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A fish kill QandA

Questions, answers and dead fish in the Menindee Lakes

Hundreds of thousands of native fish have died in recent weeks in the Menindee Lakes. Drought is the catalyst, but policy failure and mismanagement are the cause. Both State and federal governments and water agencies are responsible for this disaster.

Discussion paper

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Summary

Massive fish kills have been reported on the Darling River and Menindee Lakes in western NSW. Up to one million native fish are reported to have died due to low water levels and poor water quality. This report covers the key questions and answers relating to the causes of this crisis for Australia's native fish and NSW communities:

Q: Were the fish kills caused by the drought?

A: No. While drought conditions in much of the Basin catchment are a catalyst for the conditions that led to the fish kill, the reason there is so little water in the lakes and Lower Darling relates more to the management of the lakes.

Q: Why are the Menindee Lakes and Lower Darling so dry?

A: The lakes were drained in late 2016 and 2017, with a total of 819GL released from Menindee Lakes, almost the equivalent of two Sydney Harbours. This is not a natural phenomenon, but a management decision. Such releases have been made in the past, but in recent times inflows from the Northern Basin to refill the lakes have declined significantly.

Q: What's behind the change in inflows to the Menindee Lakes?

A: Drought and high temperatures are a factor, but a key issue is that smaller flow events now rarely reach Menindee. Large floods still occur, but smaller flows to regularly replenish the system have largely stopped. River regulation and irrigation development are playing a key role in this change, according to reports by the Murray Darling Basin Authority (MDBA). 2017-18 was the third largest cotton crop on record. While this year is likely to be much smaller, a substantial amount of irrigation is still occurring.

How much irrigation is currently being undertaken is unclear. Government agencies do not collect or publish data on how much water is held in on-farm storages in the Northern Basin. There is no monitoring of on-farm storages or any public register of how much water can potentially be held in private dams.

Q: Who is responsible for draining the lakes?

A: The MDBA coordinated the management of the lakes for most of this time and is partly responsible. However, claims by the NSW Water Minister that this crisis was "under the control of Canberra" are false. The MDBA coordinates the management of

the lakes, but does not 'control' it. In fact, states can direct the management of the lakes via the Ministerial Council and Basin Officials Committee.

Q: Why were the lakes drained? Was it for the downstream environment?

A: No. There was a total of 89GL of environmental water released from Menindee in the 2016/17 year. This represents just 11% of the total releases to the Lower Darling. Furthermore, no Menindee environmental releases were badged in the delivery to South Australia.

Q: Were the lakes drained to meet South Australia's needs?

A: No. Releases were made from Menindee Lakes in excess of South Australia's requirements. While the NSW Water Minister claimed that South Australia had 'pulled the plug' on Menindee Lakes, in fact, parts of South Australia were recovering from flooding and months of wet weather at that time.

Q: Were the lakes drained to save evaporation.

A: Yes, long-standing practice by the MDBA is to prioritise releases from Menindee Lakes above other storages to minimise evaporation. However, causing an ecological disaster to avoid evaporation can hardly be described as good environmental management, particularly when downstream areas were in flood. There is nothing in the laws and regulations guiding the management of the Basin that directs its managers to prioritise evaporation efficiency over environmental and community outcomes.

Importantly, claims around the 'inefficiency' of Menindee ignore that when the lakes are allowed to dry completely, a huge amount of water is required to wet the lake beds before they begin to hold water again when the lakes are refilling. This means that fully draining the lakes could be considered equally inefficient.

Q: What's really going on?

A: There is very little transparency around exactly why the lakes were drained by the MDBA with the consent of the BOC and state governments. A possible part of the answer is that the lakes were drained to justify the Menindee Lakes Water Saving Project, related changes to the Basin Plan and the related Broken Hill pipeline project. These are opposed locally and have proceeded with minimal transparency around business cases, cultural and environmental impacts. They are easier to justify if the lakes are empty and Broken Hill appears at risk of running out of water.

Q: Does this affect communities and ecosystems outside of the Darling and Northern Basin?

A: Absolutely. Just under half of South Australia's water entitlements have historically come via the Menindee Lakes. Reducing this means more water needs to come from Murrumbidgee and Murray irrigators in NSW and Victoria. The 2016-17 draining of Menindee may have contributed to reduced crops in the Riverina and job losses in processing, such as the 100 people who were let go from a rice mill in Deniliquin.

Q: Where to from here?

A: There should be an urgent public assessment of:

1. Whether the level of extraction in the Northern Basin is sustainable, particularly with respect to floodplain harvesting.
2. How to manage Menindee lakes in a future with less inflows in the small to medium flow range?
3. If the past practice of managing lakes to minimise evaporation still relevant if the lakes will dry more often and require more water to refill?

Finally, transparency and accountability is required if there is any chance for governments and water agencies to restore confidence in the implementation of the Basin Plan:

1. All decisions of the Basin Officials Committee should be made public;
2. The annual reviews of the River Murray Operations by the Independent River Operations Review Group should be made public;
3. The annual reports of the River Murray Operations by the River Murray Operations should be made public;
4. The size and location of all private storages in the Northern Basin should be made public, along with actual storage levels; and
5. A genuinely independent assessment and quantification of the causes of the reduction on low and medium flows in the Barwon-Darling should be completed as soon as possible and made publicly available.

Introduction

Otto: What do the English usually eat with chips to make them more interesting?

Ken: <<Looks fearful>>

Otto: Wait a moment! It's fish, isn't it![1]

The 1988 comedy *A fish called Wanda* saw the evil Otto tie up the hapless Ken and torture him by eating his precious pet fish alive, one by one.

The fish of the Darling River and Menindee Lakes are just as precious to local people there. However, no one will be eating the region's fish alive anytime soon – most of them are dead.

The Menindee Lakes are in south west NSW, located at the end of the Darling/Baaka River, approximately 100kms east of Broken Hill and 200kms north of Wentworth. The lakes can hold up to 2,000 gigalitres (GL) of water, approximately as much as four Sydney Harbours, 60 Lake Burley Griffins or almost 10% of Port Phillip Bay. They have historically supplied nearly 40% of South Australia's regulated water entitlement; supply a small irrigation industry in the Lower Darling; supply town water for Broken Hill, Menindee, Pooncarie and Silverton, stock and domestic water supply for riparian farmers and around 250,000 sheep. The Lakes are central to the identity of the traditional owners, including the Barkandji, who have native title, and the Maraura peoples. They are also a treasured amenity for recreation, boating and tourism. The lakes are extremely important ecologically and are a critical habitat for native fish such as Murray Cod and Yellow Belly (Golden Perch).

On 22 December 2018 and 6 January 2019, local Menindee residents witnessed huge numbers of dead native fish, with reports of one million dead.[2] The massive fish kills are due to a harmful algal bloom and sudden changes in weather, which has sucked the remaining oxygen out of the water and suffocated the fish.[3] The fish range from fingerlings to Murray Cod estimated to be at least 50 years old, and possibly decades

[1] A fish called Wanda, this scene available here: https://vimeo.com/180099982

[2] Gooley (2018) *Clean-up of almost one million rotting dead fish in Northern NSW to begin this week,* https://thenewdaily.com.au/news/state/nsw/2019/01/12/dead-fish-nsw-cleanup/

[3] Carmen and Tomevska (2018) *A million fish dead in 'distressing' outbreak algal bloom at Menindee,* https://www.msn.com/en-au/news/australia/a-million-fish-dead-in-distressing-outback-algal-bloom-at-menindee/ar-BBRWNe9?ocid=spartanntp

older. The restocking of native fish populations will take decades, if they ever recover at all.

The Australian taxpayer is spending $13 billion on the Murray Darling Basin Plan to manage our greatest river system. With videos of huge dead fish attracting millions of views, the Australian public is rightly looking for answers. Federal Labor leader Bill Shorten has written to the Prime Minister to urge immediate action and NSW Labor leader Michael Daley has committed to an inquiry, if elected.[4]

Meanwhile, the NSW Water Minister, Niall Blair, is blaming federal authorities like the MDBA, the Commonwealth Environmental Water Holder (CEWH) and South Australia:

> Unfortunately this is the type of thing we do see in a period of drought...The Menindee Lakes were full, but the reason they were let out was because they were under the control of Canberra and the water is being let out for places such as South Australia as environmental flows. So they can't have their cake and eat it, they can't on one hand say this is an environmental catastrophe, at the same time its environmental water that's being used as the excuse to let this water out. Now, NSW doesn't have control over Menindee Lakes and the water the water in that until it reaches a low level of 480GL. A lot of water has been let out, but that has been at the call of South Australia, it has been at the call of the MDBA , it's been at the call of the Commonwealth Environmental Water Holder, 'cause they're the ones that have pulled the plug.[5]

The CEO of the Murray Darling Basin Authority (MDBA), Phillip Glyde, has blamed the drought for low inflows and water levels in the lakes and pointed out that NSW currently controls the lakes:

> The recent tragic fish deaths in the Lower Darling are a terrible reminder of the effects drought can have on our environment.
>
> Unfortunately, the main causes of this distressing event are the lack of water flowing into the northern rivers, and the impact of 100 years of over-allocation of precious water resources throughout the entire basin.

[4] Hannam (2019) *NSW Labor demands water management inquiry after massive fish kill*, https://www.smh.com.au/environment/conservation/nsw-labor-demands-water-management-inquiry-after-massive-fish-kill-20190110-p50qlb.html; Coughlan (2019) *Shorten wants federal action on dead fish*, https://www.theherald.com.au/story/5848300/shorten-wants-federal-action-on-dead-fish/

[5] Blair (2018) *2GB Interview: Murray-Darling Basin Authority and drought blamed for mass fish death, https://www.2gb.com/podcast/murray-darling-basin-authority-and-drought-blamed-for-mass-fish-death/*

> The Menindee Lakes are currently under the sole control of New South Wales. This occurs when the water in storage falls below 480 gigalitres as it did in December 2017.[6]

South Australian Senator Sarah Hanson Young blamed upstream water use:

> The Liberal National Party is blaming this on drought when in fact it is cotton, corruption and climate change killing these fish and our river. We should be putting people and the environment before big corporate cotton growers.
>
> Greedy cotton farmers upstream are still storing water and irrigating their crops. ……. This is the clearest demonstration of what happens when a political culture of robbing the environment for corporate interests goes unchecked.[7]

With so many accusations and explanations being offered, this paper seeks to ask and answer the basic questions around this shocking event.

