# The Menindee Lakes Water Savings Project – an example of poor decision-making

**Above: Shores of Lake Menindee, Mid-2021 (Photo J. M. Craciun)**

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# EXECUTIVE SUMMARY

We investigated the decision-making in relation to the ecology and management of the Menindee Lakes Water Savings Project (the Menindee Lakes Project). We investigated the available scientific evidence and stakeholder consultation, required for rigorous adaptive governance of decision-making, identifying significant weaknesses in the approach, driving poor decision-making. Specifically, we examined three objectives related to scientific evidence: (1) trends in long-term (1880-2019) rainfall and flows in the Darling River reaching Menindee Lakes; (2) trends in abundance and richness of waterbirds at Menindee Lakes (1983-2019) and association with flows and; (3) the evidence basis for government decision-making in the Business Case for the Menindee Lakes Project. We also surveyed local communities, dependent on the ecosystem, in relation to perceptions of the condition, consultation processes and future options for the Menindee Lakes and the Darling River.

## Key findings

- Flows to Menindee Lakes have significantly declined over the past century contributing to a ~68% decline in waterbird abundances, with declines across most functional response groups (piscivores, herbivores, ducks, large wading birds).
- Traditional owners, local residents, and farmers voiced concern over the ecological condition of the lakes and the viability of their communities resulting from decisions related to the Menindee Lakes Project designed to improve water efficiency.
- Objective expertise was not part of the decision-making process for the Menindee Lakes project, as the well documented long-term ecological conditions of the Barka/Darling and Menindee Lakes was largely ignored, in favour of an unclear, predominantly engineered water savings offset, that could not achieve environmental equivalency, as required under the Murray-Darling Basin Plan.

- Further, there was little rigorous or transparent evidence to justify the water savings purported to be provided with the project, with significant financial and social costly decision-making based on poor evidence.
- Government options presented for proposed management of Menindee Lakes lacked administrative legitimacy, as decision-making was dominated by government water agencies, inadequately incorporating meaningful public dialogue and eroding public trust in government.
- A focus on achieving basin scale water savings outcomes at the local scale missed the opportunity to develop a management plan locally, focused on restoring the lakes and their flooding and drying cycles.

## Recommendations

1. Future plans for the Menindee Lakes should adequately incorporate ecologically sustainable principles, while also using an evidence based approach which incorporates rigorous scientific evidence and community knowledge.
2. Instead of focusing on achieving a largely illusory water savings target, predominantly through engineering works, future plans should consider social and environmental costs and investigate opportunities to save water by reinstating natural drying and flooding patterns for the lakes.
3. A more equitable decision-making process could be achieved with a more inclusive adaptive governance approach which uses the available scientific evidence and incorporates views of the local community, alongside increasing transparency in relation to scientific evidence.
4. All relevant government agencies should be included in decision-making for Menindee Lakes, including those with environmental responsibilities for the area (i.e. Kinchega National Park), particularly the NSW National Parks and Wildlife Service and expertise in the NSW Department of Planning and Environment.

## Menindee Lakes

Menindee Lakes are supplied by flows from the Darling River/ Barka. They include eight lakes (Fig. 1). The Darling River or Barka is one of the largest river systems in Australia, running from northern NSW to Wentworth in western NSW, then joining the Murray River (Fig. 1).

