ENVIRONMENTAL WATER MANAGEMENT PROGRAM

2014-2019 EVALUATION

DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

ENVIRONMENT, ENERGY AND SCIENCE

BIODIVERSITY AND CONSERVATION

FINAL EVALUATION REPORT

24 FEBRUARY 2021

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WATER FOR THE ENVIRONMENT IN NSW

Stakeholders felt that the delivery of water for the environment in NSW is making a positive difference to the health of rivers and wetlands—without the benefits provided by the program they would be significantly poorer.

THIS EVALUATION

125 stakeholder surveys received

43 interviews completed

145 program documents reviewed

Governance

Staff from DPIE-EES, WaterNSW and EWAG members around the state deliver the program in consultation with local communities

EWAGs

68% stakeholders satisfied

Staff are seen to have in-depth knowledge and experience but 'telling the story' of water for the environment needs improvement

82 out of 100 median for 'feeling heard' by the program

Water orders and delivery

River operations and constraints were the most commonly identified risks to the program's success

Delivery monitoring

Improving the speed of reporting on water used is important

Outcome monitoring

#1 Improving resourcing and funding for MER was the most commonly identified change to improve the program

PREVIOUS EVALUATION'S RECOMMENDATIONS

The previous evaluation's recommendations have mostly been implemented, with the remaining requiring ongoing work and the involvement of partner agencies to deliver.

ACKNOWLEDGEMENTS

This work was completed with the assistance of Dr Rachael Thomas, the Senior Team Leadership Group and the Evaluation Steering Committee in the Biodiversity and Conservation Division of the Department of Planning, Industry and Environment – Environment, Energy & Science (DPIE EES).

We would also like to thank the many key informants across the Gwydir, Macquarie, Lachlan, Murrumbidgee and Murray-Lower Darling valleys. We thank them for their time and insights and trust that their views are adequately represented in this report.

Photography, front cover: Macquarie River on 24 August 2020, Dubbo (Jasper Odgers, ARTD)

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KEY TERMS AND ACRONYMS

Official name	Aboriginal name
Barwon River	Baawan River (Ngiyambaa)
Darling River	Baaka River (Barkandji)
Gwydir River	Guida River (Kamilaroi)
Lachlan River	Galiyarr or Kalari River (Wiradjuri)
Macquarie River	Wambool River (Wiradjuri)
Murray River	Millewa River (Ngarrindjeri) or Tongala river (Yorta Yorta)
Murrumbidgee River	Murrumbidjeri River (Wiradjuri)
Acronym or contraction	**Definition**
AEWP	Annual Environmental Watering Priorities
Basin	Murray-Darling Basin
CEWH/CEWO	Commonwealth Environmental Water Holder or Office
DPIE	Department of Planning, Industry and Environment
DPIE EES	Department of Planning, Industry and Environment – Environment, Energy and Science
DPIE-Water	Department of Planning, Industry and Environment – Water
EWAG	Environmental Water Advisory Group
LTWP	Long Term Water Plan
MDBA	Murray-Darling Basin Authority
MER	Monitoring, Evaluation and Reporting
NRAR	Natural Resources Access Regulator
NW	North West regional implementation team
SW	South West regional implementation team
WSP	Water Sharing Plan
HEW	Held environmental water
PEW	Planned environmental water

EXECUTIVE SUMMARY

The ARTD consortium was commissioned by DPIE EES to evaluate the NSW Government's Environmental Water Management Program 2014-2019 (EWMP).

BACKGROUND

The purpose of the evaluation was to assess whether the EWMP had made a difference to the health of rivers and wetlands in NSW. The focus was on the implementation of the recommendations from the 2006-13 evaluation, using a systems lens to identify strengths and weaknesses to inform future delivery of the program.

The evaluation included a document review, field visit to the Macquarie River region, a survey of stakeholders (n=125 respondents) and interviews with staff and stakeholders (n=43 interviews).

The findings and recommendations are based on what can be reasonably deduced by expert analysis of key stakeholder perceptions. No direct measures of ecological function attributed to program decisions were undertaken by the evaluation. Nothing in this report should be interpreted as providing any general or specific legal opinion.

KEY FINDINGS

The EWMP is making a positive difference to the health of rivers and wetlands in NSW. It comprises processes and systems that have developed since the program's inception over a decade ago. There is, however, a need to strengthen and improve these systems.

Overall, there has been progress against the 2006-2013 evaluation's recommendations, with six recommendations implemented, five mostly implemented, and only one not implemented. Of the six recommendations that have been mostly implemented, many are related to ongoing improvement in partnership with other agencies and cannot be achieved immediately.

Across NSW, each Environmental Water Advisory Group (EWAG) is working with DPIE EES staff to provide input on planned watering events and communicate the outcomes of these events to their community. EWAGs are held in high regard by all program stakeholders and the broader community. There are strong relationships between water managers and river operators which would benefit from official support and shared organisational objectives to ensure the ongoing success of this partnership. Stakeholders highlighted that extended water accounting timeframes are problematic for program delivery in some valleys.

The program appears to be at an important point in its evolution. It has progressed from the relatively simple purchasing and delivery of water entitlements to a complex program that demands robust monitoring, evaluation and reporting (MER) to adapt and optimise the use of its water portfolio. During the evaluation period the EWMP had hundreds of millions of dollars' worth of water assets under management and requires improved systems for

tracking performance, asset management, risk mitigation, and ensuring the integrity and accountability that are appropriate to this scale of endeavour.

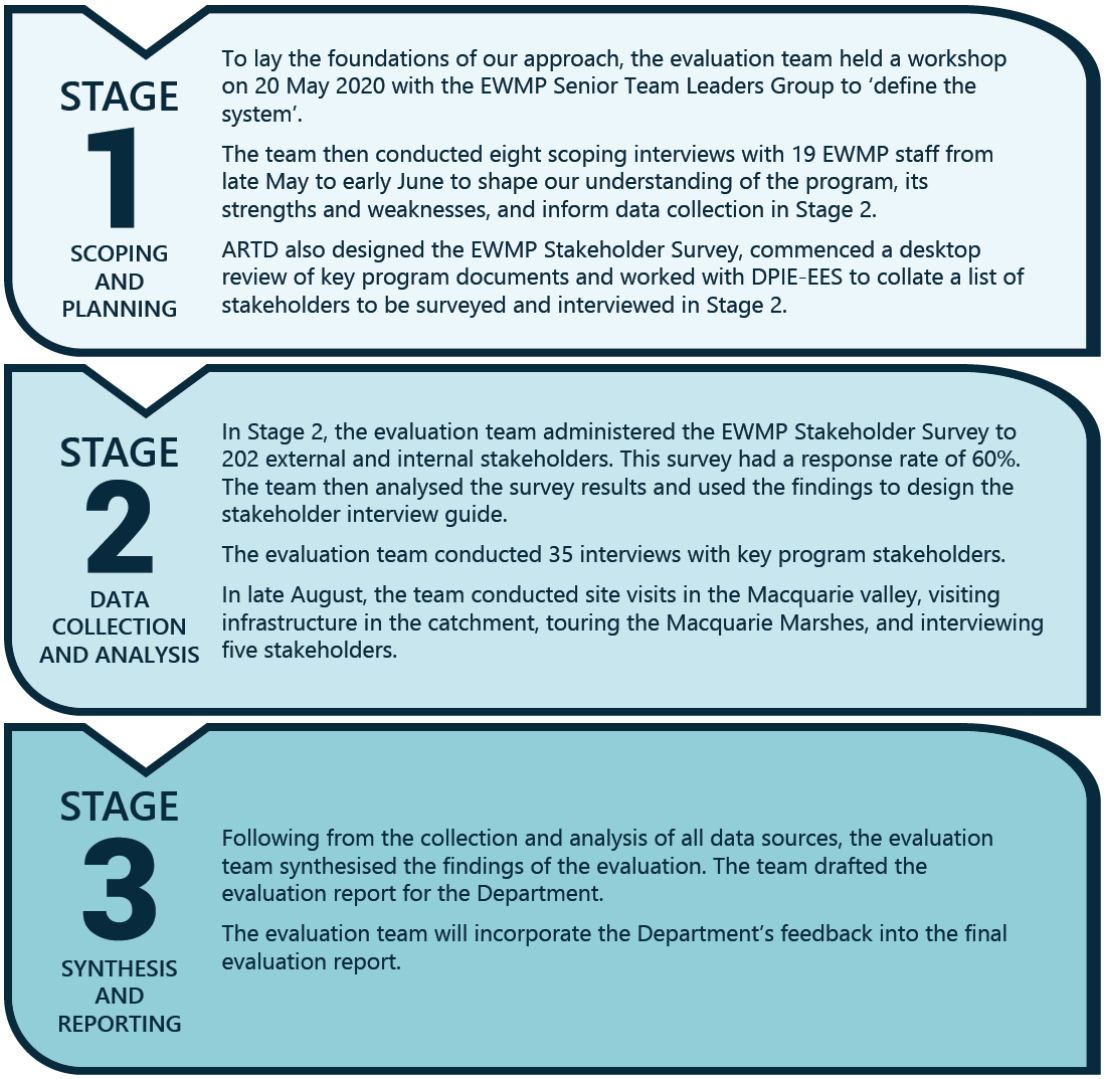
Furthering EWAGs' ability to communicate program activities and outcomes will benefit the program by maximising collaboration with communities to deliver water for the environment.

METHODS

The following methods were used in the evaluation. Their sequencing is outlined in Figure 1 below.

- **Document review**—the evaluation team reviewed 145 policy, planning, contextual and reporting documents related to the program.
- **Scoping interviews**—the evaluation team conducted a series of eight interviews with 19 staff from the EWMP program team.
- **Online stakeholder survey**—based on a list of 202 contacts compiled by the Evaluation Steering Committee, internal (DPIE EES) and external (EWAG members and observers) program stakeholders were surveyed about their perceptions of the program. The contact list included individuals from over 60 organisations across government, community and private interest groups. The survey achieved a 60% response rate.
- **Stakeholder interviews—**the evaluation team interviewed 35 stakeholders to collect detailed information on the program, its subsystems, constraints on these subsystems' efficiency or effectiveness, and how these constraints could be alleviated through program changes. Key knowledge champions were approached for interview by the evaluation team and EWAG Executive Officers in order to represent the range of stakeholder groups and river valleys involved in the EWMP.
- **Field visit**—the evaluation team travelled to the Macquarie River region to speak with program staff and local private stakeholders about the program.

FIGURE 1. STAGES INVOLVED IN APPLYING SYSTEM EVALUATION THEORY TO THE EWMP



System Evaluation Theory

System Evaluation Theory, or SET, is based on system theory and provides a framework for conducting systems evaluation. It is useful in situations where it is very difficult to attribute the changes in a complex system to any one intervention. This is, in part, because change is always due to the combined effects of multiple interacting factors. It is difficult to consider the value of an intervention without considering how it interacts with other factors in a specific context—something that may not be possible in a randomised experiment. The focus for a system evaluation is understanding the important actors and dynamics within a system.

Table 1 below details the number of stakeholders who participated in the stakeholder survey and interviews by valley. It also indicates the amount of HEW entitlements by valley. Table 2 below shows the numbers of contacts, survey responses and interviews by interest group or stakeholder type.

TABLE 1. EWMP VALLEY STAKEHOLDERS

Valley	HEW entitlements *(ML)*	Stakeholders provided by EES	Responses to survey	Interviews conducted
Gwydir	21,481.5	17 (8%)	8 (6%)	2 (6%)
Macquarie	52,786.5	21 (10%)	16 (13%)	4 (11%)
Lachlan	39,390	19 (9%)	13 (10%)	8 (23%)
Murrumbidgee	[1]198,006 [2]97,976	42 (21%)	25 (20%)	6 (17%)
Murray-Lower Darling	[1]32,184 [2]486,429.5	34 (17%)	26 (21%)	5 (14%)
Not specified or relevant to all valleys^	n/a	69 (34%)	37 (30%)	10 (29%)
Total	**[1]343,848 [2]584,405.5**	**202 (100%)**	**125 (100%)**	**35 (100%)**

Source: https://www.environment.nsw.gov.au/topics/water/water-for-the-environment/about-water-for-the-environment/current-water-holdings Note: Barwon-Darling HEW omitted from this table as the Barwon-Darling Valley is not in scope of this evaluation. ^This grouping includes external agency staff (e.g. CEWO, DPIE Water) and non-regional program staff (e.g. MER, EWG). [1]DPIE HEW only. [2]The Living Murray HEW entitlements.

TABLE 2. STAKEHOLDER GROUPS IN CONTACTS AND DATA COLLECTION

Interest group	Contacts provided	Survey responses	Interviews
NSW Government	114	70	19
Commonwealth government	25	14	3
Local government	2	1	0
Community group	24	19	5
Private (incl. consultants and researchers)	37	21	8
Total	**202**	**125**	**35**

RECOMMENDATIONS

The evaluation's recommendations cover three broad themes.

- Disseminating information and enhancing local community engagement
- Strengthening program capacity and systematising EWAG processes
- Developing and implementing robust systems of gathering evidence.

These are tabulated in short below and discussed in detail in Chapter 5.

Theme	Recommendation	Arising from section
Disseminating information and enhancing local community engagement	1. Focus on describing intended and actual environmental outcomes in external communications, in addition to water volumes.	3.1
	2. Strengthen and formalise responsibility for local, event-based communications and local stakeholder engagement to EWAGs.	3.1
	3. Meet stakeholder demand for more information by utilising more modes of communication where possible.	3.1
	4. Support staff to develop their capacity to continue the effective delivery of the EWMP	3.1
Strengthening program capacity and systematising EWAG processes	5. Enhance capacity, transparency and mechanisms for continuous improvement within EWAGS.	3.2
	6. Include Aboriginal knowledge by introducing initiatives to increase Aboriginal representation in the program.	3.2
	7. Strengthen governance mechanisms and review operational effectiveness of the DPIE EES/WaterNSW partnership.	3.3
	8. Work with WaterNSW to streamline water delivery reporting and accounting timelines.	3.4
Developing and implementing robust systems of gathering evidence	9. Revise the EWMP MER strategy to align with the LTWPs and Basin Plan.	3.5
	10. Consider appropriate levels of funding for program activities, including MER, to enable effective adaptive management.	3.5
	11. Focus MER reporting on outcomes in relation to the LTWP objectives and targets.	3.5
	12. Strengthen the adaptive management feedback loop.	3.5
	13. Continue to work complementarily with CEWO in delivering water for the environment and learning how to best use water for the environment.	3.5

1. INTRODUCTION

1.1 STRUCTURE OF THIS REPORT

This report is an independent evaluation of the Environmental Water Management Program (EWMP) run by NSW Department of Planning, Industry and Environment—Environment, Energy and Science (DPIE EES). It was conducted in 2020 by ARTD Consultants in collaboration with Cobalt59, Alexandra and Associates, and Slattery & Johnson.

This introduction (Chapter 1) provides background information on the EWMP and offers a broad outline of the evaluation project, including the systems evaluation approach and methods used. Chapter 2 documents the evaluation's key findings and Chapter 3 presents a detailed analysis of the EWMP's subsystems based on Renger's[1] System Evaluation Theory (SET). Chapter 4 discusses key considerations for the program's future, such as external risks to the program and differences between river valleys. The report concludes with a presentation of recommendations for program improvement (Chapter 5).

1.2 BACKGROUND

THE POLICY CONTEXT

Over the last 100 years, the river systems in NSW have been fundamentally changed through extensive regulation, such as dams, weirs, locks and channels.[2] These changes have disrupted the natural patterns and volumes of flows in rivers, negatively affecting the environment, in particular the hydrology and ecology of floodplain wetlands and in-stream ecosystems. Environmental water is delivered with an aim to maintain or improve the health of the environment. In NSW DPIE EES (formerly OEH) manage water allocated to the environmental through the Environmental Water Management Program. Environmental water consists of held environmental water (HEW)—held as entitlements and in storages to be used for environmental objectives—and planned environmental water (PEW), which is defined in Water Sharing Plans (WSPs), through the implementation of legislation.

Photography: Gin Gin weir, an example of how a section of the Macquarie system has been changed to make water available for irrigation. 25 August 2020 (Jasper Odgers, ARTD).

[1] Renger, R. (2015). System evaluation theory (SET): A practical framework for evaluators to meet the challenges of system evaluation. *Evaluation Journal of Australasia*, *15*(4), 16-28.

[2] DPIE/DoI. (2020). Managing environmental water. https://www.industry.nsw.gov.au/water/environmental-water-hub/management

Environmental water has been delivered across areas of NSW for decades. The NSW water reforms[3] and the state's Wetlands Policy[4] have included environmental flows as a provision to improve the function of rivers and wetlands. These efforts, along with the evolution of the EWMP,[5] more clearly formalises the management of environmental water across NSW.

The enactment of the Basin Plan 2012 provides the overarching context for environmental water management for both the NSW EWMP and the Commonwealth Environmental Water Holder (CEWH), as well as the equivalent programs in other Basin jurisdictions. As a Basin state and signatory of the Basin Plan, NSW is required to implement actions under the Basin Plan and report on the outcomes of the implementation annually and every five years. The Basin Plan establishes a framework for managing environmental water at both basin- and catchment-scale[6], with the Basin-wide Environmental Watering Strategy[7] (BWS) and Long Term Water Plans (LTWPs) being central features of this framework. LTWPs apply to catchment-scale water resource plan areas (WRPAs)[8] and serve to identify priority ecological assets, including regard for Aboriginal cultural values, and to outline ecological objectives relating to native fish, native vegetation, waterbirds, other species, and ecosystem functions.

DPIE EES is responsible for the delivery of environmental water but this requires collaboration between DPIE EES and several partners. Environmental water delivery is done collaboratively primarily through the Environmental Water Advisory Groups. DPIE EES deliver water through two key partnership agreements with WaterNSW and with the CEWH. NSW partner agencies (DPIE Water, DPI Fisheries) provide advice on watering priorities and during environmental water deliveries.

