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Committee Secretary
Inquiry into the management of the Murray-Darling Basin
Senate Standing Committees on Rural Affairs and Transport
Parliament House
Canberra ACT 2600

Dear Secretary,

Submission to the inquiry into the management of the Murray-Darling Basin

I write to provide information and references regarding the pros and cons of applying water saving measures to the conservation of freshwater ecosystems in the Murray-Darling Basin to the inquiry. This information is relevant to the inquiry's reference to examine management options and the proposed Basin Plan with respect to:

(a) implications for … the environment;
(e) the extent to which options for more efficient water use can be found and the implications of more efficient water use; and
(i) options for all water savings …

In my comments below I have cited a number of academic publications that further elaborate on the points that I make here in plain language.

My qualifications

I am a researcher at the Crawford School of Economics and Government at the Australian National University, holding the positions of: Program Leader, Australia and United States - Climate, Energy and Water, US Studies Centre, as well as Director of International Programs, UNESCO Chair in Water Economics and Transboundary Water Governance. My doctoral and part of my current research has focussed on the pros and cons of different options for conserving freshwater biodiversity under conditions of water scarcity and climate change, globally and in the Murray-Darling Basin. Environmental water demand management measures are a key opportunity that I have examined.

Water-saving measures

In theory there are many technical and engineering interventions that could enable areas of wetland ecosystems to be sustained with less water than they would require naturally. In Australia these have been termed "environmental works and measures." Internationally, I and my colleague Prof. Bruce Lankford have described these as "environmental water demand management" and we have categorised the full suite of such options (Pittock and Lankford, 2010). In our work we also assessed the risks and opportunities associated with these measures. Our review concludes that such measures will be needed to help maximise environmental conservation in many over-allocated river basins globally.

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In the context of the Murray-Darling Basin, I have undertaken further research in the areas of freshwater ecosystem management and adaptation to climate change. This work, while incomplete, shows that reliance on environmental water demand management has implications and risks that have been poorly considered by Australian managers to date. The following is a summary of my assessment of the a) physical and ecological implications, b) legal implications, and c) institutional implications. I then raise a number of alternative options.

Physical and ecological implications

Freshwater ecosystems are highly connected by water. In theory it would be possible to keep floodplain forest trees alive by water delivered through environmental works and measures. However the reduced connectivity involved through such use of channels, pumps, weirs and regulators will have environmental consequences. One consequence would be the more limited movement afforded to wildlife, such as fish, in moving into and out of the more isolated wetlands managed under this approach. This may inhibit recovery of wildlife populations. Another consequence is that the smaller volumes of water may be less efficient in maintaining habitats, such as with reduced movements of nutrients and sediments, and it may fail to adequately flush salt downstream.

In the Murray-Darling Basin many ecosystems rely on periodic inundation to remain healthy. A CSIRO report to the National Water Commission showed that only 25% of the 6 million hectares of active floodplain in the Basin (based on annual return interval of 1 in 10) has been inundated in the nine years to 2009 (Overton *et al.*, 2009). The 75% of wetlands not inundated in this time were approaching ecological thresholds at which point key species such as Red Gums were dying and a transition was occurring to terrestrial ecosystems (NRC, 2009; Pittock *et al.*, 2010; Cunningham *et al.*, 2009). An approach to managing the Basin's wetlands based on environmental works and measures involves no room for error in consistently allocating limited water if the wetlands are to remain healthy. This is known as "over-specialised adaptation" to a specific range of variation in a stressor leaving the system unable to adequately respond to variation beyond the planned range or to new stressors (Nelson, 2010). It is most likely that water availability will vary considerably in the Basin with climate change (Cai and Cowan, 2008; Timbal, 2009; Fredericksen *et al.*, 2010; CSIRO, 2008). The path dependency and high risks involved in relying on environmental works and measures in the face of such change should be avoided with larger, more flexible water allocations.

Legal implications

A further concern is that these technical interventions would be illegal under international law to the extent that they change ecological character of at least part of wetlands listed under the Ramsar Convention on Wetlands, such as by leaving some parts of these sites unwatered (Pittock et al., 2010). This would be an inevitable consequence of reliance on environmental works and measures, for instance, because water supply channels may cut off some higher elevation areas, or because super-charging weirs (locks) will not raise flood waters high enough to sustain all areas of designated wetland sites (MDBC, 2006). In listing wetlands under the Convention, Australia undertook to maintain the ecological character (at the time of listing) of all of these sites forever, unless the Australian government declares that this is not possible "in the urgent national interest". To the extent that the Water Act 2007 derives its constitutional mandate from faithful implementation of Australia's

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obligations under the Ramsar Convention, the validity of any Basin Plan that does not maintain all of the wetland areas listed under the Convention is questionable. I note that the Ramsar listed wetlands in the Basin are only a small portion of the total wetland area in the Basin (Pittock et al., 2010) however these include the largest and most downstream wetlands that require substantial water to maintain their environmental health.

