

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 114

Division/Agency: Murray–Darling Basin Authority

Topic: Name of group that represents the Indigenous

Proof Hansard Page: 9-10 (26.05.2017)

Senator ROBERTS asked:

Senator ROBERTS: Mr Glyde, this question is for you. Following on from Senator Kakoschke-Moore, why do the Indigenous support the environment more? Can you just quickly give me any reasons?

Mr Glyde: There are a number of reasons why they would do that. I am probably not the best equipped to explain the full range of values and what they have called capital—they have got a variety of different capitals they see—but I am more than happy to provide you on notice the summary of the value statements and the cultural capital work they have done, and that is reported on our website as well. There is a variety of—in our terms, I guess—environmental, social, health, cultural and spiritual values that they see. What they are seeing is that the extent of development—particularly, in this case, in the north—over the last 50 or 60 years has greatly diminished those values, as far as the Aboriginal community is concerned. Therefore, the generality of their view would be that we need to put even more water back into the environment to begin to bring up those values again so they can feel that they live and work in a healthy environment.

Senator ROBERTS: Could you just include the name of the group that represents the Indigenous?

Mr Glyde: Sure. There is a specific—

Answer:

To facilitate engagement with the Aboriginal community the Murray–Darling Basin Authority (MDBA) supports two peak Traditional Owner-based organisations with a primary focus on natural resource management in the Basin – the Northern Basin Aboriginal Nations (NBAN) and the Murray Lower Darling Rivers Indigenous Nations group (MLDRIN). The NBAN comprises 22 Traditional Owner groups from the northern part of the Basin and representatives from the NSW Aboriginal Land Council and South East Queensland Natural Resource Management. The MLDRIN represents 24 Traditional Owner groups in the southern part of the Basin.

Question Number: 114 (continued)

The MDBA conducted an Aboriginal sociocultural survey in 2016 to inform the Northern Basin Review. The survey was done in partnership with NBAN, and highlights the importance of water to Aboriginal people - showing a direct relationship between environmental watering and improved Aboriginal wellbeing.

The research measured the importance of environmental water to Aboriginal capital assets. Capital assets are aspects of a community that are owned by its population for its use in its socio economic planning and development. Drawn from the work from internationally recognised economist Sayer (2007) the capital assets are identified as Social Capital, Human Capital, Financial Capital, Physical Capital, Natural Capital and Cultural Capital. The research tested the importance of environmental water to each of the capitals in three communities and showed that in each capital asset case there was an average of 90 per cent plus importance of environmental watering.

A link to the study is below:

<https://www.mdba.gov.au/sites/default/files/pubs/Aboriginal-sociocultural-survey-report-Oct-16.pdf>

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 115

Division/Agency: Murray–Darling Basin Authority

Topic: Salinity indicators

Proof Hansard Page: 10 (26.05.2017)

Senator MCKENZIE asked:

Senator MCKENZIE: Can somebody run me through those indicators?

Mr Glyde: Sure. I might ask Mr Binning to take us through those indicators.

Senator GALLACHER: Are we trying to unravel the plan?

Senator MCKENZIE: I am just trying to make sure that it is fair, Senator.

Mr Binning: I cannot speak to the salinity indicators—I will have to take that on notice—but I can take you through what we call the flow indicators, which show the volumes of water available to the system under the different scenarios. Those volumes relate both to the environmental outcomes and to the dilution of salt within the system. But I do not have at hand the specific salinity numbers.

Senator MCKENZIE: What did that modelling say for the salinity targets under 2,400 gigalitres?

Mr Binning: As I said, I do not have the—

Senator MCKENZIE: You do not have that?

Mr Binning: I do not have the salinity numbers with me. What I do have—

Answer:

Multiple lines of evidence were used by the Murray–Darling Basin Authority (MDBA) in their decision on the environmentally sustainable level of take and the associated Basin wide recovery target in 2012. One of those lines of evidence was an assessment of environmental water requirements. Hydrological relationships with specific native fish, waterbird and vegetation life cycle needs were established at 122 key sites across the Basin. These are relationships measured through indicators such as a flow height in the river or onto the floodplain, the duration of such flows, the frequency needed and seasonality. At 21 of the 122 sites, there were 95 specific flow indicators, a further 10 specific indicators were established to measure flow and salinity outcomes for the Coorong, Lower Lakes and Murray Mouth (CLLMM) and at the other 100 sites, the focus was more on maintaining baseflows.

Question Number: 115 (continued)

You have specifically asked about salinity indicators in the CLLMM. Those indicators are set out in the table below (source - MDBA's 2012 hydrologic modelling report). The table shows the performance of a number of CLLMM flow and salinity metrics for the three key water recovery scenarios modelled during development of the Basin Plan (2400GL/y, 2800GL/y, 3200GL/y).

Modelling showed that salinity in the CLLMM is sensitive to water recovery volumes and this information was used as one line of evidence to inform the MDBA's judgement on SDL settings. In particular, maximum salinities in the North and South Lagoon (highlighted in yellow) show a significant effect under the 2400GL/y recovery scenario compared to the 2800GL/y scenario. A recovery of at least 2800GL/y avoids periods of extreme salinity levels in the Coorong and avoids exceeding salinity targets for the vegetation species *Ruppia*, which are recognised as keystone species underpinning the ecology of the Coorong. *Ruppia* is widely recognised as an indicator of the overall health of the ecosystem and is a critical part of the values that resulted in the area being recognised as being of international importance as a Ramsar wetland and a number of international migratory bird agreements.

Table 100: Flow and salinity indicator achievement for the Coorong, Lower Lakes and Murray Mouth site under without development, baseline and BP-2800, BP-2400 and BP-3200 scenarios.

Indicator	Target	Without development	Baseline	BP-2400	BP-2800	BP-3200
Average salinity (g/L) in Coorong southern lagoon over model period	less than 60 g/L	24	62	47	44	41
Maximum salinity (g/L) in Coorong southern lagoon over model period	less than 130 g/L	67	291	138	119	97
Max period (days) salinity in Coorong southern lagoon is greater than 130 g/L	0 days	0	323	64	0	0
Proportion of years salinity in Coorong southern lagoon < 100 g/L	greater than 95%	100%	82%	96%	96%	100%
Average salinity (g/L) in Coorong northern lagoon over model period	less than 20 g/L	12	29	22	21	20
Maximum salinity (g/L) in Coorong northern lagoon over model period	less than 50 g/L	49	148	75	56	47
Max period (days) salinity in Coorong northern lagoon is greater than 50 g/L	0 days	0	604	163	75	0
Proportion of years 3 year rolling average barrage flow greater than 1,000 GL/yr	100%	100%	91%	99%	99%	99%
Proportion of years 3 year rolling average barrage flow greater than 2,000 GL/yr	greater than 95%	100%	79%	96%	98%	99%

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 116

Division/Agency: Murray–Darling Basin Authority

Topic: Modelling for salinity targets

Proof Hansard Page: 10 (26.05.2017)

Senator MCKENZIE asked:

Senator McKENZIE: Could you take it on notice to check out the modelling that was done. My understanding is that, at 2,400, it was around 99.2 per cent; and, if we went up to 3,200, relaxed constraints and modified the barrage operation, we would be at 99.8 per cent. That is my understanding. Also, for all those indicators, there are a range of different scenarios. Mr Glyde, you are nodding. Can you enlighten me?

Mr Glyde: I do not know if those figures are correct. I do not have them in my head either, but, generally speaking, we had a range of indicators that were examined at the time. Salinity is one of the many environmental indicators. It is obviously a big focus, but there are a whole lot of other things, as Mr Binning indicated. We certainly can provide you with the salinity figures on notice, but we could also, if you like, provide you with the other indicators that we generally use to help compare between different scenarios.

Answer:

Multiple lines of evidence were used by the Murray–Darling Basin Authority (MDBA) in their decision on the environmentally sustainable level of take and the associated basin wide recovery target in 2012. One of those lines of evidence was an assessment of environmental water requirements. Hydrological relationships with specific native fish, waterbird and vegetation life cycle needs were established at 122 key sites across the Basin. These are relationships measured through indicators such as a flow height in the river or onto the floodplain, the duration of such flows, the frequency needed and seasonality. At 21 of the 122 sites, there were 95 specific flow indicators, a further 10 specific indicators were established to measure flow and salinity outcomes for the Coorong, Lower Lakes and Murray Mouth (CLLMM) and at the other 100 sites, the focus was more on maintaining baseflows.

You have specifically referred to the 3 year rolling average barrage flow of 1000 GL/yr indicator in the CLLMM (highlighted in yellow in the table. Source - MDBA's 2012 hydrologic modelling report). The table shows the performance of all the CLLMM flow and salinity indicators for the three key water recovery scenarios modelled during development of the Basin Plan (2400GL/y, 2800GL/y, 3200GL/y).

Question Number: 116 (continued)

The 3 year rolling average barrage flow of 1000 GL/yr indicator is a flow statistic that it is achieved in 99 per cent of years in all 3 scenarios. Clearly, this statistic is not sensitive between the 2400 and 3200 GL/y scenarios and therefore does not provide information to differentiate environmental outcomes from the scenarios modelled.

As indicated above this is one of many indicators to assess environmental outcome, which was one of multiple lines of evidence used in establishing the Basin Plan settings.

Table 100: Flow and salinity indicator achievement for the Coorong, Lower Lakes and Murray Mouth site under without development, baseline and BP-2800, BP-2400 and BP-3200 scenarios.

Indicator	Target	Without development	Baseline	BP-2400	BP-2800	BP-3200
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Proportion of years salinity in Coorong southern lagoon < 100 g/L	greater than 95%	100%	82%	96%	96%	100%
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Max period (days) salinity in Coorong northern lagoon is greater than 50 g/L	0 days	0	604	163	75	0
Proportion of years 3 year rolling average barrage flow greater than 1,000 GL/yr	100%	100%	91%	99%	99%	99%
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Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 117

Division/Agency: Murray–Darling Basin Authority

Topic: 800 gig flow-on costs for communities

Proof Hansard Page: 11 (26.05.2017)

Senator MCKENZIE asked:

Senator McKENZIE: Once you have obtained the information I am asking for on notice, could you also let me know what the cost of recovering the 800 gig would be and the flow-on costs for communities.

Mr Glyde: I am more than happy to do that on notice—and my apologies for not having that information to hand. I think it is important, though, to understand, particularly for the constituents you mentioned, that the salinity targets or the achievement of those was not the driving force behind the selection of the particular sustainable diversion limit. The whole idea was to try to make sure that we had a healthy basin and a healthy environment right up and down the basin.

Answer:

The Regulation Impact Statement (RIS) prepared when the Basin Plan was finalised compares the expected economic impact of recovering 2,400 GL for the environment compared with 3,200 GL – refer to page 54 of the RIS at <https://www.mdba.gov.au/publications/mdba-reports/regulation-impact-statement>. The estimates that follow have been developed on the assumption that 600 GL of the total water recovery target is recovered through the government’s infrastructure investments. Compared with the economic impact recovering 2,400 GL, recovering an extra 800 GL was estimated to reduce the value of irrigated agricultural production by \$160 million per year and the value of annual gross regional product by \$142 million per year.

It is important to note that the above analysis would overstate the economic impacts of the arrangements that were eventually settled with Basin states in 2012. The estimates are based on the assumption that all of the extra 800 GL would be recovered through water purchase alone, rather than through investment in infrastructure that improves the efficiency of water use both on and off farm as is intended for the recovery of the extra 450 GL through Efficiency Measures.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 118

Division/Agency: Murray–Darling Basin Authority

Topic: Modelling

Proof Hansard Page: 61 (26.05.2017)

Senator XENOPHON asked:

Senator XENOPHON: Exchange rates can fluctuate, and that could impact on the whole issue of socio-economic affects. How do you crystallise that to make a decision?

Mr Glyde: Through some very clever econometric modelling, which we are more than happy to show you. I can provide on notice the references. What we have done is all on our website. It is peer-reviewed and checked, and draws on a lot of the information we got from local communities as well. But, we will be doing assessments for the first five years of the plan. We are looking at a basin-wide scale, a regional scale, an industry scale and a local scale to try and tease out the sorts of things you are talking about.

Senator XENOPHON: You are saying that the mechanism is quite transparent and quite robust in your view to measure the social and economic impacts?

Mr Glyde: Yes, it is. And it is limited, however, by the depth of data we have. The ABS does not have a whole lot of information on small towns. We have had to go out, particularly in the northern part of the basin, and collect that information from businesses in towns like Dirranbandi and St George so that we can actually get a pretty good handle on what the impact has been of different levels of water recovery. We will provide you the linkages and the documentation that backs it up and the research that has been done to prove it.

Answer:

The social and economic work to inform the Northern Basin Review estimated the effect of water recovery under the Basin Plan separately from the effects of other drivers of change affecting these communities.

Findings in relation to the effects of water recovery were interpreted with the help of communities as well as information describing the changing social and economic conditions in each location. The following reports describe the approach used by the Murray–Darling Basin Authority (MDBA):

<https://www.mdba.gov.au/publications/mdba-reports/northern-basin-review-technical-overview-socio-economic-analysis>

Question Number: 118 (continued)

<https://www.mdba.gov.au/publications/independent-reports/northern-basin-review-economic-modelling>

The independent review of the modelling approach is available at:

<https://www.mdba.gov.au/publications/Northern-Basin-socio-economic-modelling>

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 119

Division/Agency: Murray–Darling Basin Authority

Topic: ‘Minor over bank flows’

Proof Hansard Page: Written

Senator MCKENZIE asked:

Will the MDBA revise their assumption that ‘only ‘minor over bank flows’ would be required to achieve proposed environmental flows downstream?

Data taken from the September-October 2016 flows along the Goulburn, Murrumbidgee, Murray Rivers and their tributaries proved this to be totally incorrect with significant major flooding occurring to achieve 60,000-80,000ML/day at the South Australian border.

Landowners with many years local experience of flood events know the above assumption to be absolutely wrong.

Will the MDBA revise the proposed environmental flow targets of 60,000ML-80,000ML/day over the South Australian border in light of the fact that the Spring 2016 floods which delivered a peak of 95,000ML/day and flows of in excess of 60,000ML/day for 5 weeks DID NOT scour the Murray Mouth sufficiently to withdraw dredging?

Answer:

During 2016, the peak event flows in the Murray, Goulburn and Murrumbidgee were substantially higher than the constraint levels considered in the Constraints Management Strategy’ in their associated reach. The 2016 flood levels at some upstream locations were close to levels last seen in 1975. The 2016 flood event peaked at the SA border at about 94,000 ML/day towards the end of November. A key factor impacting on the SA flow was the dry antecedent conditions in the Edward-Wakool system. The dry conditions resulted in significant losses and downstream flows were lower than would result from wet antecedent catchment conditions. In addition, the high flows from the Murrumbidgee entered the River Murray system after the peak flows had passed, extending both the duration and peak of the flow event at the SA border.