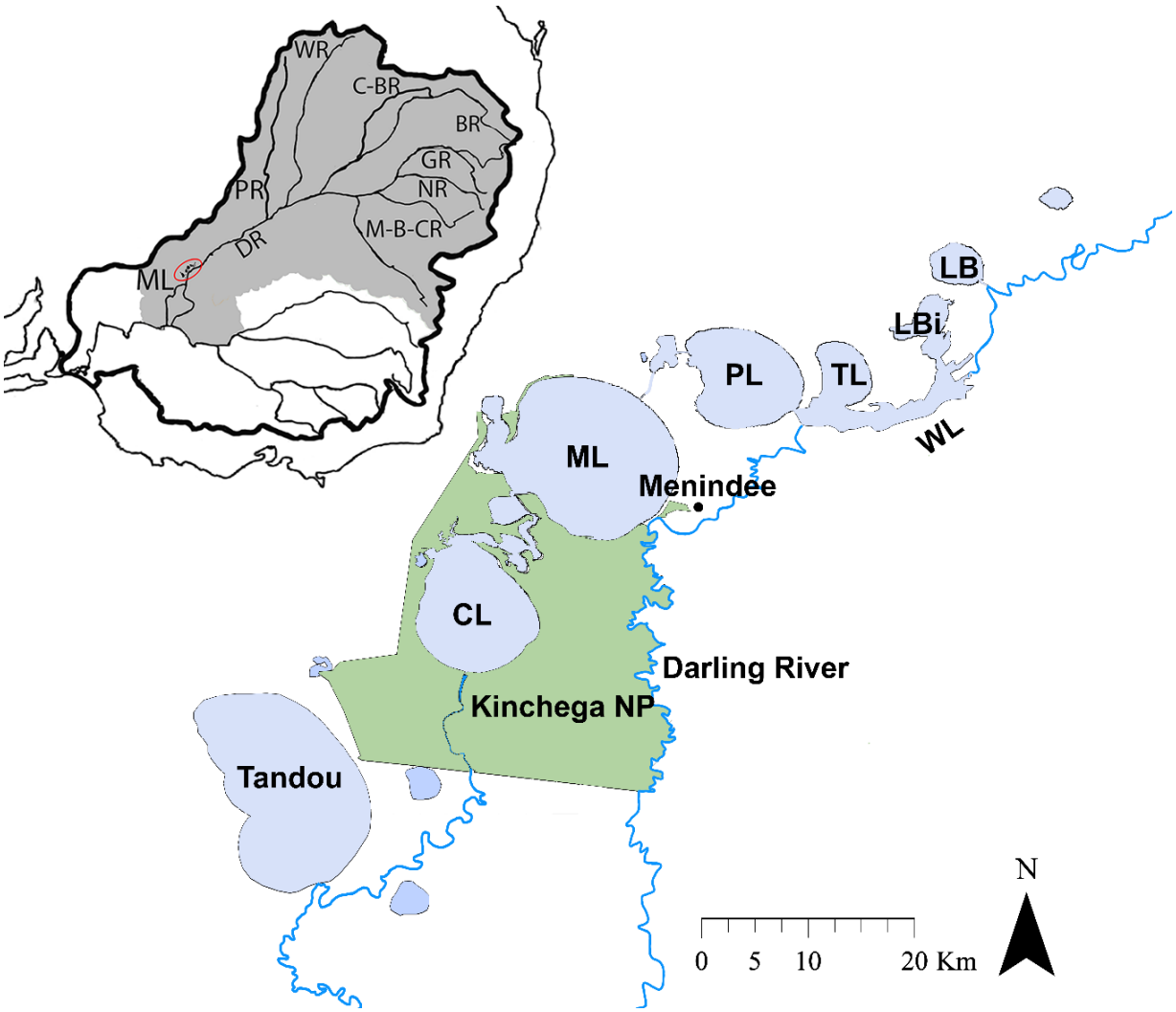



**Figure 1. – a) Location of the Darling River Basin (grey), within the Murray-Darling Basin, Australia, showing Menindee Lakes (ML) and the seven tributaries of the Darling River (DR); Paroo River (PR), Warrego River (WR), Condamine/Balonne River (C-BR), Border Rivers (B-R), Gwydir River (GR), Namoi River (NR), Macquarie-Bogan-Castlereagh River (M-B-CR). b) Locations of the main seven Menindee Lakes; Lake Balaka (LB), Lake Bijijie (LBi), Lake Tandure (LT), Lake Pamamaroo (LP), Lake Menindee (LM), Lake Cawndilla (LC), Lake Tandou (LT), within the Darling River floodplain, showing the weir pool, Lake Wetherell and Kinchega National Park (green), and Menindee town (see Fig. 1) on the Darling River.**

The Darling River's flows come from rainfall in nine tributary catchments upstream, which are highly regulated by government built dams, compared to the Darling River catchment which is mostly unregulated (Ford et al.