[6] Glyde (2019) *Tragedy of fish deaths in drought shows need for Basin Plan,* https://www.mdba.gov.au/media/mr/tragedy-fish-deaths-drought-shows-need-basin-plan

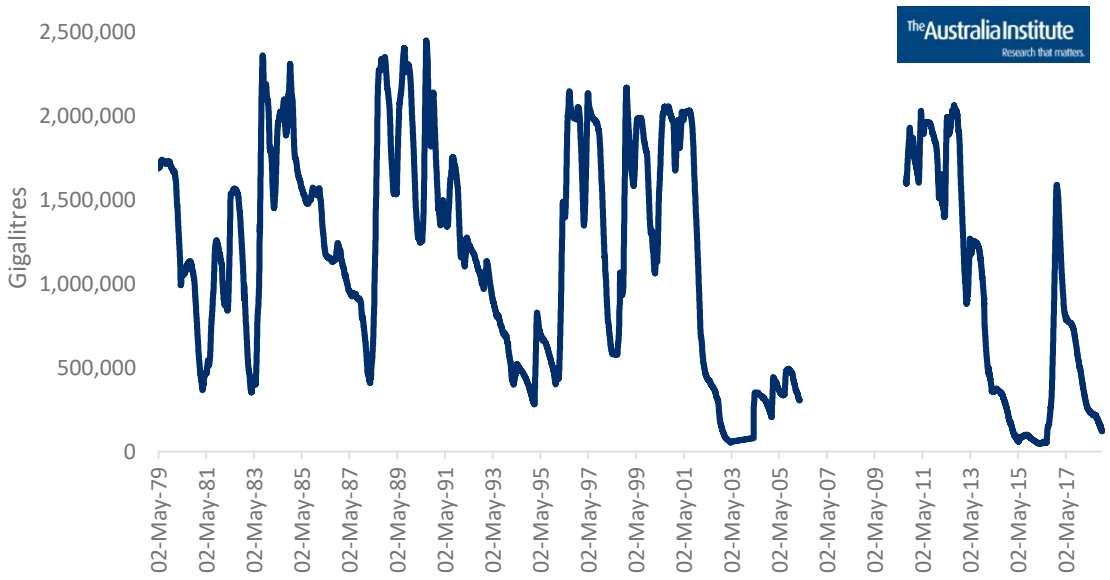
[7] Hanson-Young (2018), *Greens call for emergency water measures in wake of unprecedented fish kill,* https://sarah-hanson-young.greensmps.org.au/articles/greens-call-emergency-water-measures-wake-unprecedented-fish-kill

Q: Why are the Menindee Lakes so dry?

A: The lakes are dry for two reasons: they were drained in late 2016 and 2017 and there have not been enough inflows from the Northern Basin to refill the lakes.

Menindee Lakes are naturally occurring ephemeral lakes at the lower end of the Barwon–Darling River. Under natural conditions, lake levels rise and fall and the lakes grow and shrink as water flows out into the Lower Darling, recharges the aquifer or evaporates. The lakes were reconfigured in the 1950s and 60s to store more water. Reflective of the variability of water in the Northern Basin, the lake levels can vary dramatically, Figure 1 below shows that the lakes always had some water in them from the beginning of the data set in 1979 to 2003:

Figure 1: Volumes in Menindee Lakes 1979 - 2018



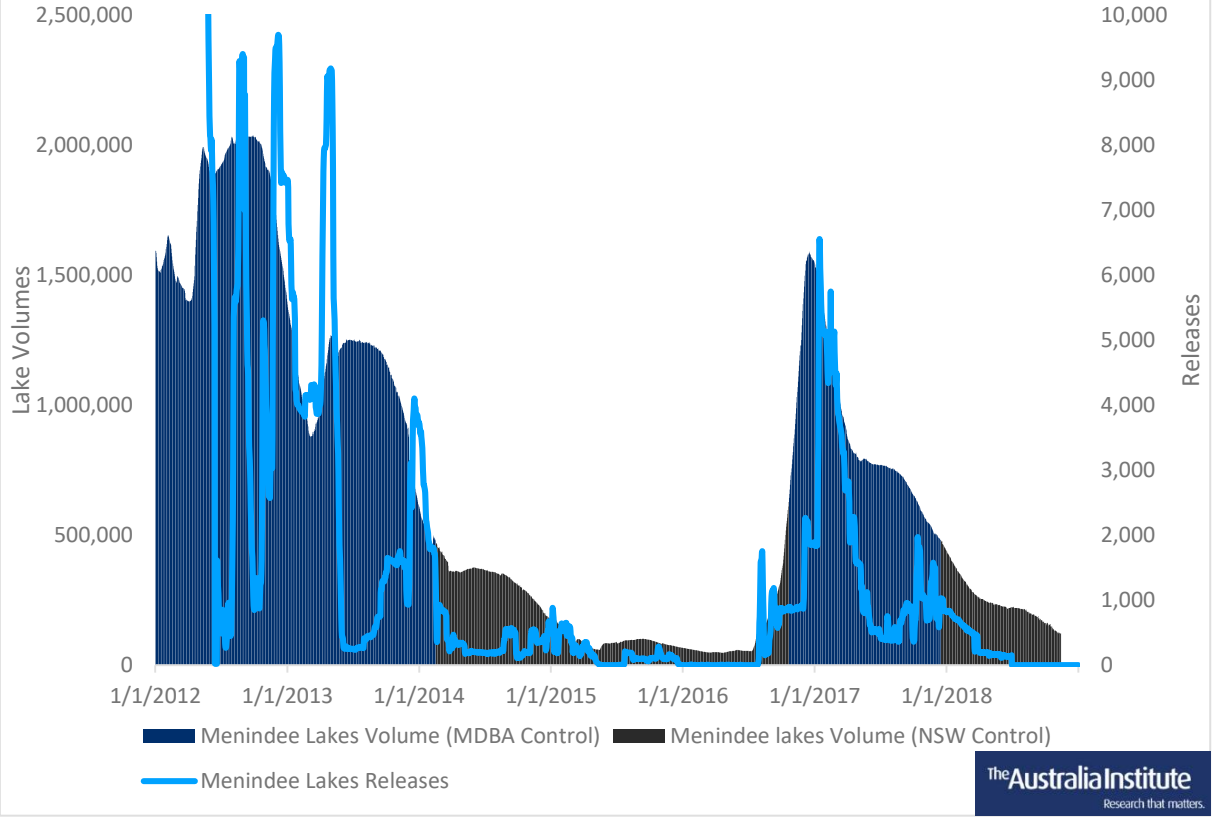
Source: https://realtimedata.waternsw.com.au/

Figure 1 shows that in 2003, during the worst of the Millennium Drought, the lakes reached extremely low levels before some recovery. Data is missing from 2006 to when the drought broke in 2010 and the lakes filled. Perhaps most important for current purposes, Figure 1 shows that the lakes were rapidly and completely drawn down in 2013/14 and again in 2016/17.

The full capacity of Menindee Lakes is quoted as 1,730, although it can hold up to 2,000ML during flood. Under the Murray-Darling Basin Agreement, the management of Menindee Lakes is shared between MDBA and the NSW Government. The MDBA 'controls' the lakes until the lake volumes drop to 480GL, then control reverts to NSW. When the lakes are filling, NSW have control until the Lakes volumes reach 640GL, when control reverts back to MDBA.[8] The 480/640GL rule has been part of the Murray-Darling Basin Agreement since the 1970s.[9]

The draw-downs are a combination of releases by river operators, evaporation and seepage. Figure 2 below shows the volumes held in the lakes and the daily volume released from them for the period 2012 until 2018. The blue line shows that several times in 2012 and 2013 almost 10,000ML per day were released, while in 2016-17 releases reached over 5,000ML per day (right axis).

Figure 2: Menindee Lakes volumes and releases 2012 - 2018 (ML)



Source: https://realtimedata.waternsw.com.au/

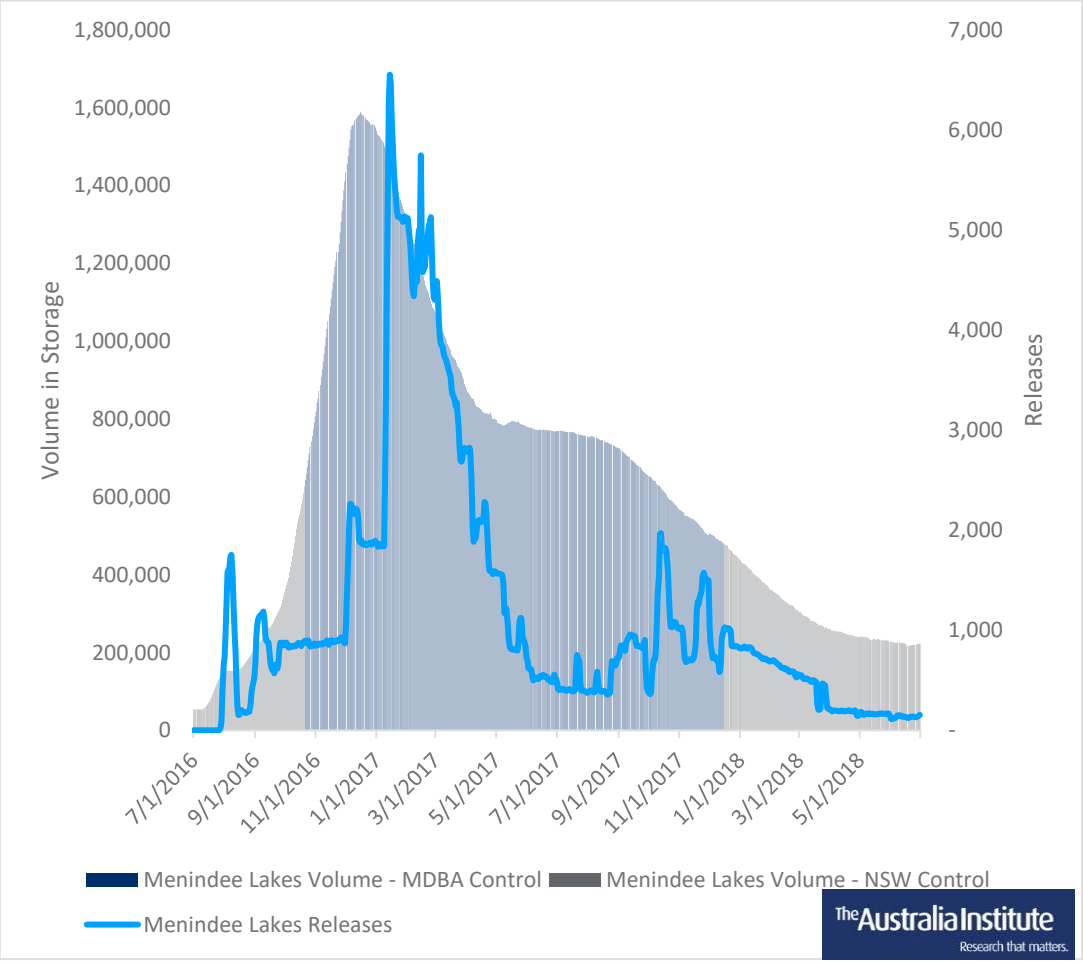
[8] s99 *Water Act 2007 – Schedule 1: Murray-Darling Basin Agreement*, http://www5.austlii.edu.au/au/legis/cth/consol_act/wa200783/sch1.html

[9] NSW Irrigators Council (2013) *Menindee Lakes: Policy,* http://www.nswic.org.au/pdf/policy_documents/130307%20-%20Menindee%20Lakes%20Policy.pdf

The Lakes were full in late 2012 and MDBA coordinated releases until the volumes fell below 480GL. At this point under the management rules of the lakes, control passed to NSW.