Question Number: 119 (continued)

Flow levels in 1989 demonstrate that the proposed constraint flow of 80,000 ML/d at the SA border is achievable with much lower upstream flow rates. Two peak flows events at the SA border occurred in 1989. The first event reached a peak flow to SA of 79,000 ML/day at the SA border as a result of flows at Yarrawonga and McCoys of around 30,000 ML/d each, 25,000 ML/d from the Darling and 20,000 ML/d from the Murrumbidgee. This flow event built on wet antecedent conditions and had flows from multiple tributaries contributing to the peak flow.

The second peak in 1989 was about six weeks later. Flows downstream of Yarrawonga were 59,000 ML/day and contributed to peak flow at the SA border of 84,000 ML/d.

The environmental flow target of 60 – 80,000 ML/day at the SA border is to deliver environmental water to the South Australian floodplain. There is no link between this flow target and the requirement to scour the Murray Mouth to a level to withdraw dredging.

The report *Proposed Environmentally Sustainable Level of Take for surface water of the Murray-Darling Basin* (2011) identified that, 'in reality maintaining an open Murray Mouth has inherent complexity in both definition and predicting potential future status due to the various factors that influence mouth opening in addition to barrage flows e.g. tidal regime, coastal sedimentary processes, sea level rise, management intervention via dredging etc.'

Scouring of sand at the Murray Mouth from the 2016 floods was not as large as had occurred from a flood of similar peak flow in 2011. The difference appears to relate to the total volume of flow at rates in excess of about 75,000 ML/d. It is also possible that high Christmas tides reduced the available energy this year. Nevertheless, over the second half of 2016, there has been a reduction of about 700,000 m³ of sand from inside the Mouth. The dredge was continuing to remove sand from areas that had not been impacted by scouring flows, whilst analyses are undertaken to determine future dredging requirements.

The Murray-Darling Basin Authority (MDBA) does not propose to revisit the environmental flow targets of 60,000ML-80,000ML/day over the South Australian border, as this target is not tied to scouring flows in the Murray Mouth. The MDBA will continue to monitor and observe the river system to improve our knowledge and understanding. The MDBA continues to incorporate all new knowledge in its endeavours to identify smarter ways to operate rivers to achieve a healthy, working Basin.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 120

Division/Agency: Murray–Darling Basin Authority

Topic: Constraints Management Strategy

Proof Hansard Page: Written

Senator MCKENZIE asked:

The MDBA has been charged with the responsibility of overseeing the MDB Plan, so how did the Constraints Management Strategy pass even the Phase 1 let alone Phase 2 Guideline criteria of “ being feasible within the estimated cost” when the Goulburn River Reach Report estimated mitigation costs have blown out by 350% from an initial \$31-\$47 million to \$140 million (GHD document ‘Cost and Benefits for Private Agricultural Land’ January 2016), keeping in mind that the total amount made available to mitigate third party impacts across the entire Murray Darling Basin is only \$200 million?

The mid-Murray mitigation costs are estimated to be approximately \$240 million.

Answer:

At the request of Basin ministers, the Murray–Darling Basin Authority (MDBA) was commissioned to produce a Constraint Management Strategy (CMS) that looks at smarter ways to operate rivers to provide greater flexibility in the delivery of environmental water and enhance environmental outcomes.

Under the CMS, Basin governments have investigated the way rivers are managed and identified opportunities to retain the benefits of river regulation, but also improve the effectiveness of environmental watering.

As described in the Intergovernmental Agreement on Implementing Water Reform in the Murray Darling Basin (the IGA) there are three phases for the Sustainable Diversion Limit Adjustment Assessment Committee (SDLAAC) to evaluate supply and constraint measures: feasibility studies (Phase 1), business cases (Phase 2), and confirmation of projects (Phase 3).

In April 2016, Basin water ministers agreed to the package of SDL adjustment proposals to be considered in the adjustment, nominating the Goulburn, Lower Darling, Murrumbidgee, Hume–Yarrawonga, Yarrawonga–Wakool Junction and the South Australian Murray as both constraints and supply measures, and the Gwydir as a constraints measure. This decision moved projects from Phase 1 into Phase 2.

Question Number: 120 (continued)

Basin states are responsible for preparing and submitting any constraints proposals for consideration as part of the package of works and measures to be considered in the Sustainable Diversion Limit adjustment mechanism. These proposals will be considered by Basin water ministers when determining the final package of Sustainable Diversion Limit adjustment measures

Basin water ministers are expected to reach a decision regarding the final package of Sustainable Diversion Limit adjustment measures – which include constraints proposals - in 2017. This decision will include if constraints measure business cases would proceed to Phase 3.

The Commonwealth has committed up to \$200 million funding from the Water for the Environment Special Account for constraints projects. Where notified as supply measures, constraint projects are also eligible for Commonwealth supply measure funding. Constraints measures notified as supply measures are also eligible to be funded from the \$1.3 billion funding envelope allocated for supply measures under the Sustainable Rural Water Use and Infrastructure Program.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 121

Division/Agency: Murray–Darling Basin Authority

Topic: Negative third party impacts measured, assessed and quantified

Proof Hansard Page: Written

Senator MCKENZIE asked:

As there are many people across the Basin who are extremely concerned with the increasing frequency of blackwater events, manipulated overbank flood flows and carp population explosion, would the MDBA specifically demonstrate how these negative third party impacts have been measured, assessed and quantified.

Answer:

River managers manage negative third party risks and impacts in their planning, implementation and evaluation of watering events. Water managers continue to learn through research and monitoring of general river management practices and environmental watering actions and apply new knowledge every time a watering action is planned and undertaken.

For example, during the planning phase a range of models and information is used to design environmental watering actions that incorporate either risk avoidance or mitigation strategies. Examples include the use of:

- Computer modelling to simulate inundation levels, flow rates and salinity responses to design infrastructure management requirements. This helps avoid unintentional inundation of private property and set requirements for mitigation strategies such as passing of dilution flows (should movement of salts from the floodplain be anticipated).
- Hypoxic blackwater risk assessment tool for the River Murray, Murrumbidgee and the Edward-Wakool systems. This has been used to inform watering actions to avoid conditions that may exacerbate blackwater risks.
- Carp population model for the River Murray. This has been used to assess the risks of different flow management scenarios on carp populations and identify opportunities to limit carp breeding.

Question Number: 121 (continued)

Real-time implementation of watering actions is also supported by a number of risk management approaches, including the use of:

- Flow forecasts to inform decision makers about the potential changes to flows as a result of natural flows or operational releases from storages upstream.
- Real-time water flow and water quality data and local observations to inform decisions.
- Operational advisory groups comprised of Basin state agencies and local stakeholders.
- Water management strategies that limit opportunities for carp to access floodplains and/or return to the main river channels.

Following a watering action, evaluation of the risk management approaches is undertaken to identify which strategies worked well and which can be improved. Monitoring data gathered from an action forms an integral part of the evaluation process. For example, the on-going Murray-Darling Basin Fish Survey will detect long-term changes in Basin-wide carp populations.

Natural flooding during the past 12 months has resulted in hypoxic blackwater events and large-scale carp breeding. These impacts are the result of natural flooding levels that, in some areas, have not been seen for 30 years. Regular cycling of organic matter into rivers will reduce the excessive build up that can generate hypoxic blackwater events. Environmental watering that benefits native fish, and the potential introduction of the carp herpes-virus, can help to restore the balance between native fish and carp.

Under regulated flow conditions, water managers work within existing river operational constraints in order to deliver water with minimal or no impacts to third parties. In delivering water, managers must have regard to the achievement of water quality objectives identified in Chapter 9 of the Basin Plan.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 122

Division/Agency: Murray–Darling Basin Authority

Topic: Volume of water diverted from the Coorong

Proof Hansard Page: Written

Senator McKENZIE asked:

What volume of freshwater is currently diverted FROM the Coorong via the South East Drainage Scheme in South Australia?

Is the MDBA planning to recover ALL that water for the Coorong, and is this occurring under the MDB Plan?

Answer:

No water (freshwater or saline) is taken directly from the Coorong. The Upper South East Drainage (USED) Network discharges drainage water and floodwaters (of varying salinities) to the Coorong via the Salt Creek Outfall.

The area which includes the USED Network is not within the boundary of the Murray-Darling Basin (as set out in s18A and Schedule 1A of the *Water Act 2007*), and therefore is not a defined Basin water resource. However, given that it is hydrologically connected to the Coorong, it is required to be considered under certain provisions of the *Basin Plan 2012*, including by South Australia in the development of the respective water resource plans and associated long term environmental watering plans.

The South East Flows Restoration Project (SEFRP) is jointly funded by the Australian and South Australia Governments under the Sustainable Rural Water Use and Infrastructure Program. The SEFRP will use a combination of natural watercourses, newly constructed floodways and existing drains to divert additional water from the Upper South East to the Coorong South Lagoon to assist in managing salinity in the lagoon.

The SEFRP is not part of the ‘bridging the gap’ recovery efforts. However South Australia has nominated the SEFRP as one of the projects for consideration under the SDL Adjustment Mechanism. If this is approved to be part of the final package, the SEFRP will result in an average annual volume of 26.5GL (made up of floodwaters and drainage flows) that can be discharged from the USED Network to the Coorong, if required to manage salinities. This water will assist in meeting the ecological targets in the Coorong.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 123

Division/Agency: Murray–Darling Basin Authority

Topic: Goulburn Broken Catchment Management Authority

Proof Hansard Page: Written

Senator MCKENZIE asked:

In January 2016 the Goulburn Broken Catchment Management Authority revealed to communities in the Goulburn River Reach that the proposed environmental flows of 25,000ML/day with a peak of 30,000ML/day at Shepparton under the Constraints Strategy, would affect or inundate 562 properties and 11,552 Hectares. The proposed repeated frequency of environmental floods - an extra 1-3 floods every 10 years with 2-3 recurrent peaks with each flood, added to the stated 6 natural floods per 10 years will cause a massive reduction in productivity on the Goulburn river flats and their tributaries.

What is the assessed cost to Victoria and Australia's productivity in dollar terms in that a large percentage of this area is prime agricultural farm land?

If this hasn't been undertaken, what is the reasoning behind this lack of feasibility analysis?

Answer:

The approach used for costing flood easements and private infrastructure works is based on the long-term impact on productivity of the proposed overbank flows. On this basis, the cost to Victoria and Australia's productivity was directly included in the feasibility analysis. As reported in the Goulburn Constraints Measure Business Case – Phase 2 Investigations, the net present value of the impact on agricultural productivity was estimated to be \$30.56 million. The costings approach was conservative and aimed to provide an upper estimate to the impact.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 124

Division/Agency: Murray–Darling Basin Authority

Topic: Constraints Strategy

Proof Hansard Page: Written

Senator MCKENZIE asked:

So how has the Constraints Strategy passed the evaluation criteria that states the proposal must be technically feasible, when landowners in the Upper Goulburn Catchment and mid Murrumbidgee have absolutely refused to accept or negotiate easements?

And why is the ‘relaxed constraints’ Strategy still being even considered when there is no hope whatsoever of delivering that water when both State and Federal Governments “will not intentionally flood private land without prior agreement of landholders, nor compulsorily acquire land or easements.”?

Answer:

The *Constraints Management Strategy 2013–24 (CMS)* is a long-term strategy that looks at smarter ways to operate rivers to provide greater flexibility in the delivery of environmental water and enhance environmental outcomes. Under the CMS, the Basin governments have investigated and continue to investigate the way rivers are managed. They have identified opportunities to retain the benefits of river regulation, but also improve the effectiveness and efficiency of environmental watering.

Basin states are responsible for preparing and submitting any constraints proposals for consideration as part of the package of works and measures to be considered in the Sustainable Diversion Limit adjustment mechanism.

To ensure a consistent assessment of proposals to evaluate supply and constraint measures for Sustainable Diversion Limit adjustment mechanism consideration three phases are being used to maintain progress: feasibility studies (Phase 1), business cases (Phase 2) and confirmation of projects (Phase 3). Each phase requires evaluation against assessment criteria.

In 2014, Basin governments, through their water ministers, agreed to proceed to the feasibility phase (Phase 1) and develop proposals to manage constraints and mitigate impacts (Phase 2).

Question Number: 124 (continued)

In April 2016, Basin water ministers agreed to the package of SDL adjustment proposals to be considered in the adjustment, nominating the Goulburn, Lower Darling, Murrumbidgee, Hume–Yarrawonga, Yarrawonga–Wakool Junction and the South Australian Murray as both constraints and supply measures, and the Gwydir as a constraints measure. This decision moved projects from Phase 1 into Phase 2.

On 16 June 2017 the Murray-Darling Basin Ministerial Committee endorsed the package of proposed SDL adjustment projects. The package included all of the nominated constraint measures, except the Goulburn which will further developed but not considered as a supply measure. The Victorian government has committed to developing a new Goulburn constraints project that must be accepted by the community, be feasible, and based on improved data and on-the-ground knowledge. More information on the development of a new project proposal will be made available from the Victorian Government over the coming months.

The consequence of constraint measures being considered under the SDL adjustment is that they contribute to the delivery of environmental outcomes and thereby increase the SDL offset achievable. In addition to the \$200 million already committed to constraint these projects gain access to the pool of funding available for SDL projects measures. The total level of funding available is determined by the water savings achieved and will significantly increase. Jurisdictions will now work with the Department of Agriculture and Water Resources to agree funding arrangements for the delivery of projects including constraint measures.

A key element of the CMS is that unacceptable impacts arising from changes to delivery of environmental water are mitigated. More detailed engagement with local communities is required to better understand concerns and to design mitigation strategies that meet community needs. As SDL projects are complex, involve long lead times and require extensive community input the Basin Plan has allowed the period to 2024 for design and implementation. Implementation will be adaptive to allow projects to be adjusted during this period.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 125

Division/Agency: Murray–Darling Basin Authority

Topic: Method of estimating mitigation costs

Proof Hansard Page: Written

Senator MCKENZIE asked:

The policy of estimating mitigation costs for affected farmland is to use a method of disaggregation, or to cost impacts on only that portion of land which is the difference between where a natural flood would reach and the extra environmental flow would inundate.

As flooding affects the management and productivity of the entire farm, why has the MDBA approved this method of estimating costs?

Answer:

The costing methodology considers the impact on the affected area, taking into account how that portion of the farm contributes to the overall farm output. This method was previously used to address easements on the River Murray between Hume and Yarrawonga and was accepted by the community as a reasonable method for assessing the impact on the whole farm enterprise.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 126

Division/Agency: Murray–Darling Basin Authority

Topic: Environmental flood flows in the Goulburn Catchment

Proof Hansard Page: Written

Senator MCKENZIE asked:

The proposed number of environmental flood flows per decade in the Goulburn Catchment are based on historical flood data over the last 55 years, despite the fact that since the beginning of the Millennium drought there has been a real step change in climate and such frequent flood events no longer occur.

