STANDING COMMITTEE ON NATURAL RESOURCE MANAGEMENT
(CLIMATE CHANGE)
SUSTAINABLE WATER MANAGEMENT INQUIRY
NSW GOVERNMENT SUBMISSION

OVERVIEW

The NSW Government is a leading proponent of sustainable water management in the face of a changing climate, and is investing significant resources to develop water policies that reflect the needs of the community, industry and the environment and are adaptive to climate variability. The Government's approach to water planning and management is multi-faceted and encompasses a broad range of measures to ensure the security and sustainability of the State's water supply. In particular, the establishment of the environment as a recognised 'user' of water underlines the Government's commitment to restoring aquatic ecosystems. At the same time, however, the Government recognises the need for an equitable balance between the water allocated to the environment and the water available for community, irrigation and industrial purposes. Establishing and preserving this balance is crucial to maintaining sustainable water resources in the long term.

The NSW Government's key achievements include:

- The development of Water Sharing Plans under the *Water Management Act 2000*, which establish rules for sharing water in rivers or groundwater systems between the environment and other users (towns, rural domestic properties, stock watering, industry and irrigation). Since 2000, 45 Water Sharing Plans, covering 90 per cent of water extractions in NSW, have been completed.
- The development of an adaptive Metropolitan Water Plan (MWP), capable of responding to drought, climate change and Sydney's increasing population. The MWP outlines an integrated strategy to secure the city's water needs, including water recycling, desalination and conservation measures. An updated version of the Plan will be released later this year.
- The recovery of environmental water for stressed rivers and wetlands, under purchase programs such as NSW Riverbank, Water for Rivers and The Living Murray initiative.
- The development of water management and use guidelines to take account of the potential effects of climate change and water shortages, including an update of the NSW Best-Practice Management of Water Supply and Sewerage Guidelines based on the results of a pilot study on eleven regional urban water supplies.
- Continuing research into infrastructure improvements to increase on-farm efficiency and reduce wastage, such as the Sustaining the Basin: Border Rivers – Gwydir irrigation modernisation initiative.
- The provision of financial incentives under the NSW Climate Change Fund to promote water conservation and recycling initiatives, such as the Home Saver Rebates, the Green Business Program, the Public Facilities Program, the Rainwater Tanks in Schools Program and the Central Coast Water Savings Fund. Over $83 million has been allocated to 180 water conservation and recycling projects, as well as household rebates to save more than 16 billion litres of water a year and $50 million in annual water bills.

In addition to these initiatives, the NSW Government is committed to national water reforms, most notably the process underway in the Murray Darling Basin to implement Basin-wide planning and management of water resources. The NSW Government will continue to engage constructively with the Australian Government on the Basin Plan, which is due to commence in 2011.

The NSW Government submission considers the Standing Committee's Terms of Reference in two parts. The first part, 'Climate Change and Water Availability in NSW' deals with Term of Reference (a) – *the likely impact of climate change on the availability of water resources under different climate scenarios*. The second part, 'Approaches to Water Management and Conservation' deals with Terms of Reference (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.*

Part 1: Climate Change and Water Availability in NSW

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.

In 2007 the Intergovernmental Panel on Climate Change (IPCC) published its Fourth Assessment Report, based on all current published scientific material. The IPCC's key findings include:

- Warming of the climate is unequivocal, demonstrated by increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea levels.
- It is 'very likely' (defined as >90 per cent probability of occurrence) that most of the observed increases in global average temperatures since the mid-20th century are due to the observed increased greenhouse gas concentrations resulting from human-induced (anthropogenic) emissions.
- Even if greenhouse gas concentrations were to be stabilised, anthropogenic warming and sea level rise will continue for centuries, due to the time lags associated with climate processes.[1]

Australia's water resources are particularly vulnerable to climate change as Australia is the driest permanently inhabited continent on Earth. Natural variations in temperature and rainfall in NSW are influenced by a number of climate systems in eastern Australia, including the El Niño – Southern Oscillation (ENSO), Southern Annular Mode and Indian Ocean Dipole. 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.

NSW's Changing Climate

To better understand what the impacts of climate change signify for the state, the NSW Government, in partnership with the Climate Change Research Centre at the University of NSW, has developed regional climate projections for NSW.[2] This work has used the same sources as were used in 2007 by CSIRO and the Australian Bureau of Meteorology[3], but the data was processed using innovative methods published in the international literature. These projections have been used to assess the likely impacts of the future climate changes NSW may face by 2050.

