

## APPENDIX 2

### Online survey questions

1. What state or territory are you located in for your work?
  - ACT
  - NSW
  - NT
  - QLD
  - SA
  - VIC
  - WA
  
2. What type of organisation do you work for?
  - Local government
  - State government authority
  - Regional arm of state government
  - State government
  - Commonwealth government
  - Not for profit
  - Other
  
3. What level is your current role in environmental water management:
  - Executive level
  - Director
  - Manager level
  - Officer/coordinator level
  - Other – please specify
  
4. How long have you worked in environmental water management?
  - 0 – 4 years
  - 5 - 9 years
  - 10 - 15 years
  - 16 – 20 years
  - Longer than 20 years
  
5. In what capacity are you mostly (i.e. more than 50% of your time) involved in environmental water management decisions? (tick one)
  - Strategic / policy
  - Operational
  - Both strategic and operational
  - Other – please provide details

6. As part of your current role, do you incorporate climate change considerations in your decision making or planning?

- 1= never
- 2= rarely
- 3= sometimes
- 4= often
- 5= always

7. Do you think incorporating climate change considerations is important in your current role?

- a. Yes – why? \_\_\_\_\_
- b. No – why not? \_\_\_\_\_

8. Please indicate the level of your concern around the following issues specifically related to climate change and environmental water management:

	Low	Medium	High	Unsure
Less run off				
Reduced water quality				
Shifting seasonality of rainfall				
Increased heatwave days				
More intense and frequent droughts				
Altered air and water temperatures impacting cues for migration and breeding				
Species extinction				
Disruption of food webs				
Reduced frequency and extent of floodplain inundation				
Increased groundwater use				
Increased overall competition for water (including consumptive)				
Ability of environment to sustain current values				
Transition of the environment to a new ecosystem type				

9. How important is climate change is to your organisation?

- 1= not important
- 2 = moderately important
- 3= important
- 4 = very important

10. How important does your organisation consider climate change for environmental water management?

- 1= not important
- 2 = moderately important
- 3= important
- 4 = very important

If climate change is less considered less important for environmental water management than other areas, please explain?

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11. Is your organisation responsible for establishing long term environmental flow objectives?

- Yes
- No (go to question 17)

12. What is the timeframe for environmental flow objectives set by your organisation?

- No timeframe
- 0-10 years
- 11-20 years
- Longer than 20 years
- Other (please specify)

13. Do you think current timeframes allow you to consider long term outlooks of climate and ecology?

- Yes
- No

If no, please explain:

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14. Can you tick which factors are considered when setting long term ecological objectives?

Flora and fauna presence, abundance and/or value	
High value habitats	
Threatened species and communities	
Geomorphology	
Ecological processes	
Current and/or historic hydrology	
Groundwater gains or losses	
Knowledge/ input of Traditional Owners and custodians of the land	
System delivery constraints	
Future streamflow/runoff scenarios	
Future ecological change under climate change scenarios	
Others - please specify:	

15. If you used future climate change related streamflow/runoff scenarios or ecological change predictions, what was the source of your information?

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Did the inclusion of future climate/ runoff scenarios and ecological change predictions alter the objectives adopted in your plan? Yes/no

16. If you did not use future streamflow/runoff scenarios or ecological change predictions, why not? \_\_\_\_\_

17. Do you think your local community would be supportive of changing the ecological objectives to incorporate climate change considerations?

18. Rate your agreement with the following statement; “there is ample information on the ecological response to climate change to inform environmental water planning”

- Strongly disagree
- Disagree
- Agree
- Strongly agree
- Undecided

19. Has your organisation drawn on knowledge of Traditional Owners and Custodians of the land when considering climate change impacts in environmental water management?

- Yes. If yes, how? \_\_\_\_\_
- No

20. If climate change considerations are *not* being incorporated into environmental water management by your organisation, why do you think this is the case?

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21. The following are general *barriers to incorporating climate change* in natural resource management. Can you indicate which of these are relevant barriers in the management of environmental water and climate change for your organisation?

