform in NSW has progressed from simply limiting growth in water use and recognising the legitimacy of environmental water demands, to explicitly allocating water between consumptive use and the environment, to current efforts to recover water for the environment and build resilience into water sharing frameworks to cope with climate change.[185]

4.34 The New South Wales Government added that, 'although environmental flow rules have been introduced, it may take some time before aquatic ecosystems receiving environmental water show signs of recovery.'[186]

Monitoring and reporting of environmental flows

4.35 In their submission, the Murrumbidgee Catchment Management Authority made a number of observations concerning environmental flow rules, in particular the need for continuous review and evaluation of their effectiveness:

- Environmental flow rules should be developed with clear targets and desired outcomes upfront which have measurable and timely parameters.
- The effectiveness of environmental flow rules should be continuously reviewed and evaluated. The results of monitoring should be more widely published and in simpler terms so as to communicate the significant social and economic benefits of healthy water ways in New South Wales.
- The predictability of agreed flow rules needs to be assessed against the best available information. Current models in use must be reviewed.[187]

4.36 In evidence before the committee, Mr John Asquith, Chairman of the Water Group from the Nature Conservation Council, supported the introduction of more transparent reporting of environmental flows. As he stated:

> The response proposed by the NCC is designed to ensure environmental flows occur, and if they do not occur find out why and report it in a public forum. The NCC would like to see the provision of a periodic environmental flows outcome report. This would demonstrate to everyone where and what environmental flows are actually occurring, in which river systems and those rivers that are not receiving adequate environmental flows. This would be a numerical value of volume for the environmental supported by an ecological assessment.[188]

[183] Ms Rachel Walmsley, Transcript of hearing, 14 May 2010, p. 5
[184] Submission 31, NSW Government, p. 12
[185] Submission 31, NSW Government, p. 10
[186] Submission 31, NSW Government, p. 10
[187] Submission 25, Murrumbidgee Catchment Management Authority, pp. 1-2
[188] Mr John Asquith, Transcript of hearing, 14 May 2010, p. 6

Environmental flows when water sharing plans are suspended

4.37 During the course of the inquiry, concerns were raised about the status of environmental flows when WSPs are suspended. As Ms Walmsley from the EDO expressed:

> In terms of what is happening with environmental water, there are still some environmental flows that are occurring, but with the plans suspended these are on an ad hoc basis. Some of them, in the opinion of a lot of our clients, would be good, but without the transparency and the certainty there are no guarantees about environmental water being delivered in New South Wales at the moment. That is inconsistent with the National Water Initiative, and it is inconsistent with what the State Act requires. So I think it is a problem.[189]

4.38 The EDO submitted that the original WMA required WSPs to provide for environmental water at all times. This requirement was later amended as it was considered that 'it would be environmentally damaging in many rivers to require that all plans specify some constant flows that must be maintained at all times.'[190] The EDO maintains that this position is not supported by scientific research.[191]

4.39 To ensure that environmental flows occur at all times the EDO supports an amendment to the WMA.[192] Such an amendment would ensure, 'there is adequate water for environmental purposes to sustain critical ecosystems, and the communities and industries that depend on them.'[193]

4.40 In contrast, the Wine Grapes Marketing Board submitted that in times of drought the needs of industry and the general population should be considered higher than that of the environment:

> On the matter of environmental flows the Board believes that these need to account for drought conditions. Areas of environmental importance cannot be expected to be supported during periods of extreme drought. To provide extra water when in fact during a drought these areas would have none needs to be done very carefully when balancing the needs of irrigated agriculture and stock and domestic usage.[194]

Conclusion

4.41 The committee acknowledges the commitments of the New South Wales Government thus far to environmental water recovery. The committee trusts that NOW will continue to ensure that the prioritisation of environmental flows during periods of severe water shortages remains consistent with the Act.

Management arrangements during water shortages

4.42 As discussed in paragraph 3.49, WSPs are suspended during periods of severe water shortages. Where WSPs have been suspended, the government has

[189] Ms Rachel Walmsley, Transcript of hearing, 14 May 2010, p. 3

[190] *Water Management Amendment Bill 2004*, Second Reading Speech, as cited in EDO, Response to questions taken on notice at hearing, 9 June 2010, p. 1

[191] EDO, Response to questions taken on notice at hearing, 9 June 2010, p. 1

[192] Submission 32, EDO, p. 7

[193] Submission 32, EDO, p. 7

[194] Submission 9, Wine Grapes Marketing Board, p. 2

established critical water advisory groups (CWAGs) to advise the government on water management, as discussed in paragraph 3.51.

4.43 The role of the CWAGs is particularly important. Mr Harriss told the committee about the value of these groups:

> Those groups have provided invaluable information to the government during the current drought over the last few years and whilst there has always been criticism from a lot of sectors because we are sharing a very limited resource, they have all operated extremely well and provided invaluable advice to the government.[195]

4.44 The submission from Mr Cohen, also highlighted the vital role CWAGs play:

> The socio-economic and environmental implication of water sharing decisions during critical water shortages is significant. Critical water advisory [groups] with representatives including different classes of water users, bureaucracy and department representatives and industry stakeholders play a crucial role in examining data on water availability and recommending courses of action consistent with the Act.[196]

4.45 Given the significant role the CWAGs play during difficult times, it is unsurprising that a number of inquiry participants raised concerns about the management of water during a time of severe water shortage. In particular, nine of the thirty-seven submissions the committee received addressed issues pertaining to critical water planning in the Lachlan Valley.

4.46 The key issues raised about management arrangements during times of critical water shortages were: membership of the CWAGs, transparency of decision making by CWAGs, prioritisation of water users, and governance arrangements for CWAGs. These concerns are discussed further below.

Membership of critical water advisory groups

4.47 NOW explained the membership arrangements for CWAGs:

> The Office invites stakeholders to participate in the CWAGs and they consist of a range of water users (e.g. irrigation, domestic and stock), local government and significant industries in a valley. For example the southern CWAGs have representatives of the rice industry and horticulture and the Lachlan CWAG has a representative from the mining industry. There are also representatives from government agencies representing urban water, environment, and fisheries, as well as State Water. The groups are convened and chaired by NOW.[197]

4.48 In the case of the Lachlan CWAG, several stakeholders questioned the appropriateness of the membership of the group. These concerns centred around the lack of representation of all water users and the vested interests of some members of the group.

4.49 In giving evidence before the committee, Mr Cohen commented that:

> the critical water advisory [groups], they currently include members from different classes of water users, department representatives and industry stakeholders. They play a crucial role in examining data on water availability and recommending courses

[195] Mr David Harriss, Transcript of hearing, 10 May 2010, p. 3

[196] Submission 13, Mr Ian Cohen MLC, p. 2

[197] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 5

> of action consistent with the Act. However, the lack of Aboriginal, local community and non-governmental environmental representation on these committees is concerning.[198]

4.50 The submission from Lake Cargelligo Watch commented that the Lachlan CWAG has an over-representation of people who have vested interests in water trading, irrigation and mining. Further, they stated that:

> There are *NO* independent community representatives on the critical water advisory [group]. As an advisory group which resolves emergency water issues, there should be *NO* members who have a fiscal interest in water.[199]

4.51 Mr Peter and Mrs Barbara Nilsson echoed these concerns regarding the lack of representation of all water users. Mr and Mrs Nilsson would like to see 'equal non-biased representation' on the Lachlan CWAG of all water users, not just those with high security licences.[200]

4.52 Mr Cohen further elaborated on the concerns about some representatives of the Lachlan CWAG:

> The representation of Barrick Gold and Jemalong Irrigation on the Critical [Water] Advisory [Group] further created the perception in the community that they are witnessing an inappropriate manipulation of the water trading market, especially when there was no representative from lower Lachlan water users.[201]

4.53 The inclusion of representatives on CWAGs who may financially benefit from the decisions of the group raised concerns of potential conflicts of interest. In particular, Mr Cohen stated that there was a lack of procedures to manage conflicts of interest between those involved in providing advice to the Minister on water allocation and their involvement in water trading.[202]

4.54 In suggesting improvements to the governance of CWAGs, Mr Cohen told the committee that:

> membership should not be provided to those that have significant pecuniary interests in licence holdings or those that are involved in a high level of water trading activity.[203]

4.55 In responding to a supplementary question on notice about governance arrangements for CWAGs, NOW stated:

> The water using interests of the various group members is known but is not really relevant as the groups do not make decisions for the valley, they have an advisory role only. If all interests are represented equitably, then the ultimate effect of the advice is that it covers all issues and can be carefully and comprehensibly considered by the Minister or NOW in making its decisions.[204]

4.56 Additionally, the committee notes that in a recent NOW media release, the Acting Commissioner confirmed that a new member representing the broader interests of stock and domestic water users will join the CWAG. The new member joins the

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[198] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 8

[199] Submission 2, Lake Cargelligo Watch, pp. 14-15

[200] Submission 11, Mr Peter and Mrs Barbara Nilsson, p. 2

[201] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, pp. 7-8

[202] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 8

[203] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 8

[204] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 6

group after expressions of interest were sought due to community concerns that there needed to be further representation on the committee.[205]

Transparency of decision making

4.57 A number of stakeholders also raised concerns about the lack of transparency in the function and decision making made by CWAGs.

4.58 Ms Walmsley told the committee:

> One of the biggest problems is finding certainty and transparency on how water management is working at the moment in New South Wales while these plans are suspended.[206]

4.59 Mr Cohen expressed similar concerns when appearing before the committee:

> Compounding this are the deficiencies in the transparency and accountability of the committees. At the present time minutes and recommendations arising from committee meetings are not being published on the New South Wales Office of Water website. This veil of secrecy does nothing to allay the community fears that the decisions that are being made are not justified or supported by scientific evidence.[207]

4.60 With respect to the Lachlan CWAG the committee heard that a number of community members felt they were not informed of decisions as they should.

4.61 The submission from Lake Cargelligo Watch stated that members of the community used freedom of information legislation to obtain the membership of the Lachlan CWAG.[208] Additionally, the committee understands that Mr Cohen obtained a copy of the minutes of the Lachlan CWAG following an freedom of information request.

4.62 When appearing before the committee, Mr Cohen explained the impact of this on the local community:

> What became immediately apparent is the maze through which one has to wade in order to identify management decisions. By and large drought affected communities are left in the dark about water allocation decision making. The result is that communities develop a sense of angst and distrust about water management. In some cases there, understandably, is a sense of mistrust.[209]

4.63 To address this situation, the NSW Young Lawyers Environmental Law Committee proposed that a transparent statute-based decision making framework is required which allows the public to have access to information on how water allocations between different users are decided. This framework should be applied consistently across New South Wales whether the relevant WSP is suspended or not.[210]

4.64 Mr Cohen further suggested:

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[205] NOW, *Commissioner welcomes new member in the Lachlan Critical Water Advisory Group*, media release, 16 July 2010, <http://www.water.nsw.gov.au/About-us/Media-releases/Media-releases-2010/default.aspx>

[206] Ms Rachel Walmsley, Transcript of hearing, 14 May 2010, p. 3

[207] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 8

[208] Submission 2, Lake Cargelligo Watch, p. 14

[209] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 7

[210] Submission 34, NSW Young Lawyers, Environmental Law Committee, p. 7

> [T]he proceedings of committees to be publicly available so that committee members can be held accountable by those whose lives are so dramatically impacted upon by the decisions.[211]

4.65 In supplementary questions on notice, the committee asked NOW what efforts were being made to ensure that decisions and advice of the CWAGs were transparent. NOW responded:

> The discussions of the CWAGs' meetings are minuted and a communiqué is prepared following meetings and posted on the publicly available NOW web page.[212]

Prioritisation of water users

4.66 As discussed in paragraph 3.60, WSPs include water sharing rules that articulate the prioritisation of available water to different licence categories. When a WSP has been suspended, section 60(3) of the WMA outlines the priorities for making available water determinations (as discussed in paragraph 3.65).

4.67 NOW further explained how available water is shared between different licence categories during times of critical water planning:

> Water sharing decisions are therefore guided by the advice provided by the CWAG whose members invariably all believe that they are the highest priority. However the water sharing decisions must be consistent with the priorities set out in the legislation, with consideration of the best interests of the environment and dependent users on a whole of catchment scale. Therefore NOW's role is to balance the individual needs of the members of the CWAG, within the constraints of the legislative framework and the requirements of the whole catchment.[213]

4.68 In the case of the Lachlan CWAG, concerns were raised that certain water users were given preferential treatment over others and that the prioritisation of water users articulated in the WMA was not adhered to along the full length of the river.

4.69 With reference to the minutes of the Lachlan CWAG, Mr Cohen raised concerns over decisions to prioritise high security water users over Lake Cargelligo. Such decisions resulted in some towns being without surface water allocations.[214] When giving evidence to the committee, Mr Cohen elaborated:

> [T]he minutes of the Lachlan River Critical Water Advisory [Group] and the water trading data demonstrate that some water users were given preferential treatment inconsistent with the priorities of critical human needs and environmental flows. Instead of putting communities first, then environmental flows, the Advisory [Group] focused on giving high security users a 10% share allocation and Jemalong Irrigation Corporation 1000 ML upstream only, conveyance allowance, so that high security licence holders could trade water at premium to Barrick Gold.[215]

4.70 Lake Cargelligo Watch raised concerns that on certain occasions the allocation of water did not adhere to the prioritisations specified in the WMA. As stated in their submission:

> The Water Management Act 2000, Section 60 clearly states that the first priority is to be given to people, i.e. domestic and town water supplies. The second priority is to be

[211] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 8

[212] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 6

[213] NOW, Response to questions taken on notice at hearing, 23 June 2010, pp. 6-7

[214] Submission 13, Mr Ian Cohen MLC, p. 3

[215] Mr Ian Cohen MLC, Transcript of hearing, 10 May 2010, p. 7

> given to the needs of the environment and the third priority is to be given to stock purposes, and high security licence holders – which includes mines & irrigators. My understanding of this legislation is that people and environment come first, irrigators and mines last.[216]

4.71 The position of Lake Cargelligo Watch was supported by the Lower Lachlan Stock & Domestic and Basic Right Water Users. In their submission they also raised concerns that water was not being made available to humans and livestock while it was being supplied for mining and irrigation. They argue that this position is contrary to the WMA.[217] In particular, they submit that water for town supply should be the top priority throughout the full length of the river and 'uniformly supplied by a high security access licence.'[218]

4.72 Ms Carmel Gleeson also provided the committee with a submission concerning the critical water planning in the lower Lachlan. Ms Gleeson questioned the decision to prioritise water to the mining industry above town water supplies and indicated that there was a lack of consultation with those affected by critical water planning decisions.[219]

4.73 In response to claims that the needs of all water users along the Lachlan Valley were not considered, NOW commented:

> NOW believes there is a perception in the Lachlan community that because some of the members of the Lachlan CWAG live in the upper reaches of the river and operational decisions were made to restrict flows to the lower parts of the river that the CWAG somehow influenced or biased the decision. This was not the case. NOW in consultation with State Water made the decision to restrict flows downstream of Condobolin because there was insufficient water in Wyangala Dam to continue to run the regulated river for its full length for a full year. To continue to do so risked the dam being empty by April 2010, with significant implications for the towns supplied (by regulated water in the Lachlan Valley (including Cowra, Forbes and Condobolin).[220]

4.74 NOW further stated:

> To address future concerns about perceived upstream bias on the Lachlan CWAG, NOW has called for expressions of interest to represent the domestic and stock users downstream of Condobolin - this is in addition to a person from Booligal also already representing similar interests.[221]

Conclusion

4.75 Given the importance of decisions made by CWAGs during difficult times of severe water shortages, the committee considers there should be stricter governance, accountability and transparency measures introduced to regulate these groups. To ensure these measures are consistent and effective, they should be underpinned by an appropriate legislative or regulatory framework.

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[216] Submission 2, Lake Cargelligo Watch, p. 17

[217] Submission 12, Lower Lachlan Stock & Domestic and Basic Right Water Users, p. 1

[218] Submission 12, Lower Lachlan Stock & Domestic and Basic Right Water Users, p. 6

[219] Submission 14, Ms Carmel Gleeson, pp. 2-3

[220] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 6

[221] NOW, Response to questions taken on notice at hearing, 23 June 2010, p. 6

4.76 These improvements would inform the public about the rationale behind decisions, ensure that all water users are appropriately represented and reassure the community that decisions are made in line with the relevant legislation.

RECOMMENDATION 3: The Minister for Water introduces measures to improve the governance, accountability and transparency of critical water advisory groups. These measures should include, but are not limited to:

i. a review of the membership of critical water advisory groups to ensure all water users throughout the water management area are equally represented through an open and public process

ii. the public disclosure of any vested interests held by a member of a critical water advisory group

iii. the minutes, and any other relevant information concerning the decisions and recommendations of a critical water advisory group, be made publicly available on a relevant government website

iv. the full and transparent justification of any water allocation recommendations that do not align with the priorities set out in s60(3) of the *Water Management Act 2000*.

Reforms to the regulatory framework

Approval of projects

4.77 During the course of the inquiry the committee was informed of the complexity and number of approval requirements. The submission from the New South Wales Minerals Council provided the committee with an outline of the regulatory framework under which the industry operates. The Council commented:

> The regulatory framework in place in relation to the minerals industry is substantial, and affects all aspects of a mine site, from exploration to closure. Water is given particular attention, with an extensive number of requirements that must be met for a project to be approved. For example, as part of its Environmental Assessment Requirements under Part 3A of the Environmental Planning and Assessment Act 1979, a study must be conducted that provides the following in relation to water:
>
> - A detailed site water balance
> - An assessment of the potential loss of surface and groundwater flows to the environment and other land users
> - An assessment of potential water quality impacts on the environment and other land users, including salinity impacts
> - A description of final void water management.[222]

4.78 In evidence before the committee, Ms Sue-Ern Tan, Deputy Chief Executive Officer, New South Wales Minerals Council, considered there to be potential in streamlining the approvals requirements associated with water management. As Ms Tan stated:

[222] Submission 37, NSW Minerals Council, p. 3

> The other side issue as well, within the New South Wales Government – and it is something that we have raised before - to look at ways to streamline its approval processes between the various government agencies so that once we get the approval from the Department of Planning, then we need to talk to the relevant catchment authorities, to the Office of Water. You are reporting about the same issue to three different government agencies. This sort of stuff is just bureaucratic; it is just a waste of time. It does not get a better environmental outcome for the government or for the people of New South Wales and I think that that is something that the government can focus on.[223]

4.79 The committee supports reforms in this area that would lead to greater efficiency. However, the committee acknowledges that different legislative instruments require consideration of different aspects affecting water. The committee considers there is merit in identifying unnecessary duplication and streamlining the relevant processes.