The projections show that based on current trends, average annual temperature in NSW has been increasing at an accelerating rate since the mid-1990s (see Figure 1

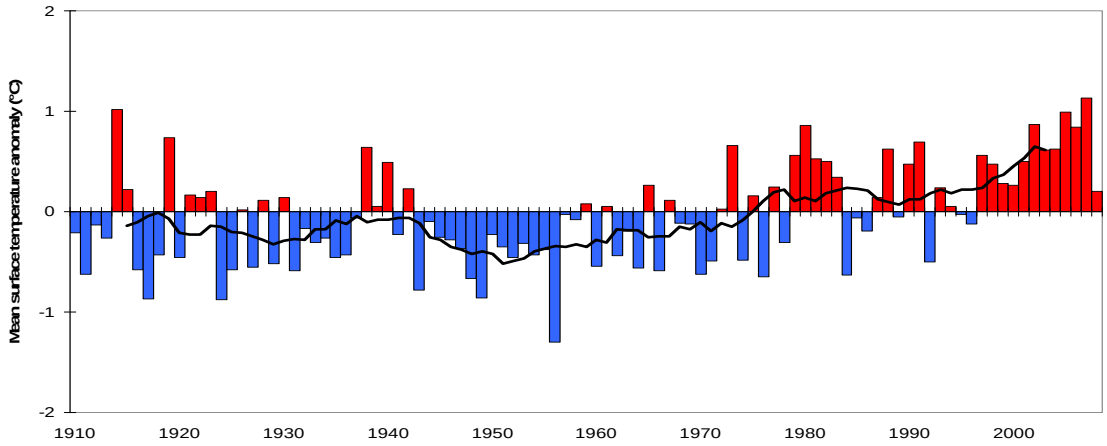
[1] IPCC 2007, *Climate Change 2007: The physical science basis*, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K., Tignor, M. & Miller, H. (eds) Cambridge University Press, Cambridge UK and New York, NY. [www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm

[2] DECCW in prep., NSW Climate Impact Profile: The impacts of climate change on the biophysical environment of New South Wales, Department of Environment, Climate Change and Water, Sydney.

[3] CSIRO & BoM 2007, *Climate Change in Australia*, CSIRO, Bureau of Meteorology and the Australian Greenhouse Office in partnership with the Australian Climate Change Science Program, Canberra [www.climatechangeinaustralia.gov.au/technical_report.php].

below). 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.[4] 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 per cent probability) the result of increased greenhouse gas emissions from human activities.[5]

Figure 1: NSW annual mean surface temperature anomaly, 1910–2008



Source: BoM 2008b
Notes: Zero on this figure is the 1961–90 NSW temperature average. The line represents the 11-year moving average of the measurements.

The latest IPCC report states that later in this century the climate is 'virtually certain' (>99 per cent probability) to be warmer than at present.[6] CSIRO projections indicate that by 2030 average temperatures in Australia will rise by about 1°C from the current average, with average summer temperatures likely to be at least 3°C warmer by 2070.[7] It is expected that NSW will become hotter, with an increase in maximum and minimum temperatures 'very likely' in all seasons. The north and west of the state are generally expected to see the greatest increases in maximum temperatures. By 2050, winter and spring annual maximum temperatures are expected to rise by around 2–3°C across much of northern NSW.[8]

Extreme weather events, such as heat waves and droughts, are projected to become more frequent.[9] In lower parts of the coastal floodplains, the combination of rises in sea levels and catchment-driven flooding is 'likely' (>66 per cent probability) to increase the height, extent and frequency of floods. Sea level rise is also 'likely' to exacerbate the erosive effect of storms.[10]

[4] DECCW in prep.
[5] CSIRO & BoM 2007.
[6] IPCC 2007.
[7] CSIRO & BoM 2007.
[8] DECCW in prep.
[9] CSIRO & BoM 2007.
[10] DECCW in prep..

Increases in temperature and evaporation will 'more likely than not' (>50 per cent probability) lead to increased fire frequency across NSW towards the year 2050. The frequency of days of very high or extreme fire risk is projected to increase by 10–50 per cent in that period.[11]

NSW Government's Response to Climate Change
Since the Commonwealth Government's ratification of the Kyoto protocol, NSW has been working constructively through the Council of Australian Governments (COAG), the major intergovernmental forum in Australia, to progress a number of important reforms, including a national emissions trading scheme and a mandatory renewable energy target. The NSW Government is also developing the Climate Change Action Plan, which will define its future role in light of the Australian Government's commitments to greenhouse gas emission reduction and the availability of more specific scientific information.

