Submission No 99

INQUIRY INTO RATIONALE FOR, AND IMPACTS OF, NEW DAMS AND OTHER WATER INFRASTRUCTURE IN NSW

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Submission on

Rationale for, and impacts of, new dams and other water infrastructure in NSW

NSW Legislative Council Inquiry

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Table of Contents

Background

I am the Director of the Centre for Ecosystem Science (CES), UNSW Australia, with a strong track record in the science of river and wetland management and their dependent organisms. In particular, I have more than 30 years of scientific investigation into the impacts of water resource development effects (dams, diversions and floodplain development) on the environment. I have also advised governments of New South Wales, other states and the Australian Government on environmental flow management and river management. I have also research on Ramsar-listed wetlands and waterbirds throughout the Murray-Darling Basin and particularly in NSW.

The Portfolio Committee No.7 - Planning and Environment is inquiring into and reporting on the rationale for, and impacts of, new dam and mass water storage projects proposed by WaterNSW including Wyangala, Mole River and Dungowan Dam projects, the Macquarie River reregulating storage project and the Western Weirs project. This submission focuses on issues raised in the terms of reference.

(a) the need for the projects, including the historical allocation of water and consideration of other options for ensuring water security in inland regions,

i. The need for the projects

There is insufficient evidence provided by WaterNSW on the public record for enlargement of Wyangala Dam, Mole River Dam, Dungowan Dam or the Macquarie River re-regulating storage.

WaterNSW has proposed the following benefits: reduced flood risk, improved town water supply and increasing general security water entitlements. There are many other alternatives which would not have the same impacts on environmental, cultural, social and economic values as the proposed projects.

There are considerable environmental, cultural, social and economic impacts of these proposed projects.

- There are significant downstream impacts on the environment and rural communities that depend on water as a result of these structures.
- Weirs and dams store water reducing downstream flooding for the environment and

dependent landholders, such as floodplain graziers.

- The projects will have significant impacts on threatened species and ecological communities under NSW and Commonwealth legislation.
- Barriers in rivers are major issues for navigation of native fish species and platypus, driving declines.
- There are also major long-term costs for NSW taxpayers which are not adequately incorporated into cost recovery mechanisms.
- Current water resource planning for the rivers are not yet approved by the Murray-Darling Basin Authority.
- There is no evidence that alternative options for water security have been considered.
- There are significant environmental obligations at state, national and international levels which are not currently met and are likely to be exacerbated.

ii. Historical allocation of water

There is widespread evidence for significant changes to ecosystems and their dependent organisms, as a result of alterations to flow, principally reductions from historical allocations. This evidence shows that there are widespread changes and associated degradation of the environment, when river flows and flooding declines, affecting many different organisms and their supporting ecological processes, including locations of the proposed new infrastructure and dams. Environmental degradation includes declining water quality and detrimental effects on biodiversity (e.g. native fish, waterbirds, frogs, floodplain vegetation). They have increased salinity and blue-green algal blooms in rivers.

Many waterbird communities, including more than 50 species, are in long-term decline across the Murray-Darling Basin rivers and wetlands because of historical water allocations (Kingsford et al. 2017). These include fish eating birds, herbivores, large waiting birds, migratory shorebirds and duck species. This has occurred because decreased flows in rivers, as a result of these allocations, has reduced the extent and frequency of flooding on major wetlands, such as some Macquarie Marshes. The extent of this impact across the full spectrum of waterbirds is symptomatic of ecosystem effects on vegetation, invertebrates, frogs and other food items. The breeding of colonial waterbirds, including herons, egrets and ibis, has also been declining because of historical water allocations. In particular, straw-necked ibis which feed on locusts in the Murray-Darling Basin have been declining, with

reductions in river flows and frequency and extent of flooding on all the major rivers of the Murray-Darling Basin (Kingsford and Johnson 1998, Brandis et al. 2011, Brandis et al. 2018). This major ecosystem service for farming communities is declining.

Historical water allocations have led to large scale die-back of floodplain eucalypts, such as river red gums, black box and coolabah. There are also long-term declines in the condition and extent of floodplain eucalypt forests, such as river red gums as a result of declining flooding, caused by historical allocations and this is expected to continue. Further, invertebrates, frogs and native fish communities are all declining on rivers as a result of historical water allocations, which also contributed significantly to the catastrophic fish kills on the Darling River at Menindee in the 2018/2019. Using the IUCN Red Listing criteria for ecosystems, there was an assessment that the floodplains of the Murray-Darling Basin, primarily in NSW, provided enough evidence for a risk assessment status of critically endangered (Keith et al. 2013). These proposed projects will affect flooding in downstream rivers systems and further degrade the ecosystems in the Murray and Darling River basins.