Integration of licensing arrangements

4.80 During the course of the inquiry, the potential to provide for greater integration of licensing arrangements under water legislation and environment protection legislation was raised.

4.81 In his submission, Mr Cohen highlighted the lack of integration between water access licences granted under water legislation and Environmental Protection Licences granted under the PEO Act. Mr Cohen submits:

> At present, five year licence reviews of Environmental Protection Licences (EPL) under the Protection of Environment Operations Act 1997 (NSW) are undertaken separately from licence reviews under the Water Act 1912 (NSW). At a catchment level there is no cross-departmental consideration of EPL holders and their discharges into unregulated river systems with regard to allocation and licence conditions of Water Act licence holders.[224]

4.82 What the above concern indicates is that where there is an increase in water extraction by water access licences there is not an inverse reduction in discharge pollutants under Environmental Protection Licences (EPLs). As Mr Cohen submits, 'with lower levels of water to dilute concentrated saline for example, pollution levels will increase.'[225] To address this concern Mr Cohen suggests there should be greater harmonisation between the licence reviews under the different Acts.

4.83 The committee notes there is potential to reform the current regulatory framework to provide for greater integration between licensing arrangements under water legislation and environment protection legislation. Such integration may assist in managing the relationship between pollution levels and changes to river flow rates.

Reporting requirements

4.84 Another matter raised was the potential to streamline certain reporting requirements under the current regulatory framework.

4.85 During its visit of inspection to Coleambally, representatives from the Coleambally Irrigation Co-operative Limited (CICL) expressed concerns about the time-consuming and repetitive reporting requirements in relation to their operations.

[223] Ms Sue-Ern Tan, Transcript of hearing, 10 May 2010, p. 17

[224] Submission 13, Mr Ian Cohen MLC, p. 3

[225] Submission 13, Mr Ian Cohen MLC, p. 3

4.86 CICL indicated their reporting requirements include:

- An annual compliance report to NOW and the Environment Protection Authority. This report is required to detail such matters as monthly and annual volume of water extracted, crop water use, salinity and nutrient monitoring, chemical usage, groundwater conditions and implementation of land and management plans. The report satisfies compliance with their EPL issued under the PEO Act and conditions of the Combined License Package issued by NOW for Water Access Licences and Nominated Works and Water Approvals issued under the WMA.
- An annual report to the Australian Competition and Consumer Commission detailing the permanent sale or termination of water entitlements by the CICL.
- A weekly report to the Bureau of Meteorology on internal transfers of water entitlements between landholders within the CICL.
- An annual report to the National Water Commission on infrastructure.[226]

4.87 They expressed concern that this caused significant duplication in the information they were required to send to agencies across different levels of government. CICL representatives suggested that greater alignment of reporting requirements would lead to greater efficiency of their operations.

4.88 The committee acknowledges that in New South Wales there is already some degree of simplification in reporting requirements. For instance, one annual compliance report satisfies reporting obligations under the PEO Act and the WMA.

4.89 While acknowledging that different reporting obligations exist under different legislative instruments, the committee maintains there is further scope for reform and the consolidation of reporting across different levels of government.

Conclusion

4.90 The committee is highly supportive of regulatory reforms that would promote the simplification of approval, licensing and/or reporting requirements. The committee understands that such reforms require careful consideration and encourages the New South Wales Government to undertake a thorough and transparent review.

RECOMMENDATION 4: The New South Wales Government improves the regulatory framework governing water management to reduce unnecessary duplication. In particular, the New South Wales Government should:

i. review the existing regulatory framework governing water management, including responsibilities under both New South Wales and Commonwealth legislative instruments
ii. identify measures to reduce unnecessary duplication
iii. release these findings for public and stakeholder consultation within twelve months of the date of this report
iv. finalise and implement the reforms shortly after

[226] CICL, *Annual Compliance Report 2010*, 2010, p. 6

Chapter Five - Best practice water conservation and management

New South Wales water consumption

5.1 According to the latest *Water Account* statistics, in 2004-05 New South Wales consumed 5,922 GL of water, which represented 31.6% of Australia's total water consumption. New South Wales had the highest water consumption of any Australian state, followed by Victoria, which consumed 4,993 GL and Queensland, which consumed 4,361 GL.[227]

5.2 A breakdown of water consumption by different industries within New South Wales, shows in Table 9 that agriculture consumed the most water of any industry in New South Wales. Agriculture consumed 4,133 GL, which accounted for 69.8% of all water consumed in the state, as illustrated in Figure 10. The next highest consumption was the water supply, sewerage and drainage services industry which consumed 631 GL and accounted for 10.7% of water consumed in the state. This was followed by households, which consumed 572 GL and accounted for 9.7% of the state's water consumption.

Table 9 - Water consumption in New South Wales in 2004-05 by industry[228]

Industry	**Water consumed (ML)**
Agriculture	4 132 537
Forestry and fishing (includes hunting and trapping and services to agriculture)	10 724
Mining	62 868
Manufacturing	125 995
Electricity and gas	75 289
Water supply (includes water losses and sewerage and drainage services)	631 363
Other industries	310 476
Households	572 711
Total	**5 921 964**

[227] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 8

[228] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

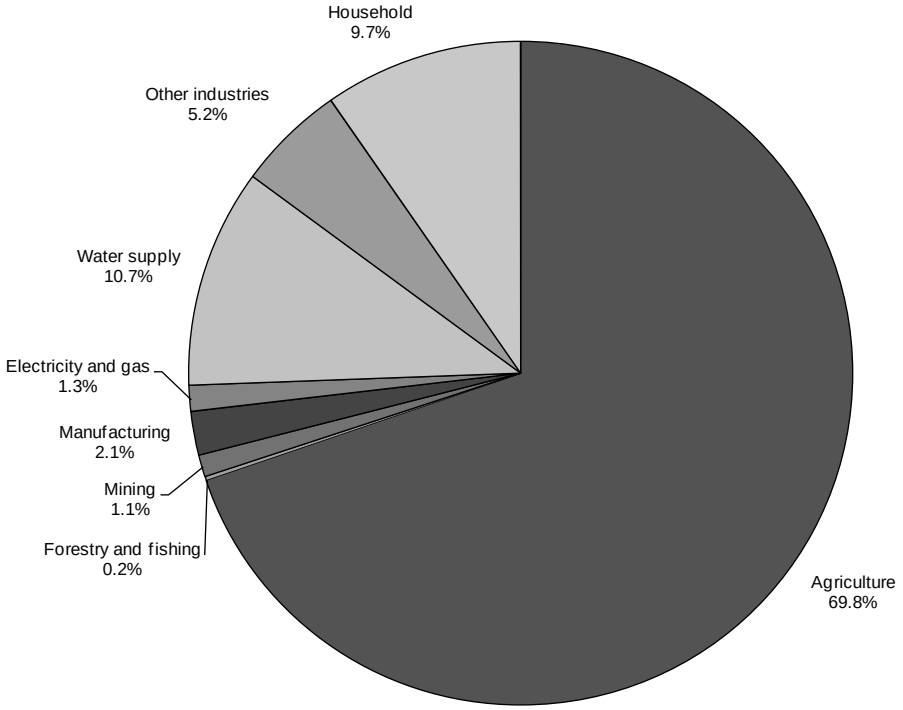

Figure 10 - Proportion of water consumption in New South Wales in 2004-05 by industry[229]

Water consumption and economic value

5.3 The committee notes that an important issue in the consideration of consumption of water is the economic value industries contribute to the economy. The committee therefore undertook to compare the economic contribution for key industry divisions as measured by the gross value added by each industry to the Australian economy, or industry gross value added (IGVA). The Australian Bureau of Statistics (ABS) measures and defines the gross value added as the value of output at basic prices minus the value of intermediate consumption at purchaser's price.[230] As previously mentioned, the most recent water consumption data available is from 2004-05. As such, the IGVA figures from 2004-05 were used in comparisons rather than the most recent 2009-10 figures.

5.4 A comparison of the amount of water consumed by each industry and its IGVA is shown in Figure 11. It indicates that the manufacturing and mining industries have the greatest IGVA with the least water consumed.

[229] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

[230] ABS, *Australian System of National Accounts, 2009-10* (5204.0), 2010, p. 125

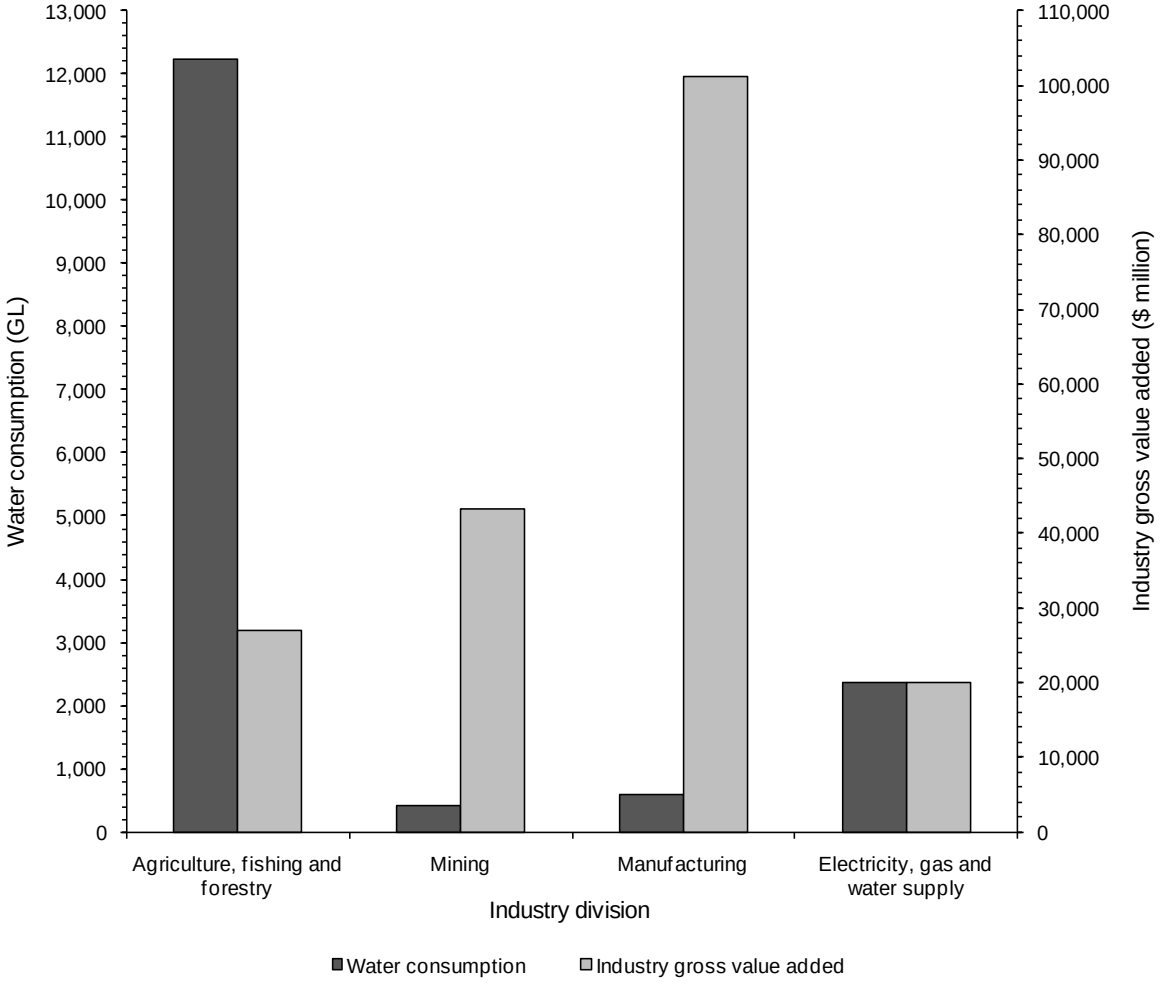

Figure 11 - Industry gross value added and water consumption in Australia in 2004-05 by industry divisions[231]

5.5 Further analysis was undertaken to determine the IGVA per volume of water consumed for each industry, as shown in Table 10. This indicates that manufacturing has an IGVA of $171.7 million/GL. This is followed by the mining industry with an IGVA of $104.9 million/GL. The lowest IGVA per gigalitre of water consumed was by the agriculture, forestry and fishing industry division which was $2.2 million/GL. While agriculture, forestry and fishing has an IGVA of over $27 billion, it also has the highest water consumption of any industry division, accounting for its low proportion per gigalitre consumed.

[231] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 15 and ABS, *Australian System of National Accounts, 2004-05* (5204.0), 2005, p. 25

Table 10 - Industry gross value added per gigalitre of water consumed in Australia in 2004-05 by industry division

Industry division	Water consumed (GL)[232]	Industry gross value added ($ million)[233]	Industry gross value added per gigalitre of water consumed ($ million/GL)
Agriculture, forestry and fishing	12 242	27 047	2.2
Mining	413	43 333	104.9
Manufacturing	589	101 122	171.7
Electricity, gas and water supply	2 354	19 942	8.5

5.6 The committee notes that the sole value of an industry is not its IGVA and that this measure fails to take into account significant social values and other economic benefits.

Best practice

5.7 The Macquarie Dictionary defines best practice as:

> the set of operations achieving the best results in quality and customer service, flexibility, timeliness, innovations, cost, and competitiveness.[234]

5.8 In the context of water conservation and management, best practice refers to those strategies and techniques employed to maximise the utility of water as a resource. The core concepts of best practice in this regard continue to evolve over time, as technology and general understanding provide for water to be used and managed more efficiently.

5.9 Best practice water conservation and management principles and models vary greatly across industries, depending on how water is sourced and applied. The diverse range of needs of water in New South Wales has resulted in a number of water efficiency initiatives in metropolitan, rural and remote regions that have been put into place through both government programs and private enterprise on a personal, commercial and industrial level.

5.10 For example, in its submission, Sydney Water discusses its Metropolitan Water Plan and the water efficiency measures that it has introduced in its capacity as water supplier and wastewater manager for the Sydney metropolitan area. Through initiatives such as the Water Wise Rules, Waterfix and the Toilet Replacement Program, Sydney Water has helped to reduce demand for water and water wastage within Sydney households. It has targeted reductions in business water use through the Every Drop Counts Business Program and the Smart Rinse program.[235]

[232] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 15

[233] Source: ABS, *Australian System of National Accounts, 2004-05* (5204.0), 2005, p. 25

[234] *Macquarie Dictionary Online*, 2010 <www.macquariedictionary.com.au>

[235] Submission 30, Sydney Water, pp. 14-16

5.11 While the forms of best practice water management initiatives differ greatly across New South Wales, there are some ideals that are common to all. The concepts of water reuse, recycling, waste minimisation and considered management can be applied across different sectors and are at the core of best practice state-wide.

Reuse water

5.12 Reuse and recycled water is becoming an increasingly important component of best practice water conservation and management. According to the ABS *Water Account*, reuse water includes waste water (from sewerage systems), drainage water and storm water that has been used again, often after being treated, without being first discharged to the environment. It does not include on-site recycling of water.[236]

5.13 Within New South Wales the consumption of reuse water in 2004-05 varied across industries, as shown in Table 11. By far the greatest volume of reuse water was consumed within the agriculture industry (160 GL). As illustrated in Figure 12, this accounted for 82.6% of all reuse water within the state. However, as illustrated in Figure 13, this accounted for only 3.9% of all water consumption of the agriculture industry in New South Wales.