Figure 3 shows the 2016-17 events in more detail. The lakes refilled at the end of 2016 to a level where they reverted to MDBA coordination. MDBA coordinated releases until December 2017, when the Lake levels again were below 480GL and reverted to NSW control.

Figure 3: Menindee Lakes: Total volume in storage and releases, 2016-17 (ML)



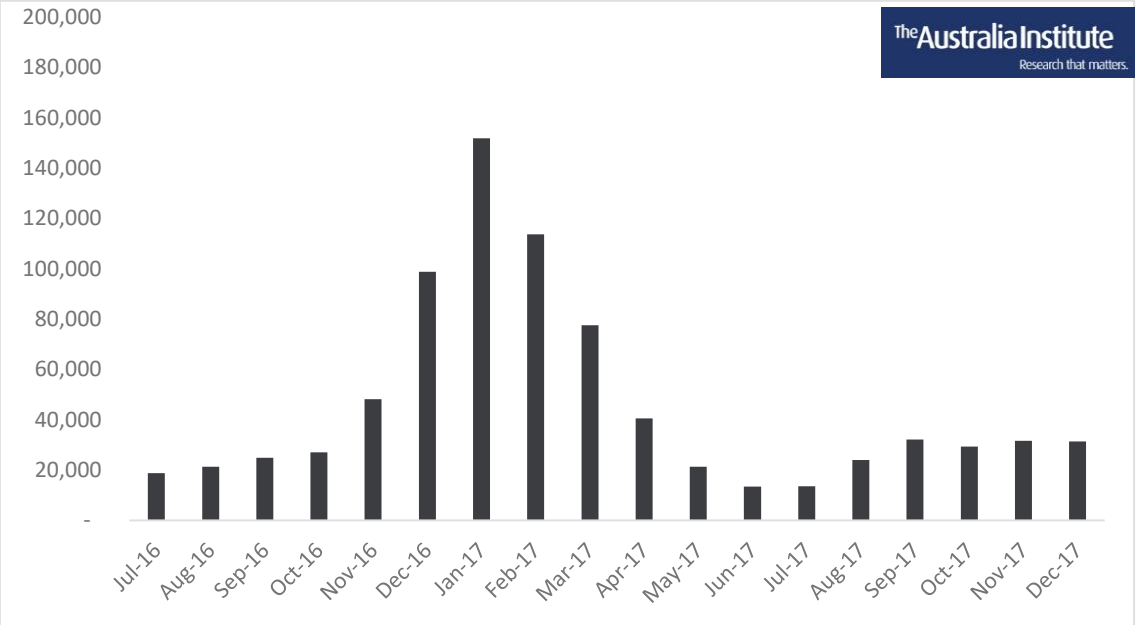
Source: https://realtimedata.waternsw.com.au/

The area under the curve shaded grey represent the period when the Lakes were under NSW control. The area under the curve shaded blue is when the Lakes were coordinated by MDBA. The bright blue line is the total releases from Weir 32 and Cawndilla outlet. The Menindee outlet release into the Lower Darling, and the Cawndilla outlet releases into the Darling Anabranch. The Lakes started filling in July 2016 and the NSW started increasing releases shortly after that. MDBA co-ordinated

releases, increasing to more than 6,000ML / day in January, and lowering releases by July 2017. The Lakes reverted to NSW control in December 2017.

Between July 2016 and December 2017, there was a total of 819GL released from Menindee Lakes. Figure 4 below shows the releases by month:

Figure 4: Releases from Menindee Lakes by month, 2016-17 (ML)



Source: https://realtimedata.waternsw.com.au/

The releases explain part of the reason why Menindee Lakes are dry, but to understand that properly, we need to look at inflows.

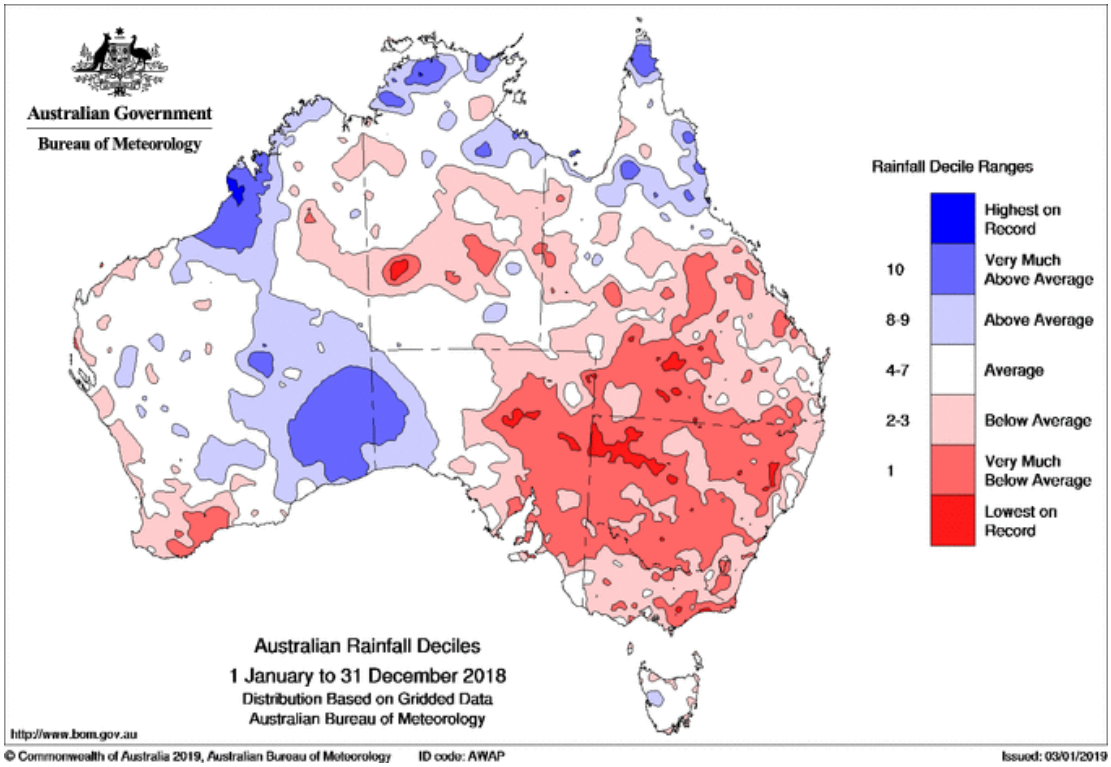
Why are there no inflows into Menindee Lakes?

A: Flows into the Menindee Lakes have reduced due to a combination of drought, climate change, river regulation, land use, and irrigation development. [10]

DROUGHT

The Murray-Darling Basin is currently in drought, which has severely decreased inflow into all Basin rivers. **Error! Not a valid bookmark self-reference.**Figure 5 below shows the rainfall deciles for the period 1 January to 31 December 2018.

Figure 5: Rainfall Deciles 1 January to 31 December 2018

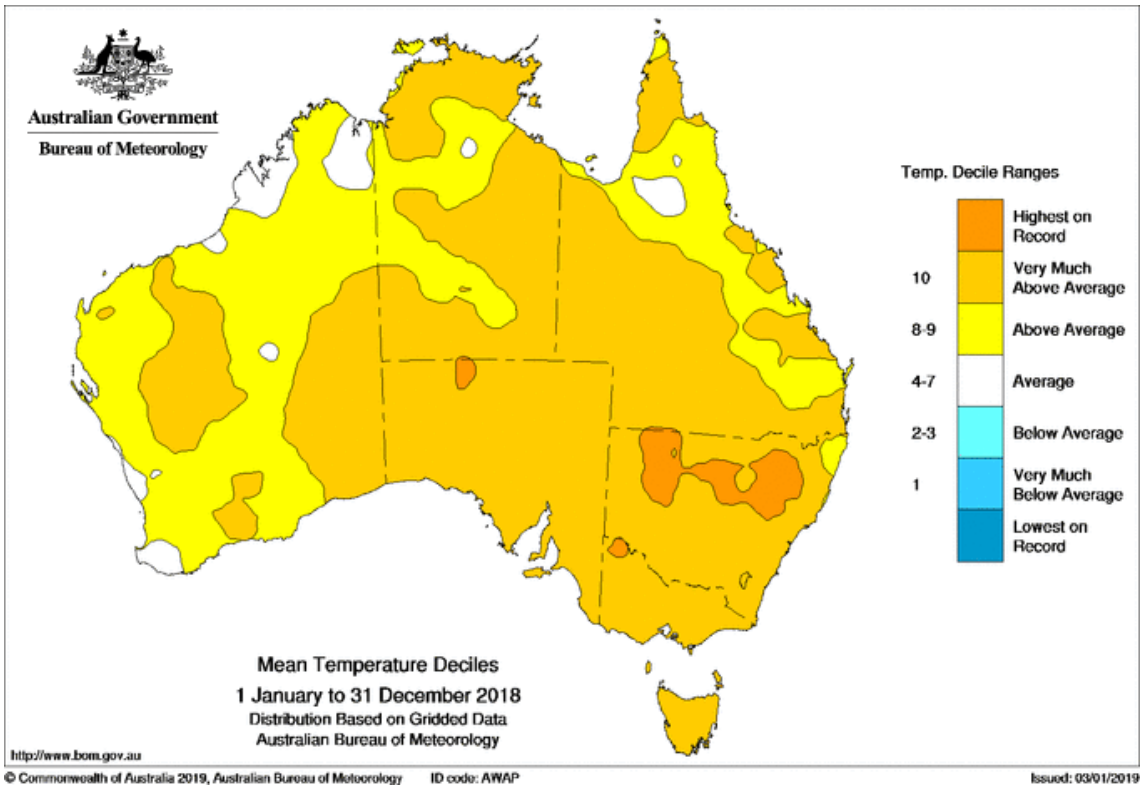


Source:http://www.bom.gov.au/jsp/awap/rain/archive.jsp?colour=colour&map=decile&period=18month&area=nat

[10] MDBA (2018) *Hydrologic assessment of flow changes in the Northern Basin*, https://www.mdba.gov.au/publications/mdba-reports/hydrologic-assessment-flow-changes-northern-basin

As shown in Figure 5 above, across the Northern Basin, 2018 rainfall was below average and, in some places, lowest on record. Conditions across the Northern Basin have also been very hot. Figure 6 below shows the temperature decile ranges for the calendar year ending 31 December 2018.