In addition to the approach to water management outlined in the following sections of this submission, the NSW Government has responded to the challenges posed by climate change through:

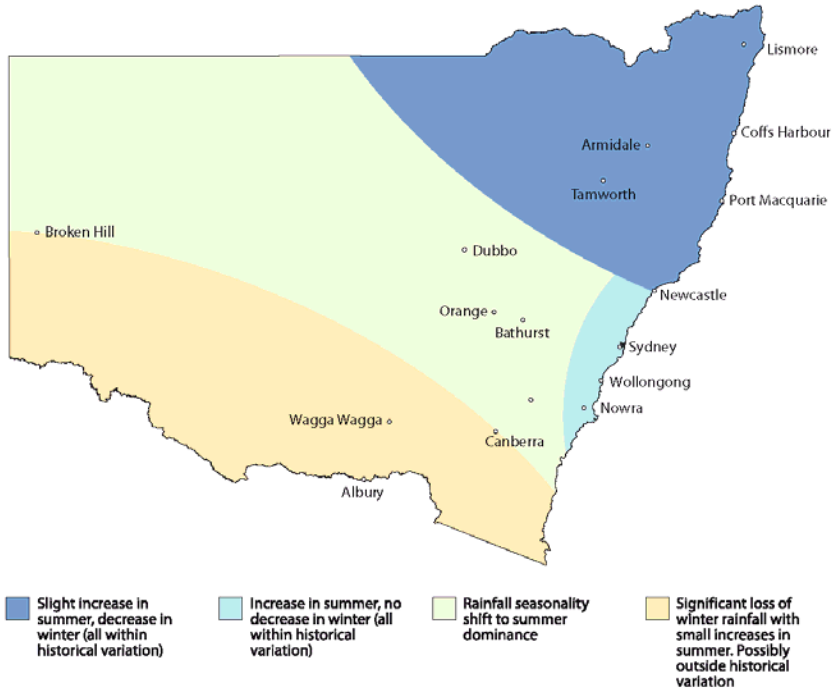
- The NSW State Plan, which aims to shape the State's future and identify priorities for the Public Sector and includes specific targets for NSW Government activity. Under the Environment for Living priority area the government committed to a return to year 2000 greenhouse gas emission levels by 2025 and a 60 per cent cut in greenhouse emissions by 2050.
- Establishing a Climate Change Fund in July 2007, incorporating an expanded Water and Energy Savings Fund, the Climate Action Grant Program and some funding from the Environmental Trust. The fund will total $340 million over five years and provide financial support for communities, schools and business.
- The $150-million NSW Energy Efficiency Strategy, which contains a range of measures to assist families and businesses save money and help the environment by reducing the growth in energy use and the state's greenhouse gas emissions
- Releasing a sea level rise policy to support consistent consideration of sea level rise in land-use planning and coastal investment decision-making, which includes sea level planning benchmarks for a rise relative to 1990 mean sea levels of 40 cm by 2050 and 90 cm by 2100.

Further information on these initiatives can be found on DECCW's website at http://www.environment.nsw.gov.au/climatechange/government.htm, and in the 2009 State of the Environment Report at http://www.environment.nsw.gov.au/soe/soe2009/chapter2/.

Climate Change and Water Availability
Until 2050, north-eastern NSW is likely to experience a slight increase in rainfall during summer while the south-western regions are likely to experience a significant decrease in winter rainfall. [12] Many parts of the state will experience a shift from winter-dominated to summer-dominated rainfall.

[11] DECCW in prep.
[12] DECCW in prep.

Figure 2: Projected changes in rainfall to 2050 (Source: DECCW in prep)



It has been observed in water catchments throughout Australia that decreased rainfall results in an even larger proportional decline in inflows to the water supply system, and the relative proportion of inflow decline rises as drier conditions persist.[13] The median or best estimate of the likely trend between 1990 and 2050 in mean annual runoff for the whole of NSW (and the Australian Capital Territory) is a 5 per cent decrease. Runoff is projected to decrease in the south and increase in the north-west.[14]

While the above projections are the best currently available, it is important to note that significant uncertainties remain for projections of rainfall along and to the east of the Great Dividing Range. The climatology of this region does not correlate well with any of the large scale climate drivers and is an area poorly resolved by the global climate models. To improve projections and reduce the uncertainty for this region, the NSW Government is investing and participating in research that will help address the existing knowledge gap. Examples include the *Murray Darling Basin South Eastern Australian Climate Initiative* (see http://www2.mdbc.gov.au/subs/seaci/about.html) and *Climate Change and its impacts on water supply and demand in Sydney*, a collaborative study investigating the potential impacts of climate variability on Sydney's predominantly rain-fed water supply system.