THE PROGRAM

The EWMP is a complex program operating in a contested policy arena that makes interventions into complex ecological systems. The objective is to ensure an allocation of water to support environmental outcomes. These policy, governance and ecological systems are made up of many interdependent elements that interact and change, often in nonlinear ways (including 'tipping points' and exponential growth, which is often irreversible). This is not the kind of problem that is solvable simply through research or experimentation—it is dynamic and must be managed adaptively[9]. Multi-disciplinary research into the complexity of flow dependent ecosystems provides insights to guide the future direction of the EWMP. Enabling the EWMP to be an innovative and adaptive 'learning program' depends on

[3] Department of Infrastructure, Planning and Natural Resources. (2004). NSW Water Reforms: A secure and sustainable future. http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/548752/ministerial_statement.pdf
[4] Department of Environment, Climate Change and Water. (2010). NSW Wetlands Policy. https://www.environment.nsw.gov.au/topics/water/wetlands/protecting-wetlands/nsw-wetlands-policy
[5] NSW OEH (2015) Evaluation of the NSW Environmental Water Management Program 2006-2013: Report to the OEH Executive, p. vii
[6] DPIE, 2019. Barwon-Darling Long Term Water Plan Part A, Draft for exhibition.
[7] Murray-Darling Basin Authority (2014). Basin-wide environmental watering strategy. https://www.mdba.gov.au/sites/default/files/pubs/Final-BWS-Nov14.pdf
[8] Murray-Darling Basin Authority. (2020). Surface-water water resource plan areas. https://www.mdba.gov.au/sites/default/files/cartographicmapping/158_Surface_Water_WRPA.pdf
[9] Kurtz, C. F., & Snowden, D. J. (2003). The new dynamics of strategy: Sense-making in a complex and complicated world. *IBM Systems Journal*, *42*(3), 462–483.

ensuring that there is strategic MER and coherent research and development (R&D) that is integrated and applied.[5]

> *The Environmental Water Management Program (EWMP), now delivered by the Department of Planning, Industry and Environment (the Department; DPIE) aims to protect and rehabilitate the rivers and wetlands of NSW through a range of management interventions, including the use of environmental water. The EWMP has specific objectives relating to the environmental themes of hydrology, vegetation, waterbirds, native fish, ecological functions and other species.*

To improve the health of the Murray-Darling Basin wetlands, Governments recognised that accessing additional water to that available under water sharing plans was necessary. Since 2005, Governments have invested in recovering water for the environment. The EWMP program now utilises a combination of Held Environmental Water (HEW) and Planned Environmental Water (PEW) to achieve its objectives. PEW is allocated through Water Sharing Plans (WSP) and comprises rules-based water and discretionary Environmental Water Allowances (EWA), while HEW comes from a number of sources, including from the Commonwealth Environmental Water Holder (CEWH) and NSW Government licenses.[10]

Currently, NSW holds entitlements for 343,843 megalitres (ML) of HEW[11] which, while varying in value per ML, amounts to a value of approximately $450m. Including the substantial entitlements held under the joint Governments' The Living Murray (TLM) program brings this to a total of 928,253.5 ML.

To achieve the EWMP's aims and objectives, this asset must be managed astutely and skilfully with an evidence-based approach. Independent evaluations, such as this one, provide opportunities to enhance the program.

1.3 THIS EVALUATION'S PURPOSE AND SCOPE

The crux of the evaluation is one key question:

> *Has the EWMP made progress in making a difference to the health of rivers and wetlands in NSW?*

The short answer is **'YES'**.

[10] https://www.environment.nsw.gov.au/topics/water/water-for-the-environment/about-water-for-the-environment/government-initiatives#licencedwater
[11] https://www.environment.nsw.gov.au/topics/water/water-for-the-environment/about-water-for-the-environment/current-water-holdings

The evaluation finds that the EWMP has made a difference, it has established processes, networks of relationships and administrative structures that will enable the achievement of this objective to continue. However, in delivering on this objective, the EWMP does face challenges and its current resourcing may be insufficient for the scope of activities necessary to meet program objectives.

In revealing the strengths and weaknesses of the program and identifying opportunities for refinement, this evaluation can guide the EWMP in conducting future improvements to the program. It may be used as a tool for program staff and stakeholders to disseminate learnings throughout the program and support evidence-based decision making that can adapt to changing environments.

SCOPE AND FOCUS

This evaluation focuses on the progress the EWMP has made towards implementing the recommendations from the 2006-13 evaluation during the 2014-15 to 2018-19 timeframe and identifying the strengths and weaknesses of the current program to inform future delivery of the program. The (2006-2013) evaluation made twelve key recommendations to improve the delivery of the EWMP and help achieve environmental outcomes in the short-, medium- and long-term, and five recommendations for improving the process and participatory qualities of Environmental Water Advisory Groups (EWAGs). These recommendations and this evaluation's assessment of progress made in implementing them are listed in Chapter 2.

This evaluation was not conducted state-wide but was limited to five NSW Murray-Darling Basin river valleys with EWAGs and active environmental water delivery.[13] These valleys span the state from north to south and the people involved have a depth of experience in the practical and policy dimensions of environmental watering in NSW. The EWMP beyond these valleys typically operates at a smaller scale but utilises the same framework elements, particularly within the Murray Darling Basin. The valleys in scope for the current evaluation were:

- Gwydir
- Macquarie
- Lachlan
- Murrumbidgee
- Murray-Lower Darling.

Photography: Gary Hall, a private landholder in the Macquarie Marshes, shows the evaluation team the development of water couch grass. 26 August 2020 (Jasper Odgers, ARTD).

[13] EWAGs which did not exist prior to 2019, were still emerging, or which have limited HEW volumes were excluded from the scope of this evaluation. These EWAGs include Barwon-Darling, Intersecting Streams, Namoi-Peel, Hunter-Paterson and Border Rivers.

1.4 METHODOLOGY

This evaluation was designed and implemented using a systems evaluation approach. Elements important to this approach include:

- defining the EWMP as a system, with several subsystems
- determining how the EWMP's subsystems are functioning
- evaluating *systems* that support the management of environmental water in NSW
- identifying opportunities for improving the EWMP.

Please note: while the evaluation reviewed the systems of consultation, planning, implementation and reporting that are central to the EWMP it did not evaluate specific watering priorities, events or regimes.

TABLE 3. EWMP VALLEY STAKEHOLDERS

Valley	HEW entitlements *(ML)*	Stakeholders provided by EES	Responses to survey	Interviews conducted
Gwydir	21,481.5	17 (8%)	8 (6%)	2 (6%)
Macquarie	52,786.5	21 (10%)	16 (13%)	4 (11%)
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Source: https://www.environment.nsw.gov.au/topics/water/water-for-the-environment/about-water-for-the-environment/current-water-holdings Note: Barwon-Darling HEW omitted from this table as the Barwon-Darling Valley is not in scope for this evaluation. ^This grouping includes external agency staff (e.g. CEWO, DPIE Water) and non-regional program staff (e.g. MER, EWG). [1]DPIE HEW only. [2]The Living Murray HEW entitlements.

TABLE 4. STAKEHOLDER GROUPS IN CONTACTS AND DATA COLLECTION

Interest group	Contacts provided	Survey responses	Interviews
NSW Government	114	70	19
Commonwealth government	25	14	3
Local government	2	1	0
Community group	24	19	5
Private (incl. consultants and researchers)	37	21	8
Total	**202**	**125**	**35**

KEY EVALUATION QUESTIONS AND DATA SOURCES

As outlined above, an iterative and interactive process using a combination of methods and data sources was used to determine and answer the key evaluation questions. In the TOR, the evaluation was required to deliver on a number of tasks. Table 5 below outlines the evaluation tasks and data sources that relate to each key evaluation question (KEQ).

TABLE 5. KEY EVALUATION QUESTION AND TASK MATRIX

	Key Evaluation Question	Task	Data source
1a	Have environmental water plans (i.e. LTWPs) been designed and implemented to deliver water in a way that is determined by the environmental situation?	Task 3. Identify and evaluate key program processes, activities and roles.	Program documentation Scoping interviews Stakeholder interviews
1b	How well are the feedback and communication loops within the EWMP system functioning? e.g. leadership, culture, training and IT.		
2	The 2006-2013 evaluation made recommendations to improve the contribution of the EWMP to the protection and restoration of water dependent ecosystems. Were these implemented?	Task 2. Evaluate the implementation of the 2006-2013 evaluation's recommendations.	Program documentation System evaluation outputs Scoping interviews Stakeholder interviews
3a	Are the systems for monitoring, evaluating and reporting on ecological systems in place and functioning?	Task 5. Assess progress towards meeting ecological targets.	System evaluation outputs Stakeholder survey Stakeholder interviews
3b	What are the legislative requirements for environmental water? Have they been met?		
4a	What are the trends and patterns in survey responses from different communities and stakeholder groups?	Task 4. Assess community involvement (EWAG) in the EWMP and the implementation of their	Stakeholder survey Stakeholder interviews
4b			

	What are the perceptions of EWAG representatives relating to the engagement of different communities and stakeholder groups?	recommendations from the previous evaluation.	
5a	What are the overall findings of the evaluation and recommendations to guide adaptive management to continue to improve the EWMP?	Task 6. Identification of key findings and recommendations.	Program documentation Scoping interviews Stakeholder survey Stakeholder interviews
5b	What system levers (e.g. leadership, culture, training and IT) can be used to improve the system?		

Note: Task 1 is not listed as this was the engagement of ARTD Consultants as the service provider for the evaluation.

2. KEY EVALUATION QUESTIONS AND ANSWERS

The evaluation used multiple lines of evidence to determine program outcomes, identify system constraints and propose recommendations to enhance the program's efficiency and effectiveness. This section presents the key findings of the evaluation and responds to the KEQs listed above.

The EWMP faces challenges in continuing to successfully deliver the program and, as always, there are opportunities for improvement. Some challenges are within the control of the program, while others have arisen externally.

The subsequent chapter of this evaluation report further develops this analysis and identifies avenues to improve the program's delivery.

KEQ1. (A) HAVE ENVIRONMENTAL WATER PLANS BEEN DESIGNED AND IMPLEMENTED TO DELIVER WATER IN A WAY THAT IS DETERMINED BY THE ENVIRONMENTAL SITUATION?

Yes. The evaluation heard specifically from interviewees that environmental water plans, such as Annual Environmental Watering Priorities (AEWP) and LTWPs, are sufficiently flexible to accommodate changes in the environmental conditions that arise in any given water year. Based on the antecedent and forecast conditions, environmental water plans are adapted accordingly using Resource Availability Scenario (RAS) planning.

Program documentation also supports this finding. For example, the 2018-19 Macquarie AEWP states "Since December 2016, rainfall in the catchment and lower floodplain has remained well below average. The Bureau of Meteorology forecasts drier than average conditions across the region. The amount of water available is unlikely to increase so carryover will be used to meet the needs of the Macquarie system", indicating that plans are adapted based on the environmental situation.

This flexibility is also evidenced in the adaptation of EWAG meeting schedules; they are changed according to when planning needs to occur and water is available.

The Summary Reports also explain methods for predicting water availability and how decision making around watering events are based on climate and water forecasts. For example, from the *Use of water for the environment in NSW 2016-17*:

Photography: Water flowing through the Macquarie Marshes. 26 August 2020 (Jasper Odgers, ARTD).

Following wet conditions in 2015-16, the Gwydir EWAG recommended environmental water should be used in response to naturally occurring triggers during the 2016-17 water year, allowing for water carryover in 2017-18.

While plans and planning processes are flexible, there is sometimes public or political resistance to using environmental water when needed—for example, in delivering environmental water during droughts or prolonged dry conditions when the use of environmental water may be perceived as a 'waste'—rather than diverting it to communities or agriculture for consumptive use.

KEQ1. (B) HOW WELL ARE THE FEEDBACK AND COMMUNICATION LOOPS WITHIN THE EWMP SYSTEM FUNCTIONING? E.G. LEADERSHIP, CULTURE, TRAINING AND IT.

Internally, the program's **leadership** is strong and respected. Staff feel supported by their leaders and reported high levels of respect for senior staff across the program. Staff and stakeholders were particularly complementary of the extensive experience of senior staff and attributed this to the program's success. In interviews, staff also discussed feeling unsure of their job security, especially in positions with project-based funding. Leadership around this issue is important as the program continues to mature. The program, however, is at risk of losing its corporate knowledge base and capacity if staff do decide to leave their positions due to this uncertainty.

Leadership is being developed across the EWAGs and devolving elements of program communication would allow EWAG Chairs and members to strengthen their leadership roles within their community.

In discussion with program staff, there is a highly consistent view of the program—including its overall objectives, the approach to achieving these, as well as enablers of success and challenges. This indicates that there is strong internal communication and understanding amongst program staff—the **culture** of the program is strong and unified. Staff are dedicated to their roles and focused on achieving the program's objectives. They respect each other and reported on the shared values throughout the scoping interviews, stakeholder survey and stakeholder interviews. The culture in the established EWAGs is similar.

The EWMP's culture of collaboration and inclusion were also reported as the most liked things about the program (30% of all comments in the stakeholder survey about what people like about the EWMP related to this aspect of program delivery), even though there was some negative sentiment about the underrepresentation of Aboriginal stakeholders in EWAG consultation. There was also a lot of recognition of the knowledge and experience of staff (15% of all comments in the stakeholder survey about what people like about the EWMP related to this aspect of program delivery), with this topic having the greatest net positivity.

TABLE 6. WHAT STAKEHOLDERS 'DO LIKE' AND 'DON'T LIKE' ABOUT THE EWMP

Do like			Difference			Don't like
	%	*n*	*n*	*n*	*%*	
Collaboration and inclusivity	30%	43	16	27	19%	Collaboration and inclusivity
Monitoring, outcomes and evidence-based decision making	23%	33	-1	34	24%	Monitoring, outcomes and evidence-based decision making
Management and staffing levels	17%	24	17	7	5%	Management and staffing levels
Knowledge and experience of staff	15%	22	22	0	0%	Knowledge and experience of staff
Communicatio n	8%	11	-19	30	21%	Communicatio n
Clear planning and processes	8%	11	11	0	0%	Clear planning and processes
				15	10%	River operations and water use
				18	13%	Politics and bureaucracy
				12	8%	Insufficient resources and funding
	100%	**144**		**143**	**100%**	

Source: ARTD stakeholder survey. Responses to open ended questions about 'What DO you like about the current environmental water management program?' and 'What DON'T you like about the current environmental water management program?' Responses coded to most common themes.

Environmental water management does not have an official certification or **training** course. However, the staff involved in the EWMP are highly skilled and have extensive experience in their fields. While there is not a formal succession strategy, staff identified a clear pathway from junior to senior positions (e.g. from WARCO to SWARCO). This pathway involves the accrual of knowledge and experience over time.

Socialising and building staff capacity around MER theory and practice may also be necessary as the program looks to further cement its ability to describe its outcomes to stakeholders. During stakeholder interviews, staff reported low levels of awareness of the EWMP MER strategy. In Table 6, above, we can see that MER is something stakeholders commonly do like about the program, as well as something they dislike about the program. In fact, 23% of all comments (n=67/287) in the survey about what is liked and not liked related to MER. Strong MER processes are related to good communication outcomes (i.e. it provides the data that can be communicated), planning of program activities (i.e. what water

to release and when) and staff who understand the outcomes of their actions. Accordingly, it is of crucial importance to the success of the program.

The recent introduction of a new **Information Technology** (IT) system, *e-flo*, has the potential to enhance MER activities. The system (a relational database product delivered by Salesforce) integrates previously separated water planning, ordering and management tasks and documentation into one platform. The system has only been implemented in mid-2019 but staff reported that it appears promising. They are hopeful that it will improve transparency and accounting of water between DPIE EES and WaterNSW, rather than water managers informally advising the EWMP registrar of water use ahead of WaterNSW invoices, which may take several months to be reconciled. Training for this new system will be important, as will a review of its capacities after a 'bedding down' period of six to twelve months. Any shortcomings of *e-flo* should be quickly rectified, so that cascading failures of poor system operability do not occur.

The EWMP's feedback and communication loops are working well within DPIE EES; however, stakeholders identified that there are communication inefficiencies with external stakeholders. Stakeholders indicated in the survey that the biggest issues relate to the measurement of what the EWMP is achieving and communicating these achievements and how much water is being delivered to the community. These issues indicate limitations in the feedback and communication processes that exist in the program.

KEQ2. THE 2006-2013 EVALUATION MADE RECOMMENDATIONS TO IMPROVE THE CONTRIBUTION OF THE EWMP TO THE PROTECTION AND RESTORATION OF WATER DEPENDENT ECOSYSTEMS. WERE THESE IMPLEMENTED?

Overall, there has been progress against the 2006-2013 evaluation's recommendations, with six recommendations implemented, five mostly implemented, and only one not implemented. Of the six recommendations that have been mostly implemented, many are related to ongoing improvement in partnership with other agencies and cannot be achieved immediately.

See Table 7, below, for detail on progress against the previous evaluation's recommendations.