Table 11 - Reuse water and total water consumption in New South Wales in 2004-05 by industry[237]

Industry	**Reuse water (ML)**	**Water consumed (ML)**
Agriculture	160 103	4 132 537
Forestry and fishing (includes hunting and trapping and services to agriculture)	3 219	10 724
Mining	6 098	62 868
Manufacturing	169	125 995
Electricity and gas	1 318	75 289
Water supply (includes water losses and sewerage and drainage services)	10 311	631 363
Other industries	10 882	310 476
Households	1 767	572 711
Total	**193 866**	**5 921 964**

[236] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 149

[237] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

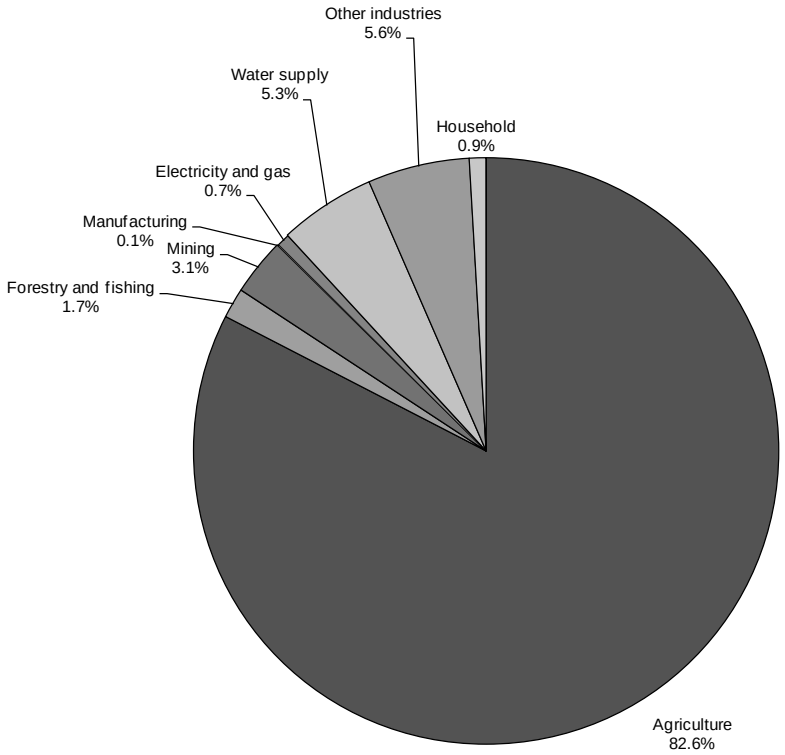

Figure 12 - Proportion of the total reuse water consumed in New South Wales in 2004-05 by industry[238]

[238] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

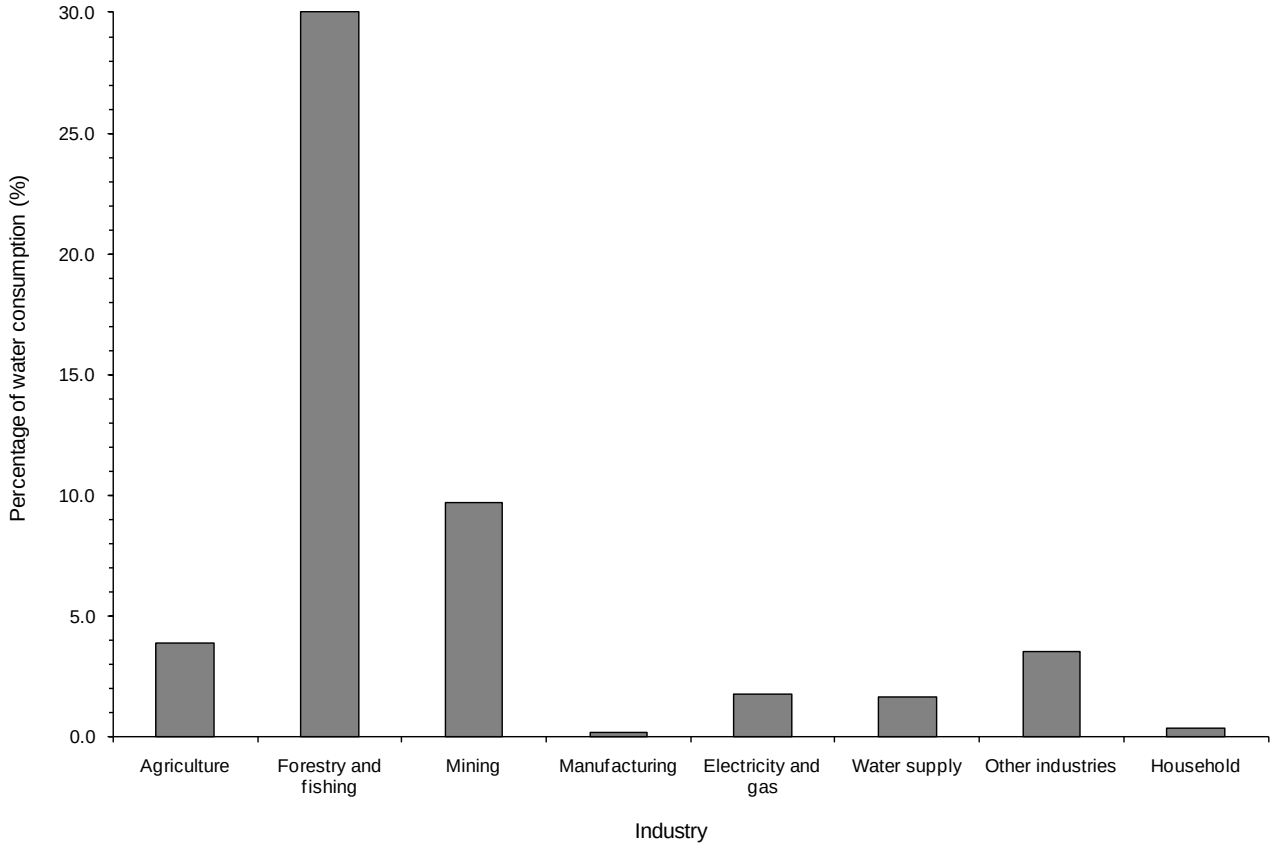

Figure 13 - Each industry's use of reuse water as a proportion of their total water consumption[239] in New South Wales in 2004-05[240]

5.14 In contrast, the forestry and fishing industry used only 3,219 ML of reuse water in 2004-05 which only accounted for 1.7% of the state's total consumption of reuse water. However, reuse water accounted for 30.0% of all water consumption within forestry and fishing in New South Wales.

Water consumption in agriculture

5.15 An analysis of water consumption by agricultural activity in New South Wales in 2004-05, shown in Table 12, indicated that cotton consumed the most water (964 GL). This accounted for 23.3% of agriculture's water consumption in New South Wales, as illustrated in Figure 14. The next highest water consumption was for the production of grains (838 GL), which accounted for 20.3%, pasture (694 GL), which accounted for 16.8% and rice (624 GL), which accounted for 15.1% of agricultural water consumption.

[239] To maintain consistency across all industries the value of water consumption was used rather than total water use. For the mining, forestry and fishing, and electricity and gas industries, water use is significantly greater than water consumption due to the amount of in-stream water used. Therefore, the proportion of reuse water as a percentage of water consumption is higher than if the percentage of water use was calculated.

[240] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

Table 12 - Water consumption in New South Wales in 2004-05 by agricultural activity[241]

Agricultural activity	Water consumption (ML)
Dairy farming	262 547
Vegetables	68 692
Sugar	531
Fruit	133 540
Grapes	171 450
Cotton	964 306
Rice	624 422
Livestock, pasture, grains & other	
Livestock	259 177
Pasture	693 508
Grains	838 321
Other	116 042
Total	**4 132 537**

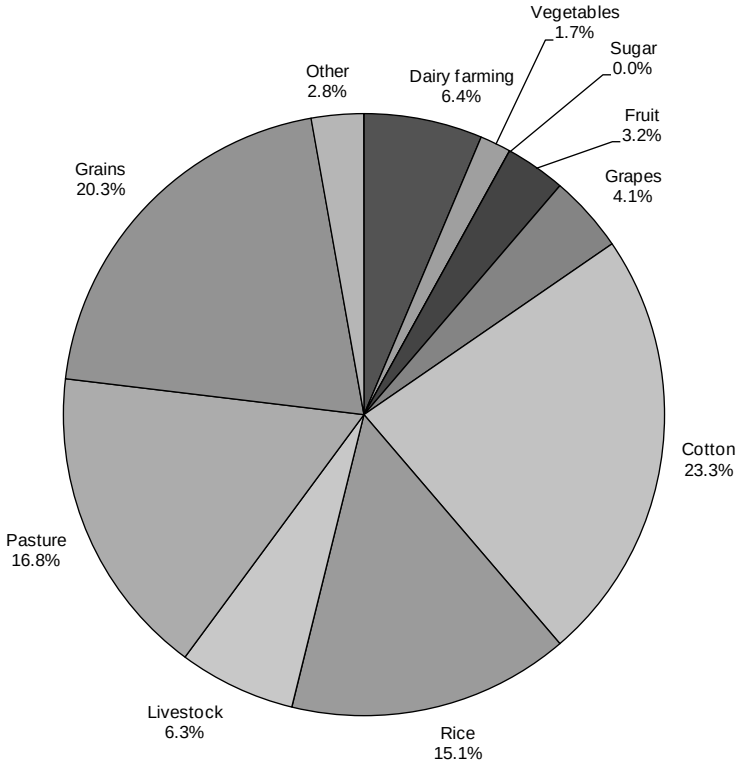

Figure 14 - Proportion of total agricultural water consumption in New South Wales in 2004-05 by agricultural activity[242]

[241] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

[242] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

Irrigation and water use

Area of land irrigated

5.16 Of the 57.3 million hectares of agricultural land in New South Wales in 2008-09, only 0.9% (503,630 ha) was irrigated.[243] This represented a 49.3% decrease in the area of land being irrigated in New South Wales since 2005-06, as illustrated in Figure 15. This decrease is largely due to drought conditions that affected the state and decreased water availability.

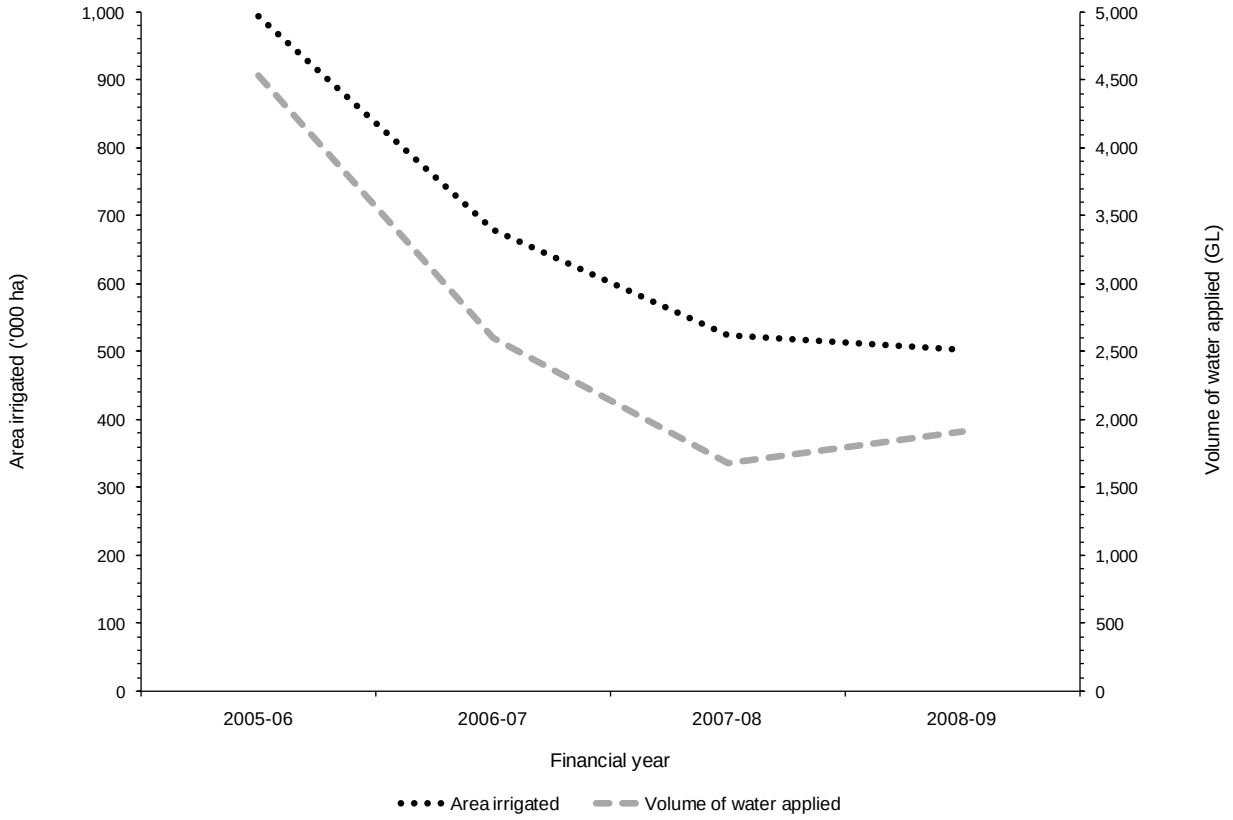

Figure 15 - Area of irrigated land and volume of water applied in New South Wales between 2005-06 and 2008-09[244]

5.17 Despite the low proportion of irrigated land compared to all agricultural land, 23.4% of all agricultural businesses in New South Wales undertook irrigation during 2008-09.[245] The percentage of agricultural businesses in New South Wales irrigating remained roughly the same since 2005-06, when 23.7% of businesses were irrigating. This shows that the same number of farmers are using irrigation, however, they are irrigating less land than they once did due to water availability issues.

5.18 Irrigation activity varies significantly across New South Wales. In 2008-09 the natural resource management (NRM) region containing the greatest area of irrigated

[243] ABS, *Water Use on Australian Farms, 2008-09* (4618.0), 2010, p. 7

[244] Source: ABS, *Water Use on Australian Farms, 2005-06 to 2008-09*, (4618.0)

[245] ABS, *Water Use on Australian Farms, 2008-09* (4618.0), 2010, p. 7

land was Murrumbidgee with 116,706 ha being irrigated, as illustrated in Figure 16. This was followed by Namoi (72,804 ha), Border Rivers-Gwydir (72,784 ha) and Murray (69,646 ha), which all have similar amounts of irrigated land. The Sydney Metro region had the lowest area of irrigated land with only 506 ha.[246]

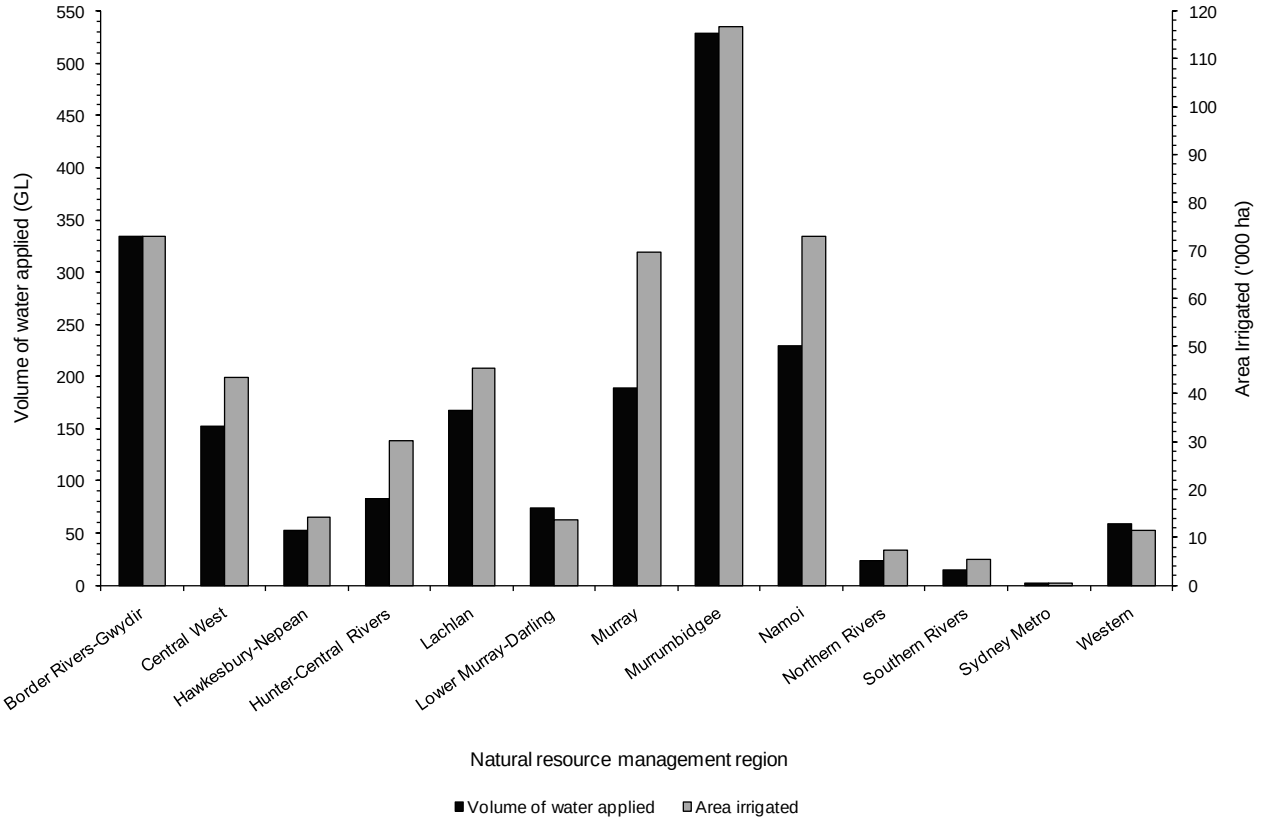

Figure 16 - Area of irrigated land and volume of water applied in each natural resource management region in New South Wales in 2008-09[247]

Volume of water applied in irrigation

5.19 The total volume of water applied in irrigation in New South Wales in 2008-09 was 1.91 million ML.[248] This represented a 57.9% decrease since 2005-06 but a 13.9% increase since 2007-08, as illustrated in Figure 15. The change in volume of water applied is largely due to changing water availability over this period as drought conditions affected New South Wales.

5.20 The volume of water applied in irrigation activity also varies across New South Wales. As indicated in Figure 16, the Murrumbidgee region applies the most water (529 GL), followed by the Border Rivers-Gwydir region (334 GL).