**Figure 2. (a) above: the town of Menindee on the Darling River (population ~550), where it feeds into Lake Menindee (Photo: Google Earth 2022). (b) below: The Darling River flows from north to south, with water overflowing into the Menindee Lakes, including Lake Menindee (top right) and Lake Cawndilla (top middle), both forming important wetlands within Kinchega National Park (Photo: R.T. Kingsford).**

2023). Like most of Australia's dryland rivers, the Darling River has one of the more highly variable flow regimes in the world, characterised by pulse flooding events (Puckridge et al. 1998). This high variability (Thoms and Sheldon 2000), drives a range of essential ecosystem processes (Kingsford 2000, Leigh et al. 2010). The area is semi-arid, with annual average evaporative losses (Westbrooke et al. 2015) and, like many Australian dryland rivers, very little (only 6%) of rainfall transforms into run-off (Chiew et al. 2008). Rainfall patterns are highly influenced by El Niño–Southern Oscillation (ENSO) cycles (Chiew et al. 1998) and the Indian Ocean Dipole (IOD) (CSIRO 2012).

The Menindee Lakes receive overflows from the Darling River and its tributaries upstream (Fig. 2b). The Darling River, or Barka, (hereafter referred as Barka/Darling river) and the Menindee Lakes are within the Barkandji native title claim area (Hartwig et al. 2018, South Australian Government 2019) and are central to the physical, mental and social health of Barkandji peoples (Gibson 2012), who have rights and responsibilities in

**Figure 3. Sunset taken from Sunset Strip, a 'beachside' community on the north shore of Menindee Lake, a culturally significant part of the lakes that attracts local tourism. (Photo: J. M. Craciun)**

maintaining the wellbeing of the Lakes and Barka/Darling river, that have struggled to be recognised under contemporary management (Hartwig et al. 2018). The Menindee Lakes are in the middle of Barkandji country, and are a particularly important site, rich with Aboriginal cultural heritage sites (Martin and Lane 2001, Pardoe 2003)

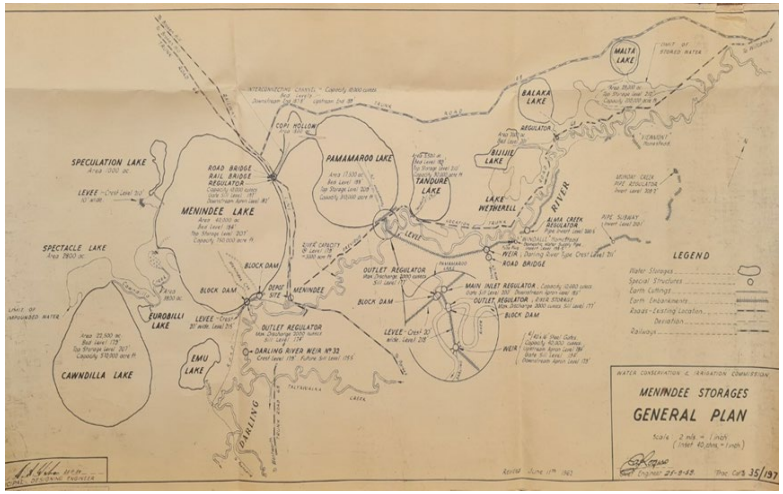
A large portion (28%; Kingsford et al. 2002) of the lakes reside within Kinchega National Park (Fig. 1), the only large wetland conservation area along the Darling River conserved for its biodiversity, cultural and recreational values (NSW National Parks and Wildlife Service 1999). Kinchega National Park has a significant representation of rare or threatened vegetation communities, including river red gum (*Eucalyptus camaldulensis)* and bluebush scrubland (Maireana pyramidata) (Westbrooke et al. 2015), well as important waterbird breeding refuges (Kingsford 2004). The National Park also has many culturally significant sites for Barkandji peoples and the area's rich pastoral history (Pardoe 2003, Allison and Cremin 2006), which serve as important sites for local tourism (Fig. 3), supporting the socio-economic wellbeing of surrounding communities (Parkinson 2002)