Why has the MDBA not revised the data used to the last 20 years as suggested by MDBA board member Mr. George Warne?

Answer:

To inform the Basin Plan, the Murray–Darling Basin Authority (MDBA) has used river flows over a 114-year period, extending from 1895 to 2009. This long time-frame covers a wide range of climatic conditions, ranging from the very wet (i.e. in the 1950s and 1970s) to the very dry (the Federation and Millennium droughts). This provided a good basis to test multiple aspects of the river system under different climatic conditions. These aspects include entitlement allocations, public storage levels, and environmental flows.

The specification of ‘environmental flows per decade’ is an easy-to-communicate terminology for long-term water requirements, and needs to adjust based on the prevailing climatic conditions in each decade. For example, a specification of ‘4 events per decade’ may include 2 events in one decade followed by 6 events in the subsequent decade. The Australian ecosystem has adapted to a highly variable climate, consisting of extended periods of both dry and wet conditions, and environmental water is used in a pattern that reflects these natural year-to-year variations.

It is not yet clear if there has been a step change in climatic conditions. The period since 2000 has experienced a prolonged, heavy drought (peaking in 2006 to 2009); a number of dry-to-median and median inflow years; and an extremely wet year in the Southern Basin (2016), a sequence that is slightly drier than (but not inconsistent with) the observed climate conditions prior to 2000.

Question Number: 126 (continued)

Hence the post-2000 years may form part of an emerging signal of climate change, but this will not become statistically significant until conditions have been observed over a longer time frame.

It is uncertain how flows will change under future climate change. Overall, it is expected that the climate (and hence river flows) will experience greater extremes, such that dry periods would become drier and more prolonged, and wet periods will become wetter. But there is a significant degree of uncertainty in these conclusions, as reflected in the wide range of 'future climate inflow' sequences provided by the CSIRO to MDBA in 2009–10. Regardless, using the past 20 years to anticipate future flows under climate change is not a scientifically robust approach.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 127

Division/Agency: Murray–Darling Basin Authority

Topic: Goulburn Murray Irrigation District and Southern Basin

Proof Hansard Page: Written

Senator MCKENZIE asked:

Victorian Water Minister Lisa Neville has stated that the Goulburn Murray Irrigation District and Southern Basin is at ‘a tipping point’ thus putting the economic stability of the state at risk.

Do you understand how significant the socio-economic impacts of the MDB Plan have already been?

Do you know under the current trajectory of the continual reduction in High Reliability Water Shares from the Goulburn Murray Irrigation District that the system is forecast to have less than 700GL left in its delivery system—down from 1600GL?

In light of this wouldn't it be wise to revise the further removal of water from the system?

Answer:

When the Basin Plan was prepared, a full analysis of the likely social and economic impacts was undertaken. This was summarised in the Regulation Impact Statement that was considered in the process by which all governments agreed to the Basin Plan in 2012.

This analysis indicated that the fundamental rebalancing of water use between consumption and the environment would have an economic and social impact and these impacts would vary across the communities within the Basin.

The MDBA is well aware of the economic and social impacts experienced as a result of this major reform, particularly in irrigation dependent communities such as the GMID.

The MDBA is also aware of the significant investments governments have made to reduce these adverse impacts such as through investment in improved irrigation infrastructure.

In 2017 the Murray–Darling Basin Authority (MDBA) is conducting an evaluation of the implementation of the Basin Plan to identify ways that future implementation can be improved. Part of the evaluation will look at the social and economic outcomes for Basin communities and the effect that the Basin Plan has had on those outcomes. It is an opportunity to assess whether the observed outcomes are consistent with those expected in 2012 and to provide more a detailed assessment of economic and social impacts.

Question Number: 127 (continued)

The evaluation will include detailed region-level assessments of water recovery by entitlement type, whether the water was recovered through buybacks or investments in more efficient on or off farm irrigation infrastructure, and the associated impacts on regional irrigated agricultural production.

The evaluation will also attempt to separately identify any changes in regional irrigated agricultural production in the Goulburn Murray Irrigation District due to the Basin Plan from other factors, such as competition from water from other industries. This will also present the opportunity to take into account the usual pattern of temporary trade between regions, which some recent studies highlight as being important for the GMID as it is often a net importer of water allocations.

In addition to the evaluation, there is an immediate opportunity to reduce the amount of environmental water recovery needed to deliver the Basin Plan outcomes. The SDL Adjustment Mechanism is the part of the Basin Plan that allows for a change to the water recovery target if projects can be identified that enable equivalent environmental outcomes to be delivered with less water. Basin governments are currently working to finalise a package of these types of projects before the 30 June 2017 deadline. The MDBA will then determine the extent to which these projects can reduce water recovery targets. Any proposed changes to the water recovery target in the southern MDB is expected to be available for public consultation in October 2017.

Finally, the Murray–Darling Basin Ministerial Council has announced an independent expert analysis to be completed in December 2017 on how best to design, target and resource efficiency measure programs to recover 450 GL by 30 June 2024 in ways that result in neutral or improved socio-economic outcomes.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 128

Division/Agency: Murray–Darling Basin Authority

Topic: Negative third party impacts

Proof Hansard Page: Written

Senator MCKENZIE asked:

Do you agree that delivering greater and greater volumes through thousands of kilometres of the Basin river channel systems also has many negative impacts, such as transporting larger volumes of sediment, nutrients and phosphates to deposit in wetlands, creating increased water turbidity, increase carp explosion and hypoxic blackwater events, spread of noxious weeds such as Lippia over thousands of hectares?

Can the MDBA specifically demonstrate how these negative third party impacts have been measured, assessed and quantified?

Answer:

The delivery of water for both consumptive purposes and to improve the overall health of the Basin is undertaken in consideration of holistic catchment management actions and within existing river operational constraints.

Water managers use a range of management approaches to avoid negative third party impacts from management of consumptive and environmental water on a variety of spatial scales (individual sites, river-reaches to river-system levels). When planning watering actions, risks are acknowledged and managed, but the benefits to native species and natural processes are the priority for environmental watering. However, if the risks outweigh the benefits, the action will not be undertaken.

The Murray–Darling Basin Authority (MDBA), in partnership with Basin state government agencies, measures turbidity and nutrients in some locations in the river system mainly for monitoring water quality however, it does not assess or quantify third party impacts of movement of sediments (turbidity), nutrients (phosphates) and noxious weeds such as Lippia (*Phyla canescens*) from and within landscapes.

Question Number: 128 (continued)

Catchment management, in particular movement of sediments, nutrients and weeds from the landscapes to water courses are responsibilities of Basin states. Under Chapter 9 of the Basin Plan, Water Resource Plans (WRPs) must identify measures to be undertaken by the states that contribute to the achievement of identified water quality objectives. The measures identified in the WRPs must have regard to causes or likely causes of water quality degradation such as turbidity due to sediment movement, nutrients such as phosphorus, salinity and dissolved.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 129

Division/Agency: Murray–Darling Basin Authority

Topic: Professor Peter Gell

Proof Hansard Page: Written

Senator MCKENZIE asked:

Professor Peter Gell of the Water Research Network, Federation University Australia , totally debunks the MDBA theory that simply delivering greater volumes of water will restore Basin health, and emphasises the importance of improved water quality and a “multi-faceted approach” if there is to be an ecological benefit.

We have constantly been told by the MDBA that the best scientific information available has been guiding the strategies put in place to restore the health of the Murray Darling Basin. Why has the MDBA failed to utilise such robust scientific evidence as that of Professor Gell and other esteemed scientists?

Why has the MDBA focussed so much, purely on attaining and delivering large volumes of water?

Answer:

The Murray–Darling Basin Authority (MDBA) routinely seeks all available information for its technical work and often commissions new work to improve understanding of the hydrology, environment and economics of the Basin’s water resources. The approach to determining the sustainable diversion limits in the Basin Plan was based on peer reviewed science and used the best contemporary hydrologic modelling available. It considered the ecological needs of the Basin’s water-dependent ecosystems and incorporated an assessment of social and economic costs and benefits of varying water regimes to optimise triple bottom line outcomes.

All of this information indicated that water recovery and additional flows were required to achieve a sustainable river system.

At each stage of the Basin Plan’s development the MDBA’s approach was reviewed by both national and international scientists, including CSIRO who reviewed the method for determining the sustainable extraction limits of the Basin Plan and concluded that:

- there was sufficient knowledge to make an informed decision on an ecologically sustainable level of extraction
- the scientific methods for determining extraction levels were fit-for-purpose

Question Number: 129 (continued)

- the body of work undertaken was substantial and sufficient to progress management at the extraction limits set in the Basin Plan.

The Basin Plan is an adaptable plan with a number of reviews built into its program to ensure that any new information or insights from the review processes can be incorporated to improve future implementation.

The MDBA acknowledges that attaining and delivering large volumes of water is not the only mechanism required to achieve environmental outcomes. Non-water mechanisms will also be important contributing factors towards achieving the aims of the Basin Plan. This is why recommendations from the Northern Basin Review included a range of 'toolkit' measures designed to maximise environmental benefits and minimise economic impacts of water recovery. The SDL adjustment mechanism, a key part of the Basin plan, also specifically allows for the sustainable diversion limit to be adjusted based on projects that can achieve equivalent environmental outcomes for using less water. This may include structures on the edge of rivers that direct water into specific wetland sites, managing dams differently, reducing evaporation and loss, or improving river management practices.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 130

Division/Agency: Murray–Darling Basin Authority

Topic: Complementary Measures

Proof Hansard Page: Written

Senator MCKENZIE asked:

Why are complimentary measures not considered an alternative to further water recovery?

At the MinCo meeting September 2016 the Authority noted that complementary measures are “good actions to take but not substitutes for flow related outcomes. They also recognised it was not feasible to develop a volumetric SDL offset assessment method in a short timeframe, if at all.”

Isn't this a very blinkered approach and detrimental to the people of the MDB?

Answer:

Complementary measures enhance environmental outcomes achieved with water recovered for the environment. For example, cold water discharged from deep water storages can harm native fish growth and reproduction. Additional water (of the same temperature) will not overcome such a limitation, where as a thermal curtain that discharges warmer water from the surface of the storage can.

In order to achieve the outcomes of the Basin Plan both flow and non-flow (or complementary) measures are needed. Complete substitution of one for another is unlikely to achieve the desired outcomes. At the most recent Murray-Darling Basin Ministerial Council meeting held in March 2017, Ministers agreed that complementary environmental projects can provide real environmental benefits and asked officials to prepare advice on how to embed complementary measures as a key element of achieving Basin Plan outcomes.

With regards to the method by which volumetric offsets are calculated for supply measures that is being used in the Sustainable Diversion Limit Adjustment Mechanism in the southern Basin it was developed following several years of research by the CSIRO and other experts and agreed by all jurisdictions following a lengthy process. The Authority was noting the difficulties in developing a similar methodology for complementary measures within a shorter timeframe.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 131

Division/Agency: Murray–Darling Basin Authority

Topic: Water in environment after the Basin Plan enacted

Proof Hansard Page: Written

Senator ROBERTS asked:

The MDBA has described in various documents related to the Basin Plan that, under pre Basin Plan conditions, 58% of water remain in the environment and 42% was extracted (ie human, irrigation or for specific environmental purposes).

- How much water remains in the environment after the Basin Plan is enacted?

Answer:

Table 1 in Schedule 1 of the Basin Plan estimates the long term annual inflow and water use in the Murray-Darling Basin. It lists the total inflows as 32,553 GL/yr, with watercourse diversions and interceptions totalling 13,623 GL/yr (42 per cent) and water use by the environment, losses and outflows totalling 18,930 GL/yr (58 per cent).

When the Basin Plan commenced in 2012, the surface water sustainable diversion limit (SDL) was set at 10,873 GL/yr. This is the amount of water that can be used by people from rivers in the Murray-Darling Basin. This target was set to balance the water needs of communities, industries and the environment and is key to achieving a healthy working Basin.

In order to achieve the SDL, 2,750 GL/yr Basin-wide has to be returned to the environment. Recovery of 2,750 GL/yr changes the proportions of watercourse diversions and interceptions to 33 per cent and water use by the environment, losses and outflows to 66 per cent.

However, it is noted that changes to the SDL proposed following the Northern Basin Review, and that may occur as a result of the operation of the SDL adjustment mechanism and efficiency measures (as set out in Chapter 7 of the Basin Plan), would result in further changes to the distribution of water between diversions and the environment.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 132

Division/Agency: Murray–Darling Basin Authority

Topic: MDBA – Regulatory Impact Statement 2012

Proof Hansard Page: Written

Senator ROBERTS asked:

MDBA Regulatory Impact Statement 2012 states that the majority of social and economic impacts of the Basin Plan will occur in the Southern Basin

1. Did the RIS identify social and economic impacts on the 2750GL?
2. How extensive was the scope of the Regulatory Impact Study (RIS) into the impacts of the Basin Plan in the Southern Basin?
3. Did the RIS primarily focus on the impacts of water recovery to irrigators?
4. Did the RIS look at impacts on:
 - Irrigators who didn't sell water (ie impacts on irrigators remaining in an irrigation system or scheme that are left to pay for the running costs of that system)
 - Effects on the temporary water market and how businesses used/depended on temporary water markets
 - Broader effects on irrigation dependent businesses and rural communities
5. Did the RIS conclude that these impacts will be largely offset by Water for the Future Program and the 650GL Sustainable Diversion Adjustment Mechanism
6. Did the RIS look at impacts to non-irrigators including associated businesses
7. Any effects on non-irrigators (ie shire assets, riparian landowners or tourism that will be affected by higher flows down the Murray , Goulburn & Murrumbidgee Rivers in Northern Vic & southern NSW)
8. Did the RIS look at social and economic impacts on irrigation rights outside the main irrigation supply schemes and any potential impacts from changes to Murray River operations
9. Did the RIS include any social and economic impact assessments from the proposed additional 450GL

Question Number: 132 (continued)

Answer:

1. Yes. The Regulation Impact Statement (RIS) summarises the results from a large number of reports and analyses of the social and economic impacts of the Basin Plan.
2. The RIS summarises the analysis of the full range of costs and benefits arising from the Basin Plan. The Murray-Darling Basin Authority's assessment of the social and economic impacts of the Basin Plan is described in detail in its November 2011 synthesis report *Socioeconomic analysis and the draft Basin Plan—Parts A and B* and in its May 2012 report *Socio-economic implications of the proposed Basin Plan*.
3. The RIS looked at the social and economic impacts of water recovery from irrigators, as well as the benefits that are expected to arise from the Basin Plan.
4. The socio-economic analysis of the expected impact of the Basin Plan that is summarised in the RIS takes into account the full range of costs and benefits from the Basin Plan, including flow on effects to businesses servicing irrigation. The socio-economic analyses also consider the effect on irrigation dependent communities. The analyses were conducted within the context of existing policies that address the issues which arise when water is sold out of a shared irrigation delivery network. It also considered the effect of inter-regional water trade, including through the general equilibrium modelling commissioned by the MDBA.
5. The RIS concluded that recovery of 600 GL of the overall water recovery target through infrastructure would reduce the economic costs to the irrigated agricultural sector by around a third. The effect of the SDL adjustment mechanism in improving the socio-economic outcomes from the Basin Plan was not considered in the RIS but will be assessed as part of the 2017 evaluation of Basin Plan implementation.
6. Yes.
7. Yes. The RIS included analysis of the net benefits expected to accrue through enhancements in tourism, recreational fishing and boating, floodplain grazing and water quality.
8. As a result of the Australian Government's commitment to bridge the water recovery gap to the new sustainable diversion limits, the Basin Plan will not affect water access entitlements regardless of whether they are held inside or outside the main irrigation schemes.
9. No. The Basin Plan requires the recovery of the additional 450 GL of water for the environment through Efficiency Measures to have no adverse social or economic consequences. The Department of Agriculture and Water Resources has commissioned an independent expert analysis to be completed in December 2017 on how best to design, target and resource efficiency measure programs to recover 450 GL by 30 June 2024 in ways that result in neutral or improved socio-economic outcomes.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 133

Division/Agency: Murray–Darling Basin Authority

Topic: Report Card - MDBA

Proof Hansard Page: Written

Senator ROBERTS asked:

In 2017 MDBA will prepare a ‘report card’ on social & economic impacts in the Southern Basin in 2017 – but MDBA have advised rural communities this will not change decisions.

