Dam risk to Murray-Darling wetlands may be underestimated

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(PhysOrg.com) -- Computer modelling used to develop the Murray-Darling Basin Plan may have significantly underestimated the effects of building dams and diverting water on the internationally listed Macquarie Marshes wetlands, according to a new study.

“This may have profound implications for the decisions currently being considered by government in relation to the basin plan, certainly for the Macquarie Marshes and elsewhere if there are similar findings," says Professor Richard Kingsford, Director of the Australian Wetlands and Rivers Center, an author of the study published in the international journal *Environmental Management*.

Kingsford and his colleague, Dr. Shiquan Ren, statistically analysed changes in flows to the Macquarie Marshes on the Macquarie River before dams and diversions occurred and then afterwards. They found that the hydrological model used for the Macquarie River for managing the river and underpinning the basin plan, underestimated the average annual impact of reduced flows to the Macquarie Marshes by 16%.

Government hydrological modelling estimated that annual average flows had been cut by dams and river regulation by only about a 27%, but the new modelling estimates the flow reduction at 43%. The Guide to the Basin Plan has recommended that there should be return of about an additional 10% of the flows to the Macquarie River.

To ensure that their analyses were accurate, the researchers also

compared outputs from their statistical modelling and the government hydrological models to actual data from flow gauges on the river. The researchers found good agreement between actual data and outputs from their statistical models. According to Kingsford: “The hydrological model used for the basin planning tended to underestimate flows before dams were built and overestimated flows after dams were built. That’s the nub of the problem causing the disparity”.

These results, the first independent assessment of hydrological modelling anywhere in the Murray-Darling Basin sends a strong warning to governments deciding the future of the basin and how much water should be returned to the rivers, says Professor Kingsford: “If we found similar results elsewhere, it would mean a significant jump in the amount of flow that we should be returning to basin rivers for sustainability." "Certainly most environmental scientists working in the Murray-Darling Basin over the last 50 years have been struck by the scale of degradation with large areas of dead river red gums, declining waterbird populations, water quality issues and general declining health of the river."

The modelling differences were primarily when the river reached the complex wetland system. According to Kingsford: "The hydrological model used for the basin planning figures in the Macquarie did not cope well with measuring the impact on the wetland but all models line up well in their predictions higher up the river.” The study concluded that this reflects the purpose of many hydrological models that underpin the basin plan: they were originally designed to manage the river for irrigation, not for the complexity of large wetland systems. This also has implications for environmental flow management. “We need modelling systems that better mirror the hydrological variability because this is a window into the ecological intricacies of these wetlands which are so important for biodiversity” says Kingsford.

More information: The paper “Statistically Integrated Flow and Flood Modelling Compared to Hydrologically Integrated Quantity and Quality Model for Annual Flows in the Regulated Macquarie River in Arid Australias” is online www.springerlink.com/index/U25VK12T571760U8.pdf

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