In addition to changes in rainfall patterns, evaporation is expected to increase significantly across much of the state by 2050 as a result of projected higher temperatures. Summer evaporation is 'likely' (>66 per cent probability) to increase across the state, particularly in central areas of NSW. The potential increases in evaporation are 'likely' to offset the expected increases in summer rainfall, with drier soil conditions expected across the west. The projected drying of the autumn, winter

[13] CSIRO & BoM 2007.
[14] DECCW in prep.

and spring seasons in the south and south-west is expected to be outside the variability observed in historical records.[15]

The greatest impacts in NSW associated with changes in water availability are likely to be seen in the Murray–Darling Basin (MDB). In 2008, the CSIRO released a major report on the projected sustainable yields of surface and groundwater systems in the MDB to 2030 under four climate scenarios. The CSIRO's key findings include:

- The median decline to 2030 for the entire MDB is 11 per cent – 9 per cent in the north of the MDB and 13 per cent in the south of the MDB.
- A decline in the south of the MDB is more likely than in the north. In the south of the MDB, a very substantial decline is possible. In the north of the MDB, significant increases are possible.
- The median water availability decline would reduce total surface water use by 4 percent under current water sharing arrangements but would further reduce flow at the Murray mouth by 24 per cent to be 30 per cent of the total without-development outflow. In volumetric terms, the majority of the impact of climate change would be borne by the environment rather than by consumptive water users.
- The relative impact of climate change on surface water use would be much greater in dry years.
- Under the median 2030 climate scenario, diversions in driest years would fall by more than 10 per cent in most New South Wales regions, around 20 per cent in the Murrumbidgee and Murray regions
- Under the dry extreme 2030 climate, diversions in driest years would fall by over 20 per cent in the Condamine- Balonne, around 30 to 50 percent in most New South Wales regions and over 70 per cent in the Murray[16].

With the increased temperatures projected due to climate change, the associated reduction in snow cover will have impacts not only on the ecology of the alpine zone but also on the seasonality and quantity of flow of water into the Murray River. Declining rainfall in the MDB is also leading to a decline in water quality, which poses a threat to the communities which rely on the system for drinking water and a threat to irrigation. The working group for the Prime Minister's Science, Engineering and Innovation Council has estimated that there is a 50 per cent chance that by 2020 the Murray-Darling system will reach a salinity level which exceeds the desirable limits for drinking water and irrigation.[17]

[15] DECCW in prep.

[16] CSIRO 2008, *Water Availability in the Murray–Darling: Summary of a report from CSIRO to the Australian Government*, CSIRO, Canberra [www.csiro.au/resources/WaterAvailabilityInMurray-DarlingBasinSummaryMDBSY.html]

[17] PMSEIC Working Group 2007, *Climate Change in Australia: Regional impacts and adaptation*, Prime Minister's Science, Engineering and Innovation Council, Canberra [www.dest.gov.au/sectors/science_innovation/publications_resources/profiles/climate_change_in_australia.htm]

Part 2: Approaches to Water Management and Conservation

WATER SHARING PLANS

In December 2000 the *Water Management Act 2000* was passed by the NSW Parliament. The main tool the Act provides for managing the State's water resources are statutory water management plans which can cover matters such as water sharing, water use, drainage management, floodplain management and environmental protection. In addition, the Act requires water management to be responsive to improvements in understanding of water requirements. As a result, the planning and management system for water in NSW is well suited to managing climate variability including climate change. Since 2000, 45 Water Sharing Plans, covering 90 per cent of water extractions in NSW, have been completed.

The general principles of the *Water Management Act* are as follows:

(a) water sources, floodplains and dependent ecosystems (including groundwater and wetlands) should be protected and restored and, where possible, land should not be degraded, and

(b) habitats, animals and plants that benefit from water or are potentially affected by managed activities should be protected and (in the case of habitats) restored, and

(c) the water quality of all water sources should be protected and, wherever possible, enhanced, and

(d) the cumulative impacts of water management licences and approvals and other activities on water sources and their dependent ecosystems, should be considered and minimised, and

(e) geographical and other features of indigenous significance should be protected, and

(f) geographical and other features of major cultural, heritage or spiritual significance should be protected, and

(g) the social and economic benefits to the community should be maximised, and

(h) the principles of adaptive management should be applied, which should be responsive to monitoring and improvements in understanding of ecological water requirements.

The principles in relation to water sharing are as follows:

(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).

To date the focus has been on developing water sharing plans which establish rules for sharing water between the environmental needs of the river or aquifer and water users, and also between different types of water users such as town supply, rural domestic supply, stock watering, industry and irrigation.

Plans can be prepared as either an individual plan covering a specific river or groundwater system or a macro plan covering a number of rivers or groundwater systems. The major elements of a water sharing plan include rules that:

- provide water for the environment by protecting a proportion of the water available for fundamental ecosystem health and/or including specific environmental rules – this is called planned environmental water;
- allow water access licences to be committed for environmental purposes - this is called adaptive environmental water which can arise from water recovery projects or by buying water licences;
- protect the water required to meet basic landholder rights;
- set annual limits on water extractions to ensure that water extractions do not increase and therefore erode the water for the environment and also the security of supply to water users – in inland river systems this limit must be equal to or less than the limit on extractions imposed under the Murray Darling Basin cap;
- determine what type of additional licences can be granted e.g. local water utility access licences (for town water supplies) and Aboriginal cultural access licences;
- determine how water is to be shared among the different types of licensed users by setting the priorities of access or supply e.g. in dry periods water for domestic purposes has priority over commercial uses;
- provide flexibility for licence holders in the way they can manage their water accounts through aspects such as the ability to carry-over some unused account water;
- in groundwater plans, minimise impacts on other groundwater users, dependent ecosystems, water quality and the stability of the aquifer;
- specify the rules for water trading (or water dealings); and
- set out the mandatory conditions that apply to licence holders.