The historical allocation of water has also had significant impacts on downstream communities and ecosystem services. Healthy river systems provide for many cultural values including sustaining cultural sites. Historical allocations of water have also decreased access to reliable water supplies for inland urban and Aboriginal communities, most obvious in the 2019 drought when towns like Wilcannia and Menindee ran out of water. Increasing low quality of river water affects many of the communities living on rivers in the Murray-Darling Basin. Economic impacts are seldom adequately measured, particularly given there are economic values to the environment which are important, including use and non-use values (Morrison and Hatton-Macdonald 2010). Many of these environmental values provide ecosystems services, critical to economic pursuits and quality of life.

It was scientific evidence of degradation of the rivers and wetlands of the Murray-Darling Basin and effects on cultural and socio-economic values which resulted in the Australian Government passing the *Water Act 2007* and subsequent development of the Murray-Darling Basin Plan. The only way that it could be effectively addressed was by returning water to the rivers from extractive uses. These project effectively undo this policy direction by removing water from the environment for consumptive use. They will exacerbate already severe degradation occurring on many of the rivers.

iii. Alternative water supply options

There are an increasing number of sophisticated and alternative approaches to the storage of water which can improve water security. This includes underground storages, in the form of aquifer recharge close to where water can be used. This can reduce evaporation costs. There are also opportunities to build off-river storage which may limit impacts on barriers in rivers.

Another alternative water supply is to reduce demand and use water more efficiently. Australia's water policy approach has often looked for a supply option to deal with water security, rather than the demand option of alternative water supply. The proposed new dams and weirs represent a supply option. This is despite some of the major ecological and socio-economic impacts from current allocations of water and building water infrastructure. One option for improving water security is to invest resources in improving the efficiency with which water reaches irrigated crops. Improving the efficiency in water use reaching irrigated crops by covering channels is well advanced in many regions of the Murray-Darling Basin. Improving water use efficiencies is increasingly recognised around the world as an important alternative water supply option for urban and irrigation communities. In addition, the recycling of waste water is often a useful alternative water supply option, as is the capture of storm water in urban communities.

Water supply options for inland urban communities could also be improved by improved management of water on inland rivers. This would mean a focus on ensuring that water supplies were always available in large dams upstream to adequately sustain rivers during long dry periods. In addition, the implementation of flood management plans could be expected to improve water security by providing opportunities to capture some of the flooding in urban and rural communities. Raising roads above floodplain would also allow access for floodwater to take a natural course downstream and limit impacts on communities.

(b) the economic rationale and business case of each of the projects, including funding, projected revenue, and the allocation and pricing of water from the projects,

Large water infrastructure projects like dams cost taxpayers a significant amount of money to build, such as the enlargement of Wyangala Dam enlargement for $650 million. There are

also major maintenance costs for the life of the dam which need to be met by taxpayers. This includes refurbishment and strengthening of walls ensuring safety of dams is maintained.

The National Water Initiative 2004 committed all governments to full cost recovery of the capital costs of water infrastructure projects. This would mean if implemented that any new infrastructure projects would have to include in their pricing of water, the capital cost of the infrastructure. There are also ongoing operating and maintenance costs of dams. It is not clear how these costs will be passed on to users.

This commitment only deals with the structural costs. It does not adequately deal with the impacts on downstream ecosystem services and communities. For example, many of the floodplain graziers in the Murray-Darling Basin have lost significant part of their income as a result of historical water allocations and the building of dams reducing the productivity of their grazing lands because of reductions in flooding. Most of the floodplain areas in the Murray-Darling Basin and likely to be affected by new dams and water infrastructure are floodplain grazing lands. These costs should also be added to the provision of water supply in a truly transparent system. Further there are likely to be significant biodiversity offset costs resulting from both the inundation of forests and vegetation where the dams are established as well as the impacts of reducing flooding downstream.

There are also significant costs, particularly in dry times, in terms of providing water to communities because of poor management of water in the river systems. An insufficient quantity of water is stored for dry times and essential supplies in large dams upstream. For example, the widespread 2016 floods in the Murray-Darling Basin filled many large dams in the upper catchments of the rivers but most of that water was provided to irrigation industries predominantly within two years, without sufficient water retained to sustain the river environments and urban communities. This caused major water security issues and subsequent costs for many communities on rivers and the NSW Government.