## History of water resource development

Before 1960, Menindee Lakes filled and dried in response to natural flow regimes from the Darling River, natural drying over time. Observation of this natural flow regime came from a local resident, A.F Cudmore; he reported that the lakes more often had water than they did not over a 30 year period up to the end of the 19$^{th}$ Century, including the Federation Drought (1895-1903) (Commissioners of the Royal Commission on the River Murray 1902)In 1949 construction began on a series of weirs, regulators, levees and channels (The Menindee Lakes Water Scheme), under the Menindee Water Conservation Act 1949 (Fig. 4). This killed floodplain vegetation and negatively impacted the diversity and density of waterbirds (Kingsford et al. 2004, Australian Academy of Science 2019). From 1960-2008 government built dams in upstream tributaries (e.g. Burrendong Dam on the Macquarie River and Keepit Dam on the Namoi River, Fig. 4) were constructed to store and capture floods, reducing flooding regimes and flows from the Darling River into Menindee Lakes. During this period, flows reaching Menindee Lakes continued to decline (Kingsford 1995, 2004, Webb et al. 2007). Development continued to intensify, with the building of private off-river storages in the mid-1980's. This caused flows

reaching Menindee Lakes to decrease further and inundation became less frequent (Kingsford and Thomas 2004, Webb et al. 2007, Australian Academy of Science 2019, Ford et al. 2023).

From 2009, the water recovery process through the Murray-Darling Basin Plan had begun and some flows were returned to the Darling River through environmental flows in the tributary rivers, however, policy of water sharing plan rules (e.g. floodplain harvesting and activation of A class licenses) reduced environmental flows reaching Menindee Lakes (Australian Government 2012, Simpson 2017). The Northern Basin review 2012-2016 also resulted in a reduction of the amount of water to be recovered under the Murray-Darling Basin Plan by 70GL $year^{-1}$ in the Darling River and its tributaries. This reduced the amount of flows returned to the Darling and its tributaries via environmental flows (Australian Productivity Commission 2018).




**Above: The first stage of development for the Menindee Lakes; the original Weirs, regulators, levees and channels constructed under the Menindee Water Conservation Act 1949 (Map from 1959).**

**Above: Government built dam, Burrendong Dam on the Macquarie River, built to store and capture floods. Photo: Richard Kingsford**

Menindee Lakes Scheme 1949-1968

Government built dams in tributaries 1960-2008

Private off-river storages built 1980-present

Water recovery begins (Basin Plan) 2012-present

Nothern Basin Review 2012-2016

Menindee Lakes SDLAM project 2017-present

**Above: Main Weir at Menindee Lakes, a key structural work at the lakes, that creates Lake Wetherell. Photo: Richard Kingsford**

**Above: Large private off-river storages upstream at Cubbie Station, the largest irrigation property in the southern hemisphere with irrigation licences for over 460 GL. (Photo: R. T Kingsford)**

**Figure 4. Timeline of Water Resource development at Menindee Lakes and its tributaries.**

## The Menindee Lakes Project

The most recent development in the management of the lakes was the Menindee Lakes SDLAM project (The Menindee Lakes project), developed in 2017. It aimed to achieve an estimated 106-180 GL per year of water savings with various infrastructure measures and operational adjustments, through reducing evaporative losses (Department of Primary Industries 2017). The Menindee Lakes Project was identified as the largest project in the Murray-Darling Basin, likely to deliver the greatest dividend in water savings to meet the environmental flow target under the Murray-Darling Basin Plan (NSW Department of Natural Resources 2007, MDBA 2017). The project was to be completed by 2024 at an initial cost estimate of $151.8 million (NSW Department of Industry 2018) as a Sustainable Diversions Adjustment Mechanism (SDLAM) Project. This project has a long history with the NSW Government identifying that more 'efficient' management of Menindee Lakes could contribute to environmental water recovery, using infrastructure and management to reduce the amount of water lost to evaporation from the lakes (Bewsher Consulting 1994). Even in the mid 1990s, there was little rigorous evidence of the quantity of water that could be saved. It is particularly surprising that this continued over more than three decades not to be addressed.