TABLE 7. IMPLEMENTATION OF PREVIOUS EVALUATION'S RECOMMENDATIONS

Previous evaluation's recommendation		Finding
1	**Formally recognise the EWMP and identify it as a priority initiative within OEH.** The EWMP involves management of a valuable public asset, with similarities to management of land for biodiversity and cultural outcomes. Formal recognition should strengthen the current whole-of-organisation input, identify adequate levels of resourcing over realistic timeframes and encourage good governance for the management of a valuable public asset.	**Implemented.** • The EWMP has grown from a small team (~5-10) to a program of regionally based teams and a central governance group (~60 staff). • Its recent website restructure has centralised all public information and documentation on NSW environmental watering here. • DPIE EES has recently (Sept 2020) undergone a realignment, with a Director Water for the Environment now having focused oversight over the EWMP.
2	**Refine the EWMP program logic and develop a formal, long-term evaluation strategy for whole-of-program and individual program components.** The experience gained since 2006 provides a practical foundation to improve the links between expected outcomes, evaluation questions and performance indicators.	**Implemented.** • The EWMP program logic still needs refinement to ensure it is a true representation of the causal logic of the EWMP, informed by the latest ecological and hydrological understanding and the practical knowledge of EWMP water managers. The updated program logic should also clarify interagency responsibilities. • There is a MER strategy and implementation plan. Individual Valley Work Plans are nearing completion and endorsement. Knowledge of these MER documents is limited outside of EWMP MER staff and reporting against the Valley Work Plans has not yet begun. • Reviewing the EWMP MER strategy to align directly with the LTWPs and Basin Plan may be expedient in mitigating external risks and ensuring MER is feasible given current resourcing. • In reviewing and realigning the program's MER strategy and program logics, the EWMP should be clear about what the program is aspiring to achieve; what the program is sufficient for achieving, i.e. what it can influence and what is outside the program's control.
3	Strengthen the contribution by EWAGs to the EWMP	**Mostly implemented.** See EWAG1 to EWAG5 below for detail.
EWAG1	**Improved Environmental Water Advisory Group Governance.** The governance of EWAGs must	**Implemented.** • Considerable progress has been made in developing chairperson capacity and in gaining representation from key

Previous evaluation's recommendation		Finding
	be clear, consistent over time and perceived to be fair and legitimate.	stakeholder groups. We heard of previous stakeholder segments who had been reluctant to join EWAGs now being encouraged to join by their peak representatives. The exception is Aboriginal representation, which was highlighted as variable. • The EWAG Terms of Reference, published in 2019, are clear and concise and should be made more readily accessible through the program's website. • Evidence was given of an environmental water strategy development process that was consistent, well supported by information, and allowed various levels of input and negotiation. • Transparency is being hindered by a lack of formalised synthesis of outcomes, and by the inability of the Chair to directly communicate these outcomes to the public. This causes a critical lag period before, and if, accurate information is presented. • We understand the EWAGs are currently undergoing a renewal process.
EWAG2	**Ensuring sustainable retention and participation of Environmental Water Advisory Group members.** Engagement in EWAGs is a long-term investment for Members who need opportunities to enhance their capacity to participate.	**Implemented.** • The commitment of EWAG members is high. Participation across EWAGs ranges from active discussions to reach an acceptable outcome, to information sharing events with less opportunity for active discussion. This reflects the different levels of engagement or maturity of process across EWAGS. This is dependent on capacity building efforts and membership. • In general, these organisations are a unique competency of EWMP in NSW. They are a very positive nexus between science, environment, irrigators and other members of the community.
EWAG3	**Development of improved review and selection process for group members.** The effectiveness of EWAGs as a mechanism for community involvement relies on a good representation of community interests and perspectives.	**Mostly implemented.** • As noted above, we understand the EWAGs are currently undergoing a renewal process. Renewal has and does occur regularly; however, formalisation and codification of the selection processes across valleys is important.
EWAG4	**Increasing the public profile of Environmental Water Advisory Groups through improved public access to process and outcomes.** EWAGs are critical for ensuring public	**Mostly implemented.** • EWAGS are increasing in profile, process and outcomes. • A synthesised summary of acceptable outcomes to all members at the conclusion of meetings would assist further.

Previous evaluation's recommendation		Finding
	participation within environmental water planning. A greater public awareness of EWAGs and their role in the wider community is essential to their role.	• The development and distribution of regular communiques would further assist public understanding and access. We understand that, under the current DPIE EES communication framework, this takes time and resources. It would still be valuable, however, as EWAGs only meet 3-4 times per year.
EWAG5	**Develop an ongoing monitoring and evaluation strategy to promote group functionality and Member retention.** EWAGs represent a considerable investment for the NSW Government and EWAG Members. It is, therefore, essential to develop a monitoring and evaluation strategy to ensure ongoing improvement in group functionality and outcomes.	**Not implemented.** • While included in the EWAG Terms of Reference (pages 6 and 8), the evaluation did not hear of systematic monitoring or evaluation of EWAG functionality and member retention. • The annual Chair of EWAGs meeting was flagged as being highly beneficial. Expanding the scope of this meeting to include other members and share information across EWAGs would be beneficial, especially for emerging EWAGs (e.g. Baron-Darling, Namoi, Coastal), allowing them to learn directly from mature EWAGs (e.g. Macquarie, Gwydir). • Capacity building based on understood and targeted capacity challenges is currently ad hoc. An annual Chairperson meeting would assist. A continuation of the development of policy around the functioning and capacity building of EWAGs would also assist. • Conducting an EWAG member survey and analysing the results of this survey annually would identify any challenges the EWAG is facing and help to develop strategies to overcome such challenges.
4	**Assess and plan resource needs on a 5-year cycle, aligning with the Basin Plan (BP) evaluation timetable and guided by an operational plan.** Each evaluation should inform subsequent funding decisions.	**Implemented.** • Following from the previous evaluation in 2015, this evaluation indicates the program's commitment to regular evaluation as part of the 5-year cycle. • This aligns with evaluation framework and timeline for the evaluation of the Basin Plan.[15]
5	**Allocate funding to undertake monitoring activities and the analysis and reporting of information obtained.** M&E by OEH will increasingly integrate with the CEWH and MDBA activity under the BP framework. The value of long-term information, shared among agencies and the community and	**Mostly implemented.** • EWMP planning documents are well-integrated under the BP framework though reporting struggles to relate back to the MDBA EW strategy. • There is uncertainty as to how DPIE MER will be funded in the future. Project-based funding makes key functions finite even though the objectives and targets require long-term monitoring to evaluate outcomes that extend past the funded project timeframe. Long-term data collection is difficult without stable funding, and staff on temporary contracts often move jobs, resulting in loss of knowledge.

[15] https://www.mdba.gov.au/sites/default/files/pubs/BPE-Framework-summary-2019.pdf

	Previous evaluation's recommendation	Finding
	covering a range of watering and climate scenarios, will increase.	• Scientific partners are rarely engaged for the 5-year monitoring cycle, leading to 'disjointed' pieces of research that often do not contribute to the larger picture or integrate with CEWH and MDBA activities. As a result, the EWMP struggles to comment on the trajectory of the health of rivers and wetlands in NSW.
6	**Co-develop plans on the desired extent and condition of water-dependent ecosystems to encourage a diversity of voices and incorporate a broad view of expertise.** Long-term watering plans (LTWP) to be developed under the BP and resourced by the Implementation Agreement between NSW and the Commonwealth provide the means to do this effectively.	**Implemented.** • Valley-specific plans on the desired extent and condition of water-dependent ecosystems have been developed in the LTWPs. They are finalised and have been published. • These plans are excellent blueprints for environmental watering, including assessments of risks to water and the water requirements of each valley. • LTWPs are not statutory documents but they are required under the Basin Plan. Enshrining them into legislation would increase their power as water management documents. • They are not widely engaged with by EWAG members and are still gaining traction with water managers, but they have only recently been completed. Some stakeholders noted they are not peer reviewed and this may make some readers sceptical of their scientific rigour.
7	**Continually improve institutional arrangements to foster flexibility, creativity and distributed decision making and encourage risk-taking to test knowledge boundaries.** This acknowledges that the EWMP is one of several programs helping to achieve the objectives of the BP. Effective arrangements should operate at both valley- and Basin-scale and should recognise the role of EWAGs.	**Mostly implemented.** • In discussion with stakeholders, when asking specifically about the health of partnerships with external agencies, we heard that there has been advancement in the arrangements between agencies involved in the planning, management and delivery of environmental water. These agencies include DPIE EES, DPIE-Water, WaterNSW, DPI DPI Fisheries, CEWO and MDBA. • We understand that a new National Partnership Agreement on implementing water reform in the Murray-Darling Basin is under negotiation. This agreement forms a crucial part of the formalisation of institutional cooperation and underpins the resourcing of MER in NSW as it relates to the Basin Plan. • While the personal partnerships between DPIE EES and WaterNSW are generally strong, the evaluation heard of difficulties in delivering environmental water accurately and as required by the environment. DPIE EES and WaterNSW appear to work well together when both organisations' objectives are aligned and their interpretations of WSPs are aligned; however, there is a risk that one party will be dissatisfied with the outcome as it relates to their organisation's overarching objectives. While the Customer Advisory Group (CAG) was flagged as one pathway for raising issues with service quality, this group does not seem to have resolved all issues between DPIE EES and WaterNSW.

Previous evaluation's recommendation		Finding
8	**Continually update the OEH Water and Wetlands Knowledge Strategy to recognise the technical support required to improve the planning, operational and reporting components of the EWMP**. The uncertainty from limited knowledge of recovery processes in stressed wetlands, together with the lack of clearly articulated environmental outcomes desired at local-, regional- and Basin-scale, highlights the importance of an ongoing knowledge acquisition program to complement the EWMP.	**Not implemented.** • During the period of this evaluation the Water & Wetlands Knowledge Strategy 2013–17 was not updated. • There were three projects identified between 2015 and 2017 (one of them published in a peer-reviewed journal) that aimed to build an inventory of wetlands in NSW, which was one of the key priority knowledge needs identified by the Knowledge Strategy. The project was piloted in the Lachlan River catchment but was not further developed to create a complete NSW Wetlands Inventory. . • Other priority knowledge needs in the Knowledge Strategy could be answerable by harnessing any information from the EWMP's event-based and long-term monitoring activities.
9	**Seek to establish a single source of communication, wherever possible, in order to reinforce the fact that individual programs are contributing to a larger program objective, namely the Basin Plan.** An obvious example is a dedicated website highlighting all watering targets in the Basin, with information on past, current and planned watering activities, asset condition and ecological responses.	**Implemented.** • The current single source of communication is the government webpage called '**Water for the environment**'. There are links to the annual environmental watering priorities for each valley for the current year and for previous years back to 2016-17, as well as links to outcomes reports. LTWPs, WRPs and information on EWAGs are also available through the website. • The outcomes reports dating from 2010-11 to 2016-17 are provided in the form of downloadable reports, and the outcomes reports from 2017-18 and 2018-19 are instead presented as summary webpages first for the basin as a whole and then for each valley. • The website contains one webpage on how using water for the environment contributes to the Basin Plan. Information around partnerships with other agencies may benefit website users.
10	**Initiate a coordinated communication strategy among NSW and Commonwealth partners, with all partners contributing resources toward its implementation.** OEH's environmental water management role has direct links to the community via EWAGs.	**Implemented.** • Amongst NSW Government agencies, the framework for managing environmental water has been developed. The framework (*Cooperative management of environmental water to improve river and wetland health in NSW*, OEH 2014) outlines the roles and accountabilities. • DPIE EES and CEWO have an official partnership agreement relating to the delivery of environmental water within NSW. • There are also working groups, including communications staff from Basin state and Commonwealth agencies, which

	Previous evaluation's recommendation	Finding
		focus on coordinating aspects of delivering water for the environment (e.g. communications). • The current negotiation (2020) of the second iteration of the NPA on implementing water reform in the Basin shows that Commonwealth and state agencies are committed to working together towards the implementation of the Basin Plan.
11	**Improve the use of models to inform planning and evaluation components of the EWMP.** Models can provide significant efficiencies by predicting outcomes from multiple scenarios to support planning; discriminating the contributions of individual management actions or sources of water; and allowing the extrapolation of results to areas where there is no active monitoring. Models, however, must be co-developed with managers (users) to be credible.	**Mostly implemented.** • There is some use of models in the EWMP, as evidenced in the Environmental Water Requirements in the LTWPs; however, these plans are not yet widely used for planning and communicating objectives to stakeholders because they were endorsed in 2020. • A Basin-wide Ecosystem Response Model[16] that is sensitive to each river valley and EWAG should be commissioned to inform decision making about flows and communication about outcomes. A water manager's perspective, taking advantage of their understanding of input from hydrologists and scientists are the critical elements of such a model. As such, they should lead the development, and ensure the ongoing development of these models. • Working with WaterNSW and DPI Fisheries to share and understand their hydrological and ecological conceptual models respectively would contribute to more informed water planning. • Iterating and making models more transparent will improve reliance and trust in their outputs.
12	**Develop a succession plan to ensure an appropriately skilled workforce in the long-term.** The skill set required for effective environmental water management is based strongly on experience and the standing of individual officers within the local regional community. OEH has highly skilled operational staff who are valued by their local community. The current Regional Operations structure will foster the transfer of experience over time.	**Mostly implemented.** • The current Regional Operations structure is fostering the transfer of experience over time. • While there is not a formalised succession plan, staff have an understanding of how they progress from junior conservation or project officers to senior conservation officers. • Although this evaluation was not able to analyse the turnover of staff since the last evaluation, it may be useful to collect and collate this data ahead of the next evaluation in 2025, to understand whether staff turnover is stable. • Some DPIE EES staff were concerned that the loss of experienced staff represents a huge risk to the EWMP as staff members' knowledge, ecological skills and networks leave with them.

[16] Saintilan N., Overton I. (eds.) 2010. *Ecosystem Response Modelling in the Murray-Darling Basin,* CSIRO.

KEQ3. (A) ARE THE SYSTEMS FOR MONITORING, EVALUATING AND REPORTING (MER) ON ECOLOGICAL SYSTEMS IN PLACE AND FUNCTIONING?

While there are MER systems in place, they are not operating as efficiently or effectively as required by a program of this size and with such a substantial asset portfolio. The program has a track record of reporting on activities annually (with the Summary Reports and Use of water for the environment reports). The Summary Reports, however, are an internal annual monitoring document that need to more clearly communicate the program's progress against its objectives. EWAG members indicated that they use the best available evidence presented to them to give advice on planned water events. This was attributed to the information provided by DPIE EES water managers, WaterNSW and DPI Fisheries during EWAG meetings.

The EWMP's MER strategy contains the overarching strategy, its implementation plan and valley-specific work plans, which include management questions mapped against LTWP objectives. The program and its context have both evolved since the development of this strategy and the logic underlying its assumptions may no longer hold, meaning that a comprehensive review and revision is required. Part of this process should include monitoring of the status of the risks identified in the LTWPs (Chapter 5).

The EWMP's annual environmental watering priorities[17] and the management questions in the MER Valley Work Plans align with the 'four pillars' of the MDBA's Basin-Wide Environmental Watering Strategy—connectivity, waterbirds, native vegetation and native fish. The MER Valley Work Plan management questions relate directly with LTWP objectives and state research priorities, and could act as 'key evaluation questions.' Management questions are not, however, directly reported against in the Summary Reports or any other documentation received or accessed by the evaluation team. However, LTWPs (and the management questions that directly relate to their objectives) are relatively new in their development and implementation, and so are likely to be reported against in the coming years. Using the management questions to address LTWP objectives and feed into the Basin-Wide Environmental Watering Strategy will likely be advantageous in bridging science and monitoring data with day-today management and larger strategic decision-making, and is a key strength of the EWMP.

With the completion of the LTWPs, now is the appropriate time to revise the program logic and MER strategy. This should be done in order to make the program's monitoring requirements as streamlined and achievable as possible—the program must be able to answer the questions it sets for itself. This revision process should engage water managers and scientists to ensure that management needs align with research priorities. Developing explicit conceptual models underpinning water action would also support the logic of the MER strategy (similar to the Environmental Water Requirements in the LTWPs). There may be an opportunity to make reporting activities more efficient, especially where they complement the needs of the state's reporting requirements under the Basin Plan. As a principle, MER should be structured to enable multiple reporting products to be generated.

[17] For example, see the Gwydir's annual environmental watering priorities for 2017-18, https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-for-the-environment/annual-environmental-watering-priorities-17-18-gwydir-170308.pdf

KEQ3. (B) WHAT ARE THE LEGISLATIVE REQUIREMENTS FOR ENVIRONMENTAL WATER? HAVE THEY BEEN MET?

The answer to this question is in line with the methods for the evaluation. Nothing in this report should be interpreted as providing a general or specific legal opinion about the extent of legal requirements or whether they have been met.

Legislative requirements for environmental water are not contained in one piece of legislation. It is covered by various legislation and plans, including the NSW Water Management Act 2000, Commonwealth Water Act 2007, NSW Water Sharing Plans (components of Water Resource Plans), and the Murray-Darling Basin Plan 2012.

The regulation of environmental is determined by the mechanism through which water is allocated to the environment:

- **PEW** is allocated within statutory NSW Water Sharing Plans under the NSW Water Management Act 2000. The NSW Minister for the Environmental has concurrency over Water Sharing Plans, meaning DPIE-EES helps develop these plans.
- **HEW** is allocated to water licenses held for environmental use, recovered through infrastructure works or buybacks of water licences. State and Commonwealth governments have purchased water licences for environmental purposes.

River operations come under the WaterNSW Act 2014 and the Murray-Darling Basin Agreement (for the River Murray). The objectives of the WaterNSW Act do not include environmental objectives that guide the EWMP's program objectives. The Murray-Darling Basin Agreement does require governments, including river operators, to give effect to the Commonwealth Water Act 2007 and the Murray-Darling Basin Plan 2012.

Long-term watering plans are also important guiding documents for environmental water in NSW and are required under the Basin Plan; however, they are not statutory documents.

Intergovernmental Agreements (IGA) such as the National Water Initiative, The Living Murray and Basin Plan Implementation agreements include environmental provisions. National Partnership Agreements (NPA) link funding to obligations under these IGAs. The IGA for implementing water reform in the Murray-Darling Basin[18] has been an important agreement and NSW receives funding to deliver this agreement under the associated NPA[19]. While the original NPA has now ceased, we understand there is currently an opportunity for NSW to continue to be supported by the Commonwealth to deliver the Basin Plan reforms under a new NPA. NSW was paid in all years of the NPA except for the payment relating to 2016/17,[20] indicating that the Commonwealth Government was satisfied with NSW's implementation of the agreement.

However, the legislative requirements are generally broad and often the lines of responsibilities are unclear. That is, it is difficult to say if the legislation is met and who is

[18] https://www.coag.gov.au/about-coag/agreements/intergovernmental-agreement-implementing-water-reform-murray-darling-basin
[19] https://www.agriculture.gov.au/water/mdb/npa-water-reform-mdb-milestone-reports
[20] https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/water/payments-basin-states-under-npa-water-reform-mdb.pdf

accountable for it. Reviews undertaken by or commissioned by governments tend to be favourable.

The following are some of the reviews of programs that involve environmental water:

- Productivity Commission – National Water Reform (2018)
- Productivity Commission – Basin Plan Implementation (2019)
- ANAO report – New South Wales' Protection and use of Environmental Water in the Murray-Darling Basin (2017)
- MDBA – Basin Plan Evaluation (2017)
- Natural Resource Commissioner Review of Barwon-Darling Water Sharing Plan (2019)

LEGISLATIVE REQUIREMENTS FOR EWAGS

There are EWAGs (or similarly named entities) in the Gwydir, Macquarie, Lachlan, Murrumbidgee and Murray-Lower Darling valleys. These EWAGs are only codified in two out of five of the state's WSPs for these valleys, as shown in Table 8 below. The state or Commonwealth holds HEW entitlement in all valleys and PEW is specified in all valleys' WSPs. As discussed in Section 3.2 below, further codifying EWAGs and their scope in WSPs is important in establishing robust and effective processes across the state.

TABLE 8. SUMMARY OF THE WATER SHARING PLANS' INCLUSION OF EWAGS, HEW AND PEW

WSP	EWAG	HEW	PEW
Gwydir	✔	✔**	✔
Macquarie	✔	✔**	✔
Lachlan	*	✔**	✔
Murrumbidgee	*	✔***	✔
Murray-Lower Darling	*	✔***	✔

Source: Legislation NSW WSPs for each valley and Water for the Environment website. *In this valley, EWAGs are mentioned in the WSP but their membership or scope is not defined. ** In this valley, HEW is mentioned in the WSP but its scope is not defined.