	<b>Relevant (Yes/No)</b>
Lack of confidence in climate change forecasts	
Uncertainty about which climate change scenario to choose for planning	
Lack of confidence in future rainfall/run off predictions	
Uncertainty around how ecosystems will respond to climate change	
Not knowing how or where to start	
Insufficient funding and staff resource	
Current water governance arrangements	
Lack of clarity around which organisation is responsible	
Conflicting objectives of organisations managing environmental water	
Lack of will in your organisation	
Current legislation doesn't consider climate change	
Lack of political leadership – any level of government	
Lack of public support for commencing to adapt to climate change	
Legacy land use and water sharing issues	

22. Rate your agreement with the following statement; “Current operational delivery restrictions limit the ability to incorporate climate change adaptations actions in environmental water management?”

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

23. What operational restrictions would you change to enable greater incorporation and action on climate adaptation?

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24. *A species vulnerability assessment looks at the pressures that climate change will have on a particular species or taxonomic group by assessing their sensitivity, exposure and capacity to adapt to the predicted change, such as potential range and habitat changes and extinction probabilities.*

Has your organisation previously undertaken species vulnerability assessments in planning?

Do you think incorporating species vulnerability assessments into planning would change your objectives?

- Yes
- No
- Not sure

25. What do you think is needed to enable inclusion of climate change considerations and adaptations more readily into environmental water planning? (choose your top 5)

Fit for purpose and consistent region-wide hydrological models	
Species/community vulnerability assessments	
Quantified ecosystem response models to predicted scenarios of hydrology/temperature change	
A flow assessment method that incorporates future climate and hydrological scenarios	
More frequent updates of flows studies and long term planning documents	
Change in setting site based objectives to landscape scale objectives	
A shift in environmental water management from largely annual planning to longer term	
Removal of delivery constraints where appropriate	
Increased monitoring of environmental water delivery	
Greater investment in research of climate change and environmental water	
Improved knowledge exchange between applied research and industry	
Tools and information/framework to guide decision making under uncertain circumstance (e.g. adaptation pathways)	
Working with economists to put a value ecosystem values	
Improved integration with complementary river health works	
Other (please specify)	

26. Who should be taking the lead on providing guidance for inclusion of climate change scenarios and adaptation in environmental water?

○ (tick the most appropriate)

- Commonwealth environmental water holder
- Murray-Darling Basin Authority
- State environmental water holder/agency
- Other state environmental department
- Regional authorities
- Collaboration at all levels of environmental water management
- Each organisation should do their own planning
- Other; please specify

27. What type of actions would you consider for your catchment to address climate change issues:

(tick all that apply)

Commence discussions with community on changing environment and then need to change objectives	
Purchase/reallocate more water for the environment	
Invest in infrastructure for watering	
Review water trading and storage rules	
Prioritise sites and decide to 'let some go'	
Deliver water to maintain ecosystem functions rather than specific species, even if this means watering for non locally indigenous species	
Build habitats, including refuges and habitat corridors	
Remove barriers to movement of species	
Improve riparian and wetland vegetation cover, including species from different climatic zones	
Actively promote ecosystem transformation e.g. translocating species, encouraging wetlands to modify to a different type	
Stock river systems with farm bred fish instead of delivering flows to promote spawning	
Revise ecological objectives to include future climate and flow scenarios	
Look at a landscape scale approach to achieving objectives outside your current management area	
Other (please specify)	

28. Given the impacts of climate change do you think it will be possible for your organisation to maintain the full suite of existing environmental objectives in the future within the bounds of current policy?

- Yes
- Not sure
- No

If no, why not? Are there particular policy settings or water sharing arrangements you would petition to change?

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29. Which approach(es) does your organisation currently have for future objective setting with respect to climate change? (*tick as many as apply*)

- Regularly revise objectives
- Incorporate climate change and run off scenarios into planning
- Incorporate vulnerability assessments into planning
- Stress test existing objectives under climate change scenario modelling to see when they are no longer achievable
- Invest in a knowledge broker to connect research and applied management
- Investigate and fund a multiple option style approach for planning and decision making (e.g. plan for a range of future scenarios rather than just one future)
- Work with government to change policy (e.g. ensuring return flows occur on all applicable deliveries, find alternate water source for consumptive use)
- Start conversations with local communities about future feasibility of the current ecosystem
- Other (please provide detail) \_\_\_\_\_
- No approach at present

Thank you for participating and sharing your perspectives. Your response to this survey will help advance understanding of climate change inclusions in environmental water management.