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Queensland Floods Commission of Inquiry
PO Box 1738
Brisbane QLD 4001

9 April 2011

Dear Commissioners,

Submission to the inquiry concerning dams and their alternatives for flood management

1. Introduction

I write to offer the following information concerning the role of dams in flood management, the opportunities to re-operate dams, and alternative means of reducing flood risks. I am a researcher at ANU and have worked on river conservation and water infrastructure in Australia and globally since the late 1980s. While little of my experience is in Queensland, I write to offer information on the role of water infrastructure in flood management elsewhere that may be of use in your deliberations. My submission is prompted by calls for greater use of dams in flood management by a number of political leaders, and the need to consider a wider range of flood risk management options.

My submission addresses:

- Trade-offs in using dams for flood mitigation;
- Limitations to a flood management strategy based on dams;
- Climate change and dams;
- „Soft path' options for flood risk management;
- Environmental implications of dams and floods.

1. Trade-offs in using dams for flood mitigation

In January 2011 one Australian political leader concluded "I think it's time that as a nation we put new dams back on our agenda and I think that the Queensland flood disaster makes this very timely indeed because dams can be flood mitigation devices as well as water storages. They can be a potential source of zero emissions power as well as water storages" (Liberal Party, 2011). I argue that hasty calls for more flood control dams are misplaced and that instead a broader range of options for managing flood risk should be considered.

Management of large floods involves difficult trade-offs: to catch a flood a dam has to be substantially empty and thus cannot maximize its potential to store and supply water to people or generate hydropower (WCD, 2000). Brisbane ran low on water during the Millennium Drought resulting in billions of dollars of investment in desalination and water recycling plants and pipelines (QWC, 2008), which may have been minimized if Wivenhoe Dam could store more water in place of flood control capacity, illustrating one of the costs in the trade-offs involved. No one dam can stop the largest

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floods, as we have seen with the flooding of Brisbane in 2011 despite the large flood storage capacity in Wivenhoe Dam: at best dams only partially manage flood risk. Indeed flood control dams may only manage moderate, beneficial floods and lull communities downstream into developing on floodplains, thus exacerbating risk in large floods. I argue (below) that it is usually better to move people and critical infrastructure out of harm's way rather than relying on engineering interventions and infallible institutions to manage them well in every flood.

2. Limitations to a flood management strategy based on dams

In Australia the best sites for dams have largely been developed and remaining sites usually have high environmental values, would displace many residents, or are inefficient. For instance, CSIRO concludes for northern Australia that "There are significant constraints on the viability of surface water storages" (CSIRO, 2009). Many developed countries are now removing redundant or unsafe dams: the Victorian Government has just spent AUD$60 million decommissioning a large water storage, Lake Mokoan (Victorian Auditor General, 2010).

Water supply for urban areas is a valuable service yet there is a long list of proposed dams abandoned by Australian governments due to community opposition, usually with belated agreement from major political parties: Tillegra in New South Wales, Traveston Crossing in Queensland, Welcome Reef in New South Wales and Tennant in the Australian Capital Territory are among the most recent. I believe this near-systematic public opposition is no accident and it highlights the likelihood that a flood-control strategy predicated on new dams would fail to be implemented in a timely manner, if at all. A policy for new flood control dams invites the „nuclear question': which valley would proponents inundate next - up river of Brisbane for example?

3. Dam re-operation and climate change

Climate change forecasts suggest that more frequent extreme climatic and hydrological events are likely, including floods and droughts (Bates et al., 2008). Dam projects are an inflexible, one to two decade development proposition compared to the quicker, incremental „soft path' alternatives (Gleick, 2002; Hallegatte, 2009). Indeed the future of our current stock of dams will come under greater scrutiny with climate change: the increasing loss of reservoir capacity, applying changing safety standards to aging dams, failing to deliver intended services due to changing hydrology, and emerging demands for new services from existing dams (for instance, as back up energy storage for intermittent renewable power generators) will see resources diverted from new dam proposals (Pittock, 2010; Bates, 2008).