KEQ4. (A) WHAT ARE THE TRENDS AND PATTERNS IN SURVEY RESPONSES FROM DIFFERENT COMMUNITIES AND STAKEHOLDER GROUPS?

The evaluation conducted an online survey of program stakeholders that received 125 responses from 202 invited stakeholders. Survey respondents were NSW State Government staff (55%[21]), Commonwealth Government staff (11%), agricultural landholders, (10%), Aboriginal community representatives (6%), members of environmental advocacy groups (6%), scientists or researchers (6%), members of irrigation schemes (2%), recreational fishers (2%), field naturalists (1%), and members of local government (1%).

[21] Percentages may not sum to 100% due to rounding.

Over two-thirds of stakeholders are satisfied (68%)[22] with the way environmental water is managed in NSW. Stakeholders from different valleys had different levels of satisfaction, with those from Murrumbidgee being the most satisfied (84% satisfied), while those from Gwydir, Macquarie, Lachlan and Murray-Lower Darling were less satisfied (56%-62.5% satisfied).

Different types of stakeholders also reported different levels of satisfaction. Three-quarters (74%) of government staff (Commonwealth, state and local) and environmental advocacy group members were satisfied with environmental water management, but less than half of Aboriginal community representatives and agricultural landholders (43%) were satisfied. In interviews, non-government stakeholders across EWAGs spoke of gradually increasing engagement in EWAGs and the EWMP over time and with increasing understanding of water for the environment. An annual self-review amongst EWAGs, or a survey as part of future evaluations, would help to understand this level of engagement further.

In addition to the above findings, Table 9 below also shows a cross-tabulation of the mean scores for three survey results—stakeholder ratings of data available to understand whether the program is 'doing what it's meant to do'; stakeholder ratings of feeling 'heard' by water managers; and overall stakeholder satisfaction with water management in NSW—with respondents' stakeholder type. The cross-tabulation indicates that river operators are the stakeholder group with the highest mean score for both quality of data available to them and feeling heard by water managers, while stakeholders in conservation, land management or MER have the lowest mean score. Private stakeholders (such as agricultural landholders or land managers) have the lowest mean score for both feeling heard by water managers and overall satisfaction with environmental water management in NSW. Commonwealth Government staff have the highest mean score for overall satisfaction; however, these scores are all relatively high and at the positive end of each scale.

[22] Somewhat satisfied and very satisfied responses combined.

TABLE 9. RATING OF DATA AVAILABLE, FEELING HEARD AND OVERALL SATISFACTION BY STAKEHOLDER TYPE

Stakeholder type	Quality of data[a] (0-100)		Feeling heard[b] (0-100)	Overall satisfaction[c] (0-5)
	n	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
Commonwealth Government	12	66.9 (28.8)	77.0 (15.3)	4.2 (1.0)
Env. water mgmt.	16	62.8 (19.1)	88.2 (12.4)	3.9 (1.1)
Env. water planning and policy	16	65.8 (29.4)	86.4 (21.4)	3.9 (1.1)
Community group	15	81.1 (13.4)	78.3 (17.8)	3.7 (1.2)
Conservation, land mgmt. or MER	32	59.9 (23.7)	71.4 (26.1)	3.7 (1.0)
River operators	7	71.5 (21.4)	85.0 (13.2)	3.6 (1.1)
Private	19	66.4 (30.8)	62.6 (32.5)	3.1 (1.4)
Aboriginal community representative	8	24.5 (32.3)	39.8 (25.8)	2.8 (1.3)
Total	**125**	**65.1 (26.0)**	**74.5 (25.1)**	**3.6 (1.2)**

[a] *How would you rate the quality of the data available to you or your organisation to help understand whether the program is doing what it's meant to do?* Where 0 is poor quality and 100 is high quality.
[b] *To what extent do you feel that your (or your organisation's) feedback has been considered or 'heard' by the NSW environmental water program managers?* Where 0 is not heard and 100 is completely heard.
[c] *Overall, how satisfied are you with environmental water management in NSW?* Where 0 is very unsatisfied and 5 is very satisfied.
Source: ARTD stakeholder survey.

KEQ4. (B) WHAT ARE THE PERCEPTIONS OF EWAG REPRESENTATIVES RELATING TO THE ENGAGEMENT OF DIFFERENT COMMUNITIES AND STAKEHOLDERS' GROUPS?

Overall, most stakeholders feel 'heard' and that their interests are represented in EWAGs, with a median score of 82 out of 100, where 100 indicated they felt completely heard. In a follow-up question about whether all of their interests were represented in their EWAG (or EWAGs generally), however, close to half of all survey respondents indicated that Aboriginal interests are not adequately represented. Further detail on this issue is presented in Section 3.2.3.

Survey respondents also suggested that recreational river users were not adequately represented on EWAGs and that environmental groups had been difficult to engage in the process of seeking feedback and advice on environmental water management.

KEQ5. (A) WHAT ARE THE OVERALL FINDINGS OF THE EVALUATION AND RECOMMENDATIONS TO GUIDE ADAPTIVE MANAGEMENT TO CONTINUE TO IMPROVE THE EWMP?

The evaluation found that the program is integral to the preservation, maintenance and improvement of inland rivers and wetlands in NSW. The program is part of a rapidly advancing field seeking to understand and actively govern how water can be managed and delivered to ensure that critical ecosystems continue to exist. The recommendations of the evaluation centre around three key areas:

1. Communicating program success and enhancing stakeholder engagement
2. Strengthening program capacity through resourcing, systematising EWAG processes and staff development
3. Developing and implementing robust systems and processes to improve capacity and ensure program effectiveness.

These recommendations are listed alongside each subsystem section (see Chapter 3) and described in full in Chapter 5.

KEQ5. (B) WHAT SYSTEM LEVERS (E.G. LEADERSHIP, CULTURE, TRAINING AND IT) CAN BE USED TO IMPROVE THE SYSTEM?

In the survey and interviews, stakeholders highlighted the importance of the program being able to 'tell the story' of environmental water. There are diverse audiences for this story, including politicians, local community groups and Aboriginal organisations. MER may be the greatest asset to telling this story. It is able to deal with the different information needs of various stakeholders, as discussed above. It also speaks to the importance of genuine stakeholder engagement and listening, as well as telling the story to empower local stakeholders.

The results of the survey suggest that there is not always a direct correspondence between what people see as being a risk and what they consider a realistic change to manage the risk. This is understandable as some risks are outside the scope of the program, such as climate change and political decision making. On the other hand, some changes will address multiple risks, such as greater or ongoing funding for MER. In the stakeholder survey, while only 18 of the 160 risks identified by stakeholders (11%) were related to resourcing and MER, 37 of the 130 suggested changes (28%) related to resourcing and MER. In addition, while staffing and secure employment was only raised as a risk in 4 out of 160 (3%) identified risks, a similar theme was mentioned in 20 out of 130 (15%) suggested changes.

The greatest risks were identified as inadequacies of river operation rules, protocols and physical constraints (Table 10). This was followed by the risk of communication that does not lead to a shared understanding of environmental water.

The most commonly suggested changes to manage these risks all related to increasing the ability to 'tell the story' of environmental water and engage in a dialogue with local stakeholders to inform and shape the program (Table 10). This can be seen in the emphasis on improved communication and engagement, consultation and collaboration with the

community and stakeholders, especially Indigenous groups, and enhanced resourcing of MER. Other suggested changes related to river operation and water usage and changes to management structures and retention of staff with important knowledge of this complex system.

These findings from the stakeholder survey, taken together with findings from the stakeholder interviews, has led the evaluation to a series of recommendations that are listed alongside each subsystem section (see Chapter 3) and described in full in Chapter 5.

TABLE 10. RISKS IDENTIFIED AND CHANGES PROPOSED BY STAKEHOLDERS

Risk identified			Difference			Change suggested
	%	*n*	*n*	*n*	*%*	
Communication: lack of shared understanding and agreement	21%	33	12	21	16%	Improved communication and engagement
Lack of resources and funding, especially for MER	11%	18	-19	37	28%	Improved resources and funding, especially for MER
River operations and constraints	29%	47	27	20	15%	Changes to river operations and water usage reporting
Climate change	8%	13	7	6	5%	Understanding environmental conditions
Insufficient levels of consultation	7%	11	-10	21	16%	Consultation & collaboration with community and stakeholders, especially Aboriginal groups
Political involvement	21%	34	29	5	4%	Political involvement
Staffing and secure employment	3%	4	-16	20	15%	Managerial changes and staffing
	100%	**160**		**130**	**100%**	

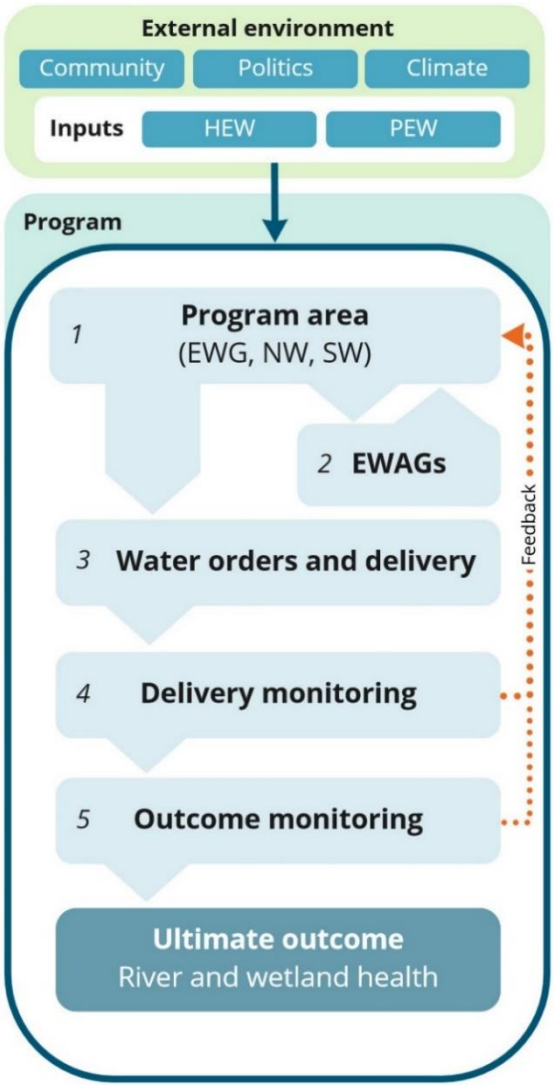
Source: ARTD stakeholder survey.

3. STRENGTHS AND WEAKNESSES OF THE PROGRAM

In order to identify the strengths, weaknesses and guide improvements in the EWMP, the evaluation investigated the systems that make up the program. This chapter documents the strengths, weaknesses and opportunities for improvement that were identified as part of this systems analysis.

This process commenced with a workshop with program staff to define the system and its component parts. The system model evolved over the course of the project as the team documented the different stages and processes that make up the program—and learned more about the program and its subsystems. The final EWMP system diagram including the five subsystems is shown in Figure 2, below. Diagrams illustrating each of the subsystems are presented throughout this chapter.

FIGURE 2. EWMP SYSTEM DIAGRAM



3.1 SUBSYSTEM 1—PROGRAM AREA

This subsystem includes all EWMP program staff—from the Environmental Water Governance (EWG) team to the North West (NW) and South West (SW) regional implementation teams. For the purposes of this evaluation, it also includes staff from DPIE Water and DPIE EES Science group who work on elements of the EWMP.

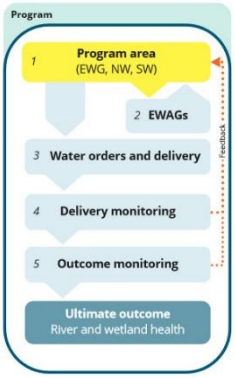


FIGURE 3. PROGRAM AREA SUBSYSTEM (1) DIAGRAM

As identified in the system diagram above, this subsystem includes the core program management components of the EWMP. It functions as the control room for program activities and is the primary interface with the external environment.

In discussion with program staff and stakeholders, two key areas of constraint were identified: communications and monitoring, evaluation, and reporting (MER).

Throughout the following section, the report expands on these areas and proposes recommendations to enhance the efficiency of the EWMP team as a subsystem of the EWMP program.

3.1.1 COMMUNICATIONS

As with many other natural resource management issues characteristic of environmental water management and policy is that it is contested, conflicted, and politicised. Enhancing open and respectful communications is critical.

COMMUNICATING TO THE GENERAL POPULATION

There was a great deal of appreciation for the information provided through DPIE EES public affairs channels and EWAGs to the wider community. Program stakeholders and community members would greatly value enhanced and further communication about the intended environmental outcomes of watering events and regimes, to better conceptualise the value of such watering events. Stakeholders mentioned some frustration with the timing of communication.

Stakeholders perceived that additional communication with communities would be very valuable. This would further support EWAGs in bringing divergent water user and interest groups together. Jointly reaching a decision on how to use environmental water in a way that is acceptable to all parties was seen as very successfully de-politicising the process. Limitations in terms of frequency and depth of content in communications was seen to provide a vacuum for re-politicising the process.

There have recently been several instances where media outlets published stories presenting incorrect information that eroded public confidence in environmental watering and, in turn, the EWMP. In discussion with water managers across NSW river valleys, we heard that water managers feel they are not able to defend themselves against this misinformation. They flagged particular concern about this for two reasons:

- if the community perceives that water managers are not correcting these articles then they are factual, eroding individual water managers' relationships and social license to operate within their community; and
- more broadly, it erodes the program's social license to operate across the Basin.

While EWMP staff understand the need to manage the risk caused by negative media coverage and the related process of getting media releases or communications materials approved, there is a perception that the current system is not working to the advantage of the EWMP.

We heard from EWMP staff and WaterNSW staff that information about environmental releases is often only communicated to the community by WaterNSW in the form of a press release detailing volumetric information relating to the environmental release. While this type of communication is appropriate for WaterNSW based on its operational objectives, it does not meet needs of the EWMP. This format does not inform the community about why the event is taking place nor the intended ecological outcomes of the event.

COMMUNICATION CHANNELS

Staff and EWAG members gave examples of the success and the potential of more devolved models of communication. This raises the issue of how to enable effective local communication that strengthens community engagement in a way that can coexist with and benefit from a centralised, coordinated, program-wide communication model.

There is a strong appetite amongst EWAG members and program stakeholders to leverage the potential benefits of improved communication and engagement with stakeholders through social media. Failing to acknowledge and communicate with community through this channel limits the program in its ability to rapidly disseminate information.

There are already communities using social media platforms such as Facebook Groups to distribute information and communicate about upcoming meetings or watering events (e.g. the Macquarie Marshes Environmental Landholders Association). Users find it to be more 'digestible' than other, more formal, methods of communication. While the evaluation did hear of the potential risk of communication through social media platforms, an absence of

content in this space may increase the chance that misinformation is spread through this medium.

We understand that DPIE EES previously commenced work on a Social Media Framework; however, this work was not completed or piloted within the EWMP. Revisiting this framework and trialling it with one valley may provide a 'proof of concept' for this avenue of communication with stakeholders.

Other examples given of nuanced, local and rich engagement with networks included:

- Events (e.g. river walks, wetland tours, etc.)
- Stories in local media outlets
- Development of local or state-wide school curriculum projects.

To achieve improved outcomes, it was felt that local community engagement should be better resourced.

COMMUNICATION BETWEEN DPIE EES AND EWAG MEMBERS

This is a strength of the program. It was clear in every EWAG that there is a high level of trust and valuable information exchange between members and DPIE EES.

DPIE EES staff were continually praised for the way they presented information, their diligence in ensuring the EWAG approach is a success, and the openness and flexibility in their approach.

EWAG members feel that their opinions and advice are heard by water managers. While EWAG members do not always agree with every decision, they felt as if matters always reached a position that they could live with.

EWAG COMMUNICATIONS STRATEGY

A number of the above issues were raised as part of the previous evaluation and a draft EWAG communications strategy was provided as part of this evaluation. We understand that this strategy is in the final stages of approval and nearing public release. The strategy covers many ways to improve the situation.

Alongside the communications strategy, specified EWAG resourcing and budgets would add greater stability and credibility to the EWAGs as a systematised component of the EWMP.

3.1.2 BUSINESS STRUCTURE

DPIE EES utilises a matrix business structure to blend project and functional roles across the organisation. Through this structure, DPIE EES is able to resource the EWMP with both dedicated program staff (such as environmental water managers and environmental water governance officers) and other DPIE EES staff whose skills and knowledge contribute to the progression of the program's systems and activities.

The matrix structure supports devolved decision making and the EWAGs provide real strength as networking forums with the capacity to mobilise local support and focus resources. The survey and interviews indicated a fairly high level of satisfaction with this regional approach.

There is a positive perception amongst stakeholders that the program leverages localism and customer-informed decision making taking place. That is, decisions on environmental water management take into account the local valley environment. This structural model enables EWAGs to distribute information about watering events in their communities; however, this role needs to be enhanced.

The EWMP has a broad operational and policy foci; however, our analysis found that it lacks a dedicated policy team which was identified as a potential issue during stakeholder interviews.

Building capacity for policy development, policy coordination and interagency coordination would benefit the program's ability to operate and evolve. This will lead to a more efficient use of water and assist in the ongoing protection of the asset itself.

The need for resources is further developed in the following 'Program Resourcing' section.

3.1.3 PROGRAM RESOURCING AND POLICIES

The EWMP is a program that has evolved significantly over the course of its existence. Since its inception in 2005, when it was known as NSW RiverBank, it has rapidly evolved in terms of its assets under management and the complexity of its operations.

Considering the program as a business, the EWMP has successfully completed its 'start-up' phase and is now entering its growth phase. To successfully transition into this next phase, the program will need to expand its capacity to manage environmental water through greater resourcing of staffing, MER and communications.

As discussed in Chapter 1, the EWMP coordinates a large share of environmental water in NSW—this includes state HEW, Commonwealth HEW and PEW as specified in the WSPs. Considering HEW alone, the value of the program's assets under management is approximately $450m. The efficient and effective management of this asset is undertaken by only 60 DPIE EES staff.

The management of environmental water is a quickly evolving policy and operational area in which governments have had relatively limited experience. With climate change, the pressures on the river systems, and those managing them, is only going to increase.

There are pressing needs to learn from current experience, systematise management and develop further expertise. This evaluation suggests that increasing program resources would support these needs.