In addition, there were major environmental costs for governments. For example, this included the significant costs incurred in dealing with the 2018/ 2019 fish kills at Menindee Lakes. Significant government resources were required to remove fish, invest in aerators and take some fish (Murray cod) to a nursery so that they could breed when there was sufficient water and some could be returned. This did not deal with the cost of this fish kill to people

fishing along the river or tourism impacts.

There is generally poor transparency in the costing of water with most actual costs remaining hidden. These include restoration and rehabilitation costs which sometimes eventuate decades after the impacts of water allocations and building of infrastructure. Such costs include dealing with the effects on water quality, ecosystems and ecosystem services. This includes impacts on floodplain grazing and traditional owner communities related to loss of water. Governments generally fail to adequately account for long-term costs over decades resulting in shifting of these costs to future generations. There is also seldom any compensation for downstream losses in terms of water quality amenities, floodplain grazing or loss of recreational fishing opportunities. Governments and communities are often required to pay costs subsequently. For example, the >$13 billion invested in the Murray-Darling Basin Plan is a direct cost resulting from historical over allocation and the building of large dams and diversion of too much water.

(c) the environmental, cultural, social and economic impacts of the projects, including their impact on any national or state water agreements, or international environmental obligations

i. Environmental, cultural, social and economic impacts of the projects

There are significant environmental, cultural, social and economic costs of building dams. This is because the water that would have gone down the river is captured and no longer available for many of dependent environmental, cultural, social and economic values. The Mole River Dam, the Dungowan Dam, enlargement of Wyangala Dam and the re-regulating weir on the Macquarie River and Western weirs are all designed to capture water. This water is then regulated. It is then available for distribution, primarily for irrigation, although sometimes for town water supply as in the Western weirs.

Most of these new projects will have the effect of taking water from the rivers. They will exacerbate the loss of floodplain forests. They will increase the incidences of blue-green algal blooms and salinity in rivers. They will ensure that more floodplain graziers will have their livelihoods affected as a result of reduced flooding. They will increase the impacts on species already severely under pressure, such as platypus. They will also increase the impacts on

downstream urban communities downstream. Some downstream towns will have their water security reduced not improved by these new projects. It is the water that will be captured in the Dungowan Dam and the Mole River Creek Dam that would have gone down the Darling River and supplied traditional owner communities living in towns like Menindee and Wilcannia. Water captured in the enlargement of Wyangala Dam on the Lachlan River would have flowed down to supply the graziers of the Booligal Creek, Lower Lachlan and Cumbung system, an extensive floodplain already severely impacted by historical allocations and large dams.

Water captured in the new dams will also impact on Aboriginal communities and their cultural values which are highly dependent on rivers. For example the Great Cumbung Swamp is an important wetland area with many cultural values, affected by reductions in river flows. It will also water that is captured in an enlarged Wyangala Dam which will further reduce breeding extent and success of straw-necked ibis on the Booligal Creek system which can support over 100,000 breeding pairs of birds (Lyons et al. 2019). This means that these birds that reduce numbers of locusts, a pest reduction service they do for nothing will no longer have the same capacity. There is also increasing understanding that terrestrial biodiversity is also affected. Woodlands birds, such as honeyeaters, also depend on the productivity of floods as do small terrestrial mammals.

The proposed projects will have severe environmental, cultural, social and economic impacts on the rivers downstream with many downstream communities affected.

ii. Impact on national or state water agreements, or international obligations n

These new projects will undermine or being contravention of a range of agreements or legislation and policy at state national and international levels.

State level. At a state level, it is not clear how these projects will be consistent with water resource planning. They are in contravention of state legislation and policy for the conservation of biodiversity, including the *Biodiversity Act 2016* and the *Fisheries Management Act 1994*. For the biodiversity legislation, they will impact on a range of threatened species, including Australasian bittern *Botaurus poiciloptilus* and Australian painted snipe *Rostratula australis*. Further, under the biodiversity legislation, there is explicit identification that these structures and the diversions of flows that they allow is a key

threatening process affecting biodiversity. There should be a threat abatement plan to mitigate against such developments but the New South Wales Government has failed to develop this. Similarly, under the *Fisheries Management Act 1994*, the proposed water infrastructure is also defined as a key threatening processes because of their impacts on the many native fish species, including threatened species. This is because these structures and the resultant diversions of water will impact a range of threatened species in freshwater systems. This exacerbates the already parlous state of native fish populations on inland rivers in New South Wales. They are only about 10% of the original numbers of native fish in the rivers of the Murray-Darling Basin. Native species will be affected by river regulation the building of the proposed dams and weirs (Gehrke et al. 1995, Gehrke and Harris 2001, Koehn et al. 2014).