- What are the parameters of the proposed report card?
- What are the limitations of this proposed report?
- What is the basis for this MDBA statement and why wouldn’t new information on social and economic impacts be utilised in current MDBA decisions to reduce those impacts?
- Will the report card also include impacts from foreign investments or speculative traders in water?

Answer:

The Murray–Darling Basin Authority (MDBA) has not advised rural communities that the 2017 evaluation of the Basin Plan will not change decisions. The report card is part of the MDBA’s ongoing monitoring and evaluation program, which is designed to measure Basin trends and conditions over time. The information from the report card will be used to adapt and improve water management in a number of ways such as improved environmental watering, or more efficient water delivery.

The report card will assess progress in implementing all elements of the Basin Plan, including whether key milestones and legislative requirements have been met. It will also assess the social, economic and environmental outcomes to date, and try to tease out the effect of the Basin Plan from other factors affecting communities and industries, such as changing commodity prices and industry mechanisation.

Question Number: 133 (continued)

The report card is not of itself a review of the Basin Plan. Other mechanisms in the Basin Plan and the *Water Act 2017* provide for reviewing and amending the Plan if required. These include:

- the Northern Basin Review – completed in 2016 and resulting in a proposed amendment to reduce the water recovery target in the north by 70 GI provided state governments improve management practices
- the sustainable diversion limit adjustment process – currently underway in the southern Basin and which could result in reducing the water recovery target by up to 650 GI
- five yearly reviews of the Basin Plan’s water quality targets and the environmental watering plan
- 10 yearly reviews of the whole Basin Plan.

No. The report card will consider the operation of water markets and the possible consequences of water trade but will not be examining the specifics of foreign investment or speculative water traders.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 134

Division/Agency: Murray–Darling Basin Authority

Topic: Catchment area of Coorong not included in the Basin Plan

Proof Hansard Page: Written

Senator ROBERTS asked:

1. Why was the main catchment area of the Coorong (South East of South Australia) not included in the Basin Plan when identifying environmental flow needs for the Southern Lagoon of the Coorong?
2. Has the Murray Darling Basin Authority (MDBA) re- considered the historical impacts of the South Australian South East Drainage Scheme and the Upper South East Drainage and Flood Mitigation Scheme?
3. Does the MDBA know what volumes of water flow through the SA drains out to sea?
4. What percentage of flows could be returned from both the South East Drainage Scheme and the Upper South East Drainage and Flood Mitigation Scheme?
5. Could investments in the updating and fully automating the Barrages help in controlling and/or release water in a timelier manner assisting with salinity targets for Lake Alexandrina and sand deposits in the Murray Mouth?
6. Has the MDBA received any firm quotes for the full automation of the barrages & what were the amounts?
7. Has the MDBA received any quotes below \$40 million?
8. Has the MDBA looked at an adaptive management approach to management of the Lower Lakes in times of extreme drought, including the option of a Weir at Wellington?
9. Has the MDBA looked at friction piling as a method of building the base for a lock that needed to be built into deep silt such as would be needed near Wellington? If not, then why not?
10. Did the MDBA consider allowing sea water through the barrages when lake Alexandrina's lake bed was partially dry during the recent drought and local people were getting respiratory problems from the dust coming from the acid lake bed? If not, why not? If so, why did it not allow sea water in to cover the lake bed sufficient to neutralise the acid areas?

Question Number: 134 (continued)

11. Did the MDBA or any of its staff ever make a statement about how long they thought it would take to refill Lake Alexandrina, when the lake bed was partially exposed? If so, what time period was mentioned?
12. Has the MDBA considered the idea of having a straight narrow channel directly from the barrages through bird island to the Murray mouth, be able to run regular (fortnightly or so) flows of approx. 150 ML to keep the mouth open while maintaining current levels of the lakes?
13. Has the MDBA authority looked at how much fresh water would be required to enter the lower lakes if an estuarine system was brought into play in the MDBP? If so what amount would be required?
14. To achieve targets for the Coorong, Lower Lakes and Murray Mouth, did the MDBA rely on reports generated within South Australia?

Answer:

1. The hydrological modelling undertaken by the Murray–Darling Basin Authority (MDBA) that informed the Basin Plan took into account the best available information regarding inflows from the South East of South Australia. Thus the impact of the catchment area of the Coorong was considered when identifying environmental flow needs for the Southern Lagoon of the Coorong.
- 2 – 4. The South East Flows Restoration Project (SEFRP) is jointly funded by the Australian and South Australia Governments under the Sustainable Rural Water Use and Infrastructure Program. The MDBA is not involved in the project’s delivery. The SEFRP will use a combination of natural watercourses, newly constructed floodways and existing drains to divert additional water from the Upper South East to the Coorong South Lagoon to assist in managing salinity in the lagoon.

The SEFRP is not part of the ‘bridging the gap’ recovery efforts. However, South Australia has nominated the SEFRP as one of the projects for consideration under the Sustainable Diversion Limits (SDL) Adjustment Mechanism. If this is approved to be part of the final package, the SEFRP will result in an average annual volume of 26.5GL (made up of floodwaters and drainage flows) that can be discharged from the USED Network to the Coorong, if required to manage salinity. This water will assist in meeting the ecological targets in the Coorong. The MDBA is not aware what percentage of total flow carried by the South East Drainage Scheme this represents.

5. Fully automating the barrages would provide little benefit in managing salinity and sand ingress at the Murray Mouth. The base flows available (typically in the order of 2000ML/d) are small compared to the relative volumes in the Goolwa Channel and Coorong. As such, there is little material benefit in fluctuating flows past the barrages in harmony with the tides. The overall system is simply not responsive enough to short term fluctuations.
- 6 – 7. The MDBA has not sought firm quotes to fully automate the barrages. However, based on the cost of automation already installed on a relatively few number of gates, the cost would be expected to be in excess of \$100 million.

Question Number: 134 (continued)

8 – 9. The MDBA in conjunction with South Australia has considered a range of interventions to manage the Lower Lakes in an extreme drought and would do so again if such conditions emerge in the future. Sealing of the barrages to prevent ingress of seawater was undertaken in the Millennium drought and would likely be appropriate in a future event. However, this would need to be evaluated in light of the conditions prevailing at the time and especially the volume of water available to the lower lakes.

A weir at Wellington has been considered but would be a very expensive and difficult structure to construct. Previous investigations have failed to identify a site with suitable foundations meaning that a structure would need to be founded on a significant depth of silt with a deep cut off to prevent erosion of the foundation by seeping water. The river is also quite deep in this reach meaning the structure would be quite high and dewatering the construction site while the river continued to flow would be a major exercise. While possible, constructing a weir at Wellington would be a very significant engineering feat.

Advocates for this proposal generally also suggest removal of the barrages to allow seawater to enter the lower lakes. This would have a very significant environmental effect on the lower lakes as evaporation would progressively concentrate salt in the lakes. With flow from the Murray much less than natural due to upstream diversions the lakes would not re-establish to their previous condition prior to regulation of the river. During periods of low flow the Lakes would likely become hyper saline.

A piled foundation for a weir at Wellington could be a viable solution albeit complex and costly. To assess this concept in detail would require detailed site investigations and engineering analysis. Given the issues associated with removal of the barrages as described above this proposal has not been pursued in detail.

10. Allowing seawater through the barrages into Lake Alexandrina was contemplated during the Millennium drought as a means of keeping the lake bed wet and reducing soil acidification. The ultimate decision to do so would have rested with the South Australian government not the MDBA. A number of detailed studies were undertaken at the time to understand the potential impacts of such an action. These identified a number of adverse consequences and demonstrated that using the limited freshwater available was preferable to maintain the long term recovery and health of the lake ecology. A series of technical reports on this study are available

at http://www.environment.sa.gov.au/managing-natural-resources/river-murray/river-restoration-and-environmental-water/monitoring-river-health/Research_projects/Acid_Sulfate_Soils_Research_Program_reports

The key concern was that if seawater were allowed into the lakes and the drought persisted for one to two more years the salinity would have progressively concentrated due to evaporation ultimately leading to the lakes becoming hypersaline. With high nitrogen and phosphorus loads eutrophication would also likely have occurred. This would have had a significant, long lasting and detrimental effect on the lake ecology.

Air quality monitoring undertaken by South Australian Environment Protection Authority during this time indicated a low risk to health from breathing dust or drinking rain water from tanks around the lower lakes.

Question Number: 134 (continued)

11. No statement was made by the MBDA on how on how long it would take for Lake Alexandrina to refill. Refilling time was dependent on future rainfall and inflows which the MDBA was unable to predict.
12. No proposal has been considered by the MDBA for a channel through Bird Island. Modelling has shown the current sinuous channels to be the most effective in maintaining connectivity and maximising natural scour with the water available.
13. There is no proposal in the Murray Darling Basin Plan (MDBP) to return the Lower Lakes to an estuarine condition. To return the Lakes to their pre-development condition would require return to natural flow conditions. Even with the level of water extraction in the early 1900s the lakes were becoming more saline. To establish a sustainable estuarine system would require far greater water recovery than proposed under the Basin Plan.
14. The MDBA collaborates with all state governments to ensure the best science is used to inform targets for achieving environmental outcomes.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 135

Division/Agency: Murray–Darling Basin Authority

Topic: Salinity

Proof Hansard Page: Written

Senator ROBERTS asked:

1. Can the MDBA supply evidence relating to the figure of 2 million tons of salt that needs to be exported through the Murray Mouth?
2. The basin Plan sets specific salt targets for Lake Alexandrina - 1000 EC 95% of years & 1500 EC 100% of years – to meet this target water is being removed from food production largely in southern NSW & Northern Vic , did these figures come from the South Australian Government?
3. Is the MDBA aware that during southerly swells in SA, sea water can re-enter Lake Alexandrina when the barrages are open, with salt levels rising to 40,000 EC at Goolwa wharf & salt levels rising to high levels right up to Milang?
4. Why has the MDBA focussed on flows down the Murray River to meet the MDBA's target of 2 million tonnes of salt to be exported and not included strategies to prevent sea water incursions into Lake Alexandrina reducing the reliance on water recovery from upstream states?

Answer:

1. The figure of 2 million tonnes provided in the Basin Plan is an indicative measure to assess the achievement of the salt export objective which is aimed at ensuring adequate flushing of salt from the River Murray System.

The indicative figure of 2 million tonnes was calculated on the basis of a long-term modelled estimate approach that took into account cyclical climate influences on flows, as well as existing complementary works and measures (such as salt interception schemes) that avoid substantial quantities of salt entering the River Murray system.

Question Number: 135 (continued)

This calculation was derived from the pre-existing Murray-Darling Basin End of Valley Target (Murray-Darling Basin Agreement - Schedule B, Appendix 1) of a mean annual salt load (estimated over a 25 year period) of 1.76 million tonnes for the Murray River at Morgan, South Australia. The calculation of the indicative figure used a rolling average over a shorter 10 year period to smooth out natural variation due to climatic conditions and included an additional allowance of 10% for average salt intrusion between Morgan and the barrages. The annual assessment as required by the Basin Plan is to report the annualised average salt load exported over a 3 year period which is slightly different from averaging over a 10 year period.

2. The Basin Plan set a 1000 EC salinity target at Milang, Lake Alexandrina to be considered when making decisions regarding flow management. There is no specific requirement in the Basin Plan to meet this target. The salinity values for Lake Alexandrina (1000 EC 95 per cent of days and 1500 EC 100 per cent of the time) are used in the modelling of the Sustainable Diversion Limits (SDL) adjustments and they do not necessarily represent environmental watering or management targets. None of these salinity figures come from the South Australian Government.

Water is not being removed from food production to meet these salinity values as they are not targets that must be achieved.

3. The Murray–Darling Basin Authority (MDBA) is aware that sea water can re-enter the lower lakes during southerly swells in South Australia when the barrages are open, and in some cases even when they are closed. South Australia actively manages the barrages to reduce these events although sometimes they are unavoidable.

At our measuring point at Goolwa, there have been no events of salinity reading above 20,000 EC since 2012 and the peaks that did occur were very short lived. The salinity at Milang can be marginally increased by these events but has not exceeded 1000 EC since 2011.

4. There is a salt export objective in the Basin Plan to ensure adequate flushing of salt from the River Murray System. There is not a salt export target of 2 million tonnes in the Basin Plan. Rather the 2 million tonnes is a comparative indicative measure when assessing the achievement of the salt export objective (i.e. an indicator of performance not of outcome).

The MDBA does not focus on flows down the River Murray to export 2 million tonnes of salt, rather the MDBA attempts to ensure river salinity levels are maintained at acceptable levels for environmental, social, cultural and economic activities. In order to maintain acceptable river salinity levels, now and into the future, it is essential to ensure the natural processes of salt moving through the river and flushing of salt out of the system. The Basin Plan setting endeavour to flush salt from the river system that would have occurred naturally if the river is not regulated as it is today.

The MDBA, in partnership with other Basin jurisdictions, is implementing other cost-effective strategies such as Salt Interception Schemes and improved land management practices to manage salinity in the River Murray System including that of Lake Alexandrina.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 136

Division/Agency: Murray–Darling Basin Authority

Topic: Cost Benefit Analysis

Proof Hansard Page: Written

Senator ROBERTS asked:

1. Has the MDBA ever conducted a cost benefit analysis to determine the most effective ways to achieve environmental targets/outcomes, in particular for targets associated with the Coorong, Lower Lakes and Murray Mouth?
2. Would the MDBA consider or has it considered an adaptive approach to management of the Lower Lakes in times of extreme drought including an option for a weir at Wellington?