The findings in relation to the resourcing of the program include:

- The EWMP is a complex program that spans policy, operational, research and stakeholder engagement functions
- For many core functions such as MER, the EWMP depended and depends on project-based funding and the expertise, dedication and continuity of its experienced staff. A project-based resourcing model was critical in the start-up phase of the EWMP but resourcing needs to shift into a more strategic and committed model to achieve long-term implementation of the Basin Plan, meet ecological objectives and evaluate and report on progress in the next 5-, 10- and 20-year cycles.
- The previous evaluation identified the need for succession planning and enhancing staff capabilities through professional development and this need is emphasised again in the findings of this evaluation.
- Specific program components such as MER and stakeholder engagement are under resourced and require strategic approaches to resource allocation
- Short-term project and external funding has been central to the program's implementation of the Basin Plan. Project-based funding makes key functions of the program insecure. For example, long-term ecological monitoring, evaluation and planning is difficult without staff continuity.
- The EWMP may need additional resources to broaden its responsibilities that include policy and interagency coordination, and the development of systematic measurement, monitoring and modelling programs. The EWMP requires increased functionality and capacity in communication, education, stakeholder engagement and Aboriginal liaison.

3.1.4 MONITORING, EVALUATION AND REPORTING

For a detailed discussion of MER process, please see Section 3.5 below.

3.1.5 RECOMMENDATIONS FOR IMPROVEMENT

1. **Focus on describing intended and actual environmental outcomes in external communications, in addition to water volumes.** Communications that explain the intended and actual outcomes of environmental flows and real-world outcomes will reduce confusion about the scale of watering events or misunderstanding of the relative difference between litres, kilolitres, megalitres and gigalitres.

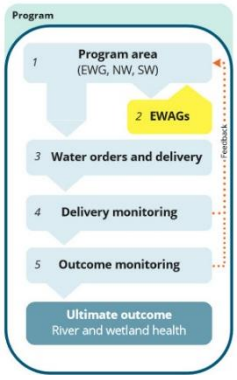
2. **Strengthen and formalise responsibility for local, event-based communications and local stakeholder engagement to EWAGs.** Improving community knowledge and understanding of local watering events can be achieved by empowering EWAGs to publish information about approved environmental watering actions. Supporting EWAGs with resourcing to educate their community and finalising the EWAG communication strategy will facilitate this.

3. **Meet stakeholder demand for more information by utilising more modes of communication where possible.** While traditional media formats (e.g. newspapers and radio) are still key modes of communicating in regional communities, harnessing the potential of social media (e.g. Twitter, Facebook, Instagram) and other modes of

community engagement (such as working with local schools) will magnify the program's impact in reaching the community and building long-term engagement.

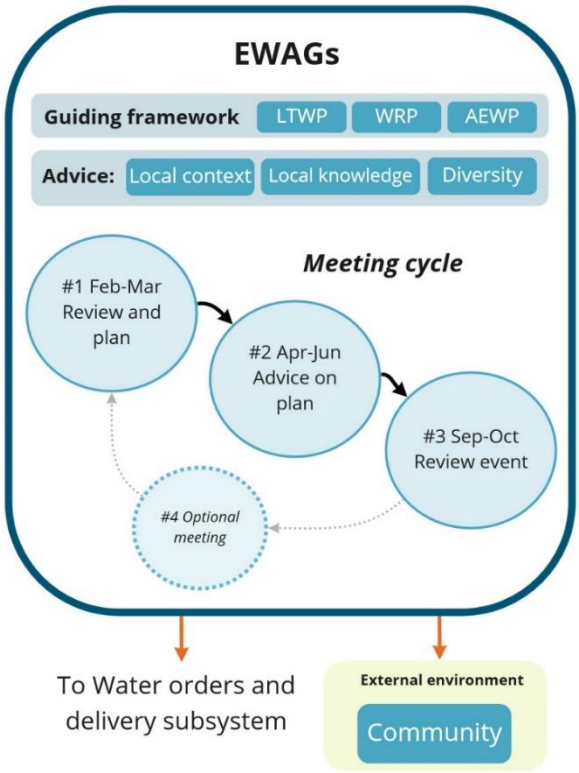
4. **Support staff to develop their capacity to continue the effective delivery of the EWMP.** To do this, the EWMP should:
    a. provide any necessary training to handle the technical, social and cultural demands of managing the program's assets; and
    b. foster peer-to-peer learning and mentoring within the program and DPIE EES.

3.2 SUBSYSTEM 2—ENVIRONMENTAL WATER ADVISORY GROUPS



Environmental Water Advisory Groups (EWAGs) are a fundamental component of the EWMP. The evaluation's survey and interview results indicated that they are held in high regard by stakeholders and are functional forums for two-way advice and consultation regarding environmental water.

FIGURE 4. EWAG SUBSYSTEM (2) DIAGRAM



3.2.1 FUNCTION OF EWAGS

The objective of the EWAG is to advise the Department on managing environmental water to maximise ecological benefit, while identifying risks and mitigating adverse impacts. Each EWAG will assimilate a range of knowledge and experience from communities and government agencies and strive to reach consensus when formulating advice. Advice may include scientific, technical, political, social and cultural considerations if they affect the ability of the Department and others to maximise the outcomes of managing environmental water.[23]

EWAGs deliver multiple functions in the governance of environmental water including acting as key conduits in the information flows. EWAGs act as:

- Recipients of information from DPIE EES water planners and managers
- Providers of advice to DPIE EES water planners and managers, especially regarding local issues and factors which may affect watering events
- Distributors of information about environmental watering events to their own networks. For example, some interviewees explained that, following an EWAG meeting, they will immediately speak with members of the communities they represent to communicate any key information arising from that meeting.
- Fact checkers for the community. EWAG members are typically respected in their communities, which is often related to their being independent of government and representing the interests of their communities. This enables EWAG members to counter misinformation they encounter in their communities.

[23] Environmental Water Advisory Group: Terms of Reference, Environment, Energy and Science, Department of Planning, Industry and Environment, 2019

- Synthesisers and communicators of program outcomes and research results.

EWAG Chairpersons could be further utilised by the program to communicate with members of the community. This evaluation identified that some EWAG members promptly distribute information to their networks after EWAG meetings. Clear guidance and training on how to disseminate information from EWAG meetings would enable the EWMP to share its desired messages more effectively among communities. This will allow the program to maximise its positive public perception, retain its social license to operate, and insulate itself against misinformation seeded by adversaries in the media.

It is important to recognise the differences between EWAGs; some are well-established, and others are still being established. Newer EWAGs could harness the experience of more mature EWAGs and incorporate their learnings into their governance, but only with an active facilitation role by the EWMP. Opportunities for cross-EWAG networking as a form of inter-regional learning are outlined in the following section.

The EWAG Executive Officer is typically a DPIE EES environmental water manager, who is also the main point of contact for all stakeholders associated with the EWAG. They arrange meetings, undertake meeting administration, coordinate all communication between members, reimburse members for expenses, and manage many other responsibilities (outlined in the EWAG Terms of Reference).

A Senior environmental water manager's duty as EWAG Executive Officer are included in their role description. The amount of time and effort required to act as an effective Executive Officer, however, is not reflected in the resourcing of this role, i.e. the time spent on their duties as an EWAG Executive Officer can compromise other important duties.

EWAGs are a complex cross-cultural forum bringing together people inculcated in government, farming, water, Aboriginal and environmental perspectives. These perspectives mean issues will be framed and understood differently by different members, depending on their background. Resourcing EWAGs to explore and enhance their abilities to communicate across these differences will be critical to their longer-term successes. Therefore, attention to enhancing the cross-cultural capabilities of EWAGs is critical. While this includes better cultural awareness and competency training, it should also extend to developing a broader understanding of the complex social, technical and political environment in which the members are working.

3.2.2 HARNESSING EXPERIENCE THROUGH REFLECTIVE PRACTICE

The evaluation found strong support for the EWAG model as it works to give effect to subsidiarity principles, enabling local understanding and involvement in strategic and operational decisions and acting to legitimise and give credibility to the EWMP. EWAGs enable adaptive and reflective practice in the following ways:

- Meeting times can change depending on when water is available; although some stakeholders felt this could be more flexible.
- EWAG Chairpersons meet annually to remain current, share processes, learn from each other and gain access to the Department's Environmental Water Governance team.

There is some EWAG documentation in place and the Lachlan Valley EWAG has recently revised the member appointment process as it appointed a new Chair (in 2020). Finalising and publishing these processes will improve the perception of EWAGs as strong advisory groups in the community.

The EWMP could actively facilitate cross-EWAG networking as a form of inter-regional learning, which may include:

- Sharing advice on community mobilisation techniques, such as field trips or engaging Aboriginal people on Country
- Reviewing effective mentoring and induction strategies
- Reviewing 'successful' communication from EWAG members. This may be useful in understanding 'what works' when combatting misinformation in the media or backlash in the community. For example, this might include letters to the editor to clarify facts in an article or discussion with members of the community on a social media page.

The EWAG Terms of Reference specify that a biennial self-evaluation of the EWAG will be conducted by the EWAG Chairperson. This 'reflection' process would allow EWAGs to draw out and share learning, potentially across the state. This idea was supported by all EWAG Chairs.

3.2.3 MEMBERSHIP AND ABORIGINAL REPRESENTATION

The EWAG Terms of Reference recommend a range of nominal stakeholder groups to be represented as EWAG members, including:

- Aboriginal people
- Commonwealth Environmental Water Office
- Non-government organisations: community
- Non-government organisations: riparian and wetland
- Non-government organisations: scientific
- NSW bulk water operator
- NSW Government – fisheries
- NSW Government – land management, primary production and healthy landscapes
- NSW Government – water planning, policy and management
- NSW Government – wetland ecology, environmental water manager
- Private wetland and floodplain land managers
- Public wetland and floodplain land managers
- Waterway operators, including irrigation entities and organisations who make a knowledge contribution to environmental watering.

Some of these categories may require more than one member to cover the required breadth of knowledge and/or spatial representation, particularly in gaining Aboriginal representation from all relevant Nations in a valley.

There is a difference between the roles of EWAG members and observers. Members contribute to the decision making at EWAG meetings, are paid sitting fees for their attendance and have travel, accommodation and meal expenses reimbursed. Observers are invited by the EWAG Chair to present information, respond to questions and/or contribute to discussions. The EWAG Terms of Reference does not provide guidelines for the provision of fees or expenses for observers who are invited to attend EWAG meetings. As noted by Aboriginal stakeholders during interviews, a lack of clarity around reimbursements can act as a barrier to observer participation. Developing a clear, consistent and readily available Basin-wide approach to paying and reimbursing Aboriginal members and observers will facilitate inclusion by formally recognising the significance of their contribution.

An assessment of community representativeness—for example, as part of a biennial self-evaluation—would benefit EWAGs in understanding whether all stakeholder groups are adequately represented. As part of this evaluation, EWAG executive officers collated lists of members and observers in their EWAGs. This list may be useful for future reference to confirm representativeness or to act as a survey contact list for annual self-evaluations.

In terms of community representativeness, nearly half (48%, n=38) of all survey respondents independently raised Aboriginal representation when asked, "*Are there any groups or 'interests' that you feel are not adequately represented in your EWAG?*" (Table 11)

This issue shaped our questioning in the next stage of the evaluation, later asking interviewees, "*How do you think EWAGs could better include the input of Aboriginal community representatives?*"

According to interviewees and survey respondents, Aboriginal representation at EWAGs has been and is improving—each EWAG should theoretically have one to two members representing Aboriginal people. More may be required depending on the location of watering events as it is important that local Aboriginal people are able to speak about their Nation and not others'.

TABLE 11. MENTIONS OF ABORIGINAL GROUPS NOT BEING REPRESENTED ON EWAGS

Valley (responses to question)	n	% of valley responses
Gwydir (n=6)	2	33%
Macquarie (n=15)	7	47%
Lachlan (n=6)	2	33%
Murrumbidgee (n=16)	9	56%
Murray-Lower Darling (n=17)	10	59%
Valley not applicable (n=19)	8	42%
Across all valleys (n=79)	**38**	**48%**

Source: EWMP Stakeholder Survey 2020.

AMPLIFYING THE VOICE OF ABORIGINAL PEOPLE

A main concern was that not all Nations in a catchment area are represented on the EWAG; one or two Aboriginal representatives cannot speak on behalf of all Nations. Some Aboriginal landholders mentioned that government agencies tend to have their own 'go-to' members in the Aboriginal community. Respondents felt that the lack of representation from all Nations on the EWAGs weakened the Aboriginal engagement efforts.

Some Aboriginal stakeholders were also concerned that representatives of a Nation had to have the cultural authority and community support to be able to properly speak on behalf of their Nation. They suggested that applications by Aboriginal community members to join the EWAG require a cosignatory from another member of their community as a show of community support. In the Murray-Lower Darling catchment, the Murray Lower Darling Rivers Indigenous Nations group (MLDRIN) has been a long-standing member of the EWAG. MLDRIN was described by the Aboriginal stakeholders we interviewed as a single point of contact; a 'one-stop shop' through which government agencies can connect to Aboriginal Nations directly. Nations delegate their own representatives to MLDRIN and Aboriginal people see the group as trustworthy.

This appears to be a promising partnership model to help ensure the voices of each Nation in a valley contribute to the planning and delivery of environmental water. Nations could convene through MLDRIN to discuss environmental water and prepare a response that includes the concerns of all relevant Nations, with a MLDRIN representative delivering this response at the EWAG meetings as an observer or paid member. Aboriginal stakeholders

also indicated that EWAG meetings should always include representatives from the Aboriginal Nation on which an EWAG meeting is held.

There is a need for greater training of other potential Aboriginal leaders in the environmental watering space. It also suggests that EWAGs might not work for Aboriginal people and are not necessarily culturally safe. Asking Aboriginal people what they want from EWAGs and the EWMP overall might prove useful and a commitment to this is recommended.

Despite a strong desire among Aboriginal people to have their voices heard, stakeholders felt they needed a deeper understanding of the science and legislation around environmental water to enable them to feel empowered to participate fully in EWAG meetings. It is important that all participants are able to contribute to discussions on environmental water; however, it is just as important that water managers hear and respond to Aboriginal knowledge as it is to increase Aboriginal people's involvement in the program. It is important that everyone understands the science, policy, planning and legislation of environmental water; however, it is just as important for DPIE EES to think critically and strategically about how these concepts are communicated to laypeople and to better respect the knowledge that Aboriginal people have about waterways on their Country.

There is need to ensure EWAGs and officials gain a deeper understanding and respect for Aboriginal water perspectives, to recognise that water has and remains central to many aspects of spirituality, sociality and material existence. There is a strong desire among Aboriginal people to be involved in water management so that their expertise is reflected in water management decisions.

We have identified some promising strategies to increase the technical understanding of Aboriginal EWAG members and observers as well as the cultural competency of non-Aboriginal EWAG members, which include:

- A briefing session for Aboriginal EWAG members and observers on the environmental water legislature, particularly the Water Sharing Plans, and on the hydrology of the relevant valley(s)
- A dedicated two-way mentoring program in which Aboriginal EWAG members mentor a DPIE EES staff member and vice versa for their first year on the EWAG
- Providing cultural competency training sessions for DPIE EES staff and/or non-Aboriginal EWAG members.

In the EWAG Terms of Reference, there is a role outlined for a mentor who assists other members with induction and succession planning, helps new members integrate into the group, reduces feelings of alienation, and improves overall participation.

One stakeholder we interviewed mentioned the ongoing engagement required to build trusting relationships with a Nation. The EWMP wishes to engage Aboriginal people effectively and appropriately, but this is not yet reflected in policy and resourcing.

Instating a dedicated two-way mentoring program will help build mutually beneficial and lasting relationships where DPIE EES and Aboriginal people can learn from each other.

ON THE GROUND ENGAGEMENT

Direct, in-person engagement with Aboriginal people was flagged as being more effective than merely inviting Aboriginal people to participate in EWAG meetings. Meeting with communities on Country could help build trust between DPIE and the community, which may, in turn, enable Aboriginal people to attend subsequent meetings.

Aboriginal people in some parts of Australia have designed and conducted community-centred consultations, inviting water planners, managers or government representatives to come onto Country and hear from the community directly about how waterways are changing and their aspirations for how they would like to see the water managed. The formation of formal regional or valley-based alliances like MLDRIN or NBAN provides one opportunity. Another could be gained through establishing forums for Aboriginal people to discuss and develop their joint positions on what they want to occur with respect to water and culture, as has occurred with the Martuwarra Fitzroy River Council (MFRC) in the Kimberley. Regardless of the form these processes take, it is important to recognise that current water legislation and administration has processes that embed alienation.[24]

The EWAGs offer an important linkage mechanism to enable greater Aboriginal involvement in river operations. Resourcing is required. Several opportunities for improvement were identified in the evaluation consultation including:

- Providing sitting fees and travel reimbursement for Aboriginal representatives
- Resourcing Aboriginal representatives to consult with Aboriginal people along the length of the valley
- Providing opportunities for cultural celebration of waterways, especially in conjunction with e-water events
- Supporting cultural engagement events on Country.

Cultural watering for communities

Cultural flows are the delivery of water to communities for cultural reasons. The Aboriginal Water Initiative Program[25], which aimed to increase Aboriginal participation and representation in all areas of water management[26], was launched in 2012 and was completed in 2016. In the Murrumbidgee Valley, only 2,000 megalitres of water are assigned for cultural flows each year.

One stakeholder from the Macquarie recounted an event whereby water for the environment was channelled through a culturally significant site, supporting an Aboriginal women's gathering. It was an excellent example of specific cultural and environmental benefits from the same managed flow.

Delivering environmental water in a way that also achieves cultural outcomes will help build the relationship between DPIE EES and Aboriginal people across the Basin.

Stakeholders also explained that EWAG meeting locations vary. In the Murrumbidgee Valley, water managers from DPIE EES invite a key representative or elder from the Nation where the

[24] Hartwig, L. D., Jackson, S., & Osborne, N. (2018). Recognition of Barkandji water rights in Australian settler-colonial water regimes. *Resources*, *7*(1), 16.
[25] http://www.water.nsw.gov.au/__data/assets/pdf_file/0007/548278/plans_aboriginal_water_brochure.pdf
[26] https://healthinfonet.ecu.edu.au/key-resources/programs-and-projects/?id=2356

meeting takes place to give a Welcome to Country and they are remunerated. This supports the attendance of at least one Aboriginal community member and builds non-Aboriginal EWAG members' cultural competency through an increased understanding of the traditional owners of the land on which they are gathering.