In 2017, the NSW Government announced the estimated water savings (72 GL per year of water) for the Menindee Lakes Project (Department of Primary Industries 2017), would make it a large contributor to the recovery of environmental water, under the Murray-Darling Basin Plan (Department of Primary Industries 2017). The project was built on a long history of engineering works focused on the Menindee Lakes, since the 1960s (Fig. 4). The Barka/Darling River was 'dammed' by the Main Weir (Fig. 1), which turned some of the large natural lakes into dams to store water (total storage volume of 1,731GL). Lakes turned into dams through river regulation are often referred to as reregulating storages. Water is predominantly stored in Lakes Cawndilla, Menindee, Pamamaroo, Wetherell and Tandure (Fig. 1). Stored water could then be delivered locally, to Broken Hill and the Lower Darling. This regulated system was also used in making decisions about water delivered to South

Australia, allowing water agencies including the Murray-Darling Basin Authority to manage this system integrated with water delivery in the Southern connected basins, particularly the River Murray and Murrumbidgee River and their river storages (e.g. Dartmouth Dam).

The associated ecological, cultural and economic risks of the project and the inadequacy of government community consultation caused deep concern among local communities (Australian Productivity Commission 2018, Northern Basin Aboriginal Nations (NBAN) and Murray Lower Darling Rivers Indigenous Nations (MLDRIN) 2019, South Australian Government 2019, Jackson and Head 2020). Stakeholders were concerned about the transparency and complexities in the decision-making processes, resulting in a high risk project that was unlikely to be completed (Murray Darling Basin Authority 2020), jeopardising its significant contribution to environmental water recovery under the Murray-Darling Basin Plan.

In this report we assessed the governance approach taken by the New South Wales Government to the Menindee Lakes Project, using a combination of scientific evidence and stakeholder consultation. We focused on four elements of The Menindee Lakes Project: (1) ecological condition of the Menindee Lakes and the Barka/Darling; (2) Inclusion of public dialogue in decision making processes; (3) the evidence basis for government decision-making in the Business Case for the Menindee Lakes Project (Department of Primary Industries 2017) and; (4) scale of governance for the project.

## Ecological decline of Menindee and the Barka/Darling

Annual flows in the Barka/Darling River supplying Menindee Lakes have continued to decline over three phases of water resource development (Ford et al. 2023), increasing the evidence of long-term declining flows (Kingsford 1995, Thoms and Sheldon 2000, Leblanc et al. 2012, Australian Academy of Science 2019, BOM 2020) and increasing drying of the river with more cease to flow events (Australian Academy of Science 2019, BOM 2020). These trends are driven primarily by water resource

development in the Barka/Darling tributaries and upstream in the Darling River. Additionally. there was little evidence of any major changes in annual rainfall patterns in the tributaries or the Barka/Darling River over a period of 139 years (1880-2019), despite multiple periods of prolonged drought and high variability (Ford et al. 2023).

These abiotic changes extend to ecological indicators of long term decline at Menindee Lakes. Waterbird communities have experienced long-term declines in abundances (~68% decline from 1983-2019, Ford et al. 2023) with the development of water resources upstream. This decline has occurred over more than three decades, driven by declining river flows, indicative of the overall

**Figure 5. Australian pelicans at Menindee Lakes (an important waterbird breeding site) captured during the annual Eastern Australian Aerial Waterbird Survey. (Photo: R. T Kingsford).**

deterioration of ecosystem health (Australian Academy of Science 2019). Observations by the local community reported similar trends (Ford et al. 2022), reflecting declines in fish-eating birds. Local fish communities were also declining (Gehrke et al. 1995, Gilligan 2005, Wallace, T., Sharpe, C., Fraser, P., Rehwinkel, R., and Vilizzi 2008) most seriously reflected in the mass fish kills of millions of fish in 2018/19, attributed to lack of flows in the Barka/Darling River and die-off of blue green algae

(Australian Academy of Science 2019). This decline was also significant for fish species of high cultural importance for Barkandji people (Ellis et al. 2022), such as *Parntu* (murray cod, *Maccullochella peelii*), Pangula (black bream, *Acanthopagrus butcheri* or silver perch, *Bidyanus bidyanus*) and Kunpali (yellow belly or golden perch, *Macquaria ambigua*), for which the lakes serve as a basin-wide breeding and recruitment area (Ebner et al. 2009, Stuart and Sharpe 2020). The Menindee Lakes project, as proposed in June 2017, involves decommissioning Lakes Cawndilla and Menindee so that they will no longer receive significant flows from the Barka/Darling. This would have further disrupted essential ecological processes and affected the integrity of Kinchega National Park. As of October 2021, plans for the project are to be re-scoped and the project completion has now delayed (Sullivan 2022).