Figure 6: Mean Temperature Deciles 1 January to 31 December 2018



Source:http://www.bom.gov.au/jsp/awap/rain/archive.jsp?colour=colour&map=decile&period=18month&area=nat

As shown in Figure 6, across the Basin, temperatures were either 'very much above average' or 'highest on record'.

Well below average rainfall and above average temperatures combine and exacerbate record low inflows into all Basin Rivers. Historically, rainfall reduction of approximately 15% has led to a reduction to inflows between 23 and 44%.[11]

Despite this, irrigation is still occurring in the Northern Basin and there is water in some on-farm storages. Cotton is the dominant irrigated crop in the Northern Basin, so

[11] South Eastern Australia Climate Initiative (2010) *Climate Variability and Change in South Eastern Australia,* http://www.seaci.org/publications/documents/SEACI-1%20Reports/Phase1_SynthesisReport.pdf

the industry is a good indicator of irrigated agriculture in the north. Michael Murray, the Chief Executive Officer of Cotton Australia said in early January:

> New South Wales is in the grips of a long and devastating drought. This drought is impacting all agricultural sectors, including the cotton industry where this season's crop is forecast to be at least half of last season's.[12]

It is not clear if Mr Murray meant 'less than half' or 'at least half'. Regardless, the 2017/18 season was reported by Rabobank as the third most successful cotton season ever, so reference seems to be off a high base.[13]

Nonetheless, even half of a record cotton crop requires considerable volumes of water in on-farm storages. So, the drought should not be interpreted as no water in the system anywhere. Governments do not have the data to know how much water is currently being held in on-farm storages. There is no continuous monitoring by government of on-farm storages or any public register of how much water can potentially be held in on-farm storages.

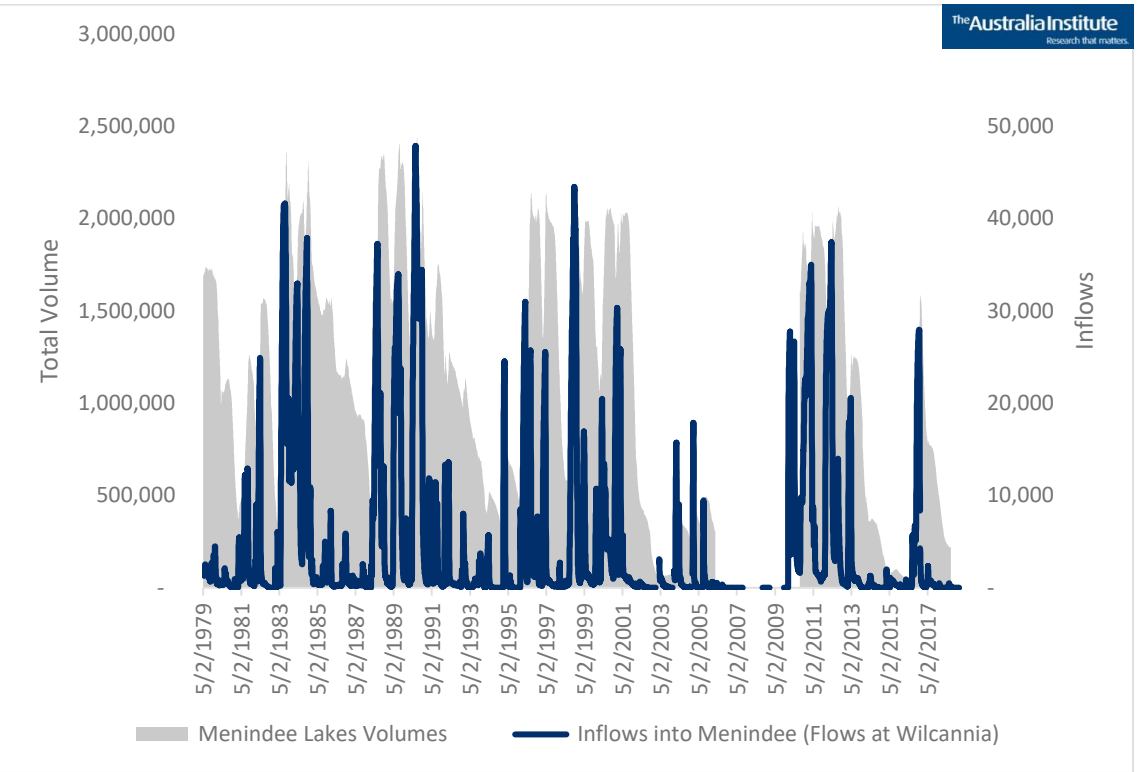
LOWER INFLOWS INTO MENINDEE

There has also been a decline in flows in the Barwon-Darling River resulting in more frequent and longer periods of low flows and lower inflows into Menindee. While Menindee Lakes has been drawn down in the past at a similar rate seen in 2016/17, the Lakes were typically replenished with inflows, as shown in Figure 7 below:

[12] Murray (2019) *Cotton Australia Statement of Fish Deaths at Menindee,* https://cottonaustralia.com.au/news/article/cotton-australia-statement-on-fish-deaths-at-menindee

[13] Twomey (2018) *Cotton's rollercoaster ride to continue into 2018-19,* https://www.theland.com.au/story/5501593/global-perspective-cottons-rollercoaster-ride-to-continue-into-2018-19/

Figure 7: Menindee Lakes Inflows and Total Volumes



Source: https://realtimedata.waternsw.com.au/[14]

As shown in Figure 7, while high flow periods still reach Menindee Lakes, low to medium sized flows are now infrequent. Up until this century, low to medium inflows frequently replenished the lakes, so even when being drawn down they were also being replenished. Since 2001, the Lakes were replenished by a medium flow in 2005/06 and two large inflows in 2012 and 2016. The lakes were emptied in each of those events, but there has not been a subsequent replenishment with small to medium inflows.

MDBA analysis in early 2017 on the inflows into Menindee Lakes showed:

The Flow at Bourke:[15]

- *Large reduction in flow over time*
- *Moderate/large flow events still occur*

[14] N.B: Data is not available for storage levels between 2006 and 2012. Corresponding inflow data has been removed for the corresponding period.

[15] Bourke on the Barwon-Darling is typically the site to assess Barwon-Darling flows, because it is below most major tributaries.

- *Smaller floods and freshes appear to be decreasing*
- *Recent low flow periods are lasting longer*[16]

The significant increase in low flows at Bourke has increased significantly since the late 1990s. This is consistent with the reduction of inflows into Menindee Lakes shown in Figure 7 and MDBAs observations that medium flows (small floods and freshes) are declining and low flows are occurring more often and for longer.

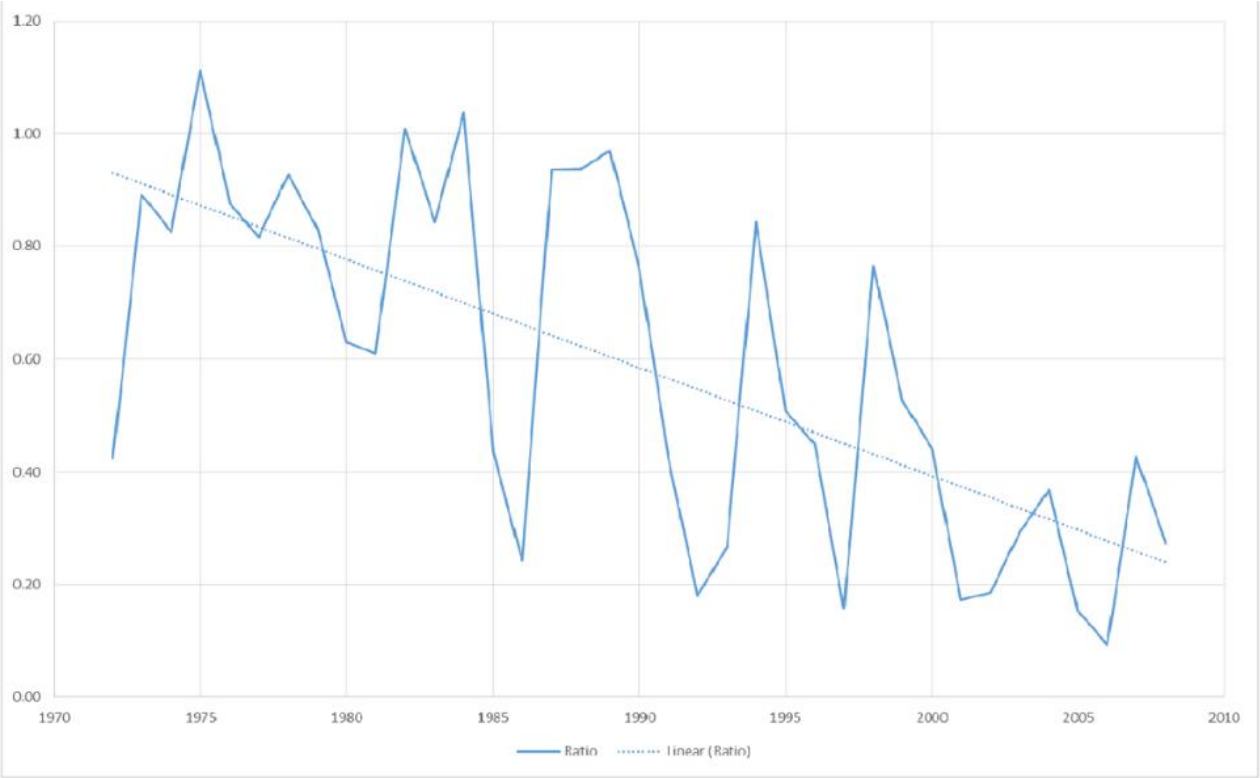
> The results presented here suggest a change to the hydrologic behaviour of the Barwon–Darling has occurred since the turn of the Millennium (particularly in the mid-sections of the system) reflected in the characteristics of both individual low and fresh flow events, and in the dry spells between events.
>
> Additional work is required to disentangle the relative contributions of both the natural and development-related process to the observed change, which includes the need for additional data such as water usage information, cropping patterns, on-farm business and infrastructure changes, market information, development within Barwon-Darling tributaries, more detailed climate information and geomorphological change. Also, satellite imagery could be used to check if any visible cause of flow impact can be seen in the landscape. ……However, the analysis presented here indicates that it is likely that a significant anthropogenic impact has occurred in the small and low-to-zero flow part of the Barwon–Darling flow regime since the year 2000, which is difficult to fully attribute to climate.[17]