There are two endangered ecological communities will be degraded by these new projects. The Mole River Dam, Dungowan Dam, re-regulating storage on the Macquarie River and Western Weirs will degrade *Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River*. The enlargement of Wyangala Dam will degrade the *Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River*. Exacerbating this problem introduced species like European carp *Cyprinus carpio* and mosquito fish *Gambusia affinis* benefit from the introduction of such regulatory structures in the Macquarie River (Rayner et al. 2009, Rayner et al. 2015, Cruz et al. 2020).

In addition, the New South Wales government is not adequately exercising its responsibilities for conservation of wetlands and their biodiversity. In particular there is clear scientific evidence for the impacts of diversions of water and river regulation on the Macquarie Marshes, where the Department of Planning, Industry and Environment has a nature reserve, Macquarie Marshes Nature Reserve, for which they are responsible for its conservation as well as responsibilities to the Australian Government under the Ramsar Convention, given its Ramsar listing status. It is a key responsibility of NSW in relation to protected areas, including National Parks and National Reserves to protect environmental and cultural values. Further, all governments in Australia are also responsible for the conservation and wise use of all wetlands under their jurisdiction under the Ramsar Convention, not just those gazetted.

National level. At the national level, these dams and the water that they will capture will be inconsistent with the *Water Act 2007* and the subsequent Murray-Darling Basin plan. The capture of water by these dams is essentially taking away planned environmental water that supposedly under the protection of the basin plan. These proposed projects redefine water shares, moving environmental water to consumptive water. They will essentially exacerbate the problem for the rivers of the Murray-Darling Basin and undermine the objectives of the *Water Act 2007*, aimed at restoring the environmental health of the river of the Murray-Darling Basin. Governments have spent significant amounts of taxpayers money, more than $13 billion, on restoration of the Murray-Darling Basin rivers. This restoration was only achievable through the buyback of water and the increasing flows in river systems. The proposed new infrastructure removes this water for maintaining the rivers and essentially provides it for diversions.

Further, these proposed projects and the water they capture are not consistent with the Murray-Darling Basin Cap. Governments of New South Wales, Victoria, Queensland, South Australia and the federal government agreed in 1995 to constrain river diversion in New South Wales at 1993/ 1994 levels of development. These new projects undermined this agreement and probably also reduce the amount of water reaching South Australia or Victoria.

There are 16 Ramsar sites in the Murray-Darling Basin, with many highly reliant on river flows (Pittock and Finlayson 2011). Three of these sites are the focus of Article 3.2 notifications of the Ramsar Convention (Australia is a signatory), to the international community that their ecological character has changed as a result of human impacts: Coorong, Lower Lake and Murray Mouth; Gwydir wetlands; and Macquarie Marshes. The latter two are in NSW and affected by these proposed new dams on the Macquarie River and the Namoi and Border Rivers catchments. All the scientific evidence currently available indicates that Australia is failing to meet its international obligations for the management of internationally important wetlands: Ramsar listed wetlands. This was one of the major reasons the Australian Government, under its international responsibilities (see also migratory birds) was able to establish new water legislation, the *Water Act 2007*, to try and avoid the mismanagement of the Murray-Darling Basin by the States. Australia's two internationally listed wetlands under the Ramsar Convention in NSW (Gwydir wetlands, Macquarie Marshes) will continue to change their ecological character, mainly as a result of

reductions in flow. Current water management is not sufficiently providing for the ecological character of the two internationally listed wetlands which are in ecological decline. The re-regulating storage proposed for the Macquarie River will exacerbate the degradation of the Ramsar-listed Macquarie Marshes (Ren et al. 2010, Ren and Kingsford 2011, Thomas et al. 2011, Steinfeld and Kingsford 2013, Bino et al. 2014, Bino et al. 2015, Catelotti et al. 2015, Ocock et al. 2016).

International level. Australia has international commitments for the management of wetlands of international importance, under the Ramsar Convention. In the Murray-Darling Basin, the Macquarie Marshes will be affected by the proposed project of the re-regulation weir on the Macquarie River. In addition it is possible that given the amount of water that will be stored by all of the proposed projects that there could be a reduction in flows to other River Murray Ramsar sites (e.g. Chowilla floodplain, Coorong, Lower Lakes and Murray Mouth).