The decision to change the locations of EWAG meetings was made as an effort to help overcome the travel barrier for all who attend EWAG meetings—some need to travel a long way to attend just one meeting. Some EWAGs pay sitting fees and cover travel expenses for their members/ attendees. However, this varies across EWAGs and depends on whether EWAGs are formalised through the valley's WSP. In an effort to maximise the engagement of Aboriginal community representatives, it may be most appropriate to uniformly pay all members' or attendees' sitting fees and travel expenses. Holding meetings on or near Country may improve Aboriginal community representation and engagement at EWAG meetings.

BARRIERS AND ENABLERS

The key barriers and enablers to increasing Aboriginal membership, attendance and input at EWAGs are summarised in Table 12 below. Formally implementing these enablers would help improve relationships between DPIE EES and Aboriginal people.

Some of the barriers to increasing Aboriginal membership, attendance and input at EWAGs are physical or financial and can be remedied by providing sitting fees and reimbursing travel costs or providing travel to and from EWAG meetings. A lack of trust in governments may keep some Aboriginal stakeholders from wanting to engage with DPIE EES but could be improved, in part, through building personal relationships and integrating Aboriginal knowledge into environmental water management.

Aboriginal people and environmental water managers have many objectives in common—to maintain or improve freshwater ecosystems. Ideally, the EWMP provides opportunities to restore the rich human and cultural relationships to these systems while improving the biophysical condition of the rivers.

This alignment of values needs to be made with Aboriginal people. If the EWMP continues to build the support of the Aboriginal community, it may enable the emergence of strong champions for river health. Any relationship the EWMP has with Aboriginal people should be genuine and mutually beneficial.

TABLE 12. BARRIERS AND ENABLERS TO INCREASING ABORIGINAL MEMBERSHIP, ATTENDANCE AND INPUT IN EWAGS

Increasing Aboriginal membership, attendance and input in EWAGs	
Enablers	**Barriers**
Recognition of the value of Aboriginal knowledge and provision of sitting fees for all Aboriginal community members at EWAG meetings	Exclusion of Aboriginal knowledge in environmental water managements
Inviting local elders to deliver a (paid) Welcome to Country	Need to travel, distance of travel and related costs
Engaging with Aboriginal people on Country and on the river	Lack of trust in government agencies
Deliver environmental flows, for cultural benefits (e.g. women's group on Macquarie Marshes) as well as environmental outcomes	Use of language that is not easily understood by persons without technical or bureaucratic experience

3.2.4 RECOMMENDATIONS FOR IMPROVING EWAGS

5. **Enhance capacity, transparency and mechanisms for continuous improvement within EWAGS.** This includes, but is not limited to, formalising procedures and documentation related to:
    a. the Chair/ member appointment or renewal process;
    b. uniform sitting fees and travel expenses;
    c. induction and training packages providing hydrological and ecological information related to river management; and
    d. best practice guides, mentoring or opportunities for networking to facilitate emerging EWAGs to learn from established EWAGs;
    e. an annual or biennial conference of EWAGs, which would allow members and stakeholders to share learning across regions and capitalise on the most effective EWAG systems and processes.

6. **Include Aboriginal knowledge by introducing initiatives to increase Aboriginal representation in the program.** Increasing Aboriginal representation on EWAGs involves removing barriers to entry and enabling engagement. Strategies include:
    a. Meeting on Country
    b. Inviting and remunerating local Aboriginal Elders or representatives to provide a Welcome to Country
    c. Inviting members of the Aboriginal Nation on whose lands the meeting is being held. This is especially important if regular Aboriginal EWAG members do not have the authority to speak about the land on which the meeting is taking place.
    d. Aspiring to employ at least one Aboriginal DPIE EES staff member in each river valley. These staff would hold workshops with communities across each valley and work within DPIE EES to build the cultural literacy of staff.

e. Developing strong partnerships between EWAGs and the traditional owners of the river valley. This can be facilitated through groups such as MLDRIN and NBAN or directly through Nation groups not represented by these collectives such as the Barkandji. This will enhance the representation of all Nations who live in an EWAG's valley.
f. Engaging dedicated Aboriginal mentors to provide EWAGs with cultural literacy training. Each EWAG should have one cultural literacy event per year.
g. Provide leadership, ecological and hydrological training for future Aboriginal water leaders, such as hiring and training Aboriginal community members for monitoring activities.
h. Delivering environmental water in ways that also benefit Aboriginal people.

3.3 SUBSYSTEM 3—WATER ORDERS AND DELIVERY

This subsystem includes the water ordering and delivery processes. As shown in the subsystem diagram on the right, the subsystem involves DPIE EES water managers planning and making water orders through to delivery of the order by river operators, usually WaterNSW. WaterNSW is a state-owned corporation responsible for operating the state's river systems.[27]

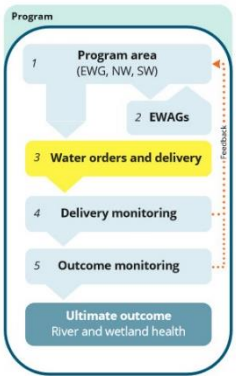
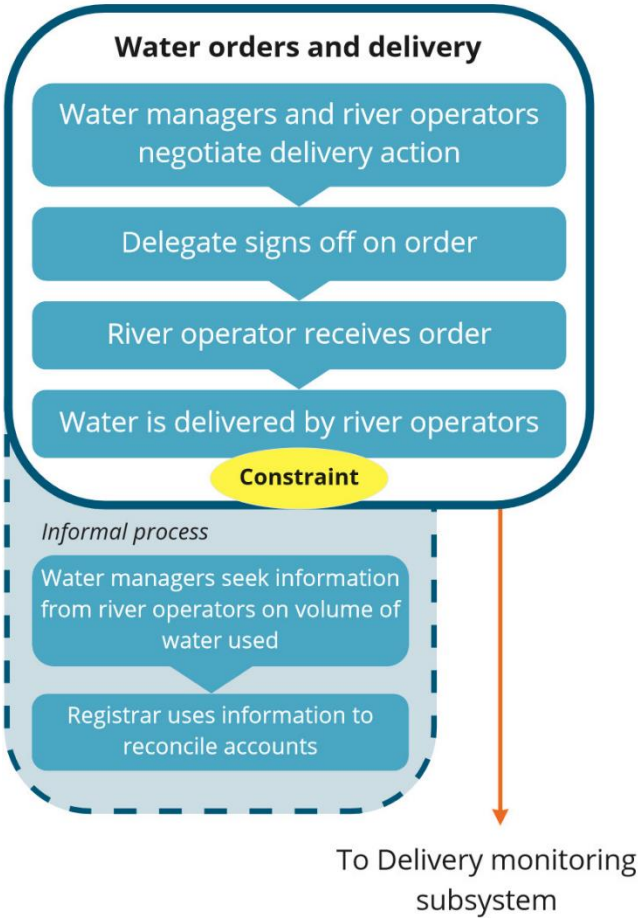


FIGURE 5. WATER ORDERS AND DELIVERY SUBSYSTEM (3) DIAGRAM

The water ordering and delivery subsystem is the crucial processes by which water plans are enacted and water is delivered to its intended locations. Stakeholders identified the need to improve the systems used for the delivery of environmental water by river operators, including improving systems for water accounting and solving issues regarding conveyance water and loss calculations.

This section summarises why the ordering, delivery and accounting for water used is an underpinning system enabler for environmental water management. It identifies several areas for improvement and proposes recommendations to enhance the efficiency of this subsystem and, in turn, the effectiveness of the EWMP overall.



3.3.1 RIVER OPERATIONS

The EWMP depends on the river operators delivering environmental water to its intended location. Without systems and processes that ensure the execution of water orders by river operators, environmental water cannot be delivered. The EWMP also depends on timely and accurate reports on these operations.

The evaluation identified several issues with the delivery of environmental water. The interviews and stakeholder surveys indicated that the nature of the working partnership between DPIE EES and WaterNSW varied across valleys, with historical experience and personal relationships being influential in how this critical relationship works (see Section 4.2 below for detail). Broadly, EWAGs and environmental water managers in the North West

[27] https://www.industry.nsw.gov.au/water/environmental-water-hub/water-for-the-environment

region were more satisfied with how WaterNSW executed DPIE EES orders than water managers in the South West region. The level of environmental water managers' satisfaction is tied to several key issues:

- Equitable treatment of agricultural and environmental water orders
- Timely and accurate execution of orders
- Use of fair and reasonable calculations for conveyance losses
- Fair interpretation of WSPs
- Credible systems for accurate and timely reporting
- Collegiate working relationships.

3.3.2 IMPROVING ORDERING AND DELIVERY SYSTEMS

The EWMP is WaterNSW's biggest customer. The evaluation identified many opportunities to establish better systems of working together on river management. For example, the evaluation team was made aware of the following issues:

- The EWMP sometimes relies on email chains with river operators to detail the specifications of water orders, rather than these details being captured in a centralised system. This should be remedied by e-flo.
- Water order forms do not always allow for sufficient detail on order specifications, such as flow regime or rate of recession, to be specified.
- System capacity can limit the ability of river operators to deliver environmental water as specified by water managers.
- Delays in the reporting chain can limit the ability of system operators and water managers to manage watering events based on how the system is responding.

The current system relies on the good relations with river operators and effective communication. There is a need for improved systems with dispute resolution mechanisms as there does not seem to be a clear path for complaints about incorrect delivery or execution of water orders.

The rules, protocols and accepted practices of river operations are not codified in NSW, except in the Murray-Lower Darling. River operations are very subjective and rely heavily on the professional judgement of the river operators, who juggle multiple objectives and demands at any one time.

The environmental water manager relies on the river operator to make releases, quantify those releases, and advise on volumes delivered to sites. There are limitations on the environmental water managers' abilities to scrutinise or verify those numbers. There is no

Photography: Lake Windamere offtake tower. 27 August 2020 (Jasper Odgers, ARTD).

independent arbiter of those numbers. There is no process for dispute resolution between the river operator and the environmental water manager should there be disagreement about these numbers.

Estimating, in real-time, the volume of environmental water released during unregulated flows requires comparison of 'with environmental water' and 'without environmental water' scenarios. The 'without environmental water' scenario requires many assumptions and estimates and it can be very difficult to quantify the environmental release. This is made more difficult when multiple environmental watering actions are combined across a river system.

Agreed protocols and transparent processes are required for the reporting on and estimation of environmental releases. These processes should include:

- The estimation methods use
- Disclosure of assumptions used
- Who has the role and responsibility of estimating environmental releases
- Agreed timeframes for advising environmental managers of the estimated environmental releases
- How to address any subsequent adjustments to the estimation
- How any disputes will be resolved
- Decision criteria to determine other parts of the hydrograph, such as pre-releases or unregulated flows
- The arrangements for transparently disclosing the estimation of environmental releases.

3.3.3 TREATMENT OF HEW

The evaluation identified the need to improve accountability and transparency for how HEW is used, assessed and reported on. The evaluation identified several issues that impact on the program's efficiency.

There are strong working relationships between individuals across all valleys, however the evaluation identified a number of issues (technical, procedural, operational and accountability) in relation to the delivery of environmental water orders.

Some stakeholders suggested that it appears environmental water orders are treated differently than orders from consumptive users, particularly in the Murrumbidgee and Murray-Lower Darling valleys. It is important to note that the evaluation can report evidence of what stakeholders reported, but it was beyond the scope of the evaluation to attempt to verify these claims. This commentary should be interpreted as what stakeholders felt, rather than what may necessarily be the case. Examples of stakeholder perceptions of differential treatment include:

- Water for the environment is assigned a lower priority and water orders for environmental water will be executed after orders for consumptive use.
- WaterNSW prefers not to deliver overbank flows for environmental water orders but has delivered overbank flows for consumptive orders.

- Environmental water holders may be charged up to 20% for transmission losses on their water orders, whereas consumptive users may not be charged for losses at all.
- Notice of maintenance requirements is not timely and may interrupt planned watering events at times of key ecological need (e.g. spring). This can result in wetland assets being stranded and unable to be watered.

Stakeholders flagged that river operators cannot deliver water to locations where gauges are faulty—it is a legal requirement of their operations that they must be able to gauge water that they deliver. DPIE EES should work in partnership with WaterNSW to amend their policy and maintenance scheduling to be able to deliver environmental water at particularly critical moments.

Some stakeholders mentioned that the system is simply not (physically) designed appropriately to service what environmental watering is trying to achieve. It is designed to deliver water for irrigation purposes, not to inundate wetlands. Some stakeholders suggested that 'in an ideal world' DPIE EES might buy some of its own pumps to distribute water to key holdings or that the system might be redesigned to more appropriately deliver water for the environment.

3.3.4 CONVEYANCE WATER

Each valley has water allocated for use in conveyance when delivering water. Conveyance water is like the 'train tracks' needed to get water down a river system. This conveyance water is socialised across all water holders and taken out of the collective pool before water is allocated to individual water licences.

This system has evolved and worked well for irrigation water management, where extractions are taken out of the system and (mostly) not returned. HEW is intended to be used within and throughout rivers and wetlands, often flowing on to multiple sites, rather than as an extraction from the river at a given location. This means more water is used within rivers and wetlands, thereby increasing conveyance (losses) compared to water used in deliveries for irrigation. In one sense, these losses are the water used by wetland and floodplain ecosystems for their biological production.

HEW accounts should be debited for water used in wetlands but it is questionable whether HEW should incur any additional conveyance losses over those already budgeted for in the system. There are concerns, however, that too much conveyance water is charged against HEW. If this occurs, HEW entitlements are subsidising consumptive uses by way of the excessive conveyance water charges. One stakeholder identified that there may be instances

Photography: Irrigation infrastructure in the Macquarie Valley. 25 August 2020 (Jasper Odgers, ARTD).

where different rates are charged for conveyance water. While the evaluation is not a technical review of conveyance water calculation methods, the rigour and credibility of these kinds of technical procedures has a bearing on the entire water management system, of which EWMP is one part.

3.3.5 PARTNERSHIPS WITH WATERNSW AND MDBA

A strong partnership with WaterNSW and clear statutory requirements that codify the responsibility of WaterNSW to deliver environmental water are integral to the success of the EWMP.

WaterNSW is the river operator in all valleys evaluated, except the River Murray where the MDBA plays a lead role in coordinating and managing the Murray & Lower Darling. Environmental water is coordinated through a MDBA committee (Southern Connected Basin Environmental Water Committee). Membership includes MDBA policy, MDBA river ops, state river operators (GMW, SA Water, WaterNSW) and environmental water holders (CEWH, TLM, EES, VEWH).

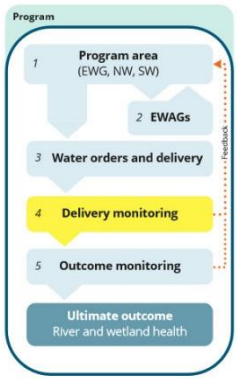
The water resources management system was developed for consumptive uses of water and remains the primary objective for WaterNSW.[30] Reforming it to deliver environmental water back to ecosystems is a slowly evolving process and requires good governance, transparency and accountability.

3.3.6 RECOMMENDATIONS FOR IMPROVING WATER DELIVERY

7. **Strengthen governance mechanisms and review operational effectiveness of the DPIE EES/ WaterNSW partnership.** Formalising a complaint and dispute resolution protocol (other than the Customer Advisory Group) is key to strengthening this partnership.

[30] https://www.waternsw.com.au/about/legislation/water-nsw-act-2014

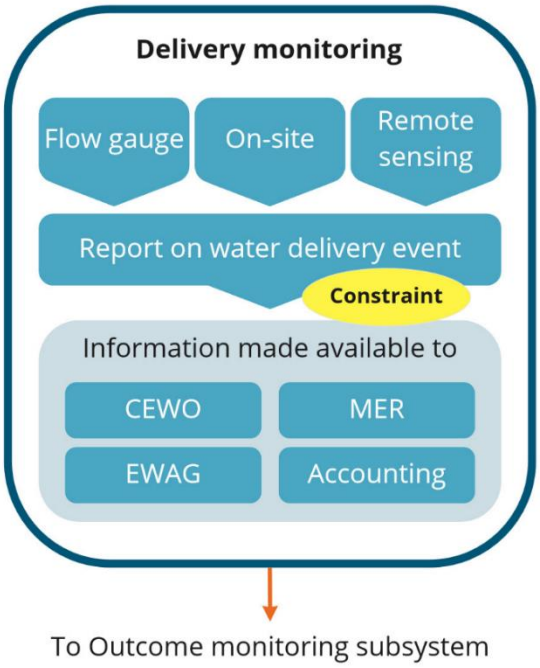
3.4 SUBSYSTEM 4—DELIVERY MONITORING



This subsystem is concerned with the monitoring of water as it is delivered to its intended location by WaterNSW river operators. This subsystem is monitored in the interest of understanding whether the order was successful, as well as ensuring the correct allocation of charges to customers' accounts.

FIGURE 6. DELIVERY MONITORING SUBSYSTEM (4) DIAGRAM

3.4.1 QUANTIFYING ENVIRONMENTAL WATER RELEASES



The current system relies on DPIE EES having good relations with WaterNSW river operators.

The rules, protocols and accepted practices of river operations are not codified in NSW, except in the Murray. River operations are subjective and rely heavily on the discretion and professional judgement of the river operators.

The EMWP relies on river operators to make releases, quantify those releases, and advise on volumes delivered to sites. There is little opportunity or ability for water managers to scrutinise or verify those numbers. There is no independent arbiter of the numbers. There is no formal process for dispute resolution between the river operator and the environmental water manager should there be a disagreement.

Estimating, in real-time, the volume of environmental water released during unregulated flows requires comparison of 'with environmental water' and 'without environmental water' scenarios. The 'without environmental water' scenario requires many assumptions and estimates, and it can be difficult to quantify the environmental release. This is made more difficult when multiple environmental watering actions are combined across a river system.

There is a need for a transparent process for the estimation of environmental releases. This process should include:

- the estimation method
- disclosure of assumptions used
- clarification of roles and responsibility for estimating environmental releases
- the timeframes for advising environmental managers of the estimated environmental releases
- how to address any subsequent adjustments to the estimation

- how any disputes will be resolved
- decision criteria to determine other parts of the hydrograph, such as pre-releases or unregulated flows
- transparent arrangements for disclosure of the estimation of environmental releases.

3.4.2 REPORTING ENVIRONMENTAL DELIVERIES

The EWMP needs more timely information on operational aspects of flow management. The speed and accuracy of reporting is necessary for accountability and management. The time taken to receive updates on water used is long and causes issues for water event planning and management.