Answer:

1. The Murray–Darling Basin Authority (MDBA) has previously examined alternative ways to keep the Murray Mouth open and maintain connectivity between the Southern Ocean and the Coorong. Options included infrastructure such as breakwaters to prevent sand being deposited in the Mouth and other arrangements to increase water exchange and remove sand from the Mouth (such as sand jetting or pumping seawater into the Coorong). The study concluded that given the dynamic process that occur at the Mouth and in particular the periodic change in direction of long shore currents, other fixed arrangements were unlikely to be successful and that dredging when conditions at the Mouth required it remained the most effective and lowest cost solution.
2. The MDBA has considered a range of interventions to manage the Lower Lakes in extreme drought and would do so again if such conditions emerge in the future. Sealing of the barrages to prevent ingress of seawater was undertaken in the Millennium drought and would likely be appropriate in a future event. However this would need to be evaluated in light of the conditions prevailing at the time and especially the volume of water available to the lower lakes.

A weir at Wellington has been considered in the past but would be a very expensive and difficult structure to construct. Previous investigations have failed to identify a site with suitable foundations meaning that a structure would need to be founded on a significant depth of silt with a deep cutoff to prevent erosion of the foundation by seeping water. The river is also quite deep in this reach meaning the structure would be quite high and dewatering the construction site while the river continued to flow would be a major exercise. While possible, constructing a weir at Wellington would be a very significant engineering feat.

Question Number: 136 (continued)

Advocates for this proposal generally also suggest removal of the barrages to allow seawater to enter the lower lakes. This would have a very significant environmental effect on the lower lakes as evaporation would progressively concentrate salt in the lakes. With flow from the Murray much less than natural due to upstream diversions the lakes would not re-establish to their condition pre river regulation. During periods of low flow the Lakes would likely become hyper saline.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 137

Division/Agency: Murray–Darling Basin Authority

Topic: Flood event 2016

Proof Hansard Page: Written

Senator ROBERTS asked:

In October 2016 major floods occurred in the Murray River below Albury. Catastrophic flooding occurred at and beyond Tocumwal with flow figures of approximately 200,000 ML/day. Flood waters of approximately 95,000 ML/d reached the SA Border in December and approximately 70,000 + ML/d at the barrages later in December.

- Is it correct that dredging of the Murray Mouth resumed 9th January 2017?
- What lessons have been learnt from this flood event and will the MDBA review its reliance on high flows down the Murray River as the primary mechanism to clear sand deposits in the Murray Mouth?
- Will the MDBA consider that localised infrastructure or operational improvements are required to address sedimentation risks in the Murray Mouth?
- What other opportunities could there be?
- What risks management plans have you put in place since then to avoid a repeat of catastrophic flooding in 2017 and subsequent years?
- Has the MDBA held formal meetings with affected people to discuss future flood risks options?
- In 2017, there perhaps is even a higher risk of catastrophic flooding as it is likely that Hume Dam, Dartmouth Dam & the Goulburn weir in Victoria will be near capacity – has the MDBA discussed these risks with both the States Governments of Vic/NSW and stakeholders?
- What decisions are likely to result?

Answer:

Dredging of the Murray Mouth resumed in early January 2017.

Question Number: 137 (continued)

Scouring of sand at the Murray Mouth from the 2016 floods was not as large as had occurred from a flood of similar peak flow in 2011. The difference appears to relate to the total volume of flow at rates in excess of about 75,000 ML/d. It is also possible that high Christmas tides reduced the available energy this year. Nevertheless, over the second half of 2016, there has been a reduction of about 700,000 m³ of sand from inside the Mouth. The short period of flow above 75,000ML/d over the barrages scoured sand from the channels previously established by dredging making them more incised. However, it did not scour sand that had deposited further towards Bird Island. As a result the channels remain relatively narrow and at risk of rapid closure under a period of adverse tide and swell conditions. In light of this outcome dredging was recommenced in early January and continues to remove sand from areas that have not been impacted by scouring flows, whilst analyses are undertaken to determine future dredging requirements.

High flows remain important to scouring large volumes of sand from the Mouth. In addition, barrage operations have been adjusted to trial short periods of higher flows coinciding with low tides and swells to increase scour. These trials are limited by the volume of water available under regulated conditions but a small positive effect on scour has been observed.

The Murray-Darling Basin Authority (MDBA) has previously examined alternative ways to keep the Murray Mouth open and maintain connectivity between the Southern Ocean and the Coorong. Options included infrastructure such as breakwaters to prevent sand being deposited in the Mouth and other arrangements to increase water exchange and remove sand from the Mouth such as sand jetting or pumping seawater into the Coorong. The study concluded that given the dynamic processes that occur at the Mouth and in particular the periodic change in direction of long-shore currents, other fixed arrangements were unlikely to be successful and that dredging when conditions at the Mouth required remained the most effective and lowest cost solution.

Flooding is a natural phenomenon, which cannot be fully controlled. A repeat of the flood levels of 2016 will, at some time, occur again. Significantly larger and more damaging floods have been observed historically and will occur again from time to time. Whilst the existence and operation of the many headwater dams across the Murray-Darling Basin has significantly reduced the frequency of damaging floods, the larger floods cannot be fully contained even by these structures.

Primary responsibility for managing on ground flood risks and responses to particular flood events rest with local councils, SES, Police and the Bureau of Meteorology. To support them, MDBA has recently met with councils and SES in Albury to discuss the outlook for storage levels at Dartmouth and Hume Dams and messaging for communities about flood preparations. MDBA will, in coming months, continue to provide advice to communities on current dam conditions and outlooks and support these key agencies in any communications they may have with communities.

The MDBA continues to liaise with the floodplain landholders downstream of Hume through the Murray River Action Group (MRAG). This is a valuable forum for disseminating information on Hume operations and in particular any emerging flood risk as the season develops and storages progressively fill.

The State and Australian Governments have, via the Basin Officials Committee, recently reaffirmed their priorities for the operation of Dartmouth and Hume Dams. That is, to continue the long-standing priority given to water security which underpins the economies of the many communities reliant on the River Murray System.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 138

Division/Agency: Murray–Darling Basin Authority

Topic: Northern Basin

Proof Hansard Page: Written

Senator ROBERTS asked:

1. The MDBA has written to states with proposed amendments to the Basin Plan that have arisen from the Northern Basin Review?
2. What was the trigger for the Northern Basin Review?
3. The Basin Plan in its current form has a reduction of 390 GL reductions for the Northern Basin. What is the MDBA's estimate of job losses for a recovery level of 390 GL in Dirranbandi specifically and across the northern basin under the current setting?

Answer:

1. Yes. The Chair of the Murray–Darling Basin Authority (MDBA) wrote to members of the Ministerial Council on 11 May 2017.
2. The Basin Plan was based on the best information available at the time however governments recognised that there was room for improving the evidence base for setting sustainable diversion limits in the northern Basin. As part of finalising the Basin Plan in 2012, the Australian Government and the Basin state governments agreed to the Northern Basin Review to address gaps in the evidence base.
3. Under current Basin Plan settings, there is a 390 GL water recovery target in the northern Basin. The MDBA estimates that the employment impact arising from a 390 GL recovery target would be 711 fewer jobs (full time equivalent) across the 21 communities studied as part of the Northern Basin Review, including a loss of 64 jobs in Dirranbandi.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 139

Division/Agency: Murray–Darling Basin Authority

Topic: Loss of jobs in Dirranbandi under the proposed 320GL reduction target

Proof Hansard Page: Written

Senator ROBERTS asked:

1. How many less jobs will be lost in Dirranbandi? Does that include flow on effect jobs (shop assistants in the town) or just direct jobs (farm employees)?
2. How many less jobs lost across the northern basin? Does that include flow on effect jobs?
3. What are the total estimated job losses across the Northern Basin under a 320GL target?
4. Will any jobs be lost or gained in the southern basin as a result of the proposed 320 GL reduction?
5. What are the volume of extra water and other implications of flows at the SA Border as a result of the proposed northern Basin changes? (e.g. with both the 390 GL & 320 GL options)
6. What are the volume of extra water and implications of the recommendations for proposed northern Basin flows at the barrages in South Australia? (For both the 390 & 320 GL reductions?)
7. Supposing around 3 GL of extra water was expected to flow over the Barrages under the 390 GL plan than the 320 GL plan, would the MDBA consider another option in say the Coorong / lower Lakes end of the MDBP that could give the same extra 3 GL flow at the Barrages / Murray mouth?
8. In the Northern Basin how many Basin Plan flow targets are met under the 320GL target as opposed to the 390GL target?
9. How does the MDBA model expected job losses in the MDB? Is it from expected revenue loss from lower income going into the community divided by an average wage?
10. Does the MDBA factor into the water allocation reductions, how the social fabric of a community changes when a school closes or a shop or business closes and residents then have to travel much further to obtain services , repairs or schooling etc.? If so how? If not, then should the MDBP start to address this issue?

Question Number: 139 (continued)

Answer:

1. Changing the water recovery target from 390 GL to 320 GL is estimated to result in 15 fewer job losses (full time equivalent positions - FTE) in Dirranbandi. This includes flow-on effects beyond the farm employees.
2. Changing the water recovery target from 390 GL to 320 GL is estimated to result in 183 fewer job losses (FTE) across the northern Basin communities studied. This includes the flow-on effects to other sectors.
3. Compared with no Basin Plan, recovering 320 GL of water for the environment would lead to 528 fewer jobs (FTE) across the 21 communities studied by the Murray–Darling Basin Authority (MDBA) as part of the Northern Basin Review.
4. The proposed change to the water recovery target in the northern Basin will have no impact on the water recovery target in the southern basin and consequently no expected effect on employment.
5. The Basin Plan’s 2,750 GL recovery scenario (which includes a northern Basin recovery of 390 GL), increased modelled flows across the South Australian border from 6,764 to 8,720 GL/y (i.e. an increase of 1,956 GL/y) compared to pre-Basin Plan conditions.

Reducing the northern Basin recovery to 320 GL resulted in a slight reduction in modelled SA border flows of 4 GL/y (i.e. to 8,716 GL/y). The reduction is relatively small because the 2016 Northern Basin Review recommendation includes a far more targeted recovery approach compared to the 2012 Basin Plan.

SA border flows in dry years were relatively unimpacted by this change — in fact, flows during the 2006–2009 dry period were found to be slightly increased under the 320 GL option, again as a result of the targeted recovery strategy.

6. As per the response to 5 above, the 2,750 GL recovery scenario increased barrage flows by 2,130 GL/y compared to pre-Basin Plan conditions.

Reducing the northern basin recovery target to 320 GL resulted in a slightly smaller increase in barrage flows compared to the Basin Plan settings (i.e. 2,127 GL/y, or 3 GL/y less than the 390 GL option).

7. The barrage flows for both the 390 and 320 GL options listed above assume current management arrangements for water in the Southern Basin (albeit, with full water recovery). However, the SDL adjustment mechanism includes 36 supply measures, some of which have been designed to improve the management of environmental water. This includes a significant reconfiguration of Menindee Lakes which will result in a formal recognition of environmental water from the northern Basin, and a more effective use of this water for environmental outcomes in the southern Basin. These changes are expected to far outweigh the change in flows resulting from reduced northern Basin recovery.

Question Number: 139 (continued)

8. The 390 GL option was able to satisfy the 21 of the 43 flow targets across the Northern Basin. In contrast, the 320 GL option was able to satisfy 19 of the 43 flow targets.

In response to the slight reduction in 'achieved' flow targets, the MDBA included a set of toolkit measures associated with the 320 GL recommendation. These toolkit measures include a recommendation for targeted water recovery, and also include a number of measures to enhance environmental outcomes, such as through improved protection of environmental water. It is expected that the combination of 320 GL and the toolkit measures will minimise any reduction in ecological outcomes.

9. The MDBA estimates the employment impacts of different water recovery targets by using econometric modelling of the relationship between water availability, irrigated activity, and employment. The method has been publicly released and peer reviewed. It is available at:

<https://www.mdba.gov.au/publications/independent-reports/northern-basin-review-economic-modelling>

10. The modelling takes into account how a change in water that is available for irrigation is expected to lead to changes in employment in the individual communities. This information is interpreted in conjunction with other information on the social and economic characteristics of each community.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 140

Division/Agency: Murray–Darling Basin Authority

Topic: Additional Social and Economic Impacts (450GL)

Proof Hansard Page: Written

Senator ROBERTS asked:

1. What is the factual scientific basis for the additional 450GL of water for the environment?
2. Has there been any cost benefit analysis on this additional 450GL and in which region?
3. With such devastating social & economic impacts seen in both the Southern Basin & Northern Basin from the existing reductions of water e.g. job losses in the South (Deniliquin, Wakool, Shepparton etc.) & in the Northern basin (Dirranbandi, St George & Wee Waa of 33, 34 & 8 job losses already,) isn't it impossible for another 450 GL of water allocations to be reduced anywhere with neutral or beneficial socio economic impacts?
4. Does the MDBA's social & economic neutrality test mean the following?
 - If one irrigator participates in an on farm efficiency program, the neutrality test is met?
 - Social & economic effects on a riparian landholder could be deemed socially & economically neutral if a completely separate irrigator in a completely separate region takes up efficiency project deal?

In the southern Basin – stakeholders have advised that the MDBA environmental flow targets within 2750GL will have third party impacts & these are yet to be resolved (i.e. overbank flows and related natural or constraints issues, e.g. bridges, private property impacts etc.)

- Doesn't this make third party impacts worse if an extra 450GL is acquired for the environment?

Answer:

1. The enhanced environmental outcomes that will be pursued with recovery of an additional 450GL/y are specified in Chapter 5 of the Basin Plan. This includes, but is not limited to, outcomes at Coorong, Lower Lakes and Murray Mouth (CLLMM).

It is important to note that the additional 450GL/y was based on its ability to deliver a range of environmental benefits. In particular, modelling indicated that the additional water recovery, in conjunction with removing or easing constraints, would markedly improve the ability to achieve high flow targets in the River Murray and enable more frequent inundation of floodplain in South Australia, New South Wales and Victoria. Such

Question Number: 140 (continued)

flows are expected to lead to improvements in the health of forests, native fish, waterbird habitat, river channel connection along the river and with its floodplain, and replenishment of groundwater. The anticipated benefits of the 450GL/y and constraints relaxation are more fully described in the relaxed constraints modelling report (<https://www.mdba.gov.au/publications/mdba-reports/hydrologic-modelling-relaxation-operational-constraints-southern-connected>).

2. The Murray–Darling Basin Authority (MDBA) is not aware of any cost benefit analysis of the recovery of the additional 450 GL through Efficiency Measures. This measure is part of the SDL adjustment mechanism requested by Basin state governments when the Basin Plan was finalised.
3. The Minister for Agriculture and Water Resources has announced an independent expert analysis to be completed in December 2017 on how best to design, target and resource efficiency measure programs to recover 450 GL by 30 June 2024 in ways that result in neutral or improved socio-economic outcomes.
4. The agreed test included in the Basin Plan for social and economic neutrality is at clause 7.17(2)(b) of the Basin Plan, and centres on the participation of water users in the program. The assumption is that individual water users or irrigation networks would not voluntarily take up the offer of public funding to upgrade their irrigation infrastructure if it was not in their interests to do so.