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.

ENVIRONMENTAL WATER

Healthy rivers and wetlands are vital to sustain biodiversity, protect water quality and support human uses of water as diverse as recreation, town water supply and irrigation. However, the health of NSW aquatic ecosystems, particularly inland systems, is in decline. In addition to the pressures on water availability due to climate change outlined above, about 97 per cent of river lengths in NSW have been substantially modified by such changes as the removal of riverine vegetation, the regulation of river flows, sedimentation from erosion of land and riverbanks, and the introduction of exotic species.[18] Iconic wetlands, including the Ramsar-listed areas within the Macquarie Marshes, Gwydir Wetlands and Narran Lakes systems, have declined in extent and health but are benefiting from targeted environmental water purchases.[19]

Environmental water recovery and management are critical for arresting this decline and protecting and restoring environmental assets and ecosystems. For more than a decade the NSW Government has led efforts to secure water for the environment through planning mechanisms, water purchase, and water-efficient infrastructure.

[18] DECCW, 2009.
[19] DECCW, 2009.

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. Current measures include:

1. Allocating water through Water Sharing Plans
Environmental flow rules, implemented through the NSW water sharing plans for each river valley, enable the equitable sharing of available water between users, while also providing water for environmental needs. Over the long term, the plans for regulated rivers will return on average an additional 220,000 ML of water per year to the environment, over and above the requirement under the Murray–Darling Basin cap.

Although environmental flow rules have been introduced, it may take some time before aquatic ecosystems receiving environmental water show signs of recovery. 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.

Water sharing plans have been suspended in the Lachlan since the plan commenced in 2004, the Murray and Murrumbidgee since September 2006, the Macquarie–Cudgegong since July 2007 and the Hunter Regulated Water Source since 2006. During 2009 conditions have eased in some river valleys and the Hunter plan has now been reactivated.

2. Environmental Water Recovery
Environmental water recovery through the purchase of water access licences is a significant element of the NSW Government's commitment to rehabilitation and protection of stressed rivers and iconic wetlands. DECCW purchases water access licences on behalf of the NSW Government and uses and manages them for improved environmental and cultural benefits. The Government retains ownership of the acquired licences. Together NSW and the Commonwealth Environmental Water Holder have already recovered approximately 15 per cent of entitlements in the Gwydir, Macquarie and Lachlan valleys.

In 2005, the NSW Government announced *NSW RiverBank*, a $101.5 million program to buy water for NSW's most stressed and valued inland rivers and wetlands. RiverBank was the first program dedicated to the purchase of environmental water entitlements in Australia and remains the largest dedicated fund for environmental water purchase at the state level.

The NSW and Australian Governments agreed to fund the $181 million *Rivers Environmental Restoration Program* (RERP) (NSW RiverBank funding plus approximately $80 million Commonwealth funding). Of Commonwealth RERP funding, $46 million was devoted to water purchase, $8 million to wetland research and management tools, $10 million to environmental water management infrastructure, $15 million to purchase key wetlands and improve management of wetlands for environmental and cultural objectives, and $1 million to program management and implementation.

RiverBank prioritises its acquisition of water assets based on the conservation and cultural significance of rivers and wetlands, the water supply risks currently posed to

those values and other factors such as the potential for developing strategic alliances with other stakeholders and building on the outcomes of other initiatives. The environmental assets targeted by RiverBank are in the Gwydir Wetlands and Macquarie Marshes, both of which include Ramsar sites, the Lachlan valley, and wetlands on the Lowbidgee floodplain, principally in Yanga National Park.

As of January 2010, 109,509 ML of entitlement has been purchased through RiverBank, including approximately 19,177 ML in the Murrumbidgee, 24,575 ML in the Lachlan, 48,255 ML in the Macquarie and 17,533 ML in the Gwydir regulated river valleys. RiverBank/RERP water recovery targets in the Gwydir and Lachlan have been met and targets are expected to be met in the Murrumbidgee and Macquarie by 2010-11.