This information is needed immediately, so that water in environmental accounts can be 'freed up' to be used (or saved from use) in other valley events. Information technology solutions can help. With the introduction of the e-flo database, there is a great opportunity to develop a 'one-stop shop' for event data which represents the single point of truth.

As a relational database, e-flo should have the capability to deliver this functionality. A review of the environmental flow system, conducted after it has been in place for 12 months, should assess whether its capabilities are being fully utilised; whether water managers find it easier to place orders and whether staff find it easier to retrieve data to answer research and management questions.

3.4.3 RECOMMENDATIONS FOR IMPROVING DELIVERY MONITORING

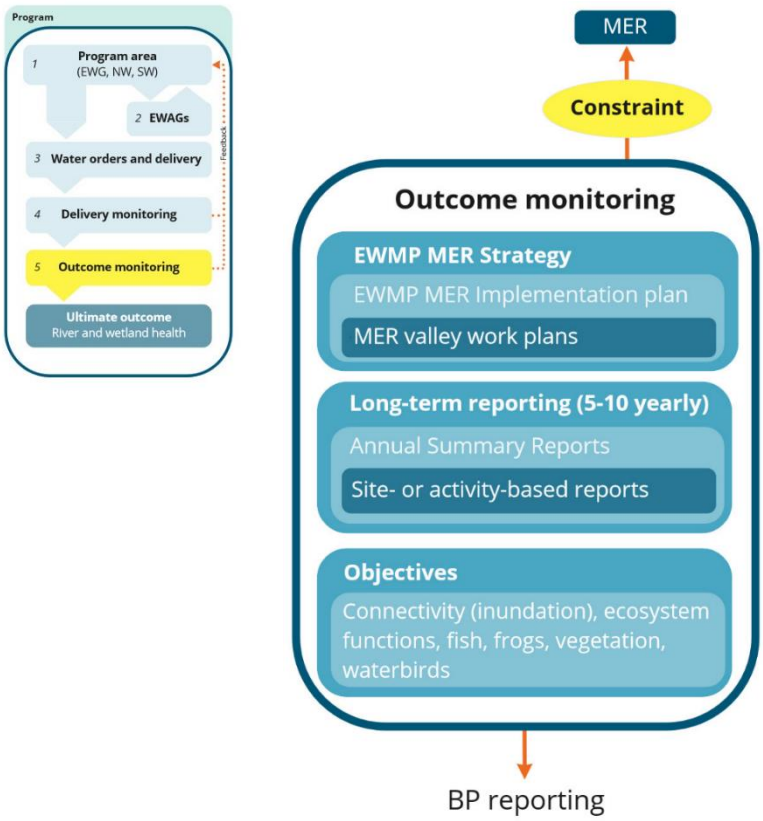
8. **Work with WaterNSW to streamline water delivery reporting and accounting timelines**. Adequate delivery of environmental water by WaterNSW is integral to program success.

3.5 SUBSYSTEM 5—OUTCOMES MONITORING, EVALUATION AND REPORTING (MER)

The fifth subsystem of the EWMP relates to the monitoring, evaluation and reporting of ecological outcomes.

Monitoring, evaluation and reporting (MER) is recognised as a critical component of an adaptively managed system and is, therefore, a key element of the EWMP program. MER works to generate and communicate information that links plans (strategy), management, performance and accountability. MER has multiple functions including providing the feedback needed for a 'learning system' and generating reliable outcomes reports to provide accountability in the performance of public assets and the progress in achieving agreed public policy goals.

FIGURE 7. OUTCOMES MONITORING SUBSYSTEM (5) DIAGRAM



3.5.1 MONITORING OF OUTCOMES

The EWMP's MER component is two-fold:

- **Event-based monitoring** focuses on water use (the amounts of water ordered and delivered to the targeted location, its timing and duration) and the immediate environmental outcomes of the event such as inundation extent, wetland vegetation growth, presence of wetland dependent fauna. Event-based monitoring should test

whether water was delivered as outlined in Water Event Plans (previously Form As). Event-based monitoring outcomes should allow water managers to adapt future watering events to enable the best possible outcomes.

- **Long-term monitoring:** focuses on the monitoring of ecological and environmental data in a designed way over time and flow regimes to determine the progress made by the EWMP in restoring or maintaining the health of wetlands and rivers in NSW through objectives outlined in each LTWP. Long-term monitoring can also contribute to the testing of the program's assumptions about the environmental water requirements (EWRs). Event-based monitoring contributes to the long-term monitoring datasets.

MER for the EWMP needs to use monitoring data to evaluate environmental outcomes at the site (wetlands), valley, and state scales. These results should inform management decisions and reporting appropriate to all of these scales. Many stakeholders expressed views that the program's MER components are not adequate for the scale of the ecological and policy challenges. The program's MER component was also described by some stakeholders as short term, piecemeal and disjointed. As a result, there was the view that the program's MER component does not contribute as effectively to the overarching policy goals and program strategy as it needs to. Therefore, there appear to be substantial opportunities for improvement.

However, the development of and contribution to the LTWPs by EWMP staff appears to be a substantial benefit to the program. LTWPs contain ecological objectives and targets for native fish, native vegetation, waterbirds, ecological function and other species (namely flow-dependent frogs). The EWMP's MER Valley Work Plans contain management questions that relate directly to LTWP objectives, deftly bridging science and monitoring data with day-to-day management and larger strategic decision-making. Reporting against these management questions is set to commence in the coming years.

Based on interviews with internal and external stakeholders and the document review, the MER components of the EWMP differ in their method development, spatial coverage, and temporal archive:

- **Inundation mapping** via satellite remote sensing is co-ordinated and carried out by dedicated DPIE EES MER science staff to quantify inundation extent in the vegetation communities of most (not all) of the large floodplain wetlands that receive environmental water (Gwydir wetlands, Macquarie Marshes, Lower Lachlan, Lowbidgee and Millewa Swamp Forest) on an annual basis. For some locations (Macquarie Marshes, Gwydir, Lower Lachlan and Lowbidgee) the satellite archive has been processed to provide quantified measures of inundation regimes (e.g. inundation frequency) across the floodplain. Inundation mapping is a key feature of event-based monitoring.
- **Waterbird** monitoring via ground surveys is co-ordinated and carried out by dedicated DPIE EES MER staff with additional support provided by environmental water managers, NPWS staff and field naturalist groups to collect the bulk of the ground data. It has a well-established method and is comprehensive in that it covers important wetland assets in many valleys and is systematically carried out every year (or biannually in some locations). In some valleys this survey work is done in collaborative partnerships with research providers funded by the CEWO Eflow-MER program (formerly LTIM). UNSW lead aerial waterbird surveys and reproductive success monitoring only.

- **Fish** monitoring is managed primarily by DPI Fisheries, whose objectives align well with those of the EWMP. Many stakeholders praised DPI Fisheries' approach to MER, particularly in developing robust conceptual models that inform practical and applicable research questions.
- **Vegetation** monitoring via ground surveys is primarily outsourced to consultants and universities. Monitoring techniques are still in development and the coverage and temporal archive of MER activities varies significantly between valleys.
- **Ecological function** monitoring focuses mostly on the provision of vital habitat, quality instream habitat, water quality, movement and dispersal opportunities, instream and floodplain productivity, groundwater-dependant ecosystems, sediment and nutrient exchange, and inter-catchment flow contributions. Many water actions aim at increasing lateral connectivity as an indicator for movement and dispersal opportunities. Historical inundation mapping, as well as measuring the duration and timing of flows, act as proxies and contributes to the EWMPs monitoring and understanding of ecological functions. Assessing water quality and sediment/ nutrient exchange is not as well developed as other measures of ecological function.
- Monitoring of **other species** mainly covers flow-dependent frogs and is a well-established component in most (but not all) of the valleys, with many water actions delivered specifically to preserve refuge habitat for flow-dependent frogs. While frogs do not fall under one of the four pillars of the MDBA Basin-Wide Environmental Watering Strategy, objectives for frogs are spelled out in the Long-Term Watering Plans under Other Species. Frog monitoring methodologies are largely similar across the valleys, although the amount of historical frog data between valleys differs.

The evaluation identified several challenges for the EWMP's MER component:

- Reliance on project-based funding and insufficient resourcing to accommodate the requirements for event-based and long-term monitoring across all valleys with existing environmental water deliveries plus valleys with emerging environmental water management activities.
- Insufficient use of conceptual models that underpin objectives
- The need for a strategic, whole-of-program approach to MER
- A lack of clear responsibility for some MER activities.

3.5.1 REPORTING ON OUTCOMES

The EWMP produces two types of annual reports—an internal reporting document[31] (or Summary Report) and a series of public webpages[32]—which communicate the program's water usage, annual activities and outcomes. The latest (2018-19) report indicates that the program responded to prevailing dry conditions and low water availability by supplementing rainfall events to provide opportunities for native fish and waterbirds to feed and breed, plants to grow and set seed, and floodplains to release essential nutrients into the food chain.

While the Summary Reports occasionally compare current year outcomes to historic data (2+ years prior), they focus on comparing current year outcomes to previous year outcomes. Throughout the reports, there are some evaluative statements (particularly in the Summary section and Synthesis section); however, more frequent use of outcomes statements would make the outcomes of the program clearer to readers.

The sections on waterbird monitoring outcomes are generally better at exploring ecological outcomes over time and relating waterbird outcomes to inundation patterns than other sections. This is likely because they are well-established monitoring programs

The Synthesis sections of the Summary Reports summarise the ecological outcomes resulting from environmental water delivery and outline the limitations to the EWMP's MER program. In this section of the Summary Reports for each year, it is highlighted that the EWMP is limited by the resourcing to effectively monitor the effects of all of their watering events and, as such, takes a strategic approach to monitoring. This section is integral in convincing the reader of the value of environmental water in maintaining and restoring wetland habitats and, essentially, appealing for more resourcing.

Should the EWMP wish to appeal for increased resourcing, this message—a message shared by nearly all stakeholders we interviewed—needs to be brought to the forefront and delivered in a way that endures in the mind of the reader.

The Summary Reports are starting to highlight key actions, objectives and outcomes in their Outcomes Snapshot section and in the Summary of Water Actions tables in each valley's outcomes section (Chapters 3, 4, 5, 6, and 7). The Outcomes Snapshot infographic could be modernised and made much clearer. Each valley has its own chapter in the Summary Reports, which outlines the monitoring outcomes for that valley, and each chapter begins with a Summary of Water Actions table. These tables outline the objectives and primary

Photography: Wetland plants on the Macquarie Marshes. 26 August 2020 (Jasper Odgers, ARTD).

[31] As provided to ARTD, titled *Monitoring outcomes of environmental water in NSW: Summary report*

[32] Current year reporting retrieved from https://www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/water-for-environment-outcomes-2018-19

(ecological) objectives, the timing and the total volume of water delivered for each water action that took place in that valley in the year. To strengthen the message that environmental watering is crucial for maintaining and restoring wetland ecosystems, two columns could be added to the Summary of Water Actions tables including:

- a checklist of ecological objectives from the LTWPs (e.g. NF1, NV3) and whether they were met
- the data sources used and an assessment of the degree of certainty that ecological and hydrological outcomes were a result of the hydrological regime.

In summary it is recommended that there be a review of reporting requirements for the EMWP's MER component.

DATA AVAILABLE TO STAKEHOLDERS

Overall, the quality of data available to help stakeholders understand whether the program 'is doing what it's meant to' was rated highly, with a median score of 73.[33] Higher ratings on this question were associated with feeling heard, suggesting that 'feeling heard' may be related to the amount of information available to the stakeholders or their knowledge of program activity. Interestingly, and consistent with what we heard about the importance of MER, patterns in the survey suggest that overall satisfaction is slightly more highly correlated with being able to obtain quality data (correlation coefficient r= .374) than it is with being heard (correlation coefficient r= .299).

Most respondents (64%) also had at least one suggestion for additional data they would like to see (see Table 13 below). These suggestions ranged over a broad array of topics, reflecting the challenges and inherent complexity of factors affecting the value of the EWMP.

Three topics were raised most frequently and together accounted for almost half of all the comments made (16% each). These included more data generated from monitoring of changing ecological conditions; more timely and real time data; and modelling to inform management decisions linked to LTWP and BP objectives, including the costs and benefits of environmental watering. Other comments were linked to the interest of communities in learning more about the program and how education about its activities would increase positive perception of water for the environment. A number of comments did not relate to specific outcomes but referenced the earlier issue requiring a greater quantum and certainty of resources to build on the monitoring and evaluation already in place.

[33] Score out of 100 on a scale where 0 is poor quality and 100 is high quality.

TABLE 13. STAKEHOLDER COMMENTS ON ADDITIONAL DATA

Comment	n	%
Ecological conditions	19	16%
Timeliness and accessibility of data	19	16%
Modelling to inform mgmt. decisions linked to LTWP, BP objectives	18	16%
Event-based measurement of outcomes	15	13%
Public communication	13	11%
Coverage of more locations	9	8%
Water flows and extraction	7	6%
Cultural outcomes	7	6%
Inundation mapping	5	4%
Water quality and dissolved oxygen	4	3%
Total codes	**116**	**100%**

Source: ARTD stakeholder survey.

3.5.2 REALIGNING THE EWMP MER STRATEGY

It is timely to revisit the EWMP's MER program and revise the strategy to include the LTWP objectives, given these have been recently completed. There is a need for the EWMP's MER component to realign with the monitoring of LTWP implementation. The management questions contained in the EWMP's Valley Work Plans are aligned with the LTWPs' ecological objectives because they were developed after the LTWP planning process but need to be replicated in strategic monitoring activities and reporting[34]. Revising the program's MER component will require dedicated and centralised direction, coordination and management, including in conjunction with CEWO and the scientific research community.

The development of a revised MER strategy is recommended. The continued input of, and involvement from, EWMP water managers will ensure the strategy includes practical questions focused on water management. A revised MER strategy requires a revised program logic, investment into updating underlying conceptual models and an updated alignment between science and management.

Many stakeholders praised DPI Fisheries' approach to MER due to the robust, evidence-informed conceptual models that underly their MER programs, their relative autonomy over their resources and projects and their strong marriage between science and management. One stakeholder highlighted that DPI Fisheries is a well-established agency with a well-resourced research and monitoring program, and they work with species with high recreational and commercial interest. A direct comparison between DPI Fisheries and the EWMP may not be appropriate. More helpful lessons to be learned from DPI Fisheries may

[34] Note: as we understand it, reporting against management questions (and therefore LTWP ecological objectives) will commence in the coming years.

be around how to harness special interest (fish, bird and frog) groups as advocates and how to communicate complex scientific findings and conceptual models to wider audiences.

Core MER activities should produce results and reports that can be applied by water managers in their day-to-day work, with additional funding provided to projects that address ecological and hydrological knowledge gaps as they are identified.

Decisions need to be made around reporting priorities aligned to the LTWPs and the Basin Plan, whilst focusing on helping water managers improve decision making on watering events.

It is difficult at the moment for the EWMP to definitively prove cause and effect between water delivery and ecological outcomes, because the natural systems at question are invariably complex and multi-faceted. By this we mean that there are difficulties in measuring the outcomes of any watering event, in a way that reliably infers the likely future outcomes of a similar watering event, because the outcomes from watering events are often non-linear, emerge over disparate time periods and heavily context-dependent. This limitation to inferring future outcomes based on evidence of past events exists in addition to the difficulty of attributing which source of water (i.e. NSW or CEWH water) caused an outcome in any particular watering event.

Stakeholders commented that DPI Fisheries has been able to develop their 'conceptual models' for native fish species. In other words, DPI Fisheries invested in research to understand how flow elements such as longitudinal connectivity (reach), water temperature, depth, salinity and other conditions affect fish species, and they use this understanding to decipher the effects of watering events on fish populations, informing the program's management of environmental water.

EES staff felt it was time for scientists and water managers to come together and collaboratively revise the program's MER strategy. This evaluation recommends revising and reviewing the MER strategy in the near future. In the future, conducting a 5-yearly review aligned with the program evaluation process would provide a regular opportunity for the strategy to be updated based on the program's changing context. Scientists will provide input on their current understanding of the ecological and hydrological factors and water managers will provide input on what information they need from MER to do their jobs effectively.

Ultimately, MER has two goals:

- To help the program to understand whether environmental water management has in fact benefited the environment, and how management practices can be adapted to increase environmental benefits
- To contribute to the causal ecological and hydrological models underpinning the program and help the program to understand whether these models are correct or need to be revisited.

Finding a balance between these two goals is difficult, and resourcing constraints means that tasks to support these goals must be prioritised. A revised MER strategy may further support the prioritisation of these tasks and enable reporting on a hierarchy of objectives.

The program logic diagrams, outlined in the Surface Water MER Plans (otherwise called the Joint MER Plans), should be revisited and refined as part of the revision to the EWMP's MER Strategy. Each valley has a Joint MER Plan that contains three program logics. The logic behind the causal pathways in these program logics is unclear and difficult to interpret. Furthermore, it is unclear who is responsible for contributing to each of the desired outcomes in the program logic diagrams.

Consequently, the program logic diagrams should be revised and consolidated to ensure they are true representations of the logic of the program, informed by the latest ecological and hydrological understanding and the practical knowledge of EWMP water managers. All outcomes statements in the program logic(s) should be updated to clearly reflect which agency/ agencies are responsible for contributing to that outcome.

In reviewing and realigning the program's MER strategy and program logics, the EWMP should be clear about:

- what the program is aspiring to achieve
- what the program is sufficient for achieving, i.e. what it can influence
- what is outside the program's control and whether the program would like to control any of these aspects.

In relation to the last point, the EWMP faces many external risks, which are discussed in Section 4.3. The EWMP's revised MER Strategy may also set up a framework to assess and monitor such risks to the program, which may enable better strategic planning in responding to or protecting against these risks.

3.5.3 FUNDING MER

Many stakeholders felt that the program's MER component is insufficiently funded and does not reflect the resources required to adequately report on outcomes to inform the EWMP. Particular concern was expressed about the lack of dedicated recurrent funding for the long-term monitoring programs.