As indicated in 3. above, an independent study has been commissioned to assist with the design of the efficiency program.

To the extent that governments agree to implement constraints measures to improve the utility of environmental water, the Commonwealth has set aside funding to mitigate any third party impacts and decisions would not be made until full community consultation has occurred. Any impacts are not anticipated to be significant, because the flow levels under consideration are below the minor flood level that occurs naturally in these systems.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 141

Division/Agency: Murray–Darling Basin Authority

Topic: Murray Darling Basin Authority Charges

Proof Hansard Page: Written

Senator ROBERTS asked:

The MDBA pass on costs to State Governments who then pass costs to irrigators to cover river operations and other programs. SA is different because charges are just picked up by the SA government & whole SA community pays;

1. Are these MDBA fees passed on to irrigators in NSW (& presumably Vic) subject to full transparency?
2. MDBA staffing levels have been reported as approx. 300, & this compares to staffing levels of about 35 -50 people under the former Murray Darling Basin Commission. Can the MDBA provide a breakdown of roles and responsibilities for the full staffing levels?
3. IS the MDBA subject to a regulatory oversight process on how MDBA fees are set and the justification for any increases?
4. Who audits the MDBA?

Answer:

1. Recovery of Murray-Darling Basin Authority (MDBA) costs is a matter for state governments. In both NSW and Victoria a portion of MDBA costs are recovered from entitlement holders with those states meeting the balance. States are intimately involved in the development of the MDBA's programs and budgets under the Joint Venture arrangement and have access to a range of supporting information. The processes to establish fees for recovery of MDBA costs are managed by the states who also decide what details to make publically available. The MDBA supports the states as requested in these processes.
2. 191 staff transitioned from the Murray Darling Basin Commission to the Murray–Darling Basin Authority in 2008.

Question Number: 141 (continued)

The staffing profile of the Murray–Darling Basin Authority aligned to the Murray–Darling Basin Authority goals in the 2016-17 Corporate Plan at 30 April 2017 is as follows:

Goal	Goal Description	Average Staffing Level (ASL)
STRATEGIC GOAL 1	Lead the implementation of the Basin Plan to achieve a healthy working basin	97.12
STRATEGIC GOAL 2	Strengthen engagement with the community	29.61
STRATEGIC GOAL 3	Evaluate and report the social, economic and environmental outcomes of basin water reforms	28.06
STRATEGIC GOAL 4	Operate the River Murray system efficiently for partner governments	81.80
STRATEGIC GOAL 5	Improve the knowledge base to support sustainable water resource management	53.64
		290.23

3. The MDBA does not set fees nor levy charges and therefore is not subject to direct pricing regulation. This is a matter for the states in determining the proportion of MDBA costs to recover and the tariff structure through which this is done.
4. The MDBA is subject to audit by the Australian National Audit Office. The Joint Programs financial reports are audited by an independent 'Big Four' accounting firm. Program delivery is regularly reported to the Joint Venture governments through the Basin Officials Committee and Murray Darling Basin Ministerial Council.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 142

Division/Agency: Murray–Darling Basin Authority

Topic: Basin Plan Science

Proof Hansard Page: Written

Senator ROBERTS asked:

The MDBA developed the Basin Plan during the Millennium Drought; baseline documents included the Sustainable Rivers Audit (a report that assessed Basin River Health during the Millennium drought)

1. Given the short political timeframes for developing a new Basin Plan, how extensive did the MDBA rely on ‘available’ information when developing the Plan?
2. Does the MDBA think given that the Millennium Drought has ended & the environment has recovered, that a review of baseline assumptions the MDBA made is required?
3. Does the MDBA consider that an adaptive approach to new science is appropriate and if so how would such knowledge be built into current decisions and key points to 2019
4. On what basis does the MDBA consider that the Lower Lakes were always fresh?
5. Can the MDBA provide evidence of this? (cite paper & authors & brief outline of evidence)

Answer:

1. In developing the Basin Plan the Murray–Darling Basin Authority (MDBA) drew upon the best available information to inform its decision to recommend recovery of 2750 gigalitres/year on average from consumptive users to return to the environment. It is a requirement of the *Water Act 2007* (Cth) that the Authority use best available scientific knowledge and socio-economic analysis in developing the Basin Plan. The multiple lines of evidence used by the Authority to support its judgement regarding Basin Plan settings included:
 - Social and economic analyses commissioned by the Authority, other social and economic analyses considered by the Authority, and the Authority’s own social and economic analyses. This work is described in the Authority’s reports *Socioeconomic Analysis and the draft Basin Plan* (MDBA 2011) and *The socio-economic implications of the proposed Basin Plan* (MDBA 2012).

Question Number: 142 (continued)

- Ecological and hydrological analyses undertaken by the Authority, as described in the reports *The proposed “environmentally sustainable level of take” for surface water of the Murray–Darling Basin – method and outcomes report* (MDBA 2011); *The proposed groundwater baseline and sustainable diversion limits: methods report* (MDBA 2012), *Hydrologic modelling to inform the proposed Basin Plan: Methods and results* (MDBA 2012), assessments of environmental water requirements for individual sites (MDBA 2012), and assessments of the impacts of removing system constraints (MDBA 2012).
- Work commissioned by the Authority to assess the benefits of the Basin Plan, in particular the CSIRO (2012) report *Assessment of the ecological and economic benefits of environmental water in the Murray–Darling Basin*, and assessments of benefits for boating, fishing and floodplain agriculture (DAE 2012; GHD 2012; MJA 2012).
- Consultation with stakeholders and the Australian public, including through the formal 20-week consultation period on the proposed Basin Plan (November 2011 to April 2012), and through subsequent communication with Basin State Ministers, as described in the *Proposed Basin Plan consultation report* (MDBA 2012) and other documents.

To inform the Basin Plan, the MDBA has modelled river flows over a 114-year period, extending from 1895 to 2009. This long time-frame covers a wide range of climatic conditions, ranging from the very wet (i.e. in the 1950s and 1970s) to the very dry (the Federation and Millennium droughts). This provided a good basis to test multiple aspects of the river system under different climatic conditions. These aspects include entitlement allocations, public storage levels and environmental flows.

At each stage of the Basin Plan’s development the MDBA’s approach was reviewed by both national and international scientists, including CSIRO who reviewed the method for determining the sustainable extraction limits of the Basin Plan and concluded that:

- there was sufficient knowledge to make an informed decision on an ecologically sustainable level of extraction
 - the scientific methods for determining extraction levels were fit-for-purpose
 - the body of work undertaken was substantial and sufficient to progress management at the extraction limits set in the Basin Plan.
2. MDBA does not agree with the premise of the question. Following the ending of the Millennium Drought there has been some encouraging signs of improvements in environmental outcomes through a combination of natural flood events and the active management of water recovered through the Basin Plan by environmental water holders on behalf of governments. This is consistent with expectations as the condition of the Basin’s rivers and biota will fluctuate in response to wet and dry times as it would have prior to European settlement and the development of water resources.

Question Number: 142 (continued)

This does not however fundamentally change the Authority's judgement that water recovery and additional flows are required to achieve a sustainable river system. As outlined in the response to question 1 above, the MDBA's approach to determining the sustainable diversion limits in the Basin Plan was based on peer reviewed science and used the best contemporary hydrologic modelling available over a 114 year time sequence. It considered the ecological needs of the Basin's water-dependent ecosystems throughout the Basin and incorporated an assessment of social and economic costs and benefits of varying water regimes to optimise triple bottom line outcomes.

Notwithstanding all of the above, the Basin Plan is an adaptable plan with a number of reviews built into its program to ensure that any new information or insights from the review processes can be incorporated to improve future implementation. These reviews are also an opportunity to test and validate any assumptions that underpinned the settings of the Basin Plan, such as has recently occurred in the Northern Basin Review.

3. The MDBA welcomes any new science that can improve the management of the Basin's water resources. This includes new economic, social, cultural or environmental research that can assist MDBA to work with governments and local communities to works towards a healthy and productive Basin. The MDBA values collaboration with the research to continually seek to improve our knowledge and understanding of the Basin's communities, economic drivers, rivers and wildlife.

There is a balance to be struck between being adaptive and providing certainty. The irrigation sector has repeatedly expressed to the MDBA the importance of having certainty regarding Basin Plan settings to allow it to manage its business decisions. Similarly, Basin jurisdictions require certainty regarding sustainable diversion limits well in advance of 2019 to enable them to develop water resource plans. The Basin Plan provided this certainty by establishing clear Basin Plan settings and a timeframe for implementation.

The Basin Plan is, however, also adaptive. Two key examples of this are the Northern Basin Review and Sustainable Diversion Limit Adjustment Mechanism. MDBA has proposed amendments to the Basin Plan to reduce the water recovery target in the Northern Basin from 390 to 320 gegalitres/year on average. This followed four years of extensive research into the environmental, social and economic outcomes of water recovery. In addition, the Sustainable Diversion Limit Adjustment Mechanism is another key Basin Plan implementation decision point before 2019 that will allow less water to be recovered for the environment provided the same environmental outcomes sought by the Basin Plan can be achieved. There is robust new science that has been developed to underpin the adjustment mechanism to test that equivalent environmental outcomes can be achieved with less water. These are critical Basin Plan decision points that are adaptively changing the settings of the Basin Plan to achieve triple bottom line outcomes.

There are many examples where the MDBA is incorporating new science and knowledge into Basin Plan implementation as a core business activity. This includes but is not limited to, the planning, delivery and monitoring of water provided to the environment and further research into the social and economic impacts of the Basin Plan on local communities.

Beyond 2019, there are legislated review points built into the Basin Plan. This will provide further opportunities for new science and knowledge to be adaptively taken into account into Basin Plan implementation.

Question Number: 142 (continued)

4. Based on multiple lines of evidence, Lakes Alexandrina and Albert are known to have largely been freshwater systems and not estuarine systems prior to the development of water resources in the Basin. The evidence shows that there were only short-lived and geographically limited seawater incursions into the lakes when low River Murray flows were not sufficient enough to push back the sea.

It wasn't until the early 1900s that saltwater intrusions became common place when upstream water resource developments began to reduce the River Murray flows to the lakes. The barrages were then constructed in order to maintain navigation for river boats and to maintain a freshwater reservoir.

5. Key lines of evidence include:
- Microscopic analysis of single-celled algae (Diatoms) shows that in the 7,000 years since they were formed, the Lower Lakes would have been mainly fresh with rarer seawater inflows. See <http://www.environment.sa.gov.au/files/sharedassets/public/cllmm/cons-gen-environmentalhistorycooronglowerlakes.pdf>
 - Historical accounts of explorers, farmers, surveyors, local inhabitants, newspaper, parliamentary debates and traditional stores of the local Ngarrindjeri people show that the lakes were predominantly considered freshwater. See <http://aph.gov.au/DocumentStore.ashx?id=d6f7db62-a9a1-4b67-adfc-0378b9fa4025&subId=407451>
 - Murray-Darling Basin Authority computer modelling, which simulated what the lakes might have been like before European settlement and the development of the water resources, indicates that the lakes were predominantly freshwater systems.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 143

Division/Agency: Murray–Darling Basin Authority

Topic: Murray River Natural Capacity

Proof Hansard Page: Written

Senator ROBERTS asked:

1. Is the MDBA concerned about large new irrigation developments downstream of the Barmah Choke on the Murray River?
2. As managers of Murray River Operations, does the MDBA propose to highlight natural river constrictions and recommend to State Governments that new irrigation developments are made aware of river limitations?
3. Is the MDBA aware of discussions with Murray Irrigation Limited in regards to moving volumes of water through the Mid Murray region (including the use of Murray irrigation channels & escapes into the Edward/Wakool river system)? What is the MDBA's opinion?
4. What is the MDBA views on how these large flows would move through the system including new environmental flow demands in peak periods, new irrigation developments and how water could or could not pass through the system? What are the limitations?
5. Will the MDBA revise their assumption that 'only 'minor over bank flows' would be required to achieve proposed environmental flows downstream?
6. Will the MDBA revise the proposed environmental flow targets of 60,000ML-80,000ML/day over the South Australian border in light of the fact that the Spring 2016 floods which delivered a peak of 95,000ML/day and flows of in excess of 60,000ML/day for 5 weeks DID NOT scour the Murray Mouth sufficiently to withdraw dredging?
7. The MDBA has been charged with the responsibility of overseeing the MDB Plan, so how did the Constraints Management Strategy pass even the Phase 1 let alone Phase 2 guideline criteria of " being feasible within the estimated cost" when the Goulburn River Reach Report estimated mitigation costs have blown out by 350% from an initial \$31-\$47 million to \$140 million (GHD document 'Cost and Benefits for Private Agricultural Land' January 2016), keeping in mind that the total amount made available to mitigate third party impacts across the entire Murray Darling Basin is only \$200 million?

The overarching evaluation criteria (Point 4) of the Phase1 Assessment Guidelines for Constraint and Supply Proposals states:

"The risks and impacts associated with the proposed measure are manageable and acceptable."

Question Number: 143 (continued)

8. Whom was it who assumed they are manageable and acceptable?

The MDBA has stated that an important principle of the Constraints Strategy is that it will not create any new risks to reliability of entitlements.

9. Please explain how the removal of another 450GL of High Reliability Water Shares under the Constraints Strategy will not cause the Goulburn Murray Irrigation District(GMID) system to collapse, considering the majority of the 450GL upwater will be taken from the GMID through an on-farm efficiency program.
10. How can such a huge reduction in volume -down to 700GL- not affect efficient delivery and therefore put irrigators entitlements at risk?

Answer:

1–2. & 4. The Murray–Darling Basin Authority (MDBA) is currently working with the partner governments to better understand the risk of shortfall in deliveries as impacted by changed water usage patterns through recent horticultural development, mainly almonds downstream of the Barmah-Milewa Choke and environmental water demands. From this work we will develop some potential longer term risk mitigation measures including alternative delivery arrangements.

As part of this work the MDBA will work on a set of key messages addressing the changing demand patterns and delivery impacts targeted at the irrigation industry for use by partner governments.

3. Yes. WaterNSW and the MDBA are discussion with Murray Irrigation Limited (MIL) regarding the use of the MIL system to bypass regulated water around the Barmah-Milewa Choke. The use of this system to bypass water has been the historical practice. We understand that the NSW Office of Environment and Heritage also had a commercial arrangement in 2016–17 for use of this system to deliver environmental water to environmental sites within the Edward Wakool region.