MDBA's presentation to Lower Darling stakeholders included a graph that showed the relationship between actual and modelled flows. That graph is shown below at Figure 8.

[16] MDBA (2017), *Darling River flows and Menindee Lakes inflows – long term trends and drivers*, MDBA FOI 91 Obtained by The Australia Institute

[17]MDBA (2018) *Observed Flows in the Barwon–Darling 1990-2017: A Hydrologic Investigation Technical Report,* https://www.mdba.gov.au/publications/mdba-reports/barwon-darling-ecological-needs-hydrology

Figure 8: Ratio between Actual Flows to modelled flows at Bourke



Source: MDBA (2017) Darling River flows and Menindee Lakes inflows –long term trends and drivers[18]

Figure 8 shows a declining ratio between the modelled without development flows and the actual flows at Bourke. The model assumes that relationships between water availability, irrigation use, evaporation and seepage. A declining relationship between actual and modelled data suggests one or more of the following:

- A fundamental change in the relationship between rainfall to inflows over time;
- A fundamental change in the relationship between streamflows, evaporation and/ or seepage; or
- An increase in extractions upstream (either in the river or its tributaries).

[18] MDBA FOI 91 Obtained by The Australia Institute

MDBA has finalised and published that preliminary analysis in *Hydrologic assessment of flow changes in the Northern Basin.* [19] That report concludes that:

> The flow reduction in recent years along Barwon River is also due to other factors besides climate change and variability, such as increased river regulation and irrigation development.[20]

The analysis was limited to comparison between a small number of sites because of a limited data set. The report says:

> In the absence of long-term data on flows, alternative approaches may need to be explored to strengthen findings from this report. These include satellite data, Australian Government Bureau of Meteorology landscape water balance models or statistical approaches.[21]

It is obviously concerning that government still does not have adequate data to understand what is impacting reduced flows in the Northern Basin and the corresponding inflows into Menindee Lakes.

It is unclear how Ministers and MDBA can be confident that the cause of no inflows into Menindee is due to drought, when the MDBA acknowledges there is insufficient data to isolate and quantify the cause of reduced inflows.

[19] MDBA (2018) *Hydrologic assessment of flow changes in the Northern Basin*, https://www.mdba.gov.au/publications/mdba-reports/hydrologic-assessment-flow-changes-northern-basin

[20] MDBA (2018) *Hydrologic assessment of flow changes in the Northern Basin*, https://www.mdba.gov.au/publications/mdba-reports/hydrologic-assessment-flow-changes-northern-basin

[21] MDBA (2018) *Hydrologic assessment of flow changes in the Northern Basin*, https://www.mdba.gov.au/publications/mdba-reports/hydrologic-assessment-flow-changes-northern-basin

Q: Who is responsible for draining the Menindee Lakes?

A: In the quotes above, the CEO of the MDBA points to NSW control, while the NSW Water Minister blames federal agencies. Both NSW and the Commonwealth are responsible. While the MDBA coordinates much of the management of the lakes, it does not 'control' it. The Australian Constitution confers the ownership and control of water to the respective state governments. The States, particularly NSW as the largest Basin state, can direct the MDBA in how to manage the lakes.

The Murray-Darling Basin Agreement (Agreement) is an inter-governmental agreement that sets out how water in the River Murray and Menindee Lakes is shared between the states and the high-level rules to manage the River Murray System. The Commonwealth, Queensland, NSW, Victoria, South Australia and Australian Capital Territory are signatories to the Agreement.

The Murray-Darling Basin Ministerial Council (Ministerial Council) comprises the Water Minister from each Basin jurisdiction, its functions include:

> to consider and determine outcomes and objectives on major policy issues of common interest to the Contracting Governments in relation to the management of the water and other natural resources of the Murray-Darling Basin.[22]

The Basin Officials Committee (BOC) consists of representatives of each partner government. It takes direction from, and provides advice to, the Ministerial Council. BOC is:

> (a) empowered to make high level decisions in relation to river operations and to set objectives and outcomes to be achieved by the Authority in relation to river operations; [23] and

[22] s26(1)(c) Schedule 1: Murray Darling Basin Agreement of the Water Act (Commonwealth) 2007, https://www.legislation.gov.au/Details/C2017C00151

[23] s31(1) Schedule 1: Murray Darling Basin Agreement of the Water Act (Commonwealth) 2007, https://www.legislation.gov.au/Details/C2017C00151

> (b) approves a document which specifies those objectives and outcomes each year, unless the Committee determines otherwise.[24]

That document is called the *Objectives and outcomes for river operations in the River Murray System* ('Objectives and Outcomes').[25] That is, the MDBA manages the River Murray System in accordance with the wishes of the state governments which are expressed through either the Agreement or the 'Objectives and Outcomes'. High level decisions are made by consensus between governments. Day to day decisions are delegated to the MDBA, but it is accountable to the States. The States scrutinise MDBAs decisions on at least a monthly basis.

South Australia has a monthly water entitlement under the Murray-Darling Basin Agreement, which totals 1,850GL annually.[26] NSW and Victoria each contribute 50% to meet that entitlement (unless water availability is very low). Menindee Lakes has historically provided 39% of the regulated flow to the SA entitlement.[27]

When the MDBA makes releases from any storage, it must have regard to:

> maintaining supply to South Australia of the quantities of water which that State is entitled to receive; and
>
> facilitating the exercise by New South Wales and Victoria of their respective rights to use water from the upper River Murray, as they require. [28]

The BOC can direct the MDBA in relation to releases from Menindee Lakes:

> the Committee may, by majority vote, require the Authority to direct that water be released from Menindee Lakes Storage. [29]

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[24] s9 Schedule 1: Murray Darling Basin Agreement of the Water Act (Commonwealth) 2007, https://www.legislation.gov.au/Details/C2017C00151

[25] Murray Darling Basin Officials Committee (2018) *Objectives and outcomes for river operations in the River Murray System*, https://www.mdba.gov.au/sites/default/files/pubs/objectives-outcomes-river-operations-river-murray-system.pdf

[26] s88 *Water Act 2007 – Schedule 1: Murray-Darling Basin Agreement*, http://www5.austlii.edu.au/au/legis/cth/consol_act/wa200783/sch1.html

[27] Thoms et al (2000) *Report of the River Murray Scientific Panel on Environmental Flows: River Murray - Dartmouth to Wellington and the Lower Darling River,* River Murray Scientific Panel on Environmental Flows

[28] s98 Schedule 1: Murray Darling Basin Agreement of the Water Act (Commonwealth) 2007, https://www.legislation.gov.au/Details/C2017C00151

[29] s98 Schedule 1: Murray Darling Basin Agreement of the Water Act (Commonwealth) 2007, https://www.legislation.gov.au/Details/C2017C00151

Large scale environmental watering is challenging for river operations and relatively new. The river operating rules are not yet fully codified into the 'Objectives and Outcomes'. MDBA has been conducting large-scale environmental watering trials annually since 2009/10. The operations of the trials deviate from the 'Objectives and Outcomes' and so must be approved by BOC before the any trial starts. The 2016/17 annual report of River Murray System Summary of River Operations explains:

> The Bulk Entitlement Delivery approach requires the Authority to operate upper River Murray storages…to deliver State water entitlements and pass them downstream to their chosen destination. It is achieved through the existing provisions of Clause 98 of the Agreement…(that) requires the Authority to operate storages "to facilitate the exercise by NSW and Victoria of their respective rights to use water from the Upper Murray as they require.
>
> For example, and as occurred this year….NSW can request the Authority to release water from Menindee…."[30]

On 28 April 2016, the BOC approved releases of environmental water up to 400GL from Menindee Lakes:

> The Basin Officials Committee approved under clause 33 of the Murray-Darling Basin Agreement, on a without prejudice basis, the following uncodified actions to permit a seventh environmental watering trial on the River Murray System in the 2016-17 water year:
>
> (i) The directed releases of state water entitlements, including during periods of unregulated flows, be permitted from: ….Menindee Lakes (when next above 640GL), with mitigation strategies of a limit of up to 400GL and at flow rates set by the MDBA, after consultation with Water Liaison Working Group, aimed at preserving local water security when Menindee Lakes next fall to 480GL. [31]

This serves to show that the MDBA coordinates but does not 'control' the management of Menindee Lakes. The NSW, Victorian and South Australian governments can direct MDBA's management of Menindee Lakes. It is misleading for the NSW Water Minister to blame 'Canberra' for the draining of the lakes. NSW has a large say in the lakes' management even when it is coordinated by the MDBA.