The NSW Government has also been a key partner in recovering water in partnership with other jurisdictions. In 2003, the Murray-Darling Basin Ministerial Council announced *The Living Murray* Initiative (TLM). TLM is a Commonwealth-Basin State partnership to return up to 500,000 ML to improve the environmental health of six icon sites in the southern Murray-Darling Basin. NSW has committed $115 million to a total $700 million TLM water recovery budget. The NSW environmental assets targeted by TLM are the Millewa Forest, the Koondrook-Pericoota Forests, the NSW portion of the Chowilla Floodplain, and the Murray River channel. As of January 2010, approximately 216,582 ML of water entitlement has been recovered for TLM by NSW including 47,800 ML in the Lower Darling from the $54 million Darling Anabranch Pipeline project. It is expected that further water recovery measures to be listed in 2010 will bring the total to approximately 220,000 ML.

In addition to the RiverBank and RERP, *Water for Rivers* was established by the NSW, Victorian and Commonwealth governments in 2002 to acquire water for the Snowy and Murray Rivers to enable additional environmental flows of 212,000 ML and 70,000 ML respectively by June 2012. In addition to investigating, funding and commissioning water efficiency projects, Water for Rivers purchases water entitlements from willing sellers in the Murray River upstream of the South Australian border, the Murrumbidgee River system, and the Goulburn River system. See http://www.waterforrivers.org.au/ for more details.

3. Environmental Works and measures

Due to the on-going drought, NSW's and the Commonwealth's environmental water licences, along with environmental water allocations under Water Sharing Plans and other licence holders, have received very low allocations in recent years. Environmental works and measures are an important mechanism for maximising the use of any available environmental water.

Part of The Living Murray Initiative, the *Environmental Works and Measures Program (EWMP)* is a package of structural and operational measures primarily targeted at the six icon sites, designed to complement the First Step Decision and maximise environmental flow benefits. This program began in 2003 with $150 million in funding and was supplemented with an additional Commonwealth investment announced in 2006 to bring the budget to approximately $275 million. NSW's EWMP projects include works to enhance the capacity to deliver water within the Koondrook-Pericoota and Millewa Forests, and fishways within the Murray River. Due to the delivery times for the large infrastructure projects under the EWMP, the program will continue to 2013/14.

The NSW Rivers Environmental Restoration Program is investing $10 million in improving environmental management infrastructure. Key achievements to date include the completion of significant infrastructure projects on Yanga National Park (Lowbidgee), the construction of regulators on Muggabar and Merrimajeel Creeks (Lachlan River), and the commencement of the Marebone Weir fishway (Macquarie River – to be completed June 2010).

In addition, the $26.8 million *Wetland Recovery Program* has funded research and management tools, wetland management plans, infrastructure projects to recover water and improve environmental water management and weed control and grazing projects to improve the health of the Gwydir Wetlands and Macquarie Marshes.

Government-funded infrastructure efficiency projects are another way the NSW Government is securing water for the environment. Adaptive environmental licences are also being created through water savings from infrastructure efficiency projects through The Living Murray Initiative and Water for Rivers projects. For example, 47,800 ML per year of water has been saved and committed as an adaptive environmental licence through the initiative's Darling Anabranch Pipeline project (part of The Living Murray Initiative). For information of other projects under these programs can be found at: http://www.waterforrivers.org.au/projects/completed/ and http://www.mdba.gov.au/programs/tlm.

4. Better Management and use
Despite the drought, since 2007/08, more than 40,000 ML of environmental water has been delivered to the Macquarie Marshes, more than 18,000 ML to the Gwydir wetlands, more than 35,000 ML to the Lowbidgee floodplain in the Murrumbidgee valley, and nearly 45,000 ML to various wetlands in the in the Murray valley. These environmental water releases have utilised NSW Water Sharing Plan allocations as well as water recovered by RiverBank, TLM and the Commonwealth Environmental Water Holder, and in combination with naturally occurring rainfall and inflows have inundated more than 35,000 hectares of wetlands.

Many important ecological responses have occurred as a result of these watering events including:

- Important habitat for Southern Bell Frog has been sustained on the Lowbidgee floodplain through the current drought and recruitment of Southern Bell Frog and breeding of water birds has been supported, including a number of small colonies (totalling more than 400 egrets, cormorants, darters and spoonbills) active at January 2010.
- Areas of semi permanent wetland have been sustained in the northern and southern Macquarie Marshes with environmental water releases in early 2008 and spring 2009, and a small waterbird colony (2,000 egrets) was sustained in early 2008.
- Critical habitat for threatened species such as Southern Pygmy Perch and Southern Bell Frog has been sustained in private and public wetland areas on the Murray floodplain which has allowed limited recruitment of important species including Southern Bell Frog and Brolga, as well as regeneration of semi-permanent wetland vegetation and River Red Gum.

