CSIRO Submission 08/326

Inquiry into Water Management in the Murray-Darling Basin and the Water Amendment Bill 2008

Senate Standing Committee on Rural and Regional Affairs and Transport

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Table of Contents

Summary

CSIRO is undertaking a range of research to develop the knowledge needed to substantially improve the way Australia uses and manages water, some of which has particular relevance for the water management in the Murray-Darling Basin.

CSIRO's Murray-Darling Basin Sustainable Yields Project has provided detailed assessments of water availability in the Murray-Darling Basin under current and future scenarios.

Environmental flows

- The long-term prospects for many Ramsar sites in the Murray-Darling Basin would be poor under a continuation of current water sharing arrangements. Current arrangements protect consumptive uses from much of the impact of an overall reduction in water availability that could result from climate change. Most impact would be transferred to the environment, including important Ramsar sites and especially terminal lakes and wetlands across the Basin. Ensuring adequate environmental flows for these Ramsar sites, in the face of a likely reduction in surface water availability due to climate change, will require major reductions in the volumes of water used for consumptive purposes in the Basin, as well as major changes in the management and operation of large dams.
- Modelling indicates that in most cases existing water sharing plans in the Murray-Darling Basin would offer very little protection for the environment under long-term reductions in average surface water availability.
- The National Water Initiative (NWI) indicates that water plans should consider the risk of climate change to the size of the water resource and the implications for sharing.

Water interception

- The Murray-Darling Basin Sustainable Yields Project has assessed the likely impacts of some regulated and unregulated (i.e. unlicensed) water interception activities, including expansion of commercial forestry plantations and increases in the total capacity of small farm dams. 'Best estimate' projections of these activities indicate only very minor impacts on the total runoff reaching rivers across the Murray-Darling Basin.
- Projected expansion in commercial forestry plantations is likely to represent additional unregulated surface water use of 28 GL/year on average and new small farm dams are likely to represent an additional unregulated surface water use of 170 GL/year on average.

Climate impacts

- The Murray-Darling Basin Sustainable Yields Project has provided detailed assessments of the likely impacts of climate change by 2030 on surface water availability, and on surface water use under current water sharing arrangements.
- It found an 11 per cent decline across the Murray-Darling Basin as the median of the possible range of climate change impacts on surface water availability by 2030; a reduction of about 2500 GL/year on average. However, climate change by 2030 could reduce average surface water availability by as much as 34 per cent (around 7900 GL/year on average), or even lead to an 11 per cent increase in average surface water availability. Water availability will continue to vary greatly between years and between decades – as in the past.

Background

Murray-Darling Basin Sustainable Yields Project

Through the Water for a Healthy Country Flagship, CSIRO is researching how the Murray-Darling Basin hydrological system works. The recently completed Murray-Darling Basin Sustainable Yields Project has provided robust, Basin-wide estimates of long-term historic water availability and likely future availability in various catchments and aquifers taking into account climate change and other risks. CSIRO was contracted by the National Water Commission (NWC) to undertake the project on behalf of the Australian Government and the Murray-Darling Basin (MDB) states.

The research assesses the implications of various climate change scenarios and land use change for irrigation, the environment and the broader community across the Basin's 18 regions. The findings of this work are reported in separate reports for each of 18 regions which were progressively released throughout 2007 and 2008 and are publicly available: http://www.csiro.au/partnerships/MDBSY.html. These results are synthesised in a report for the entire Murray-Darling Basin, entitled "Water Availability in the Murray-Darling Basin" to be released by the Minister for Climate Change and Water on November 24, 2008.

Ramsar Site Investigations

CSIRO is involved in research related to water management for a number of Ramsar sites in the Basin, in particular for the Coorong and Lower Lakes, for the Chowilla floodplain and for Barmah Forest on the Murray River.

CSIRO's work on the Coorong and Lower Lakes has been associated with a larger collaborative effort involving South Australian universities supported by funding from the National Flagship Program Collaboration Fund.

CSIRO has been investigating the response of the Chowilla floodplain to groundwater management and surface water management options including a Salt Interception Scheme, an environmental regulator, weir raising, artificial watering and environmental flows.

CSIRO has been investigating the relationships between floodplain vegetation health (especially River Red Gums and invasive species) and water management (especially flooding) in the Barmah Forest with a combination of field experiments, glasshouse experiments, and system scale computer modelling linking flood inundation patterns with the spatial dynamics of vegetation health.

Interception Activities

CSIRO is leading or participating in several projects over the next two years which will improve accuracy in predicting effects of interception on water availability in the MDB.

Work funded by the Australian Government and led by consultants SKM will provide a national baseline review of groundwater and surface water interception. Intercepting activities will include farm dams, new commercial forestry plantations, change from low to high water using agriculture, flood plain harvesting, stock and domestic bores and peri-urban expansion. Current interception will be estimated, and for the Murray Darling Basin interception in 2015 and 2030 under each of the Murray-Darling Basin Sustainable Yields Project climate scenarios will be predicted.

CSIRO is leading a large collaborative project, funded by the Australian Government, to develop an integrated set of water resource management models and tools: the Australian Hydrological Modelling Initiative (AHMI). One outcome will be improved capacity to accurately predict the effects of various intercepting activities on water availability and water security at scales ranging from sub-catchment to basin-wide.

The NWC is supporting CSIRO in a project to develop nationally consistent methods to accurately assess water allocation impacts of plantations.