## Community involvement in decision-making

Good governance requires meaningful public dialogue, with a two-way flow of information between communities and government agencies. This provides opportunities for knowledge exchange and deliberation between the groups affected by decisions made and the decision-makers. The experiences of the community members who participated in government consultation processes for the Menindee Lakes project indicated limited meaningful public dialogue (Ford et al. 2023). Many in the local community commented on the lack of transparency in decision-making and felt that they had not received enough relevant information or time to make informed contributions, with stakeholders regularly requesting more information prior to meetings to review and receiving meeting notes on the day of the meetings, rather than 7-10 days prior to the meeting (R. Strachan, pers comm, June 2022). Government consultation processes were frequently described as “tokenistic”, with key stakeholder groups withdrawing from government engagement several times. Most feedback from these events was required to be submitted post meetings and there was concern that government representatives had not received this feedback (R. Strachan, pers comm, June 2022). The accessibility of government consultation events was often limited to those invited as part of a consultation committee, and not widely available for many in the community. Many people in the community commented that the

evaporative water savings to be achieved through the project unfairly targeted Menindee Lakes, given significant evaporative losses from artificial private storages upstream (Webb McKeown and Associates Pty Ltd 2007, Jackson and Head 2021). Additionally, community stakeholders were also repeatedly told that management of flows were dictated by procedural manual guides, which requests to view were unsuccessful (R. Strachan, pers comm, June 2022)

As in many other systems in decline (Postel 1997), ecosystem services have compromised the functioning of the community. The ecological impacts from water resource development that we identified (see also Ford et al. 2023), combined with a dysfunctional community engagement process and lack of transparency, eroded already wavering trust in governments, an important component of community participation (Reed 2008, de Stefano et al. 2012). This element of trust was important,

**Figure 6. Drying Lake Pamamaroo, one of the large Menindee Lakes used as a storage, drying back (Photo R.T. Kingsford).**

considering the significant involvement of Indigenous stakeholders in government engagement and the Barkandji native title claim (Jackson 2019).

## Evidence base for decisions

The proportion of peer reviewed sources cited within the Menindee Lakes Business Case did not reflect the number of relevant publications in the public domain at the time its publication (Ford et al. 2023). A large proportion of the relevant, uncited peer reviewed information in the public domain, was from open-access academic journals (41%) and many other relevant independent reports were freely available.

More problematic, a series of 11 studies (The Menindee Lakes Ecologically Sustainable Development Project). commissioned specifically to provide information on the hydrological, ecological and cultural impacts of modifying the lakes, were not cited and largely ignored. These relevant, available, and publicly funded studies came at a substantial cost of $AUD2.5 million. There was also no reference to Kinchega National Park, which occupies a large proportion of the Menindee Lakes (28%; Kingsford et al. 2002). Additionally, there was no reference to the Barkandji native title claim that the lakes reside within, or impacts on Indigenous water values. Relevant Government reports and peer-reviewed studies pertaining to this claim and Barkandji water rights and interests were not cited.

## The illusory water savings

There was little intentional or unintentional effort to consider evidence that might affect the goal of saving water by the NSW Government. There was an absence of any publicly available data or associated modelling to demonstrate how the estimated water savings of the project would be

achieved for the 22 structural and operational measures within the Menindee Lakes Business Case. Additionally, there were three different annual water savings estimates used throughout the report (72, 106, 116 GL per year), all lower than the original estimate of 180GL per year originally expected by the Australian Government. The latter figure (116 GL) was 250% higher than the lower estimate in the Business Case. This figure has been lowered again since the release of the Business case in 2017. Most recently there are reports that water savings may be adjusted to only 20-40GL per year (Davis 2021). This would further reduce the amount of water the project would provide to NSW's required contribution to water savings under the Murray-Darling Basin Plan.