- A major colony of over 100,000 nesting pairs of ibis was sustained through the purchase of 10,000 ML of water allocation (in conjunction with the then Murray Darling Basin Commission) from a Queensland irrigator to supplement flood flows into the Narran Lakes in March 2008.

Further information on the NSW Government's management of environmental water and wetlands can be found on the DECCW website at http://www.environment.nsw.gov.au/environmentalwater/index.htm

REFORMS IN THE MURRAY DARLING BASIN

The most important current development in water reform is the involvement of the Commonwealth Government in water planning and management. Under the 2008 *Intergovernmental Agreement on Murray-Darling Basin Reform* (the IGA), Basin States agreed to a limited referral of their water management powers to the Commonwealth to implement Basin-wide water planning.

Central to the new governance arrangements was the formation of a new independent Commonwealth statutory body called the Murray-Darling Basin Authority (MDBA). In addition to taking on the functions of the former Murray-Darling Basin Commission, the MDBA is preparing a Basin Plan which will identify the amount of water to be received by environmental assets, as well as establishing Sustainable Diversion Limits (SDLs) for each catchment within the Basin. The draft Basin Plan will be released for public consultation in mid-2010 and the Plan will commence in 2011. The NSW Government will continue to strongly encourage the MDBA to consult extensively and meaningfully on the preparation of the Basin Plan.

Under the IGA the States also agreed to assist with the Commonwealth's $12.9 billion Water for the Future initiative, which includes the following programs:

- Restoring the Balance Program ($3.1 billion), under which water entitlements to be managed for the environment are purchased to assist the transition to lower extraction limits for remaining licence holders.
- Sustainable Rural Water Use and Infrastructure Program ($5.8 billion), which funds projects that return water to the environment through water savings. Under this program, NSW has reached an in-principle agreement for $708 million to fund five water saving projects; and $650 million for private irrigators water efficiency projects.

The Commonwealth *Water Act 2007* establishes the Commonwealth Environmental Water Holder (CEWH) to manage the water entitlements that the Commonwealth is currently acquiring through Water for the Future program. At December 2009, more than 344,000 ML of entitlements of various types had been recovered in NSW under the Commonwealth Restoring the Balance program, representing more than 70% of Restoring the Balance purchases within all of the Murray-Darling.

The CEWH is required to use its holdings in the MDB to protect or restore environmental assets of the Basin, so as to give effect to relevant international agreements. This water is required to be managed in accordance with the environmental watering plan (a component of the Basin Plan). A panel of scientific experts has been appointed to advise the CEWH on the use of environmental water. DECCW has a Memorandum of Understanding with the Commonwealth Environmental Water Holder to maximise the cooperative management of environmental water held by both governments.

THE METROPOLITAN WATER PLAN

The Metropolitan Water Plan (MWP), a key delivery mechanism for the State Plan, outlines the mix of measures to ensure Sydney's water needs are met in the face of drought, a changing climate and the needs of a growing population.

The MWP includes an integrated portfolio of measures to reduce demand and boost supply – including a diverse range of rainfall and non-rainfall dependent options to help secure Sydney's water needs. This integrated approach enhances our capacity to secure Sydney's water needs even in the face of uncertainty about climate change.

Measures in the MWP include:

1. Diversifying water supplies to insure against drought and climate change:

- the wind-powered desalination plant at Kurnell has begun supplying water to Sydney Water customers and is 100% offset by accredited renewable energy. The project was on time and under budget.;
- massive investment in recycling: over 25 billion litres of water is recycled each year, with over 20 major recycling projects underway. For example, the Wollongong recycling scheme currently supplies up to 20 million litres of water a day to BlueScope Steel. Construction is underway on the Replacement Flows Project which will substitute up to 18 billion litres of drinking water currently being released each year from Warragamba Dam into the Hawkesbury Nepean River with highly treated recycled water from a recycling plant at St Mary's. Recycling is targeted to reach 70 billion litres a year by 2015;
- new pumps installed to access deeper parts of Warragamba and Nepean Dams, increasing long term water availability by 40 billion litres a year; and
- extensive investigations of groundwater reserves that could boost supply over two to three years during a severe drought.

2. Reducing demand for water through the wise use of water

The Water for Life campaign is the key education initiative of the MWP. It has been successful in communicating the key elements of the MWP: dams, recycling, desalination and water efficiency - and encouraging the community to have a say in long term water planning. This initiative also seeks to encourage continued wise water use across the greater Sydney community.

Water for Life works across government and non-government sectors to support and promote a comprehensive range of water conservation and community engagement measures which will help the community and business to use water wisely, saving 24% of Sydney's water needs by 2015. As well as conserving water, such measures reduce the amount of energy required to move water and wastewater around the network, as well as the amount of energy required to heat water in homes. The combined measures include:

- More than one in four homes in Sydney have taken part in Sydney Water's WaterFix program and now use water efficient showerheads and other water saving devices.
- Nearly 500 businesses have participated in Sydney Water's Every Drop Counts Business program, saving more than 17 billion litres of water a year.
- Under BASIX, all new homes are now designed to use 40 per cent less drinking water.