[30] MDBA (2017) *River Murray System Summary of River Operations 2016-2017 Water Year,* unpublished and obtained by The Australia Institute

[31] MDBA (2017) *River Murray System Summary of River Operations 2016-2017 Water Year,* unpublished and obtained by The Australia Institute

Q: DOES THE COMMONWEALTH ENVIRONMENTAL WATER HOLDER RELEASE ENVIRONMENTAL WATER OUT OF MENINDEE LAKES?

A: The Commonwealth Environmental Water Holder cannot call releases from Menindee Lakes and relies on river operators and state governments to deliver its water.

The Commonwealth Environmental Water Holder (CEWH) and the Commonwealth Environmental Water Office (CEWO) work with the river operators at the beginning of the year to plan the environmental watering trials. The CEWH can request releases from a storage, but has no powers to direct any releases.

> When a decision is made by the CEWH to proceed with a watering action, arrangements are made with state government and local delivery partners to deliver the water. Commonwealth environmental water is transferred to state accounts or licences for water orders to be made and the water to be delivered. Like all water orders, water regulating authorities and river operators in the Basin are responsible for the delivery of Commonwealth environmental water. As part of their responsibility to manage water resources and the rivers, they have the ability to delay or deny the water orders. Environmental water is delivered in accordance with state rules and regulations governing the delivery of water in each catchment.[32]

[32] CEWH (2018) Submission to the House of Representatives Standing Committee on the Environment and Energy : Inquiry into the management and use of Commonwealth environmental water, https://www.aph.gov.au/Parliamentary_Business/Committees/House/Environment_and_Energy/EnvironmentalWater/Submissions

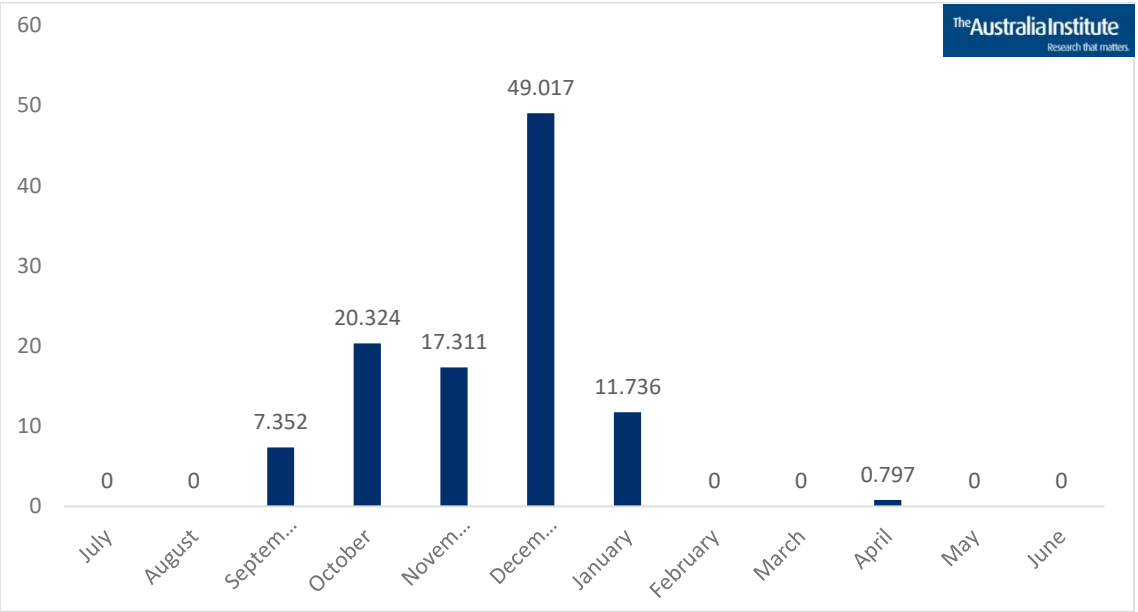
Q: So why were the lakes drained?

Q: WAS IT FOR THE ENVIRONMENT?

A: No. While NSW Water Minister in the quote above was quick to blame environmental watering for draining the lakes, environmental water has been a small portion of the water released from Menindee Lakes.

The Commonwealth Environmental Water Holder (CEWH) prepares an acquittal report each month that tracks environmental water deliveries in the River Murray System for all environmental water holders. Figure 9 shows the environmental water deliveries for the 2016/17 year from Menindee Lakes.

Figure 9: Environmental releases from Menindee Lakes in 2016-17 (GL)



Source: 2016-17 water Use Acquittal Report – Lower Murray and CLLM Flows – Approved – Appendix B – MDBA QSA Accounting – Excel (unpublished)

There was a total of 89GL of environmental water released from Menindee in the 2016/17 year. This represents just 11% of the total releases to the Lower Darling.

Furthermore, no Menindee environmental releases were badged in the delivery to South Australia. According to the 2016-17 Water Use Acquittal Report, environmental release from Menindee Lakes are not counted towards environmental flows into the River Murray, or at the South Australia border. This indicates they are regulated at

Wentworth (where the Darling meets the Murray) and counted towards the total downstream water needs and no longer tagged as an environmental flow.

Q: WERE THE LAKES DRAINED FOR SOUTH AUSTRALIA?

A: No. Some releases were made from Menindee Lakes in excess of South Australia's requirements in late 2016 and January 2017. While the NSW Water Minister claimed that South Australia had 'pulled the plug' on Menindee Lakes, some releases were made when there was flooding at the South Australian border.[33]

Unregulated flows are flows that are in excess to South Australia's entitlement, orders by NSW and Victoria and environmental water. That is, 'excess' water in the system that isn't regulated by the river operators.

The River Murray was in unregulated flows from early September until January 2017.[34,35] That is, all NSW Murray irrigator demand and NSW's commitment to South Australia was already being met by high flows in the River Murray, so that could not justify the additional Menindee releases.

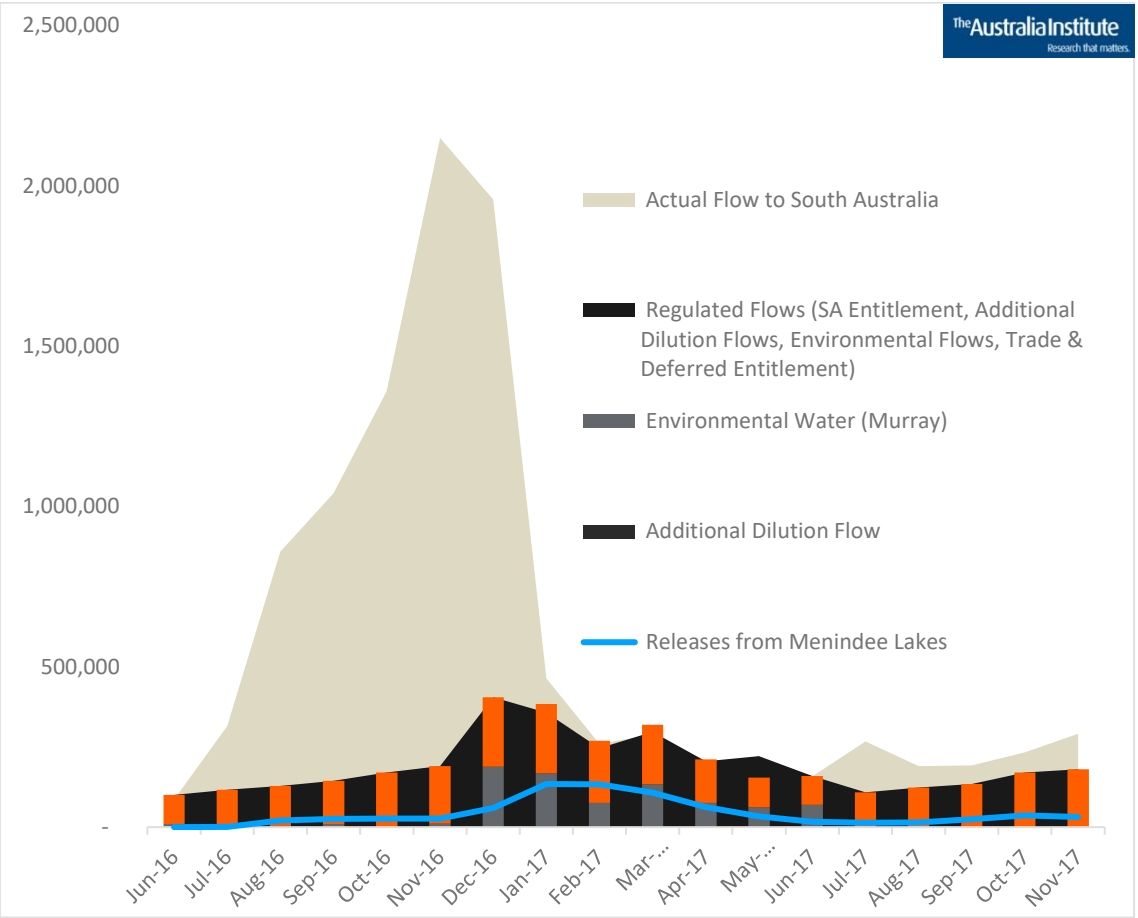
Figure 10 below shows that releases from Menindee were being made from November 2016 to January 2017, while flows to South Australia were well in excess of the state's entitlements:

[33] Burns et al (2017) Independent review of the extreme weather event South Australia 28 September – 5 October 2016, https://www.dpc.sa.gov.au/__data/assets/pdf_file/0003/15195/Independent-Review-of-Extreme-Weather-complete.pdf

[34] MDBA (2016) *River Murray Weekly Report for the week ending Wednesday, 14 September 2016*, https://www.mdba.gov.au/sites/default/files/weeklyreports/River-Murray-Operations-Weekly-Report-14th-September-2016.pdf

[35] MDBA (2016) *River Murray Weekly Report for the week ending Wednesday, 25 January 2017,* https://www.mdba.gov.au/river-murray-system/weekly-reports/weekly-report-2017

Figure 10: Flows to South Australian Border and Menindee Releases (ML)



The beige area in Figure 10 shows the large volume of water flowing into SA through late 2016, unregulated flows in excess of its entitlements, orders by NSW and Victoria and environmental water. That is, 'excess' water in the system that isn't regulated by the river operators.

However, Menindee releases (bright blue line) were made during the period when there were large unregulated flows at the South Australian border. All NSW Murray irrigator demand and NSW's commitment to South Australia was already being met by high flows in the River Murray, so that could not justify the additional Menindee releases.