DPIE EES MER staff are part of the EWMP structure but are mostly funded externally through the Commonwealth Government to implement the Basin Plan. This funding was for a set period of time which is due to expire June 2021. DPIE EES MER staff are also partially funded through NSW Waste and Environment Levy Envelope (WELE) funding. While there is certainty that the Basin Plan implementation funding (under a National Partnership Agreement) will not be renewed, there is uncertainty as to how DPIE EES MER will be funded in the future. Several staff are approaching the end of their funding period in December 2020 and several have moved into roles under different projects within the EWMP. This makes it difficult for the program to sustain the capacity to collect ecological data and to effectively analyse data to generate evidence to inform decision making. Loss of experienced staff is a huge risk to the program as their knowledge and networks leave with them. Furthermore, the work involved in renewing short-term staff contracts is burdensome and detracts from core monitoring, evaluation and reporting work. Overall capacity is reduced.

The EWMP collaborates with a range of science partners involved in the collection of ecological data—from independent ecological consultants, university research teams and other government agencies. The 2006-2013 evaluation of the EWMP recommended that the Department '*formally recognise the EWMP and identify it as a priority initiative within OEH* (now DPIE EES)'. While the EWMP is now identified as a distinct and important program area within EES (including through Treasury program performance reporting and audit cycles and the recent formation of a Water for the Environment Branch), the level of program funding dedicated to MER falls short of a recommended 5% of program funding. Increasing the program's resourcing of MER would enable the program to recurrently fund a core team of ongoing MER staff to ensure continuity of data collection in existing wetland assets so that evaluation and reporting of LTWP objectives can be carried out annually and at 5-yearly intervals as stipulated under the Basin.. A strategic approach to on-ground data collection could serve to meet the needs to monitor ecological responses to short-term flow events (water actions) and to water regimes that are patterns of wetting and drying over the long-term (multiple water actions or flow events).

3.5.4 RECOMMENDATIONS FOR IMPROVING OUTCOME MONITORING

9. **Revise the EWMP MER strategy to align with the LTWPs and Basin Plan**. Revising the EWMP's MER strategy would reframe its objectives based on its current context. Key issues to consider for this recommendation include:
    a. Reviewing reporting priorities.
    b. Reviewing mechanisms and processes required to translate new knowledge/ lessons learnt into assisting water managers in their day to day activities.
    c. Review mechanisms and processes required to translate complex information into easily digestible communicate products that demonstrate the benefits of environmental water.

10. **Consider appropriate levels of funding for program activities, including MER, to enable effective adaptive management.** This is critical to ensure the EWMP can develop as a program and has the capability to effectively manage its valuable portfolio and communicate its successes through ongoing MER.

11. **Focus MER reporting on outcomes in relation to the LTWP objectives and targets.** This includes key monitoring themes and whether LTWP ecological outcomes were met. Review reporting priorities to include annual (if relevant) performance of meeting targets and progress towards achieving objectives. Continue to leverage infographic communication such as in the annual Summary Outcomes reports' one-page summaries.

12. **Strengthen the adaptive management feedback loop.** Develop systems and processes to integrate new knowledge into the planning and management of environmental water.

13. **Continue to work complementarily with CEWO in delivering water for the environment and learning how to best use water for the environment.** There are many clear benefits of this in terms of sharing resources and agreeing on strategies such as MER.

4. DISCUSSION

4.1 WHY WE NEED TO MEASURE ENVIRONMENTAL CONDITION OVER THE LONG-TERM TO IMPROVE DECISION MAKING AND COMMUNICATION

Rigorous and fit-for-purpose science is required to inform adaptive management:

- **Planning:** science is used to gather detailed historical datasets to determine the desired ecological objectives, thresholds and environmental water requirements and targets.
- **Pre-delivery:** science is used to create conceptual and hydro-ecological models, which are used to predict outcomes and expected consequences of management scenarios.
- **Delivery:** after selecting a management scenario based on scientific modelling, water is delivered, and outcomes are monitored using well-designed scientific methods.
- **Evaluation:** when appropriate, statistical analyses are used to understand any differences between expected and actual outcomes, and why. Evaluation theory is applied to assess the effectiveness of management in achieving objectives and meeting targets.
- **Refinement:** science is used throughout the adaptive management cycle to fill knowledge gaps at the planning stage, adapt and improve ecological targets, objectives, thresholds and models, and assist in the operationalisation of water delivery.

Science can provide the research that identifies reliable patterns between inputs, outputs and outcomes in a specific ecological system. For example, science can measure the impact of different flow regimes on the health of different species and ecosystems relative to initial water levels and the requirements of species in that ecological system. Rigorous science will generate replicable and generalisable results about the relationship between output metrics that are easier to measure, such as flow rates, and outcomes that are ultimately important but difficult to link to a specific intervention.

Once a link is measured by science, there is no need for management to measure the impact of the inputs directly, only on the outputs of flow rates or river levels, because we can infer the relationship in any specific case between outputs and outcomes from the scientific evidence base. Management decisions can then focus on the most cost-effective inputs for delivering the necessary outputs to achieve intended outcomes.

The link between good science and good management (and communication of results to the public in terms they understand and care about) is a model with the appropriate parameters that will forecast the outcomes of an input without needing to measure it directly. These

Photography: Cotton farm outside of Nevertire, NSW. 26 August 2020 (Jasper Odgers, ARTD).

models will include all variables science has shown to be important in the link between flows and outcomes (i.e. type of river, time of year, baseline level of the river, location of the river, etc.). Models can tell us how many fish/ frogs/ birds will breed as a result of a watering event at a particular time, at a particular place, all other things being equal, without incurring the time and expense required for direct measurement[36].

Long-term measures of the health of the environment, or environmental conditions, are still necessary for two reasons. The first is that they provide the evidence about the current needs of the environment. Secondly, this data is important to assess and further refine the scientific models, which allow for the links to be drawn between inputs, outputs and outcomes. Long-term monitoring allows water managers and scientists to test if assumptions of water requirements are correct and if the developed models used, linking inputs and outputs, are good representations of what is occurring in reality.

It should be remembered that 'no model is perfect, but some are useful'. A collaboration between scientists, economists, communication experts and evaluators would be necessary for the development of a useful model.

A model is useful for decision making but it may be crucial for communication. If EWMP can communicate the impacts of a water regime in terms that people understand and care about, there is likely to be more support for the program. A model may also be useful in providing a quantitative mechanism for reflection, accountability and transparency.

4.2 VALLEY DIFFERENCES

The EWAGs across the state are at various levels of development or 'maturity'. These advisory groups are important in building understanding and social acceptance of the benefits of water for the environment. They include representatives from key interest groups up and down the river.

These people are brought together, with an independent Chair, and receive advice based on the best scientific and operational knowledge available. They use this advice to decide where environmental water goes. In general, this advice is followed; although it is the holders of environmental water that finally approve these decisions (the Commonwealth Environmental Water Holder and the responsible NSW Minister) and WaterNSW that makes the releases.

Photography: Lake Windamere. 27 August 2020 (Jasper Odgers, ARTD).

4.2.1 SOCIAL VALUE OF EWAG ADVICE

NSW DPIE EES runs these groups and has achieved great results. It is no exaggeration to say these groups are the most productive part of any engagement campaign NSW has in relation to water for the environment. Across all the EWAGs, environmental water managers are seen to be genuinely responsive to the advice they receive. This is a fundamental strength and a driver of the widespread support for these groups. Across all EWAGs and NSW river valleys, there was no dissent amongst EWAG members.

Deciding where water goes is difficult. Water allocation to different areas is always contentious. The best result is often what all groups can accept, as an alternative to getting what they wanted. In saying that, the action that is seen as the best for the environment, under the existing conditions, rather than a sectoral preference, has great bearing on the final decision and the acceptance of that decision.

4.2.2 INFORMATION AND STANDARDISATION

Like any new process, EWAGs learned through trial and error, notwithstanding their conceptual basis in participatory process and adaptive governance theory. Along with the EWMP, they have evolved into robust advisory groups that make integral contributions to the management of environmental water across NSW. We understand that only two EWAGs (Gwydir and Macquarie) are enshrined in the WSPs as statutory advisory groups and that EWAGs are currently undergoing a renewal process. This provides an opportunity for more voices to come to the table and for newer members to learn from more experienced members.

It is important for more established EWAGs to share their learnings with the newly emerging EWAGs (such as in the Barwon-Darling, Namoi and Coastal regions), so that they can avoid the trial and error process and establish the right processes up-front. For the more mature EWAGs, the focus should be on embedding strong systems and working with DPIE EES to support the evolution of the EWMP.

To achieve this, the best sections of the various processes need to be developed using quality management. This work has begun and there is a focus on ensuring quality chairing.

From a value chain perspective, the EWAG process still has a considerable road to travel. Many elements of these processes have been thought about; however, they are all in draft form. Adaptive management relies far too much on what is carried in the minds of the experience of staff.

The value chain of the EWAG process is shown in Figure 8, right.

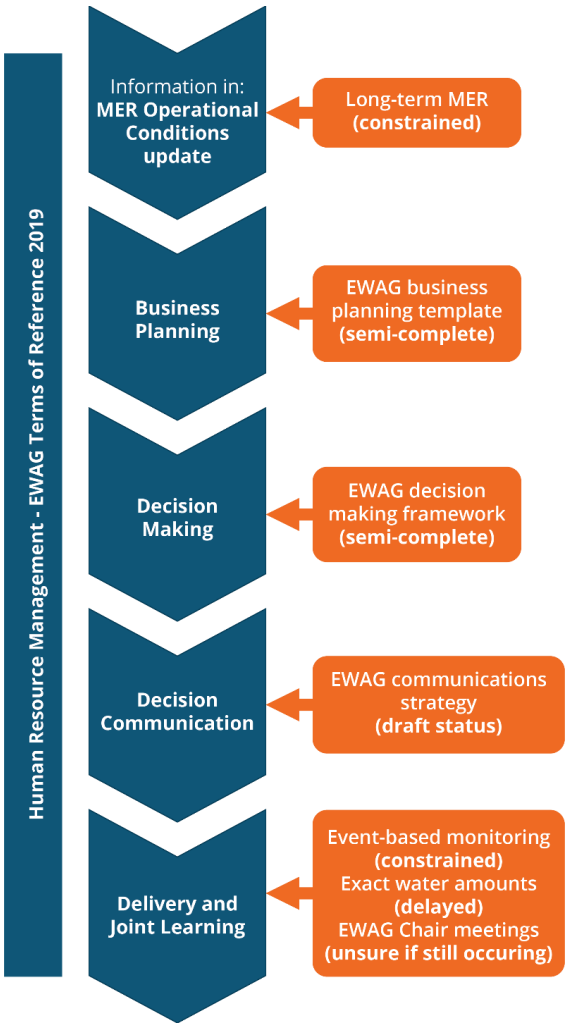


FIGURE 8. VALUE CHAIN OF EWAG PROCESS

Source: Evaluation output.

4.2.3 NSW GOVERNMENT VALUATION OF THE EWAG PROCESS

The financial valuation of the EWAG advice to the NSW Government in relation to scope, complexity and portfolio size is poor. The present sitting fee is at the lowest C1 level in Group C of the Advisory Boards, Councils and Committees Ministerial Councils, Ministerial Boards of Advice and Management Advisory Entities.[37] For the expected work, this is equivalent to a low level of remuneration.

EWAG members are not involved for the compensation. The majority do not claim sitting fees. These sittings, however, signal the importance of the role to government and society. Not paying or paying the lowest sittings fees for a regional role across a river valley, with the necessity to understand many different communities, a lot of scientific information, and conflicting operational reports, suggests that the members do not play an important role.

[37] NSW Public Service Commission (2019) "Classification and Remuneration Framework for NSW Government Boards and Committees - Policy and Guidelines" Directive, Feb 2019, D2012_005, A4214232. https://www.psc.nsw.gov.au/legislation-and-policy/nsw-government-boards-and-committees

This applies to all members, whether they are Aboriginal knowledge holders, environmentalists, farmers, irrigators, or scientists.

An improved classification would also enable greater expectations of Chairperson development and training.

Generally, one EWAG meeting per year is spent in professional development, with site visits dealing with a specific watering focus. In the most mature EWAG group, it was noted that inexperienced members on the EWAG were of little use to the process. An initiation process for new members appears to be in place; however, it has not been evaluated for quality. This is an important area of focus.

4.3 EXTERNAL RISKS TO PROGRAM SUCCESS

Chapter 3 above discusses the constraints as they exist inside the EWMP's systems; however, the external risks to the program are also important to consider. While addressing these risks may not be immediately possible for the program, or reside within its operational scope, instituting a mechanism that is able to investigate and mitigate these risks is important. This could be in the form of a policy group, such as the group formed to address channel capacity issues, or a working group, such as the interagency communications working group established between Basin state and Commonwealth Government communications officers. This mechanism will be important in protecting the EWMP's asset portfolio and ensuring the enduring success of the program.

In short, the external risks to the program are:

- Reduction in availability of HEW and PEW
- River operations
- Reliance on other Commonwealth and state agencies to achieve DPIE EES outcomes
- Proposed water infrastructure projects, including efficiency programs
- Floodplain harvesting
- Change in land use
- Climate change.

5. RECOMMENDATIONS

This chapter presents the evaluation's recommendations for improving the EWMP. These recommendations are based on the findings and are aligned with the following three themes:

- Disseminating information and enhancing local community engagement
- Strengthening program capacity and systematising EWAG processes
- Developing and implementing robust systems of gathering evidence.

DISSEMINATING INFORMATION AND ENHANCING LOCAL COMMUNITY ENGAGEMENT

1. **Focus on describing intended and actual environmental outcomes in external communications, in addition to water volumes.** Communications that explain the intended and actual outcomes of environmental flows and real-world outcomes will reduce confusion about the scale of watering events or misunderstanding of the relative difference between litres, kilolitres, megalitres and gigalitres.

2. **Strengthen and formalise responsibility for local, event-based communications and local stakeholder engagement to EWAGs.** Improving community knowledge and understanding of local watering events can be achieved by empowering EWAGs to publish information about approved environmental watering actions. Supporting EWAGs with resourcing to educate their community and finalising the EWAG communication strategy will facilitate this.

3. **Meet stakeholder demand for more information by utilising more modes of communication where possible.** While traditional media formats (e.g. newspapers and radio) are still key modes of communicating in regional communities, harnessing the potential of social media (e.g. Twitter, Facebook, Instagram) and other modes of community engagement (such as working with local schools) will magnify the program's impact in reaching the community and building long-term engagement.

Photography: Aquatic plants in the Macquarie Marshes. 26 August 2020 (Jasper Odgers, ARTD).

4. **Support staff to develop their capacity to continue the effective delivery of the EWMP.** To do this, the EWMP should:
    a. provide any necessary training to handle the technical, social and cultural demands of managing the program's assets; and
    b. foster peer-to-peer learning and mentoring within the program and DPIE EES.

STRENGTHENING PROGRAM CAPACITY AND SYSTEMATISING EWAG PROCESSES

5. **Enhance capacity, transparency and mechanisms for continuous improvement within EWAGS.** This includes, but is not limited to, formalising procedures and documentation related to:
    a. the Chair/ member appointment or renewal process;
    b. uniform sitting fees and travel expenses;
    c. induction and training packages providing hydrological and ecological information related to river management; and
    d. best practice guides, mentoring or opportunities for networking to facilitate emerging EWAGs to learn from established EWAGs;
    e. an annual or biennial conference of EWAGs, which would allow members and stakeholders to share learning across regions and capitalise on the most effective EWAG systems and processes.

6. **Include Aboriginal knowledge by introducing initiatives to increase Aboriginal representation in the program.** Increasing Aboriginal representation on EWAGs involves removing barriers to entry and enabling engagement. Strategies include:
    a. Meeting on Country
    b. Inviting and remunerating local Aboriginal Elders or representatives to provide a Welcome to Country
    c. Inviting members of the Aboriginal Nation on whose lands the meeting is being held. This is especially important if regular Aboriginal EWAG members do not have the authority to speak about the land on which the meeting is taking place.
    d. Aspiring to employ at least one Aboriginal DPIE EES staff member in each river valley. These staff would hold workshops with communities across each valley and work within DPIE EES to build the cultural literacy of staff.
    e. Developing strong partnerships between EWAGs and the traditional owners of the river valley. This can be facilitated through groups such as MLDRIN and NBAN or directly through Nation groups not represented by these collectives such as the Barkandji. This will enhance the representation of all Nations who live in an EWAG's valley.
    f. Engaging dedicated Aboriginal mentors to provide EWAGs with cultural literacy training. Each EWAG should have one cultural literacy event per year.
    g. Provide leadership, ecological and hydrological training for future Aboriginal water leaders, such as hiring and training Aboriginal community members for monitoring activities.
    h. Delivering environmental water in ways that also benefit Aboriginal people.

7. **Strengthen governance mechanisms and review operational effectiveness of the DPIE EES/ WaterNSW partnership.** Formalising a complaint and dispute resolution protocol (other than the Customer Advisory Group) is key to strengthening this partnership.

8. **Work with WaterNSW to streamline water delivery reporting and accounting timelines**. Adequate delivery of environmental water by WaterNSW is integral to program success.

DEVELOPING AND IMPLEMENTING ROBUST SYSTEMS OF GATHERING EVIDENCE

9. **Revise the EWMP MER strategy to align with the LTWPs and Basin Plan**. Revising the EWMP's MER strategy would reframe its objectives based on its current context. Key issues to consider for this recommendation include:
    a. Reviewing reporting priorities.
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12. **Strengthen the adaptive management feedback loop.** Develop systems and processes to integrate new knowledge into the planning and management of environmental water.

13. **Continue to work complementarily with CEWO in delivering water for the environment and learning how to best use water for the environment.** There are many clear benefits of this in terms of sharing resources and agreeing on strategies such as MER.

APPENDIX 1 SYSTEM EVALUATION THEORY GUIDING PRINCIPLES

TABLE 14. SET GUIDING PRINCIPLES

	Guiding subprinciple
1	
1a	Define system boundaries
1b	Define subsystems and subsystem boundaries
1c	Define within subsystem processes
1d	Define between subsystem processes (i.e. relationships and communication)
1e	Define system feedback mechanisms
1f	Define system attributes
1g	Define system inputs
1h	Define the common system goals
1i	Validate system definitions and goals
2	**System efficiency is a necessary prerequisite for optimal system effectiveness**
2a	Feedback mechanisms must provide timely, relevant, credible, frequent, and specific information to maximise efficiency
2b	Attributes must be aligned to maximise system efficiency
2c	Evaluate alternative pathways to improve efficiency
3	**Evaluate system effectiveness after evaluating system efficiency**

Source: Renger, R. (2015). System evaluation theory (SET): A practical framework for evaluators to meet the challenges of system evaluation. *Evaluation Journal of Australasia*, *15*(4), 16-28.