In collaboration with Geosciences Australia, CSIRO is developing satellite observation systems to identify water intercepting activities in the landscape and tools to estimate the water interception

associated with these activities. Specific examples include water storages such as farm dams, vegetation changes, and small-scale irrigation sourced from bores and farm dams. These estimates form part of the national water accounts and water resources assessment services that are being developed within the Bureau of Meteorology as part of the NWI. It is funded through the Water Information Research and Development Alliance between CSIRO and the Bureau of Meteorology.

Response to inquiry terms of reference

Long-term prospects for the management of Ramsar wetlands including the supply of adequate environmental flows

The water regimes for many Ramsar sites in the Basin have been greatly altered as a result of water resource development. Murray-Darling Basin Sustainable Yields reports describe the degree of change in water regimes in terms of the average maximum periods between environmentally beneficial flooding and in some cases with other flood-related metrics. A summary across the Basin is provided in the soon to be released "Water Availability in the Murray-Darling Basin" report.

These levels of water regime change appear strongly linked in many cases with major declines in ecological condition of these systems. Climate change (given current water sharing arrangements) is likely to impose additional (although smaller) changes in water regime. Details are provided in the soon to be released "Water Availability in the Murray-Darling Basin" report

For example, in the case of the Barmah Forest on the Upper Murray River, the impacts of climate change are estimated to reduce the incidence of flooding from every one to two years under natural conditions, to one in four years under the best estimates of the impacts of climate change. This compares with a flood frequency of once every three and a half years on average currently under levels of water resource development and the historical climate.

For the Chowilla Floodplain on the Lower Murray River, the impacts of climate change could be very large, with flooding reduced to once in 18 years on average, compared to once in nine years on average under levels of water resource development and the historical climate, or once every two to three years under natural conditions.

Provision of adequate environmental flows for Ramsar sites therefore needs to consider both the degradation already caused by water resource development and the likely additional stress from climate change. Providing adequate environmental flows will, in many cases across the Basin, require significant reductions in the volumes of consumptive water use, changes in the way in which dams are operated to capture flood waters, and consideration of investment in infrastructure to facilitate environmental watering of floodplains.

The risks to the basin posed by unregulated water interception activities and water theft

Water intercepting activities identified under the NWI include plantation forestry, farm dams and unlicensed bores.

The Murray-Darling Basin Sustainable Yields Project estimated the additional water use of likely new commercial forestry plantations and additional small farm dams by 2030. Mainly due to the small increases in commercial forestry plantation area, it was estimated that impacts by 2030 would be small at the scale of large rivers and the whole Basin, although they may have considerable impact on streamflow at the local scale. The best estimate of the additional surface water use due to the expansion in commercial forestry plantations was 28 GL/year on average. Farm dam construction is controlled in different ways in different states, but further increases are likely in many regions. Likely new small farm dams by 2030 were estimated by the Murray-Darling Basin Sustainable Yields Project to represent an additional surface water use of 170 GL/year on average.

Potential water intercepting activities that have been identified but could not be investigated by the Murray-Darling Basin Sustainable Yields Project due to a general lack of data include those associated with stock and domestic bores, land use intensification, for example peri-urban

development, and changes in land management practices designed to improve vegetation growth and water retention in the landscape. The combined impact of these changes on water resources cannot currently be estimated, but based on the current rate of development, is unlikely to exceed the impact from commercial forestry plantations and small farm dams.

CSIRO is not aware of investigations into the prevalence of water theft and water volumes involved. Water theft may occur through greater than permissible run-off harvesting, or greater than permissible pumping of river water or groundwater.

The adequacy of existing state and territory water and natural resource management legislation and enforcement arrangements

Sustainable Yields modelling indicates that, in most cases, existing state water plans in the Murray-Darling Basin would offer very little protection for the environment under a future situation of a long-term reduction in average surface water availability. Examples are provided in the soon to be released “Water Availability in the Murray-Darling Basin” report.

The National Water Initiative however, indicates that water plans should consider the risk of climate change to the size of the water resource and the implications for sharing.

Existing water sharing plans provide greater reliability to consumptive water users than to the environment. Although all jurisdictions have programs of environmental condition monitoring, these are not used in an adaptive management framework to improve water sharing arrangements in order to achieve more balanced outcomes. More flexible and adaptive processes for resource sharing and environmental management would be necessary for achieving environmental targets.

The impacts of climate change on the likely future availability of water

CSIRO’s Murray-Darling Basin Sustainable Yields Project has provided detailed assessments of the likely impacts of climate change by 2030 on surface water availability, and on surface water use under current water sharing arrangements. The median of the possible range of climate change impacts on surface water availability by 2030 is an 11 per cent decline across the Murray-Darling Basin; this is a reduction of approximately 2500 GL/year on average. However, climate change by 2030 could reduce average surface water availability by as much as 34 per cent (around 7900 GL/year on average), or even lead to an 11 per cent increase in average surface water availability. Water availability will continue to vary greatly between years and between decades – as in the past.

The reductions in water availability vary from region to region, with the largest percentage reductions occurring in the south of the Basin – in the areas that have experienced the largest reductions in surface runoff during the recent drought.

While the Sustainable Yields Project provides detailed climate change analyses only for the climate around 2030; simple projections are provided in the Water Availability in the Murray-Darling Basin report for 2050 and 2070.

For further details the Committee is referred to the Sustainable Yields reports – especially the soon to be released “Water Availability in the Murray-Darling Basin” report. A release of this report by Senator the Hon. Penny Wong is scheduled for November 24, 2008. CSIRO would be happy to provide a more detailed briefing on this work to the Committee if desired.