[246] ABS, *Water Use on Australian Farms*, *State and NRM Region - 2008-09* (4618DO001_200809), 2010, Table 2 - New South Wales

[247] ABS, *Water Use on Australian Farms, State and NRM Region - 2008-09* (4618DO001_200809), 2010, Table 2 - New South Wales

[248] ABS, *Water Use on Australian Farms, 2008-09* (4618.0), 2010, p. 7

Application rate

5.21 The amount of water used for irrigation varies depending on the water needs of the agricultural activity, farm size and geographic location. As can be seen in Figure 16, there are differences in the proportion of water applied to the area being irrigated between NRM regions, meaning some regions use more water per hectare than others. This is measured by the application rate, that is, the volume of water applied per hectare of irrigated land. As illustrated in Figure 17, in 2008-09 the Murray region had the lowest application rate (2.72 ML/ha) followed closely by the Hunter-Central Rivers region (2.73 ML/ha). Both of these regions were well below the Australian average of 3.69 ML/ha. The highest application rates were the Lower Murray-Darling region (5.37 ML/ha) and Western region (5.12 ML/ha).[249]

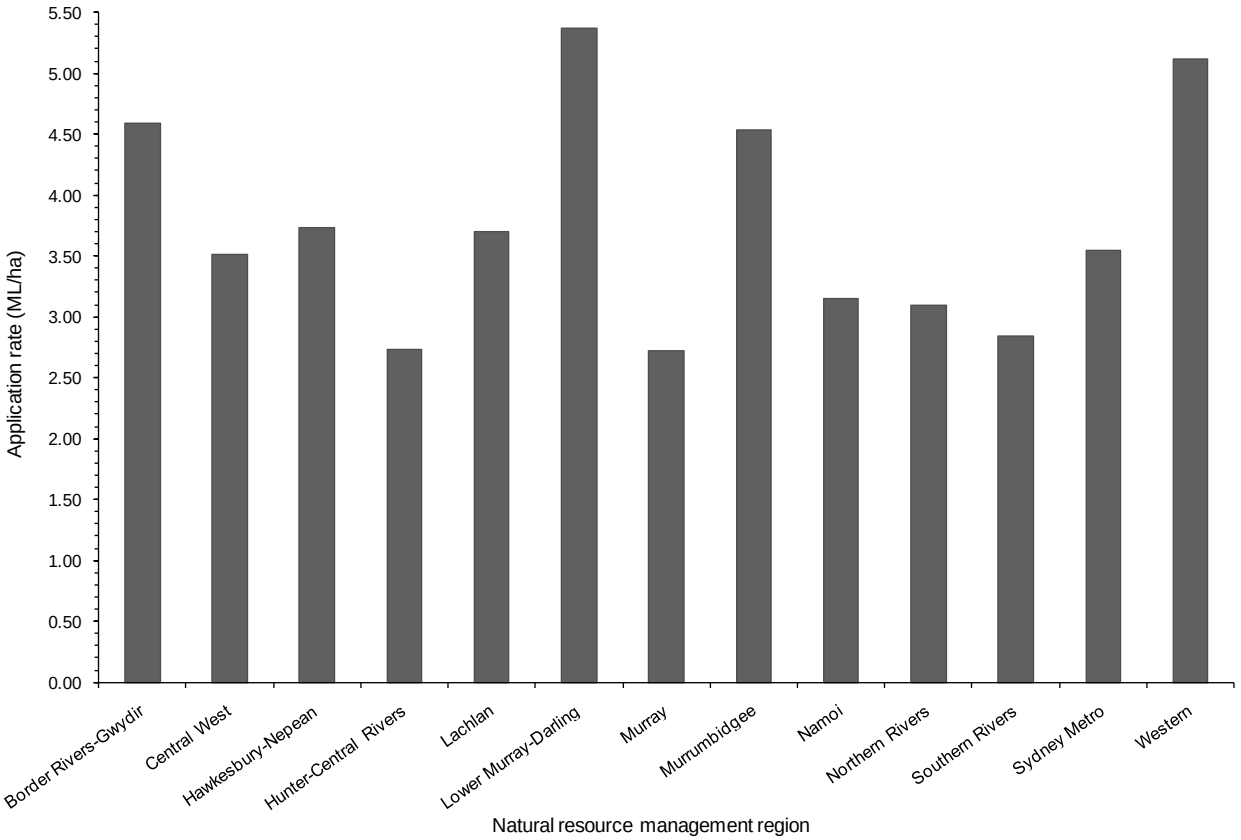

Figure 17 - Water applied per hectare of irrigated land in each natural resource management region in New South Wales in 2008-09[250]

5.22 As part of its inquiry, a delegation of the committee undertook a visit of inspection to the Ord River Irrigation Area (ORIA). During its visit the committee noted that as water is abundant in the ORIA large volumes of water are used for irrigation. The committee undertook to compare the application rate of the ORIA to those in New South Wales. In doing so it is noted that the application rates for New South Wales

[249] ABS, *Water Use on Australian Farms, State and NRM Region - 2008-09* (4618DO001_200809), 2010, Table 1 - Australia and Table 2 - New South Wales

[250] Source: ABS, *Water Use on Australian Farms, State and NRM Region - 2008-09* (4618DO001_200809), 2010, Table 2 - New South Wales

NRM regions are based on water applied per hectare in 2008-09 financial year based on ABS statistics,[251] whereas the application rate for the ORIA is based on water delivered per hectare during 2009, based on statistics from the Western Australian Department of Agriculture and Food.[252] While the resultant application rates are not identical statistical measures and caution should be used when comparing, they provide an approximate equivalent value.

5.23 In 2009, there was 149,145 ML of water delivered to the ORIA, which covered 13,475 ha. The application rate therefore is 11.07 ML/ha. This is more than two times the highest application rate in New South Wales (5.37 ML/ha in the Lower Murray-Darling region).

Value of irrigated agricultural production

5.24 The committee notes that measuring the value of agricultural production that results from irrigation is difficult. There are many factors, such as rainfall and evaporation, that are not considered in statistical measures that contribute significantly to regional and temporal variations in the use of water for irrigation.[253] Additionally, water is not the only input to agricultural production in irrigated land. Other inputs, such as land, fertiliser, labour and machinery, contribute to the total production but are considered practically impossible to measure with the current data.[254]

5.25 The best measure of the value of irrigation production is the gross value of irrigated agricultural production (GVIAP). The GVIAP refers to the gross value of agricultural commodities that are produced with the assistance of irrigation. It does not refer to the value that irrigation adds to production, or the 'net effect' that irrigation has on production. It is not a measure of productivity.[255]

5.26 While it is a useful indicator, the ABS warns that the GVIAP should not be used as a proxy for determining the highest value of water uses.[256] The committee further notes that as with IGVA, the GVIAP is not a measure of the entire value of irrigated agriculture to the economy and that there are considerable social and other economic benefits that are not accounted for in this measure.

5.27 In 2007-08 the total GVIAP in New South Wales was $2.1 billion, which represented 24.5% of the total gross value of agricultural production. This represented a 20.3% decrease from 2006-07, as illustrated in Figure 18. The decrease in GVIAP was in line with a similar decline in the volume of water used for irrigation in 2007-08 (as illustrated in Figure 15) due to the limited availability of water during the drought.[257]

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[251] Source: ABS, *Water Use on Australian Farms, State and NRM Region - 2008-09* (4618DO001_200809), 2010, Table 2 - New South Wales

[252] Department of Agriculture and Food, *Ord River Irrigation Area Production – 2008/2009 wet season & 2009 dry season*, 2010

[253] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 73

[254] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 74

[255] ABS, *Experimental Estimates of the Gross Value of Irrigated Agricultural Production, 2000-01 - 2007-08* (4610.0.55.008), 2010, Summary

[256] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 74

[257] ABS, *New South Wales – Gross Value of Irrigated Agricultural Production, 2000-01 to 2007-08*, 2010, Tables 1, 2 and 4

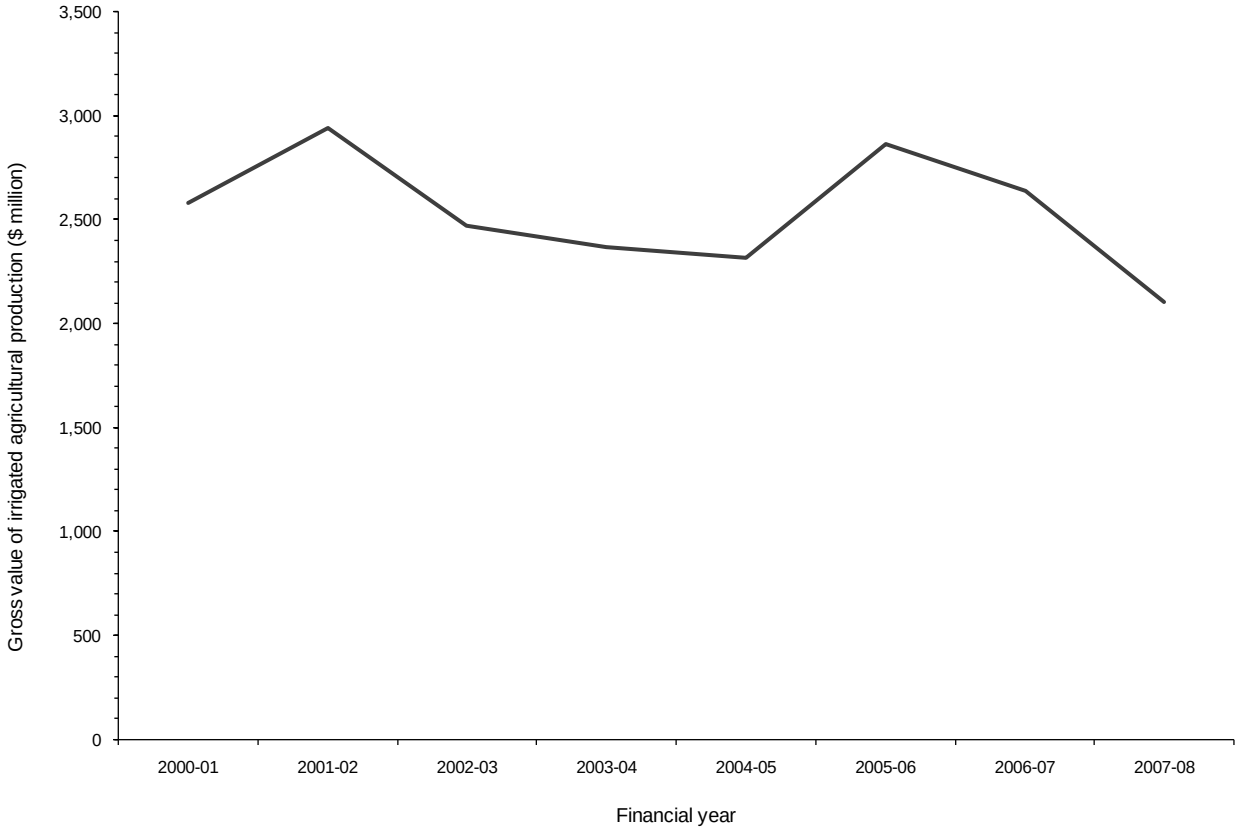

Figure 18 - Gross value of irrigated agricultural production in New South Wales between 2000-01 and 2007-08[258]

5.28 The committee undertook to determine the ratio of GVIAP to the volume of water applied for each NRM region within New South Wales. The results (shown in Table 13) indicate that the highest value in 2007-08 was in the Hawkesbury-Nepean region with a GVIAP of $7,777/ML, as illustrated in Figure 19. The next highest was Sydney Metro region with a GVIAP of $6,722/ML and the Northern Rivers region with a GVIAP of $4,594/ML. In contrast, the lowest values were in the Western region with a GVIAP of $250/ML, the Lachlan region with $652/ML and the Border Rivers-Gwydir region with $657/ML.

[258] Source: ABS, *New South Wales – Gross Value of Irrigated Agricultural Production, 2000-01 to 2007-08*, 2010, Table 1

Table 13 – Gross value of irrigated agricultural production per megalitre of water applied for each natural resource management region in New South Wales in 2007-08[259]

Natural resource management region	Gross value of irrigated agricultural production per megalitre of water applied ($/ML)
Border Rivers-Gwydir	657
Central West	1 129
Hawkesbury-Nepean	7 777
Hunter-Central Rivers	1 466
Lachlan	652
Lower Murray-Darling	1 917
Murray	1 351
Murrumbidgee	1 089
Namoi	787
Northern Rivers	4 594
Southern Rivers	3 297
Sydney Metro	6 722
Western	250

[259] Source: ABS, *NSW NRM Regions – Gross Value of Irrigated Agricultural Production, 2001-02 to 2007-08*, 2010, Tables 2-14

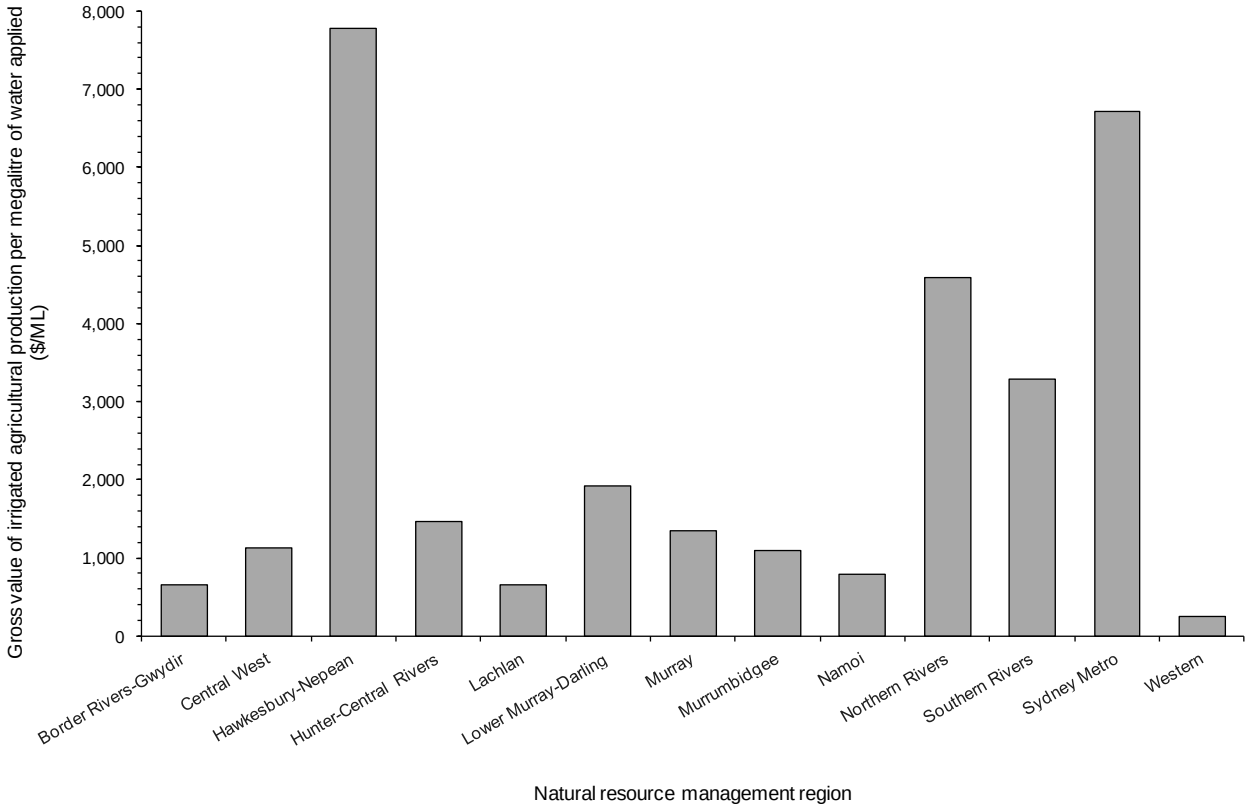

Figure 19 - Gross value of irrigated agricultural production per megalitre of water applied in each natural resource management region in New South Wales in 2007-08[260]

5.29 As with the application rate comparison, data available for the ORIA is measured differently to data available for New South Wales irrigated production. This means that it is not possible to make a direct comparison of GVIAP per megalitre of water applied between New South Wales NRM regions and the ORIA. As such, caution should be taken when considering the following figures.

5.30 In 2009 the GVIAP for the ORIA was $36.2 million and when the imputed value of forestry was included the total irrigated farm activity was measured as $101.5 million. This equates to a value of $681/ML water delivered.[261]

5.31 In considering the differences in GVIAP per megalitre water applied between regions, it is important to consider the differences in the GVIAP per megalitre of water for different agricultural commodity groups. As illustrated in Figure 20, in 2007-08 in New South Wales nurseries, cut flowers and cultivated turf had by far the greatest GVIAP per megalitre water applied with $13,627/ML water. In contrast, the lowest values were other broadacre crops with a GVIAP of $228/ML, rice with $274/ML and cereals for grain and seed with $277/ML. Therefore, the dominance of a particular commodity within a region will affect the GVIAP per megalitre of water for that region.

[260] Source: ABS, *NSW NRM Regions – Gross Value of Irrigated Agricultural Production, 2001-02 to 2007-08*, 2010, Tables 2-14

[261] The value per megalitre calculated includes the imputed value of forestry as only the total water delivered in the ORIA is available which includes use in forestry.

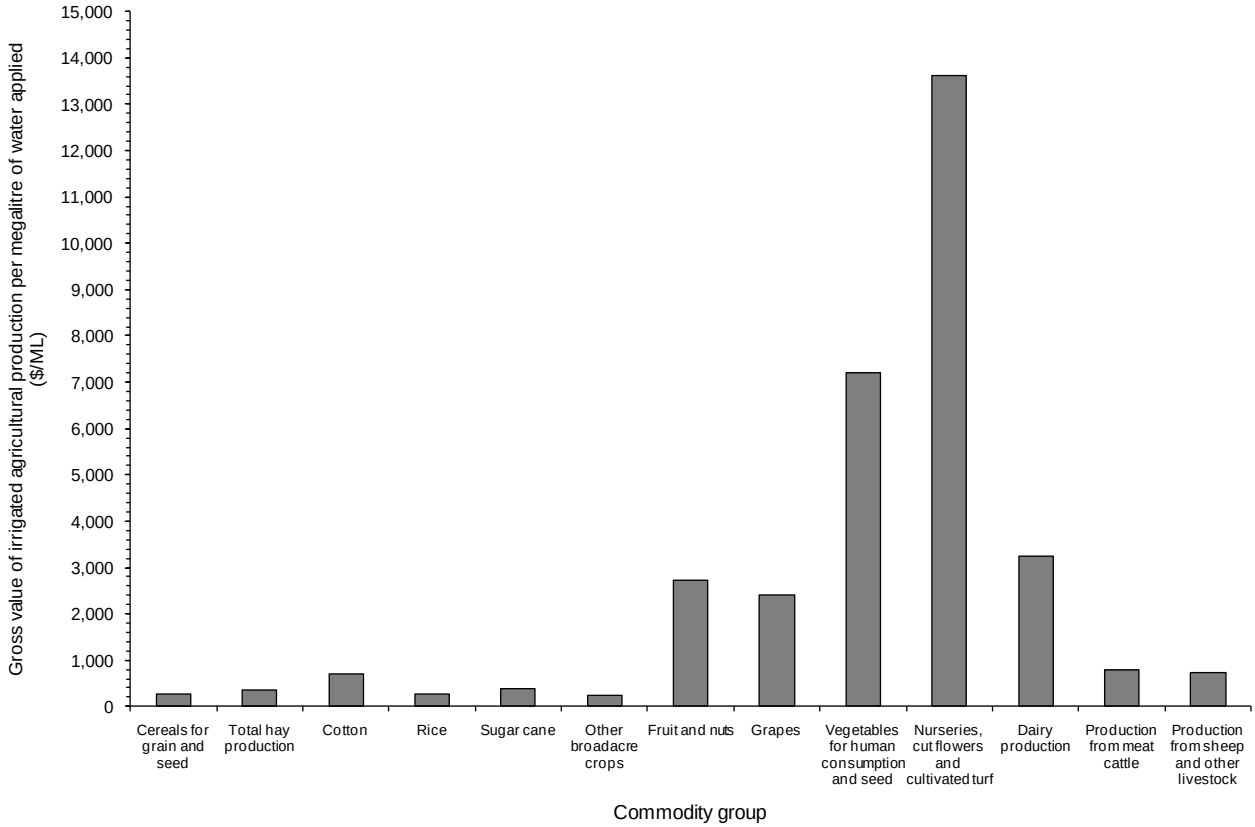

Figure 20 - Gross value of irrigated agricultural production per megalitre of water applied in New South Wales in 2007-08 by agricultural commodity group[262]

Best practice

Water reuse and recycling

5.32 Water reuse and recycling is a commonly used best practice approach across all industries and households. The ABS *Water Account* categorises the source of water for agriculture as either being self-extracted (i.e. directly extracted from the environment by farmers such as bores or on-farm dams), distributed (i.e. supplied by water providers such as irrigation authorities) or reused (i.e. regional reuse schemes where drainage, waste or storm water is used again, often after treatment, without first being discharged to the environment).[263]

5.33 The committee notes that this definition of reuse does not include water that is reused on-farm, which will be referred to in this report as recycled water. Although recycled water is not included within the *Water Account* statistics, the committee believes that on-farm recycling of water is an important best practice measure.