Further, a tenant of both the Convention on Biological Diversity and the Ramsar Convention on wetland is the conservation of – in Australian parlance – a comprehensive, adequate, representative and efficient range of wetland ecosystems (Nevill, 2007; Turak and Linke, 2011). Different types of wetlands in the Murray-Darling Basin occur on elevational and hydrological gradients, for example in the southern basin, with the most frequently water wetlands being Moira Grass, higher and less frequently watered areas being Red Gum floodplain forests, and the highest and least watered areas being Gray and Black Box floodplain forests. Despite the obligation to conserve representative areas of all wetland types, Australian governments wetlands conservation programs in the Basin to date – such as The Living Murray – have largely focussed on Red Gum forests and overlooked Gray and Black Box and other wetland types (Pittock et al., 2010). The current high levels of water diversions for agriculture have significantly reduced flood-return intervals at the expense of 'high elevation' wetlands (Overton et al., 2009; CSIRO, 2008), such as Gray and Black Box, resulting in their transition to non-wetland ecosystems over large areas (NRC, 2009). The premise behind an approach to conservation that relies on environmental works and measures is that there would be less water in the rivers due to diversions for agriculture making it harder to flood the higher elevation wetlands. Unless engineering interventions were considered at a greater scale than those underway in The Living Murray, 'high elevation' wetlands such as Black Box would continue to be lost in breach of Australia's international environmental obligations. I urge the Committee to consider how Australia can fully meet its obligations under international environmental law.

Institutional implications

To sustain ecosystems using environmental works and measures requires managers with the resources to make the right decisions every year forever. As Australian state governments demonstrated during the 2002-2010 drought with decisions to abrogate environmental water allocations, there is a very high risk of failure. Australian governments have consistently failed to fully implement their commitments to provide environmental flows under the National Water Initiative and other agreements (NWC, 2009). The decisions of Victoria in 2006 and New South Wales in 2007 to suspend their Basin water sharing plans is indicative of the problems in over-reliance on institutions. Many technical interventions require complex, day-to-day decision making (eg. when and how much water to release) and have high operating costs (eg. in pumping water). Given the myriad of changes that management agencies in states like New South Wales have undergone in the past few decades it is questionable whether they can consistently perform to a desirable standard and fund more resource-intensive measures. For these reasons I urge the Committee to consider how to spread the risk of relying on micro-management to sustain wetlands by conserving and restoring natural ecological processes to the extent practicable.

Alternative options

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The environmental works and measures undertaken during the 2002 – 2010 drought were very capital intensive. For example, it has been estimated that $2 billion has been spent on technical interventions to manage low water levels in the Coorong and Lower Lakes and supply water to dependent communities (Kingsford *et al.*, 2009). There is a high opportunity cost in these technical interventions, and reallocation of such funds to great water purchase for the environment and investment in local communities should be considered.

There are a number of freshwater conservation measures not considered by the Murray-Darling Basin Authority in the *Guide to the Basin Plan* that should be considered (but are not an alternative to allocating more water to the environment). A full spectrum of freshwater conservation opportunities need to be applied to spread the risk of management failure under conditions of water scarcity and climate change (Pittock and Finlayson, 2011). My research has highlighted the need to conserve unregulated river flows in the Basin (including those from the Ovens, Talbragar, Horton and Paroo rivers) and groundwater inflows into river channels ("gaining reaches" (CSIRO, 2008)) to retain some level of natural variation in river flows and refuges that are needed to sustain riverine flora and fauna in dry conditions (Pittock and Finlayson, 2011). I also note that Australian governments have not and should systematically identify and conserve the full spectrum of different freshwater ecosystems in the Basin using well established methods (Nevill, 2007; Nel *et al.*, 2011; Turak and Linke, 2011).

The Committee should also consider that a lot of the water infrastructure in the basin is old, and does not incorporate modern devices to minimise environmental impacts, such as fish ladders and multi-level off take towers on dams. A lot of infrastructure is also unsafe or redundant, such as the many weirs in the Basin constructed to supply water for steam trains. This legacy of old and poorly managed infrastructure has significant environmental impacts, for instance, by blocking fish migration and breeding. Some environmental gains for freshwater ecosystems could be achieved without more water by systematic review and removal or upgrading of such infrastructure. Australia's regulatory systems lack the periodic relicensing systems that exist for some classes of dams in the United States and France that drive ongoing improvements to water infrastructure, and the Committee should consider recommending such regulatory reforms (Pittock and Hartmann, 2011).

Conclusions

In theory it is possible to intervene to maintain some level of wetland functions using less water by the application of engineering measures (weirs, levees, pumps etc.) however there are two substantial risks with this approach:

a) Loss of ecological connectivity and functions. Weirs, levees and pumps reduce the connectivity of these ecosystems and thus may reduce populations of wildlife (like fish) and inhibit other ecosystem services (such as flushing out salt).
b) Institutional failure. To sustain ecosystems using environmental works and measures requires managers with the resources to make the right decisions every year forever. As Australian state governments demonstrated during the 2002-2010 drought, with decisions to abrogate environmental water allocations, there is a very high risk of failure.

Further, to the extent that such interventions change ecological character of at least part of wetlands listed under the Ramsar Convention on Wetlands, such as by leaving some parts of these sites unwatered, these measures would be illegal under international environmental law.

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The risks I have outlined here of an over-reliance on technical interventions should be largely addressed with adequate allocations of water to the environment. Additional measures that the Committee should consider that would improve conservation of freshwater ecosystems include:

- Conservation of remaining free-flowing rivers and groundwater-supplied refuges;
- Reservation of comprehensive, adequate, representative and efficient areas of freshwater ecosystems; and
- Re-operation of water infrastructure, including through periodic re-licensing systems.

I trust this information is of benefit to your inquiry. I would be pleased to provide additional information to your inquiry as required and may be contacted at ANU (above).

Yours sincerely,

Dr Jamie Pittock

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