While I am not familiar with relevant legislation in Queensland, most Australian states have inefficient regulatory mechanisms for water infrastructure. Regulation is often only focussed on larger structures and on dam safety. Most Australian states do not rigorously regulate smaller structures (as evidenced by incomplete registers of such structures), have not issued time-limited licenses for this infrastructure and have no means for periodically reassessing the economic, social and environmental performance of dams and levees. Globally a great many technologies exist that may reduce the impacts of badly designed water infrastructure (Krchnak *et al.*, 2009). A lot of old water infrastructure in Australia is

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redundant and poses a hazard during floods, for example, the many weirs constructed to supply water to steam trains. Many countries have periodic licences that enable unsafe or redundant infrastructure to be removed and facilitates upgrading of old structures with economic values to meet modern environmental standards, such as the Federal Energy Regulatory Commission hydropower relicensing process in the United States. Queensland and Australia should consider similar periodic relicensing process for all water infrastructure to facilitate its adaptive management (Pittock and Hartmann, 2011).

4. 'Soft path' options for flood risk management

Instead of flood control dams I argue that we need to consider the merits of a broader range of measures to manage flood risk including better land use planning and building standards, early warning, flood management institutions and insurance. One proven alternative that I will elaborate here is the restoration of large areas of flood plains in Europe, the United States and China to give rivers room to flood safely (Ebert *et al.*, 2009; Yu *et al.*, 2009; Opperman *et al.*, 2009; Deltacommissie, 2008). These lands have been converted to more flood-resilient uses, including for extractive industry production (sand and gravel), pasture, aquaculture and fisheries, forestry, recreation and nature conservation.

In the Netherlands, the government program "Room for the Rivers" is systematically setting back flood control levees along the nation's levees and developing floodplains for nature conservation and recreation (Deltacommissie, 2008). One project involves reopening the Gerlderse Poort floodplain on the Rhine River, including through the extraction of historical clay, sand and gravel deposits, to create a 2,500 ha nature reserve that is increasing the safe flood discharge at the cities of Arnhem and Nijmegen from 15,000 m3/s before 2006 to 16,000 m3/s in 2015, and 16,500 m3/s in 2100 (Pittock, 2008). Dutch cities are also restoring ancient river channels as high-water flood ways around urban areas. Along the lower Danube River in Europe the governments have agreed to increase flood storage through restoration of 2,250 km^2 of floodplains and 14.4% has been or is being restored. In the lower Danube a flood in 2005 killed 34 people and caused EUR€396 million in damages, whereas restoration of a larger volume of floodplains from farmland would cost an estimated EUR€20 million and generate ecological services worth EUR€50 million per year (Ebert et al., 2009). There are many places in Queensland where floodplain restoration may assist flood management.

There is even the option of removing flood control capacity from dams to generate more hydropower, as has been proposed for the Yangtze River in China. This would enable dams to be operated as run of river to reduce downstream environmental impacts from changed hydrology, and a share of the extra hydropower revenue may be used to pay for downstream floodplain restoration (Opperman et al., 2009).

5. Environmental implications of dams and floods

Freshwater ecosystems are among the most degraded globally due in large part to the impacts of dams ((MEA, 2005)Nilsson et al., 2005; Pittock, 2008). It is no accident that in Australia the two biggest development proposals that have failed to pass environmental standards established under the Federal Environment Protection and Biodiversity Conservation Act 1999 were the Nathan and Traveston

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Crossing dams in Queensland (Peel and Godden, 2005). Moderate, over-bank water flows provide many benefits for people as well as the environment and should be accommodated (Reid-Piko *et al.*, 2010). Such flows contribute to the recharge of groundwater aquifers that are important sources of water for people and livestock, especially during droughts. The recent flooding in eastern Australia will flush out salt accumulations following many years of drought and will stem the oxidation of wetland sediments to form acid. Iconic but degraded floodplain forests – such as Red Gum, Black Box and Coolibah – are being rejuvenated. Many pastoralists in inland Australia depend on beneficial floods to grow pasture for livestock, and the strong flows into estuaries and coastal waters will increase fish breeding and fish stocks. Wetland biodiversity will also benefit despite some downsides, including discharge of sediment onto coral reefs.

Conclusion

In rebuilding after the floods we have an important opportunity to learn the lessons from damage inflicted and adopt a broader range of options for more effective and resilient management of flood risk. We should focus on the „soft path' flood risk reduction options that are cheaper and more flexible and provide multiple benefits for people in terms of water, fish, timber, sand and gravel, agricultural production, recreation and nature conservation.

Yours sincerely,

[redacted]

Dr Jamie Pittock

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