## Water savings – a case of "Robbing Peter to pay Paul

This failure in achieving the original proposed water savings target, related to the key issue of scale with the Menindee Lakes project: the project attempted to use a locally scaled solution to achieve large scale (in this case the Murray-Darling Basin Plan) governance objective (Cumming et al. 2006; Guerrero et al. 2013) . Essentially, this project demonstrated that the NSW Government was intent on maximizing water savings to meet its obligations under the Murray-Darling Basin Plan at high local environmental cost to Menindee Lakes. The NSW and Australian Governments considered the Menindee Lakes project as an opportunity to 'save' water from evaporation, which then could be delivered as environmental water for the entire basin, contributing to government commitment to return 2,750 GL $year^{-1}$ to the rivers of the Murray-Darling Basin (Jackson and Head 2021). This made no concession of the natural environmental processes of drying which are critical for the ecological health of these systems.

Additionally, under the Murray-Darling Basin Plan, 'saved water' from a project such as the Menindee Lakes project is required to meet "an environmental equivalence test" by delivering a net environmental benefit overall (Mosley et al. 2010). This large-scale imperative to achieve water savings fails to address local community and environmental costs, therefore cannot achieve

environmental equivalence or an effective local solution. Additionally, there was no evidence that government water agencies used available ecological data that could have provided a satisfactory form of commensurability between the projects' infrastructure measures and rule changes for a 'like for like' substitution (Maron et al. 2016, May et al. 2017, South Australian Government 2019). Ironically, the project's inability to achieve this required net environmental benefit (instead worsening local environmental conditions) was at odds with a primary motivation for water recovery through the Murray-Darling Basin plan; widespread environmental decline, that is felt acutely in small basin communities like Menindee.

The Menindee Lakes project's focused on water savings and poorly acknowledged the essential role of the lakes as locally valued ecosystems, that naturally fill and dry (Kingsford 2004, Leigh et al. 2010, Bino et al. 2015) and sustain ecological processes and human livelihoods(Porter et al. 2007, Kingsford et al. 2010). Further, communities of Menindee described losses to local agriculture and recreation use of the lakes depressed local economic activity when most of the lakes were dry, contributing to population declines and reduced employment opportunities. This was especially relevant to Menindee town (Fig. 2), described as "a shadow of what it once was" by local people (Ford et al. 2023).

The loss of a secure water supply has also had major non-economic impacts on community wellbeing. Traditional Owners lost access to highly valued cultural resources, that they had maintained independently through thousands of years of stewardship, essential for their cultural, social and economic health (Noble et al. 2016). Local people were acutely aware of these impacts of long-term ecological decline on their communities, with an increasing awareness that this was a consequence of government decision-making (Ford et al. 2023, Australian Academy of Science 2019). Decision-making for the project disempowered and frustrated many in the local community (Ford et al., 2022). The Menindee Lakes Water Savings project was considered to have disproportionately favored needs of upstream users (Grafton 2019) at the expense of Lower Darling communities (South Australian Government 2019). Consequently, the options proposed for the Menindee Lakes SDLAM Project were

predicted to have further, major environmental and social costs for the Menindee Lakes and local communities.

## The legitimacy and effectiveness of the project

Despite promises of significant water savings, the decision making process for the Menindee Lakes SDLAM project was poor practice, a poor example of effective governance. This profoundly affected the legitimacy and implementation of the project, particularly in relation to the local community and ecological condition of Menindee Lakes and the Barka/Darling River. There were weaknesses in administrative legitimacy, especially when attempting to create reciprocal dialogue with the communities impacted by the project. If all the scientific evidence and resulting options were presented transparently to the community by government agencies, decision-making would have been considerably more inclusive. This should also have included a specification of the uncertainties. Furthermore, objective expertise did not inform decision-making for the project, considering that the long-term ecological conditions of the Barka/Darling River and Menindee Lakes was largely ignored. This was in favour of an ambiguous, mostly engineered water savings target that could not achieve environmental equivalency, as required under the Murray-Darling Basin plan. This focus on achieving basin-scale water savings outcomes at the cost of local ecosystems led to a missed opportunity to develop a management plan locally, focused on restoring the lakes, suggested by the community (Australian Academy of Science 2019).

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