

Integrating Indigenous Knowledge and Indigenous Data Sovereignty for sustainable water management

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Abstract: Large river basins such as the Murray Darling and Great Artesian Basins are not only hydrological systems but living cultural landscapes. For Aboriginal and Torres Strait Islander Peoples, water is inseparable from the natural, spiritual, and cosmological worlds, and from our social and cultural wellbeing. For over 65,000 years responsibilities to care for Country have been sustained through sophisticated Indigenous Knowledge Systems. These systems have evolved through deep observation of environmental processes, expressed through our songlines such as the Muruwari's Mundaguddah (the water snake and our authoritative water ancestor), which provides early warnings of floods and guides respectful use of water resources. However, the places where Mundaguddah resides have been severely impacted by colonisation through upstream development, over-extraction of both surface and groundwater, and pollution – threatening the continuation of cultural practices and the wellbeing of our peoples.

Across Australia, water policies and management strategies, including hydroclimate risk assessment frameworks, remain shaped by colonial legacies of terra and aqua nullius (“empty land” and “empty waters”) and have been based on disrupted, partial, and often inaccurate understandings of water histories and the cultural meanings of water. Despite water's profound cultural significance for Aboriginal and Torres Strait Islander Peoples, current water management laws inadequately recognise our rights to access, use, and manage water resources, making them among the weakest of any colonial nation. Exclusion from decision-making and limited access to relevant data continue to undermine both Indigenous custodianship and the broader capacity to manage climate-driven risks such as drought, flooding, and ecological decline.

Advancing science, modelling, and management in large river basins requires integrating Indigenous worldviews, values, and governance principles into water policies, management strategies, and hydroclimate risk assessments. Embedding Indigenous Data Sovereignty (IDSov) “*The right of Indigenous Peoples to control data about their peoples, lands, and waters*” offers a pathway for ethical, inclusive, and fit-for-purpose data ecosystems. Operationalising IDSov through the CARE and FAIR Principles, alongside local IDSov protocols and cultural lore, ensures that hydroclimate data is both technically interoperable and culturally accountable. Aligning hydroclimate science with Indigenous leadership fosters more accurate, resilient and equitable risk assessments strengthening adaptation to climate extremes while upholding responsibilities to care for Country for future generations and continuation of our songlines.

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