5–6. During 2016, the peak event flows in the Murray, Goulburn and Murrumbidgee were substantially higher than the constraint levels considered in the Constraints Management Strategy in their associated reach. The 2016 flood levels at some upstream locations were close to levels last seen in 1975. The 2016 flood event peaked at the SA border at about 94,000 ML/day towards the end of November. A key factor impacting on the SA flow was the dry antecedent conditions in the Edward-Wakool system. The dry conditions resulted in significant losses and downstream flows were lower than would result from wet antecedent catchment conditions. In addition, the high flows from the Murrumbidgee entered the River Murray system after the peak flows had passed, extending both the duration and peak of the flow event at the SA border.

Flow levels in 1989 demonstrate that the proposed constraint flow of 80,000 ML/d at the SA border is achievable with much lower upstream flow rates. Two peak flows events at the SA border occurred in 1989. The first event reached a peak flow to SA of 79,000 ML/day at the SA border as a result of flows at Yarrawonga and McCoys of around 30,000 ML/d each, 25,000 ML/d from the Darling and 20,000 ML/d from the Murrumbidgee. This flow event built on wet antecedent conditions and had flows from multiple tributaries contributing to the peak flow.

Question Number: 143 (continued)

The second peak in 1989 was about six weeks later. Flows downstream of Yarrawonga were 59,000 ML/day and contributed to peak flow at the SA border of 84,000 ML/d.

The environmental flow target of 60 – 80,000 ML/day at the SA border is to deliver environmental water to the South Australian floodplain. There is no link between this flow target and the requirement to scour the Murray Mouth to a level to withdraw dredging.

The report *Proposed Environmentally Sustainable Level of Take for surface water of the Murray-Darling Basin* (2011) identified that, 'in reality maintaining an open Murray Mouth has inherent complexity in both definition and predicting potential future status due to the various factors that influence mouth opening in addition to barrage flows e.g. tidal regime, coastal sedimentary processes, sea level rise, management intervention via dredging etc.'

Scouring of sand at the Murray Mouth from the 2016 floods was not as large as had occurred from a flood of similar peak flow in 2011. The difference appears to relate to the total volume of flow at rates in excess of about 75,000 ML/d. It is also possible that high Christmas tides reduced the available energy this year. Nevertheless, over the second half of 2016, there has been a reduction of about 700,000 m³ of sand from inside the Mouth.

The dredge was continuing to remove sand from areas that had not been impacted by scouring flows, whilst analyses are undertaken to determine future dredging requirements. The MDBA continues to incorporate all new knowledge in its endeavours to identify smarter ways to operate rivers to achieve a healthy, working Basin.

7–8. At the request of Basin ministers, the MDBA was commissioned to produce a Constraint Management Strategy (CMS) that looks at smarter ways to operate rivers to provide greater flexibility in the delivery of environmental water and enhance environmental outcomes.

Under the CMS, Basin governments have investigated the way rivers are managed and identified opportunities to retain the benefits of river regulation, but also improve the effectiveness of environmental watering.

As described in the Intergovernmental Agreement on Implementing Water Reform in the Murray Darling Basin (the IGA) there are three phases for the Sustainable Diversion Limit Adjustment Assessment Committee (SDLAAC) to evaluate supply and constraint measures: feasibility studies (Phase 1), business cases (Phase 2), and confirmation of projects (Phase 3).

In April 2016, Basin water ministers agreed to the package of SDL adjustment proposals to be considered in the adjustment, nominating the Lower Darling, Murrumbidgee, Hume–Yarrawonga, Yarrawonga–Wakool Junction and the South Australian Murray as both constraints and supply measures, and the Goulburn as a constraints measure.

Basin states are responsible for preparing and submitting any constraints proposals for consideration as part of the package of works and measures to be considered in the Sustainable Diversion Limit adjustment mechanism. These proposals will be considered by Basin water ministers when determining the final package of Sustainable Diversion Limit adjustment measures.

Question Number: 143 (continued)

Basin water ministers are expected to reach a decision regarding the final package of Sustainable Diversion Limit adjustment measures – which include constraints proposals - in 2017. This decision will include if constraints measure business cases would proceed to Phase 3.

9–10. There is no proposal under the Constraints Management Strategy to remove another 450GL of High Reliability Water Shares. The purpose of the Constraints Management Strategy is to allow more efficient use of environmental water. This means the Constraints Management Strategy aims to reduce the amount of water that needs to be recovered from irrigation.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 144

Division/Agency: Murray–Darling Basin Authority

Topic: Negative third party impacts

Proof Hansard Page: Written

Senator ROBERTS asked:

As there are many people across the Basin who are extremely concerned with the increasing frequency of blackwater events, manipulated overbank flood flows and the carp population explosion, would the MDBA specifically demonstrate how these negative third party impacts have been measured, assessed and quantified.

Answer:

River managers manage negative third party risks and impacts in their planning, implementation and evaluation of watering events. Water managers continue to learn through research and monitoring of general river management practices and environmental watering actions and apply new knowledge every time a watering action is planned and undertaken.

For example, during the planning phase a range of models and information is used to design environmental watering actions that incorporate either risk avoidance or mitigation strategies. Examples include the use of:

- Computer modelling to simulate inundation levels, flow rates and salinity responses to design infrastructure management requirements. This helps avoid unintentional inundation of private property and set requirements for mitigation strategies such as passing of dilution flows (should movement of salts from the floodplain be anticipated).
- Hypoxic blackwater risk assessment tool for the River Murray, Murrumbidgee and the Edward-Wakool systems. This has been used to inform watering actions to avoid conditions that may exacerbate blackwater risks.
- Carp population model for the River Murray. This has been used to assess the risks of different flow management scenarios on carp populations and identify opportunities to limit carp breeding.

Question Number: 144 (continued)

Real-time implementation of watering actions is also supported by a number of risk management approaches, including the use of:

- Flow forecasts to inform decision makers about the potential changes to flows as a result of natural flows or operational releases from storages upstream.
- Real-time water flow and water quality data and local observations to inform decisions.
- Operational advisory groups comprised of Basin state agencies and local stakeholders.
- Water management strategies that limit opportunities for carp to access floodplains and/or return to the main river channels.

Following a watering action, evaluation of the risk management approaches is undertaken to identify which strategies worked well and which can be improved. Monitoring data gathered from an action forms an integral part of the evaluation process. For example, the on-going Murray-Darling Basin Fish Survey will detect long-term changes in Basin-wide carp populations.

Natural flooding during the past 12 months has resulted in hypoxic blackwater events and large-scale carp breeding. These impacts are the result of natural flooding levels that, in some areas, have not been seen for 30 years. Regular cycling of organic matter into rivers will reduce the excessive build up that can generate hypoxic blackwater events. Environmental watering that benefits native fish, and the potential introduction of the carp herpes-virus, can help to restore the balance between native fish and carp.

Under regulated flow conditions, water managers work within existing river operational constraints in order to deliver water with minimal or no impacts to third parties. In delivering water, managers must have regard to the achievement of water quality objectives identified in Chapter 9 of the Basin Plan.

Although watering actions may sometimes cause negative short term impacts, the implementation of the Basin Plan will improve the overall health of the Basin in the longer term.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 145

Division/Agency: Murray–Darling Basin Authority

Topic: Freshwater currently diverted from Coorong

Proof Hansard Page: Written

Senator ROBERTS asked:

1. What volume of freshwater is currently diverted FROM the Coorong via the South East Drainage Scheme in South Australia?
2. Is the MDBA planning to recover ALL that water for the Coorong, and is this occurring under the MDB Plan?

Answer:

No water (freshwater or saline) is taken directly from the Coorong. The Upper South East Drainage (USED) Network discharges drainage water and floodwaters (of varying salinities) to the Coorong via the Salt Creek Outfall.

The area which includes the USED Network is not within the boundary of the Murray-Darling Basin (as set out in s18A and Schedule 1A of the *Water Act 2007*), and therefore is not a defined Basin water resource. However, given that it is hydrologically connected to the Coorong, it is required to be considered under certain provisions of the *Basin Plan 2012*, including by South Australia in the development of the respective water resource plans and associated long term environmental watering plans.

The South East Flows Restoration Project (SEFRP) is jointly funded by the Australian and South Australia Governments under the Sustainable Rural Water Use and Infrastructure Program. The SEFRP will use a combination of natural watercourses, newly constructed floodways and existing drains to divert additional water from the Upper South East to the Coorong South Lagoon to assist in managing salinity in the lagoon.

The SEFRP is not part of the ‘bridging the gap’ recovery efforts. However South Australia has nominated the SEFRP as one of the projects for consideration under the SDL Adjustment Mechanism. If this is approved to be part of the final package, the SEFRP will result in an average annual volume of 26.5GL (made up of floodwaters and drainage flows) that can be discharged from the USED Network to the Coorong, if required to manage salinities. This water will assist in meeting the ecological targets in the Coorong.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 146

Division/Agency: Murray–Darling Basin Authority

Topic: Goulburn Broken Catchment Management Authority

Proof Hansard Page: Written

Senator ROBERTS asked:

In January 2016 the Goulburn Broken Catchment Management Authority revealed to communities in the Goulburn River Reach that the proposed environmental flows of 25,000ML/day with a peak of 30,000ML/day at Shepparton under the Constraints Strategy, would affect or inundate 562 properties and 11,552 Hectares.

The proposed repeated frequency of environmental floods - an extra 1-3 floods every 10 years with 2-3 recurrent peaks with each flood, added to the stated 6 natural floods per 10 years will cause a massive reduction in productivity on the Goulburn river flats and their tributaries.

1. What is the assessed cost to Victoria and Australia 's productivity in dollar terms in that a large percentage of this area is prime agricultural farm land?
2. If this hasn't been undertaken, what is the reasoning behind this lack of feasibility analysis?
3. How has the Constraints Strategy passed the evaluation criteria that states the proposal must be technically feasible, when landowners in the Upper Goulburn Catchment and mid Murrumbidgee have absolutely refused to accept or negotiate easements?
4. And why is the 'relaxed constraints' Strategy still being even considered when there is no hope whatsoever of delivering that water when both State and Federal Governments "will not intentionally flood private land without prior agreement of landholders, nor compulsorily acquire land or easements."?

Answer:

1–2. The approach used for costing flood easements and private infrastructure works is based on the long-term impact on productivity of the proposed overbank flows. On this basis, the cost to Victoria and Australia's productivity was directly included in the feasibility analysis. As reported in the Goulburn Constraints Measure Business Case – Phase 2 Investigations, the net present value of the impact on agricultural productivity was estimated to be \$30.56 million. The costings approach was conservative and aimed to provide an upper estimate to the impact.

Question Number: 146 (continued)

3– 4. The *Constraints Management Strategy 2013–24 (CMS)* is a long-term strategy that looks at smarter ways to operate rivers to provide greater flexibility in the delivery of environmental water and enhance environmental outcomes. Under the CMS, the Basin governments have investigated and continue to investigate the way rivers are managed. They have identified opportunities to retain the benefits of river regulation, but also improve the effectiveness and efficiency of environmental watering.

Basin states are responsible for preparing and submitting any constraints proposals for consideration as part of the package of works and measures to be considered in the Sustainable Diversion Limit adjustment mechanism.

To ensure a consistent assessment of proposals to evaluate supply and constraint measures for Sustainable Diversion Limit adjustment mechanism consideration three phases are being used to maintain progress: feasibility studies (Phase 1), business cases (Phase 2) and confirmation of projects (Phase 3). Each phase requires evaluation against assessment criteria.

In 2014, Basin governments, through their water ministers, agreed to proceed to the feasibility phase (Phase 1) and develop proposals to manage constraints and mitigate impacts (Phase 2).

In April 2016, Basin water ministers agreed to the package of SDL adjustment proposals to be considered in the adjustment, nominating the Goulburn, Lower Darling, Murrumbidgee, Hume–Yarrawonga, Yarrawonga–Wakool Junction and the South Australian Murray as both constraints and supply measures, and the Gwydir as a constraints measure. This decision moved projects from Phase 1 into Phase 2.

On 16 June 2017 the Murray-Darling Basin Ministerial Committee endorsed the package of proposed SDL adjustment projects. The package included all of the nominated constraint measures, except the Goulburn which will further developed but not considered as a supply measure. The Victorian government has committed to developing a new Goulburn constraints project that must be accepted by the community, be feasible, and based on improved data and on-the-ground knowledge. More information on the development of a new project proposal will be made available from the Victorian Government over the coming months.

The consequence of constraint measures being considered under the SDL adjustment is that they contribute to the delivery of environmental outcomes and thereby increase the SDL offset achievable. In addition to the \$200 million already committed to constraint, these projects gain access to the pool of funding available for SDL projects measures. The total level of funding available is determined by the water savings achieved and will significantly increase. Jurisdictions will now work with the Department of Agriculture and Water Resources to agree funding arrangements for the delivery of projects including constraint measures.

A key element of the CMS is that unacceptable impacts arising from changes to delivery of environmental water are mitigated. More detailed engagement with local communities is required to better understand concerns and to design mitigation strategies that meet community needs. As SDL projects are complex, involve long lead times and require extensive community input the Basin Plan has allowed the period to 2024 for design and implementation. Implementation will be adaptive to allow projects to be adjusted during this period.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 147

Division/Agency: Murray–Darling Basin Authority

Topic: Method of estimating costs

Proof Hansard Page: Written

Senator ROBERTS asked:

The policy of estimating mitigation costs for affected farmland is to use a method of disaggregation, or to cost impacts on only that portion of land which is the difference between where a natural flood would reach and the extra environmental flow would inundate.

1. As flooding affects the management and productivity of the entire farm, why has the MDBA approved this method of estimating costs?

Answer:

The costing methodology considers the impact on the affected area, taking into account how that portion of the farm contributes to the overall farm output. This method was previously used to address easements on the River Murray between Hume and Yarrawonga and was accepted by the community as a reasonable method for assessing the impact on the whole farm enterprise.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 148

Division/Agency: Murray–Darling Basin Authority

Topic: Historical flood data

Proof Hansard Page: Written

Senator ROBERTS asked:

The proposed number of environmental flood flows per decade in the Goulburn Catchment are based on historical flood data over the last 55 years, despite the fact that since the beginning of the Millennium drought there has been a real step change in climate and such frequent flood events no longer occur.

1. Why has the MDBA not revised the data used to the last 20 years as suggested by MDBA board member Mr. George Warne?

Answer:

To inform the Basin Plan, the Murray–Darling Basin Authority (MDBA) has used river flows over a 114-year period, extending from 1895 to 2009. This long time-frame covers a wide range of climatic conditions, ranging from the very wet (i.e. in the 1950s and 1970s) to the very dry (the Federation and Millennium droughts). This provided a good basis to test multiple aspects of the river system under different climatic conditions. These aspects include entitlement allocations, public storage levels, and environmental flows.

The specification of ‘environmental flows per decade’ is an easy-to-communicate terminology for long-term water requirements, and needs to adjust based on the prevailing climatic conditions in each decade. For example, a specification of ‘4 events per decade’ may include 2 events in one decade followed by 6 events in the subsequent decade. The Australian ecosystem has adapted to a highly variable climate, consisting of extended periods of both dry and wet conditions, and environmental water is used in a pattern that reflects these natural year-to-year variations.