- Long-term water wise rules which mandate simple, commonsense actions for outdoor water uses, such as only watering in the cooler parts of the day.
- Partnerships with councils and non-government organisations to deliver practical water education projects to community and business.
- Community input on the long-term plan for greater Sydney's water supply.
- A program of training, coordination and support that targets council, state agency and non-government organisation's water education staff in delivering best practice water education.

3. Protecting the water catchments and environmental health of rivers
The MWP also includes a range of actions to help restore and protect the rivers of the Sydney region, and their catchments. Measures include:

- new rules for the release of environmental flows from Tallowa Dam to improve the environmental health of the lower Shoalhaven River;
- major new infrastructure completed at Tallowa Dam to allow the release of variable environmental flows and the passage of fish up and down stream;
- modifications completed to Avon Dam to allow environmental water to be released into the Avon River for the first time;
- reconfiguring Cataract, Cordeaux and Nepean Dams, and the weirs downstream of them, to enable water to be released and pass down the rivers to improve their environmental health, due for implementation in mid 2010;
- the establishment of the Office of the Hawkesbury Nepean as a one-stop-shop to better coordinate management of the river system; and
- planning for future water releases from Warragamaba Dam as part of a wide suite of measures to protect the health of the Hawkesbury-Nepean River .

4. Adaptive approach
The MWP is adaptive, and is reviewed every four years to take account of emerging information and circumstances, including consideration of the best available information on climate variability and climate change for the greater Sydney region. Implementation and review of the Plan is overseen by an Independent Review Panel of eminent water experts. The Plan is currently being reviewed and an update will be released in 2010.

A key feature of an effective adaptive management approach is taking steps to improve knowledge and better inform decision making. The NSW Government is committed to improving understanding of the effects of climate change on Sydney's water supplies. To meet this commitment, a significant collaborative study to examine the impacts of climate change on water supply and demand in Sydney was completed in late 2009. The final report for this study will be published in the first half of 2010.

RURAL WATER
The NSW Government is committed to promoting efficiency and innovation in water management in the rural sector in order to adapt to climate variability. Examples of current projects and policies include:

- **On-Farm efficiencies:** the prospect of climate change has prompted significant re-thinking of how to best achieve and maintain optimum water use efficiency. The NSW *Sustaining the Basin*: *Border Rivers – Gwydir* is an irrigation

modernisation initiative funded by the Australian Government's 'Water for the Future' initiative which will provide an opportunity for local water users to upgrade irrigation infrastructure, improve productivity, adapt to reduced water availability and ensure the long-term sustainability of local communities. The Department of Industry and Investment is currently conducting a tender process to determine which irrigators will participate in the program.

- **Reasonable Use Guidelines:** the NSW Government is currently developing reasonable use guidelines for water taken by rural landholders under basic landholder rights. These guidelines will ensure that water taken for domestic and stock purposes is limited to what is necessary (or 'reasonable') and applied to the appropriate purpose.

WATER CONSERVATION AND RECYCLING

Established on 1 July 2007, the NSW Climate Change Fund provides financial incentives for water conservation and recycling under a number of programs. These include Home Saver Rebates for NSW householders to install rainwater tanks, hot water circulators, dual flush toilets and water efficient washing machines. Funding is being provided to assist businesses, government agencies, community organisations and schools to save water through the Green Business Program, Public Facilities Program, Rainwater Tanks in Schools Program and the Central Coast Water Savings Fund. Support is continuing for projects previously allocated funding under the Water Savings Fund, as well as the Water for Life Education Program and Sydney Water's Demand Management Program.

As at 30 June 2009, more than $83 million had been allocated to 180 water conservation and recycling projects as well as household rebates to save more than 16 billion litres of water a year and $40 million in annual water bills.

Water and energy savings action plans were established in 2005 under the *Energy and Utilities Administration Act 1987* and are now administered under the NSW Climate Change Fund. Savings action plans were required to be prepared by Designated Users, as gazetted in the Water and Energy Savings Orders of 28 October 2005. Savings action plans require certain high using businesses and government agencies and local councils to assess water or energy use and identify opportunities to save.

Water savings action plans are required by high users and councils in the Sydney metropolitan area, Blue Mountains, and the Illawarra. All 298 water savings action plans have been approved, identifying 2,329 cost effective actions and more than 8.2 billion litres in annual water savings. Cost effective actions identified savings in industrial/commercial and government settings, including leakage repair, optimisation of equipment and processes, improved irrigation practices, and greater use of recycled and harvested water.