5.34 As discussed in paragraph 5.13, in 2004-05 in New South Wales 160 GL of water was reused in agriculture. This accounts for 3.9% of the total consumption of water by agriculture, as illustrated in Figure 21.

[262] Source: ABS, *New South Wales – Gross Value of Irrigated Agricultural Production, 2000-01 to 2007-08*, 2010, Table 6

[263] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, pp. 68, 149

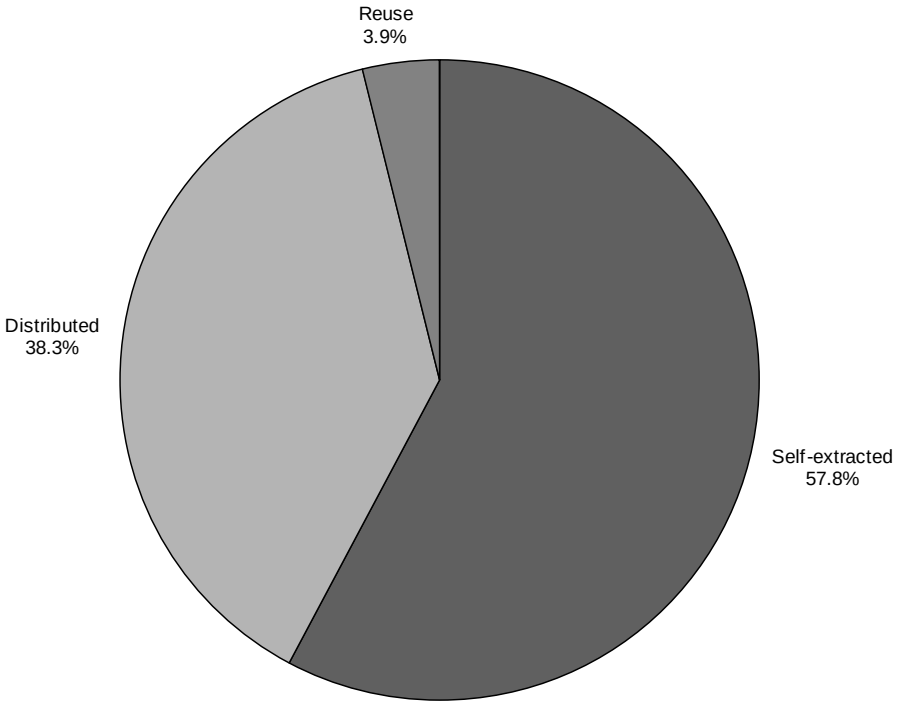

Figure 21 - Proportion of agricultural water consumption in New South Wales in 2004-05 by water type[264]

5.35 The percentage of water consumption that comes from reusing water differs between agricultural activities. As illustrated in Figure 22, in New South Wales in 2004-05 irrigation for grain crops had the highest percentage of water reuse (14.1%) of all agricultural activities. Within New South Wales there was no water reuse recorded for sugar, fruit, grapes, cotton and livestock.[265]

[264] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 75

[265] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

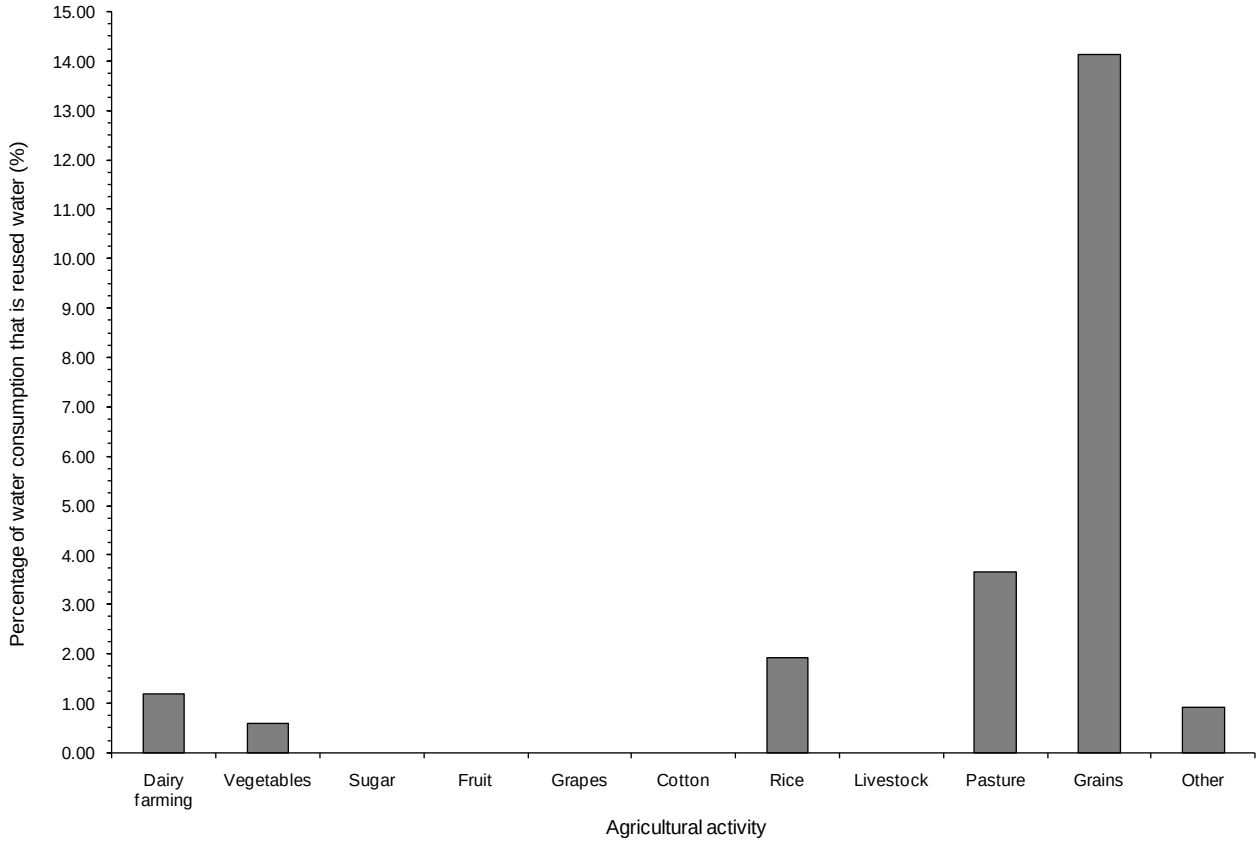

Figure 22 - Each agricultural activity's use of reuse water as a proportion of their total water consumption in New South Wales in 2004-05[266]

5.36 As discussed above, on-farm water recycling is an important best practice measure to reduce water consumption. On-farm recycling is becoming increasingly popular as it becomes more cost effective and resource friendly. It is generally more common for large farms (based on estimated value of agricultural operations), farms with broadacre crops and cotton farms to undertake some form of on-farm water recycling.[267]

5.37 During its visit of inspection to Coleambally, a delegation of the committee heard that 90% of farms within the Coleambally Irrigation Co-operative Limited (CICL) are capable of reusing their discharge water. While inspecting a local landholder's property, the delegation saw that the grading of fields allowed run-off to be collected, which was then pumped back into the irrigation channels for reuse.

Irrigation methods

5.38 There are various methods of irrigation, which are commonly categorised as either:

- surface – the controlled flooding of paddocks or irrigation bays
- drip or trickle – the technique of applying water directly to individual plants or rows or crops

[266] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 76

[267] ABS, *Year Book Australia 2008*, 2008, p. 502

- sprinkler – use of overhead sprays including microspray, portable and hose irrigators, large mobile machines and solid set.[268]

5.39 Surface irrigation tends to have the lowest water efficiencies compared to other systems and is most often used on suitable, low permeability soils.[269] In 2004-05 surface irrigation was the most preferred method of irrigation in New South Wales, with 77% of area irrigated by these means, as shown in Figure 23. This is greater than the overall Australian average of 62% of area irrigated by surface irrigation.[270]

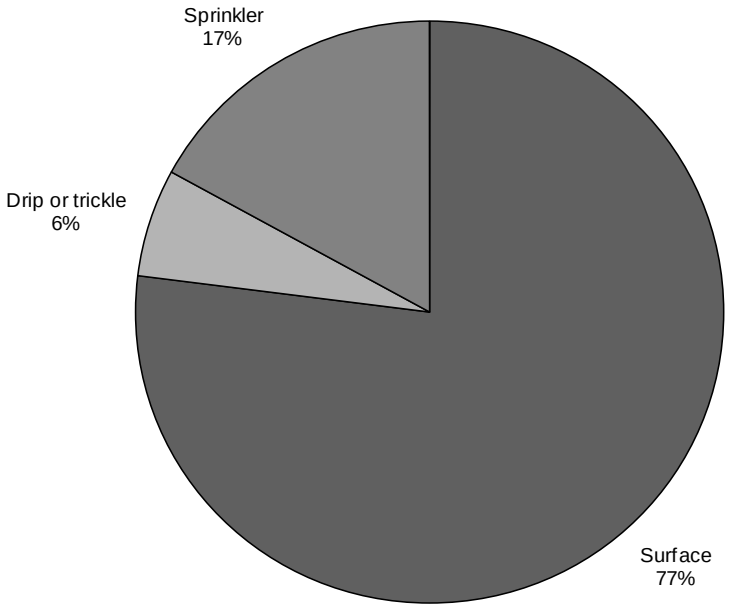

Figure 23 - Proportion of irrigated land using different irrigation methods in New South Wales in 2004-05[271]

5.40 Sprinkler irrigation covers a wide range of types, from high pressure big gun travelling irrigators, through lateral move and centre pivots, fixed solid set systems to microjet and micro sprinklers.[272] Sprinkler irrigation was the method used for 17% of area irrigated in New South Wales in 2004-05, as illustrated in Figure 23.

5.41 Drip or trickle irrigation systems include drippers, porous tubes and subsurface pipes. They generally apply water very slowly to either the soil surface or into the rootzone below the surface. As such, they can be very water efficient and use water

[268] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 73
[269] Department of Primary Industries, *Irrigation essentials: For North Coast farmers in NSW*, 2009, p. 9
[270] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 78
[271] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 78
[272] Department of Primary Industries, *Irrigation essentials: For North Coast farmers in NSW*, 2009, p. 9

of low quality if carefully managed.[273] Drip or trickle irrigation was used for 6% of irrigated land in 2004-05 in New South Wales, as shown in Figure 23.

5.42 The *Year Book Australia 2008* by the ABS notes:

> Given the high losses of water incurred in agriculture (due to leaks, evaporation, etc.) and greater recognition of the need to preserve water, [drip irrigation] technologies, while costly to establish, are being increasingly used by farmers who previously used surface and sprinkler irrigation methods.[274]

5.43 The committee heard that the most appropriate irrigation method depends on a number of factors. Mr Mark Moore, a Policy Analyst for the New South Wales Irrigators' Council explained to the committee:

> Depending on where the irrigators are located, there are different forms of irrigation methods or efficiencies that will be appropriate. It could be anywhere from the relining of channels to delivering water more efficiently throughout the system; sub-surface drip irrigation; lateral moves or centre pivots, meaning delivering a concentrated amount of water onto a particular part without getting it onto areas where it does not need to be; more efficient storage of water in certain areas where there are unregulated systems or large amounts of storage capacity in dams. On-farm storage is the main way that water is stored, so to lessen evaporation or seepage through those areas.[275]

5.44 Mr Michael Murray, Chief Executive Officer of the Gwydir Valley Irrigators Association, echoed this sentiment:

> [I]t would be extremely dangerous for any government to try to tell someone what is the most efficient outfit for their particular operation. We certainly have members who believe that they are getting 30% irrigation efficiency savings by installing lateral-move irrigators. It is a factor of: What are your soil types, what are your cropping procedures, and what was the optimisation of your previous furrow irrigation system?[276]

5.45 Irrigators often modify their irrigation practices to gain water efficiencies out of necessity during times of water shortages. During the recent drought, many irrigators have adopted more efficient irrigation methods as a means of maintaining production yields with less water.

5.46 On its visit of inspection to the ORIA, the committee delegation heard from Mr Geoff Strickland, the Chief Executive Officer of the Ord Irrigation Cooperative, that 90% of the irrigation in the area was surface irrigation (furrow) and 10% was either trickle or sprinkler systems. This was largely a result of there being plenty of water available in the ORIA which meant that there was little incentive for farmers to modify their practices to become more water efficient.

5.47 As New South Wales does not enjoy similar water availability, and with likely decreases in water availability under climate change, there is every incentive for irrigators in New South Wales to adopt more efficient practices.

5.48 In its submission to the inquiry, the Wine Grapes Marketing Board informed the committee:

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[273] Department of Primary Industries, *Irrigation essentials: For North Coast farmers in NSW*, 2009, p. 9

[274] ABS, *Year Book Australia 2008*, 2008, p. 503

[275] Mr Mark Moore, Transcript of hearing, 14 May 2010, p. 17

[276] Mr Michael Murray, Transcript of hearing, 14 May 2010, p. 14

> The winegrape producers in the Riverina have actively embraced irrigation technology. While there exists some growers that utilised the open furrow systems in their vineyards the vast majority have moved on. Such adjustments have been made by market forces impacting on the industry and through growers wanting to better manage the precious resource.[277]

5.49 The committee heard calls from irrigator groups for governments to further invest in efficient irrigation practices, especially in preference to purchasing environmental water through buying licences outright. Mr Murray explained to the committee how government investment in irrigation efficiency is advantageous:

> While sitting at the market and buying [environmental water] is certainly a relatively easy and straightforward way, other ways that we think are appropriate is the funding of irrigation efficiency programs, so basically saying, "Okay, we will co-invest with irrigators to become more efficient". The general rule of thumb is that they then expect 50% of the annual estimated savings to be returned to them in forms of entitlement. From an irrigator's point of view that has got some benefits but clearly one of the major benefits of that approach is that it actually helps protect our rural and regional communities. If you simply buy the water—I have no qualms if it has been bought off willing sellers at a market-based price; the irrigator has sold that, they have made a decision, that is fine and they have been happy with the price; they have been fully compensated and looked after.[278]

Use of technology

5.50 During its visits of inspection, the committee was able to see firsthand how the use of technology has greatly increased water efficiency in irrigation practices across Australia.

Perth Region NRM

5.51 During its visit of inspection to Perth, the delegation meet with the Perth Region NRM, who explained their Waterwise on the Farm program. Mr David Gibb, the Waterwise on the Farm Coordinator for the Perth Region NRM, explained that the program is a multi-stakeholder industry initiative which has been developed and delivered by the Perth Region NRM and the Western Australian Department of Agriculture and Food. The broader program aims to provide increased awareness and understanding of sustainable irrigation practices through the provision of training programs and the establishment of demonstration sites within horticultural sectors (vegetables, turf, avocados, strawberry, pome and stone fruit, table grape, wine grape and nursery) to implement practices that can be used to increase irrigation efficiency.

5.52 While in Perth the committee delegation had the opportunity to visit two of the demonstration sites: Sittella Winery in the Swan Valley and Sunny Valley Vineyard in West Swan.

5.53 The head winemaker at Sittella Winery, Mr Matt Bowness explained that Sittella Winery produces several varieties of grapes including Verdelho, Chardonnay, Shiraz and new plantings of Tempranillo and Petite Verdot. Currently, three hectares of the property are under production with a drip irrigation system supplying water to the vines. Mr Bowness showed the delegation how the use of automated telemetry-

[277] Submission 9, Wine Grapes Marketing Board, p. 2

[278] Mr Michael Murray, Transcript of hearing, 14 May 2010, p. 13

based soil moisture monitoring equipment had reduced the amount of water used and saved time and money in farming operations. By using the new technology, Mr Bowness was able to measure and track soil moisture at different depths in different vineyards and assess whether the irrigation practices were resulting in the correct soil moisture. Additionally, the technology has allowed him to better schedule irrigation practices to maximise their impact and obtain high quality grapes.

5.54 The committee also visited Sunny Valley Vineyard where Mr Peter Nuich, the owner, explained that Sunny Valley Vineyard produces several varieties of seedless table grapes including Dawn, Crimson, Flame, Superior and Midnight Beauty. The vines are irrigated using micro sprinklers. Mr Nuich explained how his involvement in the Waterwise on the Farm project had allowed him to install soil moisture monitoring probes to measure water levels and movement through the soil profile. He also undertook a major upgrade of the irrigation system including a telescopic sub main, new lateral lines and new sprinklers.

5.55 Comments in the ABS *Year Book Australia 2008* suggest that such approaches are become more popular within the agriculture industry:

> As well as irrigation methods, irrigation scheduling methods are also attracting greater attention. The majority of farms once tended to only use their own knowledge or observation techniques but now on-farm tools and alternative scheduling methods are also being used.[279]

Coleambally

5.56 On its visit of inspection to Coleambally, the delegation saw how technological advancements were assisting irrigators in New South Wales. The delegation heard about a number of modernisation programs that the Coleambally Irrigation Cooperative Limited had undertaken including Land and Water Management ($120 million investment from 1999-2010), Total Channel Control ($30 million investment from 2003-2010) and WaterSmart Australia ($12 million investment from 2008-2011).