Releases from Menindee (other han environmental water) when there are unregulated flows at the South Australian border contravene MDBA instructions under the 'Objectives and Outcomes' to conserve water and cannot be made by MDBA without approval by the Basin Officials Committee.

Additional Dilution Flows

Under the Murray-Darling Basin Agreement, there is a provision to release 'Additional Dilution Flows' from Menindee lakes, when the Lakes exceed a prescribed limit (1,650GL June & July, 1,500GL in August and 1,300GL September – May). The maximum that can be released is 3,000 ML / day.

Menindee Lakes exceeded the ADF trigger between 26 November 2016 and 01 February 2017. However, there were unregulated flows at the South Australian border throughout that time. Accordingly, ADF flows should not have been released from Menindee, because that demand could have been met by unregulated flows at the South Australian border. In a submission to the Independent River Operations Review Group, the South Australian government said:

> There is also a need to point out that some of the ADF was provided by substitution with unregulated flow, and did not involve an additional release from Menindee Lakes. [36]

Q: WERE THE LAKES DRAINED BECAUSE OF EVAPORATION?

A: It is a long-standing practise to prioritise releases from Menindee to meet the South Australian entitlement over releases from Hume or Dartmouth.

- Water in Menindee has a high rate of evaporation, so when needed, it should be released rather than evaporate.
- This practice prioritises saving water above the Objectives and Outcomes, of People and Communities and the Environment.
- This rationale does not consider the huge amount of water that is required to wet dry lake beds before they hold water when the lakes are refilling, which could be considered equally as inefficient.

[36] MDBA (2017) *River Murray System Summary of River Operations 2016-2017 Water Year: Submission by South Australia ,* unpublished and obtained by The Australia Institute

MDBA CEO Phillip Glyde wrote:

> The MDBA draws water from the Menindee Lakes first because Dartmouth and Hume dams are more efficient as they don't have the high evaporation rates of the Menindee Lakes.[37]

The specific management of the River Murray System is through the *Objectives and Outcomes of River Murray Operations in the River Murray System,* which is agreed by all basin Governments.[38] The objectives of managing the River Murray System are:

> **Water storage, delivery and accounting**
>
> *To operate the River Murray System efficiently and effectively in order to deliver State water entitlements.*
>
> *To maximise the water available to the Southern Basin States, after providing for operating commitments in the River Murray System.*
>
> **River Murray Assets**
>
> *To ensure that RMO assets allow the Authority to manage and deliver water that is fit for the purpose for which it is to be used, efficiently, effectively and safely.*
>
> **People and communities**
>
> *To contribute to the safety of communities along the River Murray. To contribute to, and have regard for the economic, social, environmental and cultural activities and values of people using the River Murray System.*
>
> *The provision of water to meet critical human water needs.*
>
> **Environment**
>
> *To contribute to the protection and, where possible, restoration of priority environmental assets and ecosystem functions within the River Murray System.*

[37] Glyde (2019) *Tragedy of fish deaths in drought shows need for Basin Plan,* https://www.mdba.gov.au/media/mr/tragedy-fish-deaths-drought-shows-need-basin-plan

[38] MDBA (2014) *Objectives and Outcomes of River Murray Operations in the River Murray System,* https://www.mdba.gov.au/publications/mdba-reports/objectives-outcomes-river-operations-river-murray-system

Information and communication

To ensure that the Authority, in operating the River Murray System:

a) uses the best available data, tools and systems;

b) keeps all stakeholders with an interest in the Authority's river operations well informed of its plans and activities;

c) *acts transparently; and*

d) *is accountable for its actions in accordance with the Agreement*.[39]

While the Objectives and Outcomes state there is no hierarchy between the objectives, the MDBA has frequently claimed publicly that managing water efficiently (Water storage, delivery and accounting) is its highest priority. [40,41]

That means that MDBA will prioritise releases from Menindee Lakes over releases from Hume or Dartmouth to meet the South Australian monthly entitlement. This is a long-standing practice that has been well communicated by the MDBA over many years.

MDBA and the WaterNSW river operators made releases of environmental water and they also worked with DOI Fisheries to shape a hydrograph when making operational releases (that is, no environmental water) to get better outcomes for fish recruitment. It is not apparent what, if any, actions they undertook to meet the community objective. In the absence of other information, it does appear that the objectives of water storage (efficiency) have been prioritised above the objectives for the community and somewhat for the environment.

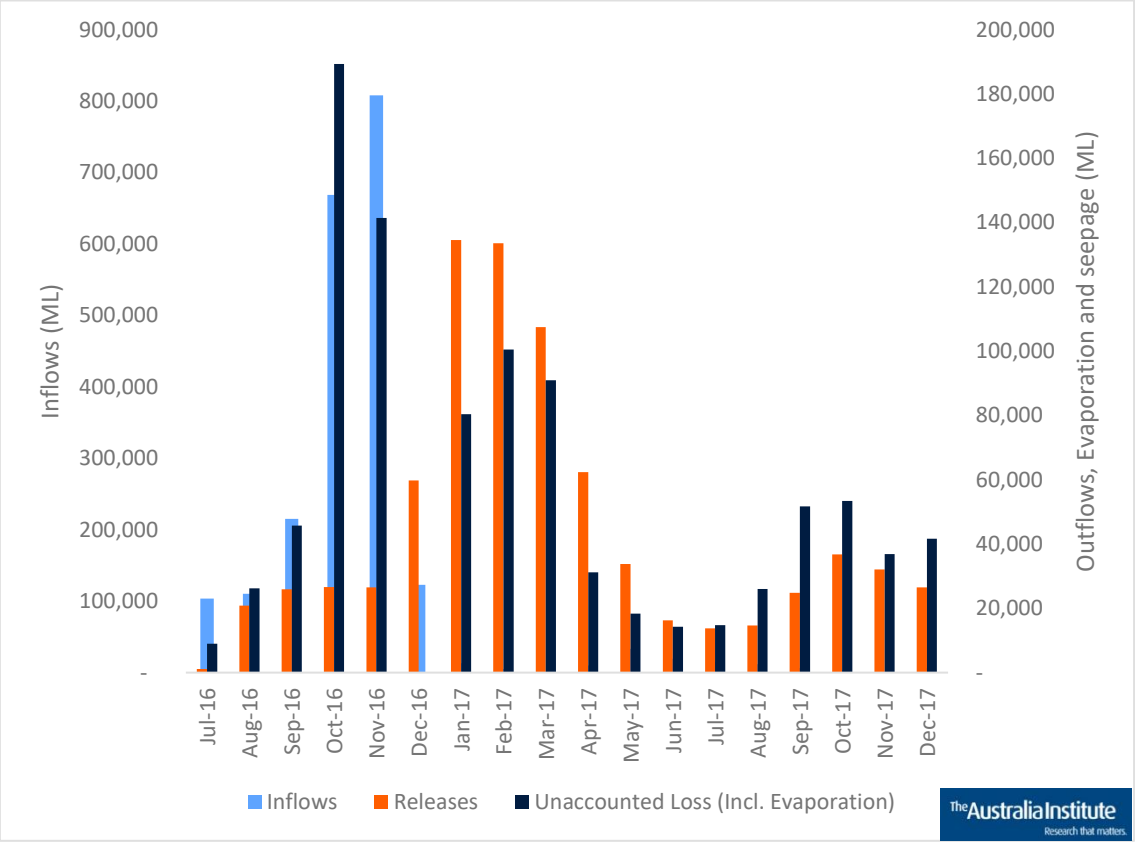
[39] MDBA (2014) *Objectives and Outcomes of River Murray Operations in the River Murray System,* https://www.mdba.gov.au/publications/mdba-reports/objectives-outcomes-river-operations-river-murray-system

[40] MDBA (2014) *Objectives and Outcomes of River Murray Operations in the River Murray System,* https://www.mdba.gov.au/publications/mdba-reports/objectives-outcomes-river-operations-river-murray-system

[41] For example, MDBA (2017) *River Murray operations weekly Report 18 January 2017,* https://www.mdba.gov.au/sites/default/files/weeklyreports/River-Murray-Operations-Weekly-Report-18-January-2017.pdf

Figure 11 below shows the relationship between inflows into Menindee (plotted on the left axis), and outflows and unaccounted differences (plotted on the right axis).

Figure 11: Menindee Lakes Inflows, Outflows, Evaporation and Seepage



Source: https://realtimedata.waternsw.com.au/

Figure 11 was derived using a simple water balance – starting with the recorded opening balance in storage, adding inflows (light blue), deducting outflows (orange) and comparing that total with the actual closing balance. The difference between that total and the actual balance is described as an unaccounted balance (dark blue), which is expected to include both evaporation and seepage.

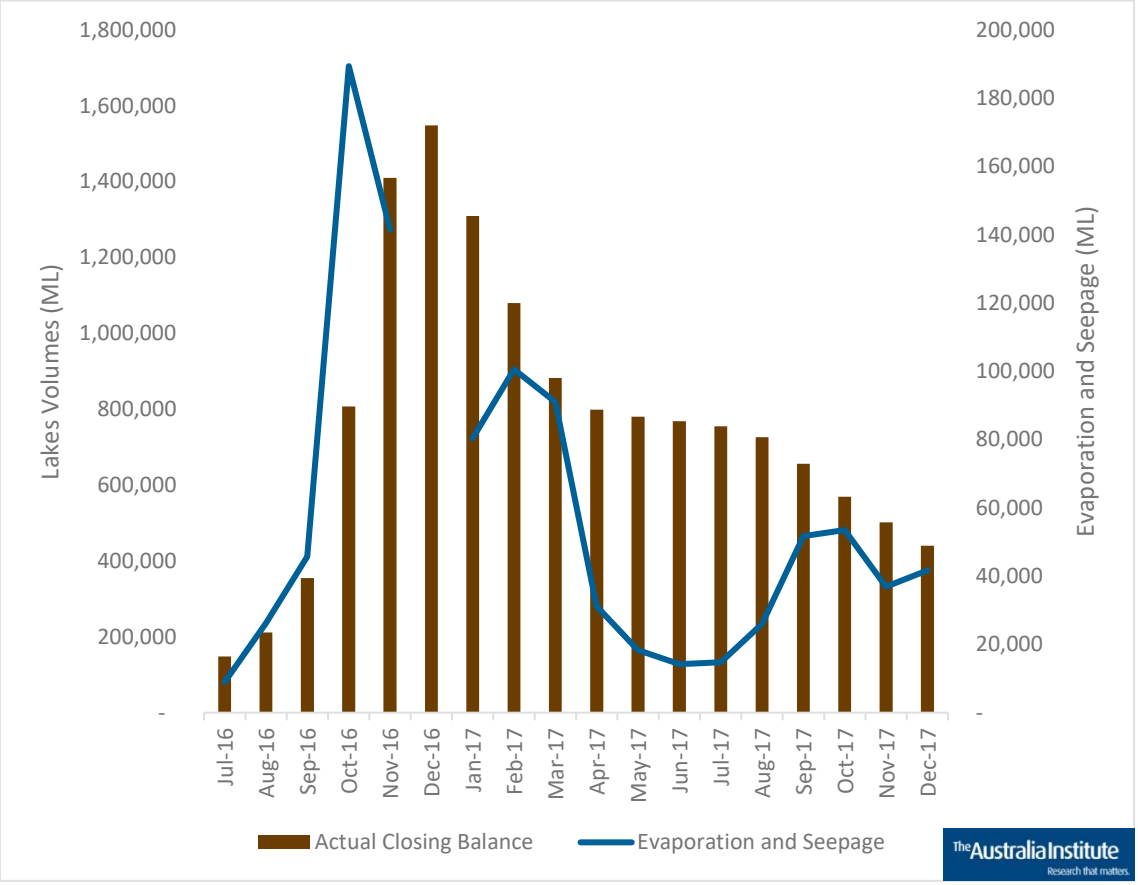
The evaporation and seepage are very high as the lakes are filling between September, and November 2016. In October and November 2016 almost 350,000ML – more than two thirds a Sydney Harbour – of water was unaccounted for. This is most likely predominantly due to wetting dry lake beds before the lakes hold water and start filling.