In addition, Australia and state governments are responsible for the conservation of migratory shorebirds under various agreements with governments overseas. There is increasing evidence that migratory species for which Australia has an international responsibility are declining (Gosbell and Clemens 2006, Clemens et al. 2016), across the continent. Inland survey data are also showing that migratory shorebirds are declining and some of this decline is due to the development of water resources on the rivers of the Murray-Darling Basin (Nebel et al. 2008). This is a matter of national environmental significance under the EPBC Act. There are range of migratory shorebirds which will have their habitats reduced and likely impact on their numbers resulting from the cumulative and individual impacts of the proposed projects.

(d) the impacts of climate change on inland waterways, including future projections, and the role of dams and other mass water storage projects in ensuring security of water supply for social, economic and environmental outcomes

There is overwhelming evidence for climate change affecting Australia and the rivers of the Murray-Darling Basin in NSW, including increasing temperatures (Reisinger et al. 2014). The CSIRO sustainable yields studies clearly identified that this would have significant

impacts on ecosystems and current users (CSIRO 2008, Leblanc et al. 2012). The effects of climate change will also fall disproportionately on the environment, compared to other users. Increasing temperatures increase evaporation of surface flows, affecting water security for the environment and other current users. Given the significant environmental impacts of current water resource development, exacerbated by increased temperatures and potentially more variable rainfall, the critically important policy decisions to restore the Murray-Darling Basin to sustainability will increasingly fail because of the impacts of climate change.

Climate change is affecting all of Australia's ecosystems. It will have a major impact on the rivers and wetlands of Australia, including New South Wales. There are two principal ways in which this affects water resources, including rivers and their dependent ecosystems. First, the increasing temperatures mean that water evaporates more from storages. This will mean that there will be less water able to be captured in current storages and proposals for new storages. As a result, water security will be reduced both to the environment, irrigation industries and urban communities. This demands major rethinking on management of water resources. In particular, there is a need to ensure that there is sufficient water available for rural urban communities and sustaining our rivers through dry periods. Second, climate change is altering rainfall and runoff patterns. There is increasing evidence that the Murray-Darling Basin where all of these projects are situated is affected. This means that even current storages will not fill as often as they used to. For example, the current Wyangala Dam storage on the Lachlan River has only filled twice and spilled in the last 20 years. Enlarging that storage and increasing the capacity does not translate to more water and improved water security. The number and size of the high flows may decrease in frequency and size with increased drying resulting from climate change. Doubling the water storage does not result in a doubling of the amount of water. This is admitted to by the WaterNSW in that even though the storage is doubling, it will only deliver 21,000 megalitres a year. There is a critical need to manage for a drying climate. This requires improved planning for shares in water which are held in storage to ensure that priority rural urban communities and rivers are sustained through increasing dry periods.

(e) water infrastructure technologies that may promote enhanced environmental outcomes

There are opportunities to improve water management and water security. But governments

cannot reply rely on a business as usual approach. We cannot simply adopt a drought-proofing approach by building more dams. This has cost communities and environments enormously. The proposed projects inadequately look to the future and represent early 20th Century thinking, without any of the subsequent science informing decision-making. There is a need to ensure that our rural urban communities and our river environments can be sustained under an increasingly drying climate. This requires us to ensure that there is sufficient water captured in our dams and available to provided for prolonged dry periods. This also means having enough water in our river systems to ensure that native fish species can survive and recolonize the river. It also means protecting those pools where platypus need to survive until the river flows again. There were high numbers of platypus dying along the Namoi river catchment during the 2019 dry period. This means working out how much water is required for such essential requirements.

For example, the water from the 2016 floods could have been managed more effectively and water retained to ensure that rural urban communities along the Darling River, including Brewarrina and Menindee did not run out of water. There could have been sufficient water retained in large upstream storage is to ensure that these communities received water when dry periods occurred. This is related to different river management approaches. For example the Macquarie and the Lachlan River are managed under what could be termed ‘a credit model’ (Steinfeld et al. 2020). This means that water managers predict how much water will be received in their storage (e.g. Burrendong Dam on Macquarie River) on the basis of past flows in the catchment. This means of when there are insufficient flows that water may be allocated even before it falls from the sky as rain let alone flows in the river. This is different to what one can be called a ‘debit model’. Such ‘a debit model’ is used in the Gwydir (Steinfeld et al. 2020). Here water is only allocated when it is available in the dam. This is a less risky approach to water management, potentially better dealing with major drying changes in water reliability in the future.

There are a range of other improvements which could be made to use of infrastructure. These include for example the importance of dealing with constraints that limit the amount of water going down a river. These can be areas of the river which have insufficient capacity to take floods or flows. They can include the dam outlets which do not allow enough water needed to go down the river. These are major restrictions on good water management in river systems.

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