5.57 The primary objective of these programs was to increase efficiency of irrigated water usage and crop productivity to bring about water savings. This has been achieved through:

- achieving near on-demand delivery of water across the Coleambally irrigation area
- improving monitoring and measurement of on-farm water use
- generating daily site specific information on evapotranspiration and climatic conditions through automated weather stations
- monitoring of soil moisture on broad acre crops
- whole farm balance surveys to quantify deep leakage losses
- large scale trial of on-farm bay automated technologies
- aggregate on-farm data collection to provide district-wide information for a water order forecasting decision support system.

[279] ABS, *Year Book Australia 2008*, 2008, p. 504

5.58 As a result of these modernisation efforts and the introduction of new technologies, the CICL estimates that they have saved about 60 GL of water each year since 2006.

5.59 In particular, the delegation had the opportunity to see firsthand the new solar powered flood gates that were installed in irrigation channels to replace the dethridge wheels. The new gates allow irrigators to order their water online or via the phone and receive their water in as little as two hours, compared to previous practices that required farmers to give twenty-four hours notice. The delegation heard from local irrigators that this technology allowed them to be more efficient in their irrigation practices and respond more rapidly to changing environmental conditions, such very hot or wet days.

Use of science and research

5.60 There is a need for sound, up-to-date science and research to support irrigators in their attempts to become more efficient. Mr Murray told the committee that providing irrigators with the best available research allows them better options for irrigation efficiency.[280]

Coleambally

5.61 While on its visit of inspection to Coleambally a delegation of the committee heard about the research that the CICL had undertaken to better understand the underlying soils of the region. This allowed them to better plan appropriate use of the land and better understand water losses that occur within paddocks and channels.

5.62 In particular, CICL explained the research they had commissioned to conduct electromagnetic soil density surveying across the entire irrigation area. The mapping identified the locations of underlying previous stream beds which had a different soil structure to surrounding areas. This has allowed CICL to identify where leaks may occur with a high degree of accuracy. As a result they have been able to undertake a targeted approach to lining channels with clay, which is generally an expensive process to undertake.

5.63 The delegation of the committee noted that CICL's investment in sound research enabled the organisation to become more water efficient as well as saving money by targeting investment where it was most needed and effective.

Conclusion

5.64 The committee has been encouraged by the numerous examples of best practice and water efficiency across the agriculture sector in New South Wales. This is particularly so given the harsh drought conditions over recent years. This is in contrast to the inefficient practices which the committee witnessed while visiting irrigators in the ORIA in Western Australia. It is the committee's impression that the Ord-East Kimberley Expansion project appears to generate greater social benefits, such as higher employment and improvements to the wellbeing of regional communities, as opposed to focussing on obtaining the greatest economic value from the significant water resources available.

[280] Mr Michael Murray, Transcript of hearing, 14 May 2010, p. 14

5.65 Within New South Wales, there is further scope for best practice initiatives to be adopted more broadly across the agriculture industry. The committee considers that the combined efforts of governments, individuals and industry bodies are essential to promoting and implementing further improvements.

RECOMMENDATION 5: The New South Wales Government identifies further opportunities to co-invest with the agriculture industry in water efficiency and modernisation initiatives, such as on-farm water recycling, efficient irrigation methods, adoption of new technology and up-to-date science and research.

Water consumption in mining

5.66 The mining industry uses water for a variety of purposes, including cleaning, cooling, product movement, dust suppression and as a raw material.[281]

5.67 The mining industry is one of the key industries where water use and water consumption are not the same amount of water. Water consumption, as measured by the ABS, does not include in-stream use of water. It is a measure of distributed water plus self-extracted water use plus reuse water use minus in-stream water use.[282]

5.68 In 2004-05 total water use by the mining industry in New South Wales was 86.8 GL, as indicated in Table 14. However, total water consumption was only 62.9 GL, which accounted for 1.1% of the state's total water consumption (as indicated in Figure 10). The difference between these figures (23.9 GL) represents the volume of water used in-stream by the industry.

Table 14 - Water use and water consumption by the mining industry in New South Wales in 2004-05[283]

	Volume of water (ML)
Water use	
Self-extracted	74 087
Distributed	6 586
Reuse	6 098
Total	**86 770**
In-stream use	23 902
Water consumption	**62 868**

5.69 A comparison of water use and consumption across sectors within the mining industry shows that water use and consumption in coal mining in New South Wales

[281] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 79

[282] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 149

[283] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 88

in 2004-05 were far greater than in other sectors, as illustrated in Figure 24. It is important to note that while coal mining water use was 72.2% of total mining water use, coal mining water consumption was relatively less, at 62.5% of total mining water consumption. The large disparity between water use and water consumption is primarily due to the large volume of water that is used in-stream (23,367 ML) in coal mining in New South Wales, a figure that is included in water use but not water consumption figures. By comparison, metal ore mining (160 ML) and other mining (375 ML) use far less water in-stream.[284]

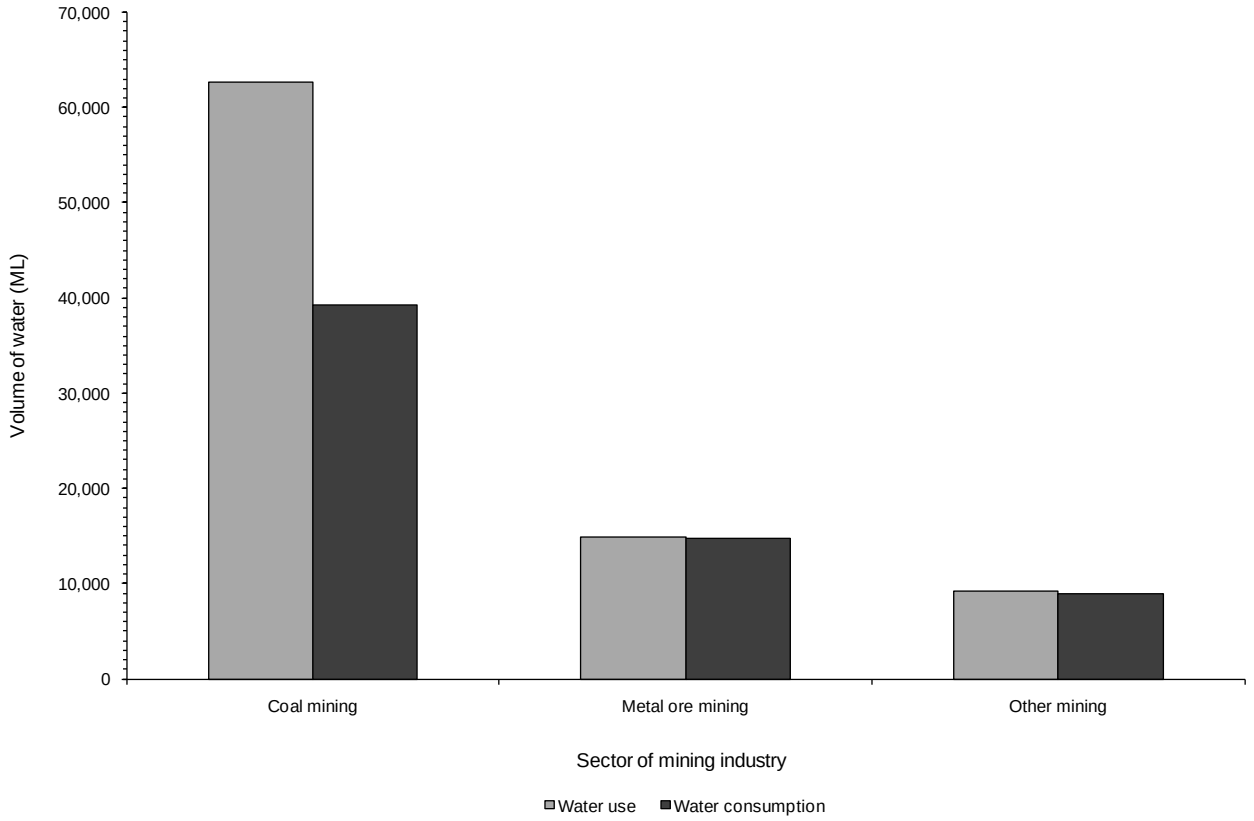

Figure 24 - Water use and water consumption by each sector of the mining industry in New South Wales in 2004-05[285]

5.70 The issue of water use by the mining industry is a significant one because although it does not have a large overall consumption of water, in regional areas a mining operation is often the largest consumer of water. The New South Wales Minerals Council submission acknowledges this:

> The minerals industry recognises that even though mining only uses 1% of water in NSW, mining operations can often be the single largest user in a town or region.[286]

5.71 As such, the mining industry acknowledges the importance of minimising water consumption and adopting best practice water conservation and management.[287] Ms

[284] ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

[285] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 17

[286] Submission 37, New South Wales Minerals Council, p. 2

[287] Submission 37, New South Wales Minerals Council, p. 2

Sue-Ern Tan, the Deputy Chief Executive Officer for the New South Wales Minerals Council told the committee:

> We try and take a strategic approach to the way we manage our water to ensure that it is efficiently managed and valued as a vital business community and environmental asset. This includes our strategic water planning, constantly improving operational performance and building relationships with stakeholders to generate mutually beneficial outcomes.[288]

Best practice

Water reuse and recycling

5.72 At its hearing in May 2010, the committee heard about efforts by the mining industry to use reuse water and recycled water. Ms Tan told the committee:

> We are moving towards, as an industry, finding alternatives to using fresh water at our sites, such as things like recycling and reuse of water at various points in our operations. A number of mine sites, such as Cadia Valley, now use mostly recycled and effluent water, both of which are water sources that cannot be used by a large number of other water consumers or users.[289]

5.73 As discussed in paragraph 5.12, the ABS *Water Account* measures reuse water as drainage, waste or storm water that has been used again without being first discharged to the environment. It does not include on-site recycling of water. The committee notes that both water reuse and on-site water recycling are used within the mining industry.

5.74 As indicated in Table 11, in 2004-05 the mining industry in New South Wales used 6.1 GL of reuse water. This accounted for 7.0% of the total water use by mining, as illustrated in Figure 25, or 9.7% of all water consumption (as shown in Figure 13).

[288] Ms Sue-Ern Tan, Transcript of hearing, 10 May 2010, p. 14

[289] Ms Sue-Ern Tan, Transcript of hearing, 10 May 2010, p. 14

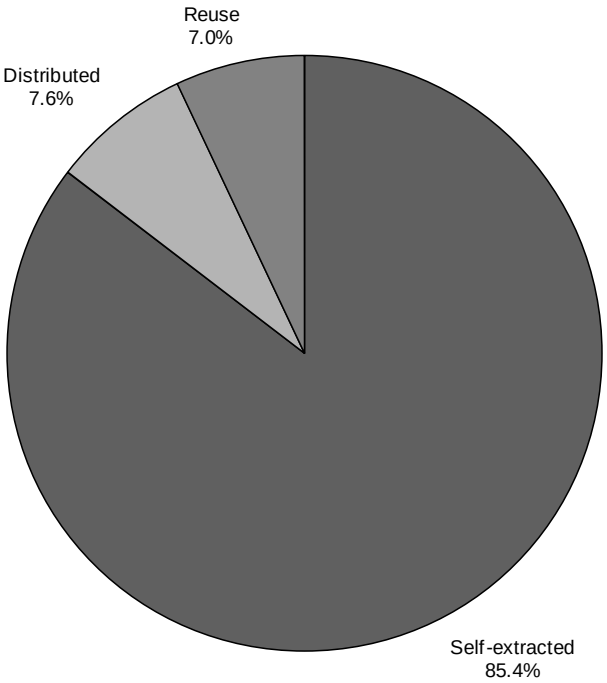

Figure 25 - Proportion of mining industry water use in New South Wales in 2004-05 by water type[290]

5.75 On its visit of inspection to Orange, a delegation of the committee was able to hear about how Cadia Valley Operations is using both on-site recycling and reuse water as a source for their water needs. In 2009 Cadia Valley Operations sourced 33% of their water from recovered effluent from Orange and Blayney.[291] Through an arrangement with Orange City Council, Cadia Valley Operations uses effluent recovered from the Orange Waste Water Treatment Plan. The water is recovered using a system of pumps and pipelines, which were installed in 1997. The system can provide a maximum of 3,650 ML/year with a maximum daily flow rate of 13 ML/day.[292] Currently, 10 ML/day is supplied to Cadia Valley Operations.[293]

5.76 Cadia Valley Operations also sources reuse water from Blayney Concentrate Dewatering Facility. Water from the facility is a combination of water recovered from filtration of the copper-gold concentrate and water recovered from the Blayney Waste Water Treatment Plant.[294]

[290] Source: ABS, *Water Account, Australia, 2004-05* (4610.0), 2006, p. 88

[291] A Wannan, *Water Management System*, presentation to the Standing Committee on Natural Resource Management (Climate Change), 26 August 2010

[292] Cadia Valley Operations, Water Management Plan, 2009, p. 12

[293] A Wannan, *Water Management System*, presentation to the Standing Committee on Natural Resource Management (Climate Change), 26 August 2010

[294] Cadia Valley Operations, Water Management Plan, 2009, p. 13

5.77 In addition to sourcing reuse water, Cadia Valley Operations also has on-site water recycling in place. Approximately 90 ML/day is recycled on-site through systems that recover water from both ore processing and underground mining.[295]

Water accounting framework

5.78 A recent industry initiative contributing to best practice water management in the mining industry is the development of a National Water Accounting Framework. The New South Wales Minerals Council's submission explained:

> The primary objectives of the Framework are to provide:
>
> - A consistent approach for quantifying flows into, and out of, reporting entities, based on their sources and destinations.
> - A consistent approach for reporting of 'water use' by minerals operations that enables comparison with other users, and relates to water sharing planning processes.
> - A consistent approach in quantifying and reporting water 'reuse' and 'recycling' efficiencies such that the reliance on sourced water is reduced.
> - A model for the more detailed operational water balance as guidance for those businesses which currently do not have an effective operational water model or see an opportunity to develop this new approach.[296]

5.79 At a public hearing in May 2010, Ms Tan further explained the progress and benefits of the Framework:

> We started a program in 2007 to look at how we could develop such an accounting framework for the minerals industry. It has actually been piloted in the Central West of New South Wales and at the moment we are just finalising that framework to be developed for use by the minerals industry. It is a partnership of the Minerals Council of New South Wales and the Minerals Council of Australia and what we are trying to do is develop a more comprehensive framework that will improve the level of water management and knowledge on sites, allow us to provide greater consistency in how we report and enable water accounts to be generated at each site. This is really important because it will allow for benchmarking across the industry and for us to continually improve water management.[297]

5.80 Once finalised, it is anticipated that the framework will be adopted by the National Water Initiative as the national model for water accounting in Australia.[298]

Conclusion

5.81 The committee notes the considerable efforts the mining industry has taken to reduce its water consumption and improve water efficiency in its operations. Given the significance of the mining sector to New South Wales the committee considers that it is critical that the government continue to support and encourage best practice.

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[295] A Wannan, *Water Management System*, presentation to the Standing Committee on Natural Resource Management (Climate Change), 26 August 2010

[296] Submission 37, New South Wales Minerals Council, p. 4

[297] Ms Sue-Ern Tan, Transcript of hearing, 10 May 2010, pp. 14-15

[298] New South Wales Minerals Council, Response to questions taken on notice at hearing, 20 August 2010, p. 2

RECOMMENDATION 6: The New South Wales Government implements measures and incentives to encourage mining operations to reduce water consumption and improve water efficiency through increased use of drainage, waste or storm water and on-site water recycling.

Appendix One - List of submissions

1 Ms Carol O'Donnell
2 Lake Cargelligo Watch
3 Central NSW Councils
4 Mr Terry Bowring
5 Strathfield Council
6 NSW Irrigators' Council
7 Ms Vanessa Ekins
8 Riverina Citrus
9 Wine Grapes Marketing Board
10 Mr Greg Parr
11 Mr Peter & Mrs Barbara Nilsson
12 Lower Lachlan Stock & Domestic and Basic Right Water Users
13 Mr Ian Cohen MLC
14 Ms Carmel Gleeson
15 Natural Resources Advisory Council
16 Cargelligo Wetlands and Lakes Foundation
17 Mr David McKechnie
18 Southern Sydney Regional Organisation of Councils
19 Ms Libby Ciesiolka
20 Darling River Action Group
21 Ms Rhonda Sutherland
22 Mr Edgar Coleman
23 Gwydir Valley Irrigators Association
24 Cotton Australia
25 Murrumbidgee Catchment Management Authority
26 Ms Virginia Falk
27 The Water and Carbon Group
28 Centre for Technologies for Water and Wastewater
29 Northern Sydney Regional Organisation of Councils
30 Sydney Water

31 New South Wales Government

32 Environmental Defender's Office

33 Sydney Coastal Councils Group

34 NSW Young Lawyers – Environmental Law Committee

35 Nature Conservation Council of NSW

36 Local Government and Shires Associations of NSW

37 New South Wales Minerals Council

Appendix Two - List of witnesses

Monday 10 May 2010

Witness	*Organisation*
Mr David Harriss Commissioner	New South Wales Office of Water Department of Environment, Climate Change and Water
Mr Ian Cohen MLC	The Greens
Ms Sue-Ern Tan Deputy Chief Executive Officer	New South Wales Minerals Council

Friday 14 May 2010

Witness	*Organisation*
Ms Rachel Walmsley Policy Director Ms Tanya Wansbrough Scientific Director Mr Robert Ghanem Policy Officer	Environmental Defender's Office
Mr John Asquith Ms Wendy Ambler	Nature Conservation Council of NSW
Mr Michael Murray Chief Executive Officer	Gwydir Valley Irrigators Association
Mr Andrew Gregson Chief Executive Mr Mark Moore Policy Analyst	NSW Irrigators' Council

Appendix Three - Visits of inspection

Ord River and Perth

From 20 to 23 July 2010 a delegation of the committee travelled to the Ord River and Perth to inspect agricultural water management practices and learn about the impacts of climate change on water resources in Western Australia.

