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Dear madam / sir,

Submission – Warragamba Dam Raising Project – SSI-8441 – Pittock, Action ACT

I write with a submission on the Warragamba Dam Raising Project – SSI-8441:

- My submission may be published in full online;
- I object to the proposal;
- The reasons why I object to the proposal are detailed below; and
- I have made no reportable political donations.

My expertise

I am a professor of environmental science and policy at the Fenner School of Environment and Society at The Australian National University. I have worked on issues of management of rivers, flood plains and water infrastructure since the early 1990s in Australia and internationally. I and my students have published extensive peer-review research on the management of flooding in Australia (Wenger, 2013, Wenger et al., 2013, Wenger et al., 2012, Kahan et al., 2020).

Warragamba Dam Raising Project context

There is no doubt that there is a risk of severe impacts from flooding the Hawkesbury-Nepean Valley and that the NSW Government must intervene in a number of ways to better manage this risk. I question, however, the proposition that raising Warragamba dam is the most sensible intervention. In this submission I will focus on the:

- a) Lack of a business case and implications for alternatives;
- b) Issues with the 2017 cost-benefit assessment; and
- c) Need to better consider other alternatives.

Here, I detail my concerns at the lack of adequate information on the costs and benefits for the proposed dam raising and the alternatives.

a) Lack of a business case and implications for alternatives

There are many alternative ways in which flood risk could physically be managed. Any assessment of the costs and benefits of the alternative options requires a presentation of the costs.

The Warragamba Dam Raising (WDR) Project Environmental Impact Statement (WDREIS) contains no business case, nor any estimate of the costs of implementing this project. This is a major gap. How can the merits of alternative options be assessed if there is no indication of comparative costs and benefits?

Infrastructure NSW's 2017 strategy proposed a capital cost of \$690 million to raise the dam (Infrastructure NSW, 2017), which has most probably increased considerably over the last five years as is common for infrastructure projects. Media reports based on leaked NSW Government documents suggest that the biodiversity off-set cost is in the order of \$1.34 billion (Hannam, 2020) (based on the full inundation zone that would be impacted, rather than the questionable reduction of this zone presented in the WDREIS). Consequently, the total project could be expected to cost at least \$2 billion.

It is probably that the real cost of the WDR is of the same order of magnitude of many of the alternative options that are dismissed in the WDREIS, especially if the benefits of the alternatives are considered. For instance, in 2017 Infrastructure NSW estimated that relocating flood prone residents would cost \$3.3 billion (Infrastructure NSW, 2017), which may be higher than the WDR, but is likely to be more favourably considered in a cost-benefit analysis when a number of benefits are considered (such as alternative land uses).

The NSW Government should not approve the WDREIS without further assessment of the costs and benefits of the WDR and its alternatives.

b) Issues with the cost-benefit assessment

In September 2018 I reviewed Infrastructure NSW's 2017 "Resilient valley, resilient communities. Hawkesbury-Nepean valley flood risk management strategy", which sets out their argument for raising Warragamba Dam (Pittock, 2018). In the WDREIS, the Infrastructure NSW report is cited as the basis for proposing the WDR and rejection of alternative options.

There are a number of ways in which the analysis in Infrastructure NSW's 2017 strategy was developed to favour the choice of WDR over other options in the following ways:

- i. The Hawkesbury-Nepean Valley Flood Management Taskforce (2014-2016) comprised representatives from organisations who at the time had already expressed a preference for WDR, and its assessment was not open to alternative views or independent review;
- ii. The Strategy is based on settling 130,000 more people in harm's way on the flood plain assuming business as usual planning settings. The NSW Government's ability to prevent new and reduce current exposure of people, homes and businesses to flood risk through more rigorous planning controls was not considered. Their argument is contradictory in saying that a higher dam is needed to protect the greater population by 2050, while also claiming that their planning settings are strong enough to exacerbate the risk;

- iii. Their cost-benefit assessment is narrowly focussed on capital construction costs vs projected benefits of reduced damage from floods. The assessment is biased in not assessing all the costs of all flood mitigation options nor in acknowledging benefits, which would change the cost-benefit results.

As an example, only the capital cost of investment in upgrading arterial roads was considered. The analysis did not consider that it may be necessary to upgrade these roads for other reasons and that a share of the cost could be attributed to these other uses. Nor were any of the benefits considered, for example, reduced travel times and increased safety, measures that are normally incorporated in assessments of proposed roads.

The same overly narrow approach to cost benefit analysis is reiterated in the WDREIS (s. 4.2.3). It appears that the WDREIS relies on 2015 modelling (s. 4.2.3.2) which I argue is out of date, for example, in not considering the cost of the WDR project that may have tripled in price (see a) above). The WDREIS provides no relevant new data to inform the choice of options. Thus, I conclude that the 2017 Infrastructure NSW report and the 2019 update, and resulting WDREIS analysis cannot be relied upon to make a well-informed decision on WDR as the preferred flood management option.

c) Need to better consider other alternatives.

The NSW Government should consider three alternative options to reduce flood risk, namely:

1. Provide alternative flood storage by lowering the full supply level in Warragamba Dam.
2. Improve evacuation routes.
3. Relocate the most flood prone residents.

There are a number of options that deserve equally detailed assessment as the proposed WDR. I outline these here.

1. Provide alternative flood storage by lowering the full supply level in Warragamba Dam.

The WDREIS rejects the alternative option of providing flood storage by lowering the full storage level of Warragamba Dam by 12 metres to free 795 billion litres of airspace for flood control. The say (s. 4.2.3.2) "Options that lower the full supply level (FSL) of Warragamba Dam would have impacts on Sydney's water supply system." This statement appears to be based on 2015 data using the flawed cost-benefit modelling described above.