It is not yet clear if there has been a step change in climatic conditions. The period since 2000 has experienced a prolonged, heavy drought (peaking in 2006 to 2009); a number of dry-to-median and median inflow years; and an extremely wet year in the Southern Basin (2016), a sequence that is slightly drier than (but not inconsistent with) the observed climate conditions prior to 2000.

Hence the post-2000 years may form part of an emerging signal of climate change, but this will not become statistically significant until conditions have been observed over a longer time frame.

Question Number: 148 (continued)

It is uncertain how flows will change under future climate change. Overall, it is expected that the climate (and hence river flows) will experience greater extremes, such that dry periods would become drier and more prolonged, and wet periods will become wetter. But there is a significant degree of uncertainty in these conclusions, as reflected in the wide range of 'future climate inflow' sequences provided by the CSIRO to MDBA in 2009–10. Regardless, using the past 20 years to anticipate future flows under climate change is not a scientifically robust approach.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 149

Division/Agency: Murray–Darling Basin Authority

Topic: Socio-economic impacts

Proof Hansard Page: Written

Senator ROBERTS asked:

Victorian Water Minister Lisa Neville has stated that the Goulburn Murray Irrigation District and Southern Basin is at ‘a tipping point’ thus putting the economic stability of the state at risk.

1. Do you understand how significant the socio-economic impacts of the MDB Plan have already been?
2. Do you know under the current trajectory of the continual reduction in High Reliability Water Shares from the Goulburn Murray Irrigation District that the system is forecast to have less than 700GL left in its delivery system-down from 1600GL?
3. In light of this has the MDBA considered a revision of further water removal from the system?
4. Do you agree that delivering greater and greater volumes through thousands of kilometres of the Basin river channel systems also has many negative impacts, such as transporting larger volumes of sediment, nutrients and phosphates to deposit in wetlands, creating increased water turbidity, increase carp explosion and hypoxic blackwater events, spread of noxious weeds such as Lippia over thousands of hectares?
5. Can the MDBA specifically demonstrate how these negative third party impacts have been measured, assessed and quantified?

Answer:

1–3. When the Basin Plan was prepared, a full analysis of the likely social and economic impacts was undertaken. This was summarised in the Regulation Impact Statement that was considered in the process by which all governments agreed to the Basin Plan in 2012.

This analysis indicated that the fundamental rebalancing of water use between consumption and the environment would have an economic and social impact and these impacts would vary across the communities within the Basin.

The Murray–Darling Basin Authority (MDBA) is well aware of the economic and social impacts experienced as a result of this major reform, particularly in irrigation dependent communities such as the GMID.

Question Number: 149 (continued)

The MDBA is also aware of the significant investments governments have made to reduce these adverse impacts such as through investment in improved irrigation infrastructure.

In 2017 the MDBA is conducting an evaluation of the implementation of the Basin Plan to identify ways that future implementation can be improved. Part of the evaluation will look at the social and economic outcomes for Basin communities and the effect that the Basin Plan has had on those outcomes. It is an opportunity to assess whether the observed outcomes are consistent with those expected in 2012 and to provide a more detailed assessment of economic and social impacts.

The evaluation will include detailed region-level assessments of water recovery by entitlement type, whether the water was recovered through buybacks or investments in more efficient on or off farm irrigation infrastructure, and the associated impacts on regional irrigated agricultural production.

The evaluation will also attempt to separately identify any changes in regional irrigated agricultural production in the Goulburn Murray Irrigation District due to the Basin Plan from other factors, such as competition for water from other industries.

In addition to the evaluation, there is an immediate opportunity to reduce the amount of environmental water recovery needed to deliver the Basin Plan outcomes. The SDL Adjustment Mechanism is the part of the Basin Plan that allows for a change to the water recovery target if projects can be identified that enable equivalent environmental outcomes to be delivered with less water. Basin governments are currently working to finalise a package of these types of projects before the 30 June 2017 deadline. The MDBA will then determine the extent to which these projects can reduce water recovery targets. Any proposed changes to the water recovery target in the southern MDB is expected to be available for public consultation in October 2017.

Finally, the Minister for Agriculture and Water Resources has announced an independent expert analysis to be completed in December 2017 on how best to design, target and resource efficiency measure programs to recover 450 GL by 30 June 2024 in ways that result in neutral or improved socio-economic outcomes.

4–5. The delivery of water for both consumptive purposes and to improve the overall health of the Basin is undertaken in consideration of holistic catchment management actions and within existing river operational constraints.

Water managers use a range of management approaches to avoid negative third party impacts from management of consumptive and environmental water on a variety of spatial scales (individual sites, river-reaches to river-system levels). When planning watering actions, risks are acknowledged and managed, but the benefits to native species and natural processes are the priority for environmental watering. However, if the risks outweigh the benefits, the action will not be undertaken.

The Murray–Darling Basin Authority (MDBA), in partnership with Basin state government agencies, measures turbidity and nutrients in some locations in the river system mainly for monitoring water quality however, it does not assess or quantify third party impacts of movement of sediments (turbidity), nutrients (phosphates) and noxious weeds such as Lippia (*Phyla canescens*) from and within landscapes.

Question Number: 149 (continued)

Catchment management issues such as the movement of sediments, nutrients and weeds from the landscape to watercourses are the responsibility of Basin states. Under Chapter 9 of the Basin Plan, Water Resource Plans (WRPs) must identify measures to be undertaken by the states that contribute to the achievement of identified water quality objectives. The measures identified in the WRPs must have regard to causes or likely causes of water quality degradation such as turbidity due to sediment movement, nutrients such as phosphorus, salinity and dissolved oxygen (a measure of hypoxic blackwater events).

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 150

Division/Agency: Murray–Darling Basin Authority

Topic: Professor Peter Gell

Proof Hansard Page: Written

Senator ROBERTS asked:

Professor Peter Gell of the Water Research Network, Federation University Australia , totally debunks the MDBA theory that simply delivering greater volumes of water will restore Basin health, and emphasises the importance of improved water quality and a “multi-faceted approach” if there is to be an ecological benefit.

Farmers within the Murray Darling Basin have constantly been told that the best scientific information available has been guiding the strategies put in place to restore the health of the Murray Darling Basin.

1. Why has the MDBA failed to utilise such robust scientific evidence as that of Professor Gell?
2. Why has the MDBA focussed so much, purely on attaining and delivering large volumes of water down the river when a holistic view/goal with environmental, socio - economic and long term job development impacts would seem the most appropriate?
3. Why are complimentary measures not considered an alternative to further water recovery?

Answer:

The Murray–Darling Basin Authority (MDBA) routinely seeks all available information for its technical work and often commissions new work to improve understanding of the hydrology, environment and economics of the Basin’s water resources. The approach to determining the sustainable diversion limits in the Basin Plan was based on peer reviewed science and used the best contemporary hydrologic modelling available. It considered the ecological needs of the Basin’s water-dependent ecosystems and incorporated an assessment of social and economic costs and benefits of varying water regimes to optimise triple bottom line outcomes.

All of this information indicated that water recovery and additional flows were required to achieve a sustainable river system.

Question Number: 150 (continued)

At each stage of the Basin Plan's development the MDBA's approach was reviewed by both national and international scientists, including CSIRO who reviewed the method for determining the sustainable extraction limits of the Basin Plan and concluded that:

- there was sufficient knowledge to make an informed decision on an ecologically sustainable level of extraction
- the scientific methods for determining extraction levels were fit-for-purpose
- the body of work undertaken was substantial and sufficient to progress management at the extraction limits set in the Basin Plan.

The Basin Plan is an adaptable plan with a number of reviews built into its program to ensure that any new information or insights from the review processes can be incorporated to improve future implementation.

The MDBA acknowledges that attaining and delivering large volumes of water is not the only mechanism required to achieve environmental outcomes. Non-water mechanisms – sometimes called 'complementary measures' – will also be important contributing factors towards achieving the aims of the Basin Plan. This is why recommendations from The Northern Basin Review included a range of 'toolkit' measures designed to maximise environmental benefits and minimise economic impacts of water recovery.

The SDL adjustment mechanism, a key part of the Basin plan, also specifically allows for the sustainable diversion limit to be adjusted based on projects that can achieve equivalent environmental outcomes but using less water. In that sense, these are an alternative to further water recovery. These projects may include structures on the edge of rivers that direct water into specific wetland sites, managing dams differently, reducing evaporation and loss, or improving river management practices. Nevertheless, because many of the birds, much of the vegetation, and all of the fish in the Basin rely on the rivers and the water that flows through them for food, shelter and reproduction, water recovery and additional flows remain necessary to maintain a healthy working basin.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 151

Division/Agency: Murray–Darling Basin Authority

Topic: Ministerial Council meeting – September 2016

Proof Hansard Page: Written

Senator ROBERTS asked:

At the MinCo meeting September 2016 the Authority noted that complementary measures are “good actions to take but not substitutes for flow related outcomes. They also recognised it was not feasible to develop a volumetric SDL offset assessment method in a short timeframe, if at all.”

1. Isn't it true that this is a very narrow approach and is fundamentally detrimental to the people of the MDB?

Answer:

Complementary measures enhance environmental outcomes achieved with water recovered for the environment. For example, cold water discharged from deep water storages can harm native fish growth and reproduction. Additional water (of the same temperature) will not overcome such a limitation, where as a thermal curtain that discharges warmer water from the surface of the storage can.

In order to achieve the outcomes of the Basin Plan both flow and non-flow (or complementary) measures are needed. Complete substitution of one for another is unlikely to achieve the desired outcomes. At the most recent Murray-Darling Basin Ministerial Council meeting held in March 2017, Ministers agreed that complementary environmental projects can provide real environmental benefits and asked officials to prepare advice on how to embed complementary measures as a key element of achieving Basin Plan outcomes.

The method by which volumetric offsets are calculated for supply measures that is being used in the Sustainable Diversion Limit Adjustment Mechanism in the southern Basin was developed following several years of research by the CSIRO and other experts. A lengthy process was then needed to get agreement to the method by all jurisdictions. The Authority was noting the difficulties in developing a similar methodology for complementary measures within the timeframe left to finalise the SDL Adjustment (ie by Dec 2017).

The Authority has acknowledged the long-term strategic value of complementary measures and recognises that whilst flow restoration is a key goal of the Basin Plan and foundational to the environmental outcomes sought, other actions will also be required. The Basin Plan includes an expectation of ongoing government effort by governments to implement complementary measures in a ‘business as usual’ sense.

Rural and Regional Affairs and Transport Legislation Committee

ANSWERS TO QUESTIONS ON NOTICE

Budget Estimates May 2017

Department of Agriculture and Water Resources

Question Number: 152

Division/Agency: Murray–Darling Basin Authority

Topic: Sustainable Diversion Adjustment Mechanism (650GL)

Proof Hansard Page: Written

Senator ROBERTS asked:

1. The SDL Mechanism allows for 650GL of projects can help ‘fill the gap’ between water entitlements bought/or acquired through efficiency programs & the 2750GL. State submitted projects are restricted by the ‘limits of change’, including that State projects cannot compromise the objectives of the Coorong, Lower Lakes and Murray Mouth (CLLMM) (refer specific flow targets to the CLLMM) Is this correct?
2. Now that changes to the historic flow patterns to the Coorong, Murray Mouth from within South Australia is better understood, is the MDBA prepared to accept that more flexibility is required how it has set criteria including the ‘limits of change’ for State projects submitted?
3. Given new knowledge, would the MDBA be prepared to encourage South Australia to submit a more comprehensive range of ‘end of system’ project options to help meet environmental outcomes locally in the Coorong, Lower Lakes & Murray Mouth.
4. If the full suite of 650GL worth of projects cannot be achieved by 30th June 2017, would the MDBA consider an ‘adaptive component’ for new projects that could be developed to 30th December 2017 or beyond?
5. What is the basis for the MDBA’s objection to the inclusion of complementary measures within the 650 GL of potential offset projects?

Answer:

1. Yes – the mechanism to determine the adjustment associated with the package of projects is constrained by the Limits of Change. The Limits of Change apply to both overbank flows for representative floodplain sites and for the Coorong Lower Lakes and Murray Mouth.
2. Basin governments negotiated and agreed the Limits of Change as set out in the Basin Plan (Schedule 6) as part of the overall SDL Adjustment Mechanism. To change a key aspect of the assessment approach requires consensus from all of the jurisdictions and the Murray–Darling Basin Authority (MDBA).

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The MDBA has committed to work with jurisdictions to provide an assessment of risks associated with the full package of notified SDL adjustment measures as part of the adjustment determination in 2017. All jurisdictions recognise that a level of sensitivity analysis on the limits of change and associated ecological risk analysis will be required when considering the offset outcome.

3. Yes – the MDBA continues to work with all governments to develop projects to deliver improved ecological outcomes for the River Murray system.

To date that has included projects relevant to the Coorong Lower Lakes and Murray Mouth. Such cooperation has resulted in projects that are already in place such as the barrage fishways, Coorong salinity monitoring network, lower lakes lake cycling project, optimisation of barrage operation and South east drains.

4. A decision to allow jurisdictions to bring forward new projects beyond June 2017 would require a legislative amendment to the Basin Plan. This requires agreement from both the Murray Darling Basin Ministerial Council and the MDBA, and consultation with all jurisdictions and the community.

In lieu of further opportunities to develop and bring forward new projects beyond 30 December 2017, the MDBA is working with Basin governments to develop an adaptive approach to reconciliation. The approach aims to accommodate changes in the design and delivery of notified projects over time.

5. The MDBA recognises that complementary measures enhance environmental outcomes achieved with water recovered for the environment. For example, cold water discharged from deep water storages can harm native fish growth and reproduction. Use of a thermal curtain that discharges warmer water from the surface of the storage would overcome this problem.

In order to achieve the outcomes of the Basin Plan both flow and non-flow (or complementary) measures are needed. Complete substitution of one for another is unlikely to achieve the desired outcomes. At the Murray-Darling Basin Ministerial Council meeting held in March 2017, Ministers agreed that complementary environmental projects can provide real environmental benefits and asked officials to prepare advice on how to embed complementary measures as a key element of achieving Basin Plan outcomes.

With regards to the method used in the Sustainable Diversion Limit Adjustment Mechanism in the southern Basin to calculate volumetric offsets for supply measures, it was developed following several years of research by the CSIRO and other experts and agreed by all jurisdictions. The MDBA's objection related to the difficulties in developing a similar methodology for complementary measures within a shorter timeframe.

The MDBA has acknowledged the long-term strategic value of complementary measures and recognises that whilst flow restoration is a key goal of the Basin Plan and foundational to the environmental outcomes sought, other actions will also be required. The Basin Plan includes an expectation of ongoing effort by governments to implement complementary measures.