Ord River

On the evening of 20 July and morning of 21 July, two committee members (Mr Matt Brown MP and Mr John Williams MP) and the Committee Manager (Dr Carolyn Littlefair) travelled to Kununurra, in the Kimberley region of Western Australia, to visit the Ord River Irrigation Area (ORIA). Irrigation commenced in the region in 1963 following the completion of the Kununurra Diversion Dam, a 20 m high structure that forms Lake Kununurra and has a maximum storage of 101 GL. A larger dam, the Ord River Dam, is located approximately 60 km upstream with construction completed in 1971. Lake Argyle, the reservoir formed by the dam, has a capacity of 10,700 GL at the spillway. The dams were built to store high volumes of water to capture the monsoonal rains which could then be used to support irrigation throughout the year. The ORIA currently consists of 14,000 ha of irrigated land.

Kununurra Diversion Dam

Upon arriving in Kununurra on 21 July the delegation met with Mr Peter Stubbs (Director of the Ord-East Kimberley Expansion Project), Ms Meghan Barnes (Department of Water), Mr Geoff Strickland (Chief Executive Officer of the Ord Irrigation Cooperative), Mr Gary Gaffney (Chief Executive Officer of the Shire Wyndham East Kimberley) and Ms Elena Leslie (Senior Project Officer for the Ord-East Kimberley Expansion Project within the Department of Regional Development and Lands).

Mr Stubbs explained the background and current activities of Stage 1 of the Ord-East Kimberley Expansion Project that will see the ORIA increase by 8,000 ha. The delegation heard that the Western Australian Government, through the Royalties for Regions fund, is investing $220 million to develop the necessary infrastructure, including water supply, drainage and roads, to support the additional agricultural land. The Federal Government is spending $195 million on projects to address social and economic disadvantage within the

Indigenous population and current deficiencies in the available social, community and common-use infrastructure.

Construction of new roads and irrigation channels as part of Stage 1 of the Ord-East Kimberley Expansion Project

Ms Barnes provided an overview of the Ord River Water Management Plan, which outlines how the waters of the Ord River are shared between the commercial water uses of irrigation and hydro-power generation, and the environmental flows necessary for the lower Ord. The delegation heard that due to the reliable and high volume rainfall during the wet season, Lake Argyle dam holds enough water for all current and future irrigation needs without the need for water restrictions. In fact, irrigators in the ORIA have always received 100% of their water entitlement every year. The Ord River Water Management Plan indicates that irrigation entitlements for the additional 8,000 ha can be easily accommodated within the existing capacity of Lake Argyle.

Lake Argyle

Mr Strickland explained the current irrigation allocations and practices within the ORIA. The Ord Irrigation Cooperative currently has an annual allocation of 335 GL, although current water consumption is less than this, at approximately 200 GL. The average entitlement allocation for irrigators is 17 ML/ha. The delegation heard that currently the most prevalent

crop being grown in the ORIA is sandalwood which accounts for about half of the irrigated land. Most irrigators (90%) use furrow irrigation methods with the remainder (10%) using trickle or sprinkler systems. The delegation heard that because there was plenty of water available there was no incentive for irrigators to introduce water efficiency measures.

Mr Stubbs then escorted the delegation on an inspection of the existing irrigation area, the construction works for the new roads and irrigation channels and the land that will become farmland as part of the expanded irrigation area.

Mr John Williams and Mr Matt Brown at Ivanhoe Crossing, Ord River

Ord River hydro electric power station

On 22 July the delegation met with Mr Brian Walter (Senior Operations Manager for Pacific Hydro Limited) and travelled to the Ord River Dam to inspect the hydro power station.

Ord River hydro electric power station

Mr Walter explained that the hydro power station opened in 1992 and has two 15 MW generators each driven by two 7.5 MW turbines. The annual energy output is 220 GWh. As

a result of the operation of the hydro electric power station Kununurra and Wyndham's diesel powered generators, which previously supplied town power, are now only used as supplementary and back up power.

One of the turbines in the hydro electric power station

On the evening of 22 July the delegation travelled from Kununurra to Perth.

CSIRO

On 23 July the delegation travelled to the CSIRO Centre for Environment and Life Sciences in Floreat, Perth where they met with Dr Don MacFarlane (Portfolio Coordinator of the Water for a Healthy Country Flagship). Dr MacFarlane explained some of the results of the Sustainable Yields Projects, which aimed to estimate the current and future (2030) yield of water in catchments and aquifers given the impacts of climate change and development. He explained some of the key findings from the Murray-Darling Basin Sustainable Yields study and the South West Western Australian Sustainable Yields study.

Perth Region NRM

The delegation then travelled to Sittella Winery in the Swan Valley to meet with Mr David Gibb (Waterwise on the Farm Coordinator for Perth Region NRM), Mr Matt Bowness (Head Winemaker for Sittella Winery) and Mr Keith Pekin (Industry Development Coordinator for the Wine Industry Association of Western Australia). Mr Gibb explained that the Waterwise on the Farm project is an initiative of the Perth Region NRM that is working with the horticultural industries to provide demonstration sites of efficient irrigation practices, irrigation efficiency training and increase awareness of sustainable irrigation and nutrient management practices.

Mr Bowness explained that Sittella Winery was one of the demonstration sites for efficient irrigation practices. Mr Bowness showed the delegation the moisture monitoring equipment that is located within the vineyards that measures soil moisture at varying depths. This information is automatically transmitted to a specially designed computer program that allows him to assess whether his irrigation practices are resulting in the correct soil moisture at different depths. The technology has allowed Mr Bowness to better schedule irrigation practices and obtain high quality grapes.

Moisture monitoring equipment within the vineyard at Sittella Winery

The delegation then travelled to Sunny Valley Vineyard in West Swan and met Mr Peter Nuich (landowner). Mr Nuich spoke about his involvement in the Waterwise on the Farm project and explained how this has enabled him to make water savings by modifying his irrigation practices.

Mr John Williams, Mr David Gibb and Mr Matt Brown at Sunny Valley Vineyard

On the evening of 23 July the delegation travelled from Perth to Sydney.

Coleambally and Orange

On 25 and 26 August 2010 a delegation of the committee travelled to Coleambally and Orange to inspect best practice water management in farming and mining operations.

Coleambally

On 25 August three committee members (Mr Matt Brown MP, Mr Gerard Martin MP and Mr John Williams MP) and the Committee Manager (Dr Carolyn Littlefair) travelled to Coleambally where they met with representatives of the Coleambally Irrigation Co-operative Limited (CICL). Representatives included Mr Trent Gardiner (Chairman), Mr John Culleton (Chief Executive Officer), Mr Austin Evans (Senior Operations Engineer), Mr Arun Tiwari (Environmental Manager) and a number of board members.

Mr Evans explained to the delegation that significant improvements in water efficiency have been made across the Coleambally system due to modernisation and improved practices. The delegation heard about the introduction of new technology, such as the replacement of dethridge wheels with solar powered automatic flood gates. The new technology allows farmers to order their water online or via the phone resulting in farmers receiving their water in as little as two hours, compared to previous practices that required farmers to give 24 hours notice.

New flood gate in irrigation channel

Mr Tiwari explained the environmental programs and research that the CICL had been undertaking. In particular, the delegation heard about extensive projects underway to map old stream systems with their distinctive soil patterns and salinity profiles along channels. Mr Tiwari further explained that 90% of farms had water recycling in place where discharge off their property was captured and pumped back into supply channels for reuse.

Channels to collect discharge water for recycling

The delegation then visited the property of Mr Barry Mannes where they witnessed firsthand a demonstration of the new flood gates and water recycling arrangements

Inspecting the flood gate as it released water into the farm channel

Water being released into the farm channel

In the late afternoon of 25 August Mr Williams departed the site inspection while Mr Brown, Mr Martin and Dr Littlefair continued to Orange.

Orange

On the evening of 25 August the delegation met with representatives from the Central NSW Councils (CENTROC). They met with Mr John Davis (Mayor of Orange City Council), Mr Garry Styles (General Manager Orange City Council), Mr Roger Bailey (General Manager of Lithgow City Council) and Ms Jenny Bennett (Executive Officer of CENTROC).

On the morning of 26 August the delegation visited Cadia Valley Operations. Cadia Valley Operations is owned by Newcrest Mining Limited and produces gold and copper. They met with Ms Nedra Burns (Community Relations Manager) and Mr Andrew Wannan (Environment Manager). Ms Burns explained the extent of current operations at Cadia Valley and the planned expansion which was approved earlier in 2010. The delegation also heard about the mining and processing undertaken at Cadia Valley and the water requirements associated with each.

Flotation during ore processing

Mr Wannan told the delegation about the different sources of water for Cadia Valley Operations and how water is stored and used. The delegation heard that 80% of water used is recycled. Mr Wannan further explained the range of licences that Cadia Valley Operations used and the negotiations undertaken with nearby landholders during the severe water shortages during 2006-07.

The delegation then had a tour of the processing plant and a visit around the site to the open pit mine and tailings dams.

Ms Nedra Burns, Mr Matt Brown, Mr Gerard Martin and
Mr Andrew Wannan at Cadia Hill Pit

During the afternoon of 26 August the delegation met with Mr Tim Gardiner (Catchment Coordinator) and Dr Jane Chrystal (Program Manager – Implementation) of the Central

West Catchment Management Authority (CMA) and visited the property of Mr John Blunt to inspect best practice water management in dryland farming. Mr Blunt is a sheep and cattle grazier and over the last 10 years Mr Blunt has replanted over 15,000 native trees and shrubs, particularly on exposed hills and drainage lines. Mr Blunt has also fenced off dams and built stock watering points to better manage water on his property.

Visiting Mr John Blunt's property

In the late afternoon of 26 August Mr Brown, Mr Martin and Dr Littlefair returned to Sydney.

Appendix Four - Extracts of minutes

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 12)
11.05 am, Wednesday 2 December 2009
Room 1254, Parliament House

Members present
Ms Hay MP (Chair)
Mr Martin MP Mr Piper MP
Mr Williams MP

Apologies
Apologies were received from Mr George and Mrs Paluzzano.

Minutes
Resolved, on the motion of Mr Piper, seconded by Mr Martin:
That the minutes of the meeting on 25 November 2009 be confirmed.

Inquiry into sustainable water management
The Chair tabled revised draft terms of reference for an inquiry into water management.

Resolved, on the motion of Mr Piper, seconded by Mr Williams:
That the committee inquire into issues of sustainable water management with particular reference to climate change impacts and, in particular, to report on the following terms of reference:
a) The likely impact of climate change on the availability of water resources under different climatic scenarios;
b) Approaches to the management of water resources by all water users including provision for environmental flows; and
c) Best practice in water conservation and management.

The committee adjourned at 11:16 am until 11.00 am on Wednesday 24 February 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 1)
11.00 am, Wednesday 24 February 2010
Room 1254, Parliament House

Members present
Mrs Paluzzano MP (Deputy Chair)
Mr Brown MP Mr Martin MP
Mr Piper MP

Apologies
Apologies were received from Mr George and Mr Williams.

Acting Chair
In the absence of a Committee Chair, the Deputy Chair took charge of the meeting.

Change in committee membership
The Deputy Chair reported that, earlier that morning, Ms Hay had been discharged from the committee and Mr Brown had been appointed to serve in her place. The Deputy Chair welcomed Mr Brown to the committee.

Election of Chair
As a vacancy had arisen in the in the position of Chair, the Deputy Chair called for nominations for election of a new Chair.

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

Minutes
Resolved, on the motion of Mr Piper, seconded by Mr Martin:
That the minutes of the meeting on 2 December 2009 be confirmed.

Submission to the inquiry into sustainable water management
Resolved on the motion of Mr Piper, seconded by Mr Martin:
That the committee:
- accepts those parts of submission 1 that are relevant to the inquiry's terms of reference and publishes them on the committee's website, and
- refers those parts of submission 1 that are not relevant to the inquiry's terms of reference to the appropriate authority, if they have not already been submitted, and advises Ms O'Donnell to this effect.

Resolved on the motion of Mr Piper, seconded by Mrs Paluzzano:
That the committee accepts submission 2 and publish those parts that are not confidential on the committee's website.

Resolved on the motion of Mrs Paluzzano, seconded by Mr Martin:
That the committee accepts submissions 3 through 6 and publishes them on the committee's website.

Background paper on water management in New South Wales
The committee noted the background paper which provided an overview of how water is used and managed in New South Wales.

Inquiry into sustainable water management
The committee discussed the background to the inquiry into sustainable water management and identified some of the key issues that could be addressed during the inquiry.

Options for visit of inspection for sustainable water management inquiry
The committee discussed options for a visit of inspection relating to the sustainable water management inquiry. Interest was expressed in undertaking a visit of inspection to South Australia and Victoria to investigate issues relating to the Murray-Darling River. The

committee agreed to consider options at a later meeting once directions for the inquiry had been decided.

Parliamentary Public Works and Environment Committees Conference
The committee noted the dates for the upcoming conference Parliamentary Public Works and Environment Committees Conference to be held in Canberra from 7 to 9 July 2010.

The committee adjourned at 11.27 am until 11.00 am on Wednesday 10 March 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 2)
11.00 am, Wednesday 10 March 2010
Room 1254, Parliament House

Members present
Mr Brown MP (Chair)
Mr Martin MP Mr Piper MP
Mr R Williams MP

Apologies
Apologies were received from Mrs Paluzzano and Mr George.

Resignation of Mr George
The committee noted the letter from Mr George to the Leader of the House resigning from the committee and requesting that Mr John Williams be appointed in his place.

Welcome to visitor
The Chair welcomed Mr John Williams as an observer to the meeting.

Minutes
Resolved, on the motion of Mr Piper, seconded by Mr Martin:
That the minutes of the meeting on 24 February 2010 be confirmed.

Submissions to the inquiry into sustainable water management
Resolved on the motion of Mr Martin, seconded by Mr R Williams:
That the committee accepts submissions 7 through 30 and publishes them on the committee's website.

Parliamentary Public Works and Environment Committees Conference
The committee discussed the upcoming Parliamentary Public Works and Environment Committees Conference.

Resolved, on the motion of Mr R Williams, seconded by Mr Martin:
That as many members as wished should attend the Parliamentary Public Works and Environment Committees Conference in Canberra from 7 to 9 July 2010.

Briefing by New South Wales Minerals Council
Ms Sue-Ern Tan, Deputy Chief Executive Officer for the New South Wales Minerals Council, provided a briefing to the committee on water consumption and water management by the mining industry.

The Chair requested some additional information from Ms Tan. The committee agreed to request a submission from the New South Wales Mineral Council for the sustainable water management inquiry.

General business
The committee discussed possible sites for visits of inspection and agreed to bring their diaries to the next meeting to set some dates for hearings and visits.

The committee adjourned at 11.54 am until 11.00 am on Wednesday 17 March 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 3)
11.05 am, Wednesday 17 March 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
Mr Martin MP Mrs Paluzzano MP
Mr R Williams MP

Apologies
Apologies were received from Mr Piper and Mr J Williams.

Minutes
Resolved, on the motion of Mr Martin, seconded by Mr R Williams:
That the minutes of the meeting on 10 March 2010 be confirmed.

Membership change
The committee noted that on 11 March 2010 Mr John Williams was appointed to the committee in place of Mr George who was discharged.

Submissions to the sustainable water management inquiry
Resolved on the motion of Mrs Paluzzano, seconded by Mr R Williams:
That the committee accepts submissions 31 and 32 and publishes them on the committee's website.

Briefing by Office of Water
Mr David Anderson, Director of Executive Services for the Office of Water, provided a briefing to the committee on current arrangements and mechanisms for managing water in New South Wales.

Mr R Williams requested that the secretariat provide additional information on the role of constructed wetlands in wastewater treatment as described in submission 27 from the Water and Carbon Group.

Visit of inspection
The committee discussed the possibility of meeting with Orange Council and CENTROC to discuss issues relating to the provision of water in regional areas, visiting Cadia mine to inspect the use of water by the mining industry and visiting Coleambally to inspect best practice water use in agricultural areas. The committee agreed that as many members as would like should attend a visit of inspection to Orange and Coleambally at a date to be confirmed in April.

The committee discussed the possibility of visiting the constructed wetlands attached to South Lismore sewage treatment plant, the Ord River Irrigation Area and the mouth of the Murray River. The committee agreed that as many members as would like should attend a visit of inspection to Lismore, the Ord River and Adelaide at a date to be confirmed in July.

The committee adjourned at 11.54 am until 11.00 am on Wednesday 21 April 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 4)
11.05 am, Wednesday 21 April 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
Mr Martin MP
Mr Piper MP
Mr R Williams MP
Mrs Paluzzano MP
Mr J Williams MP

Minutes
Resolved, on the motion of Mr Martin, seconded by Mrs Paluzzano:
That the minutes of the meeting of 17 March 2010 be confirmed.

Submissions to the sustainable water management inquiry
Resolved, on the motion of Mr J Williams, seconded by Mr Martin:
That the committee accepts submissions 33 to 35 and publishes them on its website.

Sustainable water management inquiry directions
The committee agreed to a draft report structure, future directions for inquiry and a list of potential witnesses to invited to hearings. They agreed to hold hearings on the afternoon of 10 May and the morning of 14 May.

Visit of inspection to Orange and Coleambally
The committee discussed updated arrangements for the proposed visit to the central west of New South Wales to inspect water management issues.

Resolved, on the motion of Mr Piper, seconded by Mr J Williams:

That as many members as wish should attend the visit of inspection to Orange and Coleambally on 28-30 April 2010

Invitation to 15th National Conference of Parliamentary Public Works and Environment Committees

The committee discussed correspondence about the proposed conference.

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

That as many members as wish should attend the 15th National Conference of Parliamentary Public Works and Environment Committees to be held in Canberra on 7-9 July 2010

Possible interstate visits of inspection

The committee discussed the feasibility of various proposals for interstate visits of inspection as part of the water management inquiry.

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

That as many members as wish should attend the visit of inspection to the Ord River, Perth and related sites on a date to be confirmed in the week beginning 19 July 2010.