Infrastructure NSW claim that permanently lowering Warragamba Dam's FSL by 12 metres would increase a range of water supply and infrastructure operations and maintenance costs. It is disappointing that these costs are not quantified anywhere in the WDREIS to allow a comparison of the options. All the flood risk management options are expensive. I contend that it is not good enough for the proponent to dismiss this option with unspecified claims of great expenses.

Turner et al. (2016) used publicly available data and system dynamics modelling to assess optimisation of existing and new water resources for Sydney. They found that by lowering Warragamba Dam water levels and operating desalination, significant flood protection could be achieved at a similar cost to raising the dam wall (that was estimated at the time as \$0.5 to 1 billion rather than the ~\$2 billion that is now likely). Looking forward, the growing costs for the

WDR and falling costs of renewable energy for alternative water supplies may make this option even more economically attractive.

Instead, the WDREIS provides an assessment that argues that lowering the full supply level of the dam would require additional water pumping costs, reoperating water infrastructure and jeopardise Sydney's water supply in droughts. In this respect, the proponents are being inconsistent in their arguments. They are happy to say that the increased risk of flooding from climate change requires the WDR. However, they do not acknowledge that the increased risk of drought from climate change makes it imperative that Sydney diversifies its water supply that is over-reliant (80%) on Warragamba Dam. Indeed, the NSW Department of Planning, Industry and Environment acknowledge this when they say: "We need to plan and build a water supply system that is resilient to extreme events—including droughts and floods—that may be more extreme than we have experienced in recent history. This was highlighted in the recent 2017-2020 drought where water storage levels depleted at a much faster rate than in previous droughts. Our preliminary analysis shows that over the past 30 years, average inflows to Sydney's dams have been half the long-term average since records began in 1910" (DPIE, 2021:9). They go onto say: "we need to increase our rainfall-independent supply to provide greater security for our system, particularly in times of drought" (DPIE, 2021: 12).

I also note that the supposed water quality problems cited as being exacerbated by lowering the full storage level of Warragamba Dam – which the current water treatment plants can manage – would be in part offset by diversifying water supply through greater use of desalination and water recycling.

The NSW Government's draft Greater Sydney Water Strategy (2021) already proposes to "invest in additional water supply in the next 5-10 years, then again around 2040 and once more by 2060." They already propose investments in water conservation and increasing water supply through use of desalination and water recycling. As Turner et al. (2016) showed, bringing forward investments in already planned water augmentation projects is affordable.

2. Improve evacuation routes and flood forecasting.

The WDREIS itself (s. 4.2.2) outlines how most of the arterial roads in the region are cut off by relatively low level flooding. This will be a problem with or without WDR due to flooding from downstream tributaries. As outlined above, the costs of increased investment in better evacuation routes have been exaggerated and many benefits have not been considered in Infrastructure NSW's cost-benefit analysis.

3. Relocate the most flood prone residents.

Purchase of flood prone properties is rejected in the WDREIS "due to the high financial, social and environmental costs of large-scale relocation of residential populations from the floodplain." This is surprising as it offers a great many benefits:

- Regardless of WDR, the many low-lying properties are at risk from impacts of flooding from tributaries downstream of Warragamba Dam. Global experience is that infrastructure like the WDR creates a 'levee paradox' where flood damage is exacerbated by lack of attention to flood safety and increased floodplain development. That risk is evident by the NSW Government's intention to allow another 130,000 people to settle in this region by

2050. The WDR will not prevent damage from the largest floods. Only relocation of homes and businesses will reduce that risk and the resulting damage;

- Relocation of homes and businesses is a common practice around Australia and has been used to: manage risks from floods, fires, aircraft noise; to construct dams, roads and other services; as well as to conserve penguins. From Grantham in Queensland to the inner western suburbs of Sydney, whole communities have been relocated when resident's safety was jeopardised;
- While to upfront capital cost may appear high this overlooks the opportunity to implement such a policy progressively over years or decades. It overlooks the potentially great economic stimulus effect of the resulting investment in new housing compared to a one-off infrastructure project. It also overlooks the potential economic return from repurposing the floodplain lands concerned to flood safe uses, such as farming, extraction of sand and clay, recreation, carbon sequestration and nature conservation.

Notably, the WDREIS assumes that only voluntary house purchase (Table 4.2) could be undertaken and that this would be ineffectual. This ignores practices applied by other state governments to enable widespread relocation over a period of years or a few decades. This may include regulations that: a) prohibit further development or extension of flood prone properties; b) do not enable rebuilding after flood damage and instead facilitate relocations; and c) require that the state government has the only right of purchase under just terms. Measures like these would facilitate progressive relocation with lower social impacts.

Globally, best practice management of increasing flood risk along major rivers is being managed by giving rivers more room to flood safely (Wenger et al., 2013). The experience in countries like the Netherlands is that such nature based solutions can diversify local economies and generate new jobs (Bulkens et al., 2016, Bekhuis et al., 2005).

The NSW Government should undertake a more rigorous assessment of the options outlined here.

It is notable that in the WDREIS that there is an assumption that the 1:100 flood return interval should remain as the benchmark for planning restriction to reduce flood risk. Other countries are adopting much safer standards for new developments and as a condition of government funding for new programs. For example, in the United States it is now common to apply a 1:500 year planning standard (Wenger et al., 2012). Even safer standards are applied in the Netherlands (Wenger et al., 2013). The NSW Government should apply a much safer standard in the Hawkesbury- Nepean Valley.

Conclusion

The WDREIS is deficient in not including any reliable data on the costs of WDR and for failing to adequately assess the costs and benefits of the many alternatives. The NSW Government should not approve the WDREIS without further assessment of the costs and benefits of the WDR and its alternatives.

Yours sincerely,



Professor Jamie Pittock

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