This shows that fully drying out the Menindee Lakes has the consequence of then requiring a large volume of water to wet the lake beds before they can hold water. The long held rationale about releasing water from Menindee is 'efficient' because it avoids evaporation needs to be reconsidered because decreased inflows and

subsequent more frequent drying of Menindee lakes creates a new 'inefficiency' of requiring several hundreds of gigalitres of water to wet the lakes before they can hold water.

Government agencies measure evaporation two ways. One is as a water balance (as in Figure 12 above) and the other is a pan measurement.[42,43] The daily reduction in a small (1m diameter) and shallow ring tank is extrapolated to the water body surface area to estimate evaporation. Neither method considers seepage or the initial wetting of dry lake beds. Figure 12 shows Menindee Lakes volumes, evaporation and seepage.

Figure 12: Menindee Lakes Volumes, Evaporation and Seepage



Source: https://realtimedata.waternsw.com.au/

The above graph shows the total amount of water in Menindee Lakes and the amount of water that has been used by evaporation and seepage. Across this 18 month period there was a total of 972GL in evaporation and seepage. 412GL of that 972GL of evaporation and seepage, or 42%, occurred in the three months that the lakes were

[42] https://www.mdba.gov.au/river-murray-system/weekly-reports/weekly-report-2017

[43] Evaporative loss from storage = surface area of the storage x net evaporation. Net evaporation = measured evaporation (using a 'pan' instrument) - rainfall.

filling. The remaining 560GL or 58% was in the 12 months after the lake volumes peaked. This suggests that filling the lakes after they have been dried out requires hundreds of gigalitres of water.

The rationale for draining the lakes to save evaporation seems to ignore that nearly an equal amount of water is required to enable the lakes to start refilling after they have dried out. That is, while it might be 'inefficient' to keep water in the Lakes to evaporate that could otherwise be used to meet downstream commitments; it seems equally as 'inefficient' to completely drain the lakes, because several hundred gigalitres (hundreds of thousands of megalitres) are required to wet the dry lakes beds before the Lakes will hold water and refill.

Q: What's really going on here?

A: There is very little transparency around exactly why the lakes were drained by the MDBA with the consent of the BOC and state governments.

The Lakes weren't drained for environmental flows to South Australia's Lower Lakes.

Releases from the Lakes were made in December 2016 and January 2017 to meet demand at the South Australian border, when the Murray was in unregulated flows, so the releases were in excess of demand. Why releases were made during this time is the big unanswered question. MDBA reports at the time that the releases were made for Additional Dilution Flows does not stack up and is not consistent with past practice.

Possible scenarios are:

- the publicly available data is incorrect.
- MDBA made a mistake in making the releases.
- The partner governments and MDBA wanted to test inundation levels at the South Australia border under the Constraints Management Strategy
- The lakes were drained to justify the Menindee Lakes Water Saving Project and the commencement of the associated Broken Hill pipeline project.

The Menindee project is a major part of an adjustment to the Murray Darling Basin Plan, the Sustainable Diversion Limit Adjustment. This process affects water users across the entire southern Basin. There is enormous political pressure to implement this change and allow irrigators in other areas to use any claimed water savings from the Menindee project and other 'supply measure' projects to increase water use elsewhere.[44] The project will reconfigure Menindee Lakes and is required to be finished by 2024 or more water will be required to be removed from production for the environment. The business case for the project assumed that the reconfiguration would be undertaken when the lakes are dry. The projected costs of the project are expected to significantly increase if construction is required with water in the lakes. [45]

The project requires removing Broken Hill's water from Menindee Lakes and sourcing it instead from the Murray River through a pipeline from Wentworth. The construction of the pipeline commenced in early 2018 with minimal consultation, no public business

[44] Slattery and Campbell (2018) *Trickle Out Effect,* http://www.tai.org.au/content/trickle-out-effect

[45] Blackwatch Consulting (2017) *Menindee Lakes: Interim Project Proposal,* obtained under OPD 420, http://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id%3A%22publications%2Ftabledpapers%2Fc2508f17-13bd-49a9-85eb-6f0436b70763%22

case, no Environmental Impact Statement and no Cultural Heritage Assessment.[46] The rush seemed to be justified on the basis of ensuring Broken Hill residents would not run out of water, after the Lakes were then empty.[47]

The draining of the lakes has implications for water users in the Murray River, in addition to the obvious and direct impacts for the Lower Darling community.

> Since development of the Menindee Lakes Scheme, the lakes have supplied 39% of the annual entitlement flows to South Australia (Thoms et al. 2000),[48] leading to a constant flow regime.[49]

If Menindee Lakes are not available for South Australia's entitlement, that water is instead sourced from Hume or Dartmouth dams. Under the Murray-Darling Basin Agreement, South Australia's water is prioritised over NSW and Victorian water users.

The holders of NSW General Security water holders currently have a zero water allocation. If Menindee had not been drained, it is possible that more crops could have been grown in the NSW Murray. This part of the basin produces crops that undergo substantial processing in the region, such as wineries and dairy. Rice is a major crop in the region, but the minimal rice crop has been blamed for the loss of 100 jobs at the

[46] For more detail see Slattery and Campbell (2018) *Trickle out effect: Drying up money and water in the Lower Darling*, http://www.tai.org.au/content/trickle-out-effect

[47] Gooch and Glanville (2016) *Broken Hill Water Crisis: NSW to build Murray River pipeline under $500m supply plan,* https://www.abc.net.au/news/2016-06-16/mike-baird-broken-hill-water-pipeline-plan/7515854

[48] Thoms et al (2000) *Report of the River Murray Scientific Panel on Environmental Flows: River Murray - Dartmouth to Wellington and the Lower Darling River,* River Murray Scientific Panel on Environmental Flows

[49] Murray-Darling Basin Commission (2004) *The Living Murray Information Paper no. 10: Menindee lakes, the Lower Darling River and Darling Anabranch,* https://www.mdba.gov.au/sites/default/files/archived/mdbc-tlm-reports/525_menindeelakesdarling.pdf

SunRice and Leeton mill in Deniliquin.[50] It is possible that the management of Menindee Lakes has contributed to some of these job losses by the:

- non-environmental releases from Menindee Lakes that were made during unregulated flows and therefore surplus to South Australia's needs (up to approximately 300GL);
- reduced inflows into Menindee Lakes, thereby reducing its capacity as a resource for the Southern system and supply to South Australia; and
- needing to wet the dry lake beds in Menindee Lakes before it could refill in late 2016, using up to approximately 300GL.

[50] Jeffery (2018) *SunRice axes 100 jobs at Deniliquin and Leeton mills due to Murray water allocation of zero at one location,* https://www.abc.net.au/news/rural/2018-11-30/sunrice-axes-100-jobs-at-deniliquin-and-leeton-mills/10571666

Conclusion

This fish kill has shredded the last vestige of the public's trust in governments and water agencies to manage our water and implement the Basin Plan. The crisis of confidence is so great it is threatening the social licence of some parts of our agriculture sector and cotton in particular.

The fish kill at Menindee lakes has led to a lot of further questions that should be answered:

1. Why were non-environmental releases made from Menindee Lakes when there were unregulated flows at the South Australia border?
2. Was the decision to make non-environmental releases from Menindee lakes during unregulated flows at the South Australian border taken to the Basin Officials Committee for approval?
3. Did the NSW government raise concerns with the MDBA about release from Menindee lakes at any time?
4. Did the Independent River Operations Review Group's annual review of Murray-Darling Basin River Operations report on the non-environmental releases from Menindee lakes during unregulated flows at the South Australian border, and if not, why not?
5. What is the impact on the reliability of Murray entitlements, and NSW Murray General Security entitlements, in particular, if the non-environmental releases from Menindee lakes during unregulated flows at the South Australian border had not been made?

There should be an examination of the policy settings with regard to:

1. whether the level of extraction in the Northern Basin, particularly with respect to floodplain harvesting, is sustainable?
2. how to manage Menindee lakes in a future with less inflows in the small to medium flow range?
3. whether the past practice of managing lakes to minimise evaporation is still relevant if the lakes will dry more often and require more water to refill?

Finally, transparency and accountability is required if there is any chance for governments and water agencies to restore confidence in the implementation of the Basin Plan:

6. All decisions of the Basin Officials Committee should be made public;

7. The annual reviews of the River Murray Operations by the Independent River Operations Review Group should be made public;
8. The annual reports of the River Murray Operations by the River Murray Operations should be made public;
9. The size and location of all private storages in the Northern Basin should be made public, along with actual storage levels; and
10. A genuinely independent assessment and quantification of the causes of the reduction on low and medium flows in the Barwon-Darling should be completed as soon as possible and made publicly available.