Material provided for information

Members noted:

- Correspondence to the Planning Minister from Janet Harwood, Our Future is the Natural World, regarding the Ku-Ring-Gai Town Centres Local Environment Plan.
- Information on constructed wetlands.

The committee adjourned at 11.42 am until 2.00 pm on Monday 10 May 2010.

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

2.05 pm, Monday 10 May 2010
Waratah Room, Parliament House

Members present

Mr Brown MP (Chair)
Mr Martin MP — Mr J Williams MP
Mr R Williams MP

Apology

An apology was received from Mr Piper.

Public hearing

The Chair opened the public hearing.

Mr David Harriss, Commissioner of the New South Wales Office of Water was affirmed and examined.

Mr Harriss undertook to provide the committee with further information in response to a question.

Evidence completed, the witness withdrew.

Mr Ian Cohen MLC was examined.

Mr Cohen undertook to provide the committee with further information in response to a question.

Evidence completed, the witness withdrew.

Ms Sue-Ern Tan, Deputy Chief Executive Officer for the New South Wales Minerals Council was affirmed and examined.

In support of her evidence, Ms Tan tabled PowerPoint slides entitled Mining in NSW.

Ms Tan undertook to provide the committee with further information in response to questions.

Evidence completed, the witness withdrew.

The committee adjourned at 3.24 pm until 11.00 am on Wednesday 12 May 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 6)
11.05 am, Wednesday 12 May 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
The Hon Tanya Gadiel MP
Mr Martin MP
Mr Piper MP
Mr J Williams MP
Mr R Williams MP

Change in committee membership
The Chair reported that, earlier that morning, Ms Gadiel has been appointed to the committee to replace Mrs Paluzzano. The Chair welcomed Ms Gadiel to the committee.

Election of Deputy Chair
As a vacancy had arisen for the position of Deputy Chair, the Chair called for nominations for election of a new Deputy Chair.

Resolved, on the motion of Ms Gadiel:
That Mr Martin be elected as Deputy Chair of the committee.

Briefing by Parsons Brinckerhoff
The committee received a briefing on water management issues by representatives of Parsons Brinkerhoff: Ms Margie Parmenter, Principal Natural Resources Management Consultant; Mr Geoff Fishburn, Technical Executive Surface Water; and Mr Simon Schwab, Government Relations Manager.

Minutes
Resolved, on the motion of Mr Piper, seconded by Mr J Williams:
That the minutes of the meeting of 21 April 2010 be confirmed.

Submission to the sustainable water management inquiry
Resolved, on the motion of Ms Gadiel, seconded by Mr Piper:
That the committee accepts submission 36 and publishes it on its website.

Transcript of hearing of 10 May 2010
Resolved, on the motion of Mr J Williams, seconded by Mr Piper:
That the committee agrees to the publication of the 10 May 2010 hearing transcript once witnesses have had the opportunity to make corrections.

Visit of inspection to the Ord River and Perth
The committee discussed options and dates for the visit of inspection to the Ord River and Perth.

Resolved, on the motion of Mr J Williams, seconded by Mr Piper:
That as many members as wish should attend a visit of inspection to the Ord River and Perth on 20-23 July 2010.

Visit of inspection to Orange and Coleambally
The committee discussed possible new dates for the postponed visit to the central west of New South Wales.

Resolved, on the motion of Mr Piper, seconded by Mr R Williams:
That as many members as wish should attend the visit of inspection to Orange and Coleambally on 25-27 August 2010.

General business
The committee discussed arrangements for the upcoming hearing on Friday 14 May 2010.

The committee adjourned at 12.05 pm until 10.00am on Friday 14 May 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 7)
10.09 am, Friday 14 May 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
Mr Martin MP Mr Piper MP

Apologies
Apologies were received from Ms Gadiel, Mr J Williams and Mr R Williams.

Public hearing
The Chair opened the public hearing.

Ms Rachel Walmsley, Policy Director of the Environmental Defender's Office was affirmed and examined. Mr Ghanem, Policy Officer, and Ms Wansbrough, Scientific Director, of the Environmental Defender's Office were sworn and examined.

Evidence completed, the witnesses withdrew.

Mr John Asquith, Chairman of the Water Group, and Ms Wendy Asquith, of the Nature Conservation Council were affirmed and examined.

In support of his evidence, Mr Asquith tabled a copy of his opening statement and a brochure entitled The Answers to Global Warming Scepticism.

Mr Asquith undertook to provide the committee with further copies of the brochure.

Evidence completed, the witnesses withdrew.

Mr Michael Murray, Chief Executive Officer of the Gwydir Valley Irrigators Association was sworn and examined.

Evidence completed, the witness withdrew.

Mr Andrew Gregson, Chief Executive and Mr Mark Moore, Policy Analyst for the NSW Irrigator's Council were affirmed and examined.

Evidence completed, the witnesses withdrew.

The committee adjourned at 12.13 pm until 11.00 am on Wednesday 19 May 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 8)
11.03 am, Wednesday 19 May 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
Mr Martin MP — Mr Piper MP
Mr J Williams MP — Mr R Williams MP

Apologies
Apologies were received from Ms Gadiel.

Minutes of meetings on 10 May, 12 May and 14 May 2010

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

That the minutes of the meetings of 10 May, 12 May and 14 May be confirmed.

Transcript of public hearing 14 May

Resolved, on the motion of Mr Piper, seconded by Mr J Williams:

That the committee agrees to the publication of the hearing transcript of 14 May 2010 once witnesses have had the opportunity to make corrections.

Questions on Notice

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

That the committee agrees to send additional questions on notice to witnesses who appeared at the public hearings on 10 May and14 May 2010.

Visit of inspection to Coleambally, Orange and Moree

The committee discussed including a visit to the Gwydir Valley region to a previously planned visit to Coleambally and Orange. The committee discussed flight options for travel between these regional centres and agreed to investigate the possibility of charter flights.

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

That as many members as wish should attend the revised visit of inspection to Coleambally, Orange and Moree on 25-27 August 2010.

Library Research Paper – Water: Regulatory Frameworks in Rural NSW

The committee noted the Library Research Paper, Water: Regulatory Frameworks in Rural NSW and that a further water research paper will be finalised shortly.

Resolved, on the motion of Mr J Williams, seconded by Mr R Williams:

That the committee write a thank you letter to the Library Research Service.

General business

The committee discussed a past visit of inspection to a property near Cumnock in November 2008.

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

That the committee write to Scott and Belinda Reynolds to request an update on their property following changes they have made to their grazing practices.

The committee discussed the effect of river dredging on water management.

The committee discussed the current federal government reforms for the Murray Darling Basin.

The committee discussed the issue of allocation of water for cultural flows. The committee agreed to review a letter to the NSW Aboriginal Land Council at its next meeting.

The committee adjourned at 11.48 am until 11.00 am on Wednesday 2 June 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 9)
11.03am, Wednesday 2 June 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
The Hon Tanya Gadiel MP — Mr Martin MP
Mr J Williams MP — Mr R Williams MP

Apologies
Apologies were received from Mr Piper.

Minutes of meeting on 19 May 2010
Resolved, on the motion of Mr J Williams, seconded by Mr R Williams:
That the minutes of the meeting of 19 May 2010 be confirmed.

Submission to the sustainable water management inquiry
Resolved, on the motion of Ms Gadiel, seconded by Mr R Williams:
That the committee accept the submission and publish it on the committee's website.

Public hearing of 10 May 2010
Resolved, on the motion of Mr J Williams, seconded by Ms Gadiel:
That the committee notes and agrees to the publication on its website of the response to question on notice from Mr Ian Cohen MLC.

Public hearing of 14 May 2010
The committee noted the publication "The Answers to Global Warming Scepticism" provided by John Asquith of the Nature Conservation Foundation as per an undertaking from the public hearing on 14 May 2010.

Letter to the Aboriginal Land Council of NSW regarding cultural flows
Resolved, on the motion of Mr R Williams, seconded by Ms Gadiel:
That the committee agrees to send the letter to the Aboriginal Land Council of NSW.

Library Research Paper – Murray Darling Basin
The committee noted the Murray Darling Basin Water Management briefing paper from the library research service.

15th Annual Conference of Public Works and Environment Committees
Resolved, on the motion of Mr R. Williams, seconded by Ms Gadiel:
That those members who wish to attend the 15th Annual Conference of Public Works and Environment Committees in Canberra on 7-9 July 2010 contact the secretariat.

General business
The committee discussed the upcoming draft recommendations of the Murray Darling Basin Plan.

The committee discussed the visits of inspection to the Ord River and Perth on the 20-23 July and to Coleambally, Orange and Moree on 25-27 August.

The committee discussed the issue of carbon costs and benefits of renewable and alternative energy sources.

The committee adjourned at 11.25 am until 11.00 am on Wednesday 9 June 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 10)
11.00 am, Wednesday 9 June 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
The Hon Tanya Gadiel MP — Mr Martin MP
Mr J Williams MP — Mr R Williams MP

Apologies
Apologies were received from Mr Piper.

Minutes of meeting on 2 June 2010
Resolved, on the motion of Mr Martin, seconded by Ms Gadiel:
That the minutes of the meeting of 2 June 2010 be confirmed.

General business
The Chair updated the committee on the proposed visits of inspection.

The committee adjourned at 11.10 am until 11.00 am on Wednesday 1 September 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 11)
11.03 am, Wednesday 1 September 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
The Hon Tanya Gadiel MP — Mr Martin MP
Mr Piper MP — Mr J Williams MP
Mr R Williams MP

Minutes of meeting on 9 June 2010
Resolved, on the motion of Mr Martin, seconded by Mr J Williams:
That the minutes of the meeting of 9 June 2010 be confirmed.

Public hearing of 10 May 2010

Resolved, on the motion of Mr J Williams, seconded by Mr Piper:

> That the committee notes and agrees to the publication on its website of the responses to questions on notice from the Office of Water and the New South Wales Minerals Council.

Public hearing of 14 May 2010

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

> That the committee notes and agrees to the publication on its website of the responses to questions on notice from the Environmental Defender's Office.

Visit of inspection to the Ord River and Perth

The committee discussed a recent visit of inspection by a delegation of the committee to the Ord River and Perth and noted that lessons from the visit would be included in the committee's report on the sustainable water management inquiry. The Chair thanked the secretariat for their efforts in organising the visit.

Resolved, on the motion of Ms Gadiel, seconded by Mr R Williams:

> That the committee notes that report on the visit of inspection to the Ord River and Perth on 20-23 July 2010.

The committee adjourned at 11.32 am until 11.00 am on Wednesday 22 September 2010.

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

11.04 am, Wednesday 22 September 2010
Room 1043, Parliament House

Members present

Mr Brown MP (Chair)
The Hon Tanya Gadiel MP Mr Piper MP

Apologies

Apologies were received from Mr Martin, Mr J Williams and Mr R Williams.

Minutes of meeting on 1 September 2010

Resolved, on the motion of Mr Piper, seconded by Ms Gadiel:

> That the minutes of the meeting of 1 September 2010 be confirmed.

Visit of inspection to Coleambally and Orange

Resolved, on the motion of Ms Gadiel, seconded by Mr Piper:

> That the committee notes the report on the visit of inspection to Coleambally and Orange on 25-26 August 2010.

Cost comparison of energy resources

The committee noted excerpts from the CSIRO report The Heat is On: The Future of Energy in Australia.

The committee considered it would be beneficial to send an electronic copy of the excerpts to all members.

Briefing from Department of Environment, Climate Change and Water
The Chair informed the committee that due to circumstances beyond his control Mr Albertson, Senior Conservation Officer and Gwydir Environmental Water Manager, Department of Environment, Climate Change and Water, was no longer able to brief the committee.

The committee requested that Mr Albertson's briefing either be rescheduled or that a copy of the material Mr Albertson was due to present be forwarded to the committee.

General business
Mr Piper inquired about the timetable for the committee's current inquiry into sustainable water management. The Chair confirmed that the committee intends to table the report before the end of this year.

The committee adjourned at 11.08 am until 11.00 am on Wednesday 20 October 2010.

Minutes of proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 13)
11.05 am, Wednesday 20 October 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
The Hon Tanya Gadiel MP Mr Martin MP
Mr J Williams MP

Apologies
Apologies were received from Mr Piper and Mr R Williams.

Proposed visit of inspection to Brisbane
The committee discussed the possibility of undertaking a visit of inspection to Brisbane to meet with representatives from the Queensland Department of Environment and Resource Management.

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

> That as many members as wished should undertake an overnight visit of inspection to Brisbane to meet with representatives from the Queensland Department of Environment and Resource Management at a date to be determined in November 2010.

Briefing from Department of Environment, Climate Change and Water
Mr Albertson, Senior Conservation Officer and Gwydir Environmental Water Manager from the Department of Environment, Climate Change and Water provided a briefing to the committee on the River Environmental Restoration Projects of the Gwydir Floodplain.

Minutes of meeting on 22 September 2010
Resolved, on the motion of Ms Gadiel:
That the minutes of the meeting of 22 September 2010 be confirmed.

The committee adjourned at 11.41 am until 11.00 am on Wednesday 27 October 2010.

Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 14)
11.03 am, Wednesday 10 November 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
Mr Piper MP
Mr J Williams MP

Apologies
Apologies were received from the Hon Tanya Gadiel, Mr Martin and Mr R Williams.

Minutes of meeting on 20 October 2010
Resolved, on the motion of Mr J Williams:
That the minutes of the meeting of 20 October 2010 be confirmed.

Briefing from Department of Environment, Climate Change and Water
The committee noted the copies of PowerPoint slides provided by Mr Daryl Albertson, Senior Conservation Officer and Gwydir Environmental Water Manager for Department of Environment, Climate Change and Water from his briefing to the committee's last meeting.

General business
The committee discussed the timeline for the completion and consideration of the draft report on the sustainable water management inquiry.

The committee adjourned at 11.04 am until 11.00 am on Wednesday 24 November 2010.

DRAFT Minutes of Proceedings of the Standing Committee on Natural Resource Management (Climate Change) (No. 15)
11.04 am, Wednesday 24 November 2010
Room 1043, Parliament House

Members present
Mr Brown MP (Chair)
The Hon Tanya Gadiel MP
Mr Martin, MP
Mr Piper MP
Mr J Williams MP
Mr R Williams MP

Minutes of meeting held on 10 November 2010
Resolved, on the motion of Mr Piper, seconded Mr J Williams:
That the minutes of the meeting of 10 November 2010 be confirmed.

Consideration of Chair's draft report on the sustainable water management inquiry
The Chair opened discussion on the draft report entitled: *Sustainably managing water under climate change*

Paragraphs 1.7 & 1.8
Mr R Williams raised concerns over the committee's decision not to consider the Murray-Darling Basin Plan throughout the draft report given the considerable impact it will have on water management in New South Wales.

Discussion ensued. The committee agreed that as the development of the Murray-Darling Basin Plan is a Commonwealth Government responsibility and is outside the scope of the report.

Paragraph 2.8
Mr R Williams proposed to delete the last sentence in paragraph 2.8 – 'However, it is based on the understanding that climate change risks irreversible and potentially catastrophic effects on the global environment.'

Discussion ensued. The Committee agreed to delete the last sentence in paragraph 2.8.

Paragraph 2.11
Mr R Williams considered reference should be made to the contributions made by inquiry participants rather than relying only on the studies conducted by the CSIRO and the New South Wales Government.

The Chair spoke to Mr R Williams' concern noting that the contributions of inquiry participants are adequately incorporated throughout the draft report and that the CSIRO and New South Wales Government were appropriate sources of scientific research on climate change impacts.

Paragraph 2.18
Mr R Williams raised concern over the use of the word 'expected' in the phrases 'New South Wales is expected to become hotter…' and '...minimum temperatures are expected across New South Wales'.

The Chair spoke to Mr R Williams' concern noting that the wording of the paragraph reflects the content in a submission received to the inquiry and is referenced accordingly.

Paragraph 2.24
Mr R Williams raised concern over the use of the words 'likely' and 'expected' in the first sentence.

The Chair spoke to Mr R Williams' concern noting that the wording of the paragraph reflects the content in a submission received to the inquiry and is referenced accordingly.

Paragraph 2.45
Mr R Williams raised concern over the use of the word 'expected' in the first sentence.

The Chair spoke to Mr R Williams' concern noting that the wording of the paragraph reflects the content of a report conducted by the CSIRO and is referenced accordingly.

Chapter Three
Mr R Williams commented that issues surrounding the development and management of dams across the state was not referred to in Chapter Three.

The Chair spoke to Mr R Williams' concern noting that the committee agreed at its 21 April 2010 meeting on a draft structure of the report which reflected the focus on sustainable water management in rural and regional areas and which did not include the issue of water storage. Further, Chapter Three contains a summary of legislative provisions and concepts as a background to the issues raised by inquiry participants in Chapter Four of the draft report.

Recommendation 1
Mr R Williams suggested that Recommendation 1 be amended to ensure that further studies on groundwater and surface water systems include any social and economic impacts.

Discussion ensued. The committee agreed that the social and economic implications of water management were adequately covered in other areas of the draft report.

Recommendation 3
Mr R Williams considered that Recommendation 3 should be strengthened to adequately reflect the concerns raised by inquiry participants.

Discussion ensued. The committee agreed that the existing wording of adequately reflected the concerns raised by inquiry participants. Additionally, the committee noted that Recommendation 3 does not contain an exhaustive list of measures, rather the minimum action required to address the concerns of inquiry participants.

Recommendation 4
Mr R Williams considered that Recommendation 4 should be strengthened to adequately reflect the concerns raised by inquiry participants.

The Chair spoke to Mr R Williams' concern and considered that Recommendation 4 sufficiently reflects the concerns raised by inquiry participants.

Paragraph 5.24
Mr R Williams considered that reference should be made to the ongoing social and economic benefits of agricultural production to rural and regional communities.

Discussion ensued. The committee agreed that paragraph 5.26 adequately addresses the concerns raised.

Resolved, on the motion of Mr Piper, seconded Mr J Williams:
That the committee agree to the Chair tabling the report, as amended, in the House, subject to typographical corrections and formatting by the secretariat.

General business

There being no outstanding committee business, the committee agreed not to hold the meeting previously scheduled to be held on Wednesday 1 December 2010.

The committee adjourned at 11.54 am.