Framework for Determining Commonwealth Environmental Water Use

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Australian Government

Commonwealth Environmental Water Office

Cover image credit: Painted snipe, Macquarie Catchment. Photo by Tim Hosking, NSW Office of Environment and Heritage

Acknowledgement of the Traditional Owners of the Murray-Darling Basin

The Commonwealth Environmental Water Office respectfully acknowledges the Traditional Owners, their Elders past and present, their Nations of the Murray-Darling Basin, and their cultural, social, environmental, spiritual and economic connection to their lands and waters.

Contents

1. Introduction

Commonwealth environmental water is acquired to protect and restore the environmental assets of the Murray-Darling Basin. This paper outlines the framework for determining Commonwealth environmental water use and the process for making these decisions. The framework is designed to be entirely consistent with the Commonwealth Environmental Water Holder's statutory obligations and should be interpreted in this way.

1.1. Water reform in the Murray-Darling Basin

During the twentieth century, governments and the private sector invested heavily in water storage and delivery infrastructure in the Murray-Darling Basin. These investments supported the expansion of agricultural production in what has become one of Australia's most productive food-growing regions, supporting many Basin communities.

However, irrigation development has had some unintended consequences. Changes to the magnitude, frequency and timing of flows in the Basin's rivers have affected flow-dependent species and ecosystems in riverine and floodplain environments. For example, flow regulation has reduced seasonal and inter-annual flow variability. Although very large floods can still occur, small to medium floods are commonly constrained by in-stream weirs and dams or captured by on-farm storages. These smaller floods are needed to ensure that the Basin's ecosystems are resilient and able to endure drought years.

The timing of river flows has also been affected in parts of the Basin. For example, rivers in the southern Basin once flowed most strongly in winter and spring, but their flows now peak in summer and autumn, in keeping with irrigation needs. Changes to seasonal peaks can affect breeding, feeding and dispersal opportunities for many water-dependent native animals in the Basin, and the seasonality of flooding is important for floodplain vegetation.

Changes to the quantity and quality of the Basin's water resources also have social, cultural and economic implications. Healthy river and floodplain ecosystems support the provision of water for drinking and irrigation; maintain floodplain grazing land; and support tourism and recreational activities. Changes to Basin rivers have also eroded their capacity to meet the needs and support the cultural values of Indigenous people.

There is a long history of collective management and government involvement to address environmental degradation in the Basin. Through the 1980s to 2000s, strategies based on a Basin-wide perspective were put in place to manage salinity and water quality. In 1995, a 'cap' on water diversions was introduced to halt the growing overuse of Basin water resources. The 2004 National Water Initiative provided a strategic framework for reform, and through the Living Murray Agreement almost 500 GL/year of water has been recovered, which along with the

construction of environmental works and measures, is aimed at improving the health of icon sites along the River Murray.

The *Water Act 2007* ('the Water Act') initiated a number of steps to continue management reform to achieve a healthy working Murray-Darling Basin. This included the establishment of the Commonwealth Environmental Water Holder and the development of a Basin Plan by an independent Murray–Darling Basin Authority.

1.2. Commonwealth Environmental Water Holder

The Commonwealth Environmental Water Holder ('CEWH') is an independent statutory position established by the Water Act to manage Commonwealth environmental water holdings for the purpose of protecting or restoring environmental assets, including within the Murray-Darling Basin. The CEWH leads and is supported by the Commonwealth Environmental Water Office ('the Office'), a division of the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Commonwealth environmental water holdings are tradeable water rights acquired through the Australian Government's *Water for the Future* initiative. These rights are granted by the respective state governments, with Commonwealth environmental water managed under the same trading and carryover rules, and charged the same fees, as equivalent entitlements. Information on the Commonwealth's environmental water entitlements is available at www.environment.gov.au/ewater.

The Office seeks to ensure that the outcomes from the use of available water are maximised through efficient and effective management of the portfolio of Commonwealth environmental water holdings. Tradeable water rights offer some flexibility to act as a market participant and to adjust the portfolio of water as circumstances change. As such, the management of Commonwealth environmental water requires on-going assessment of options including whether water should be used within the current year, carried over for use in future years, or whether trade should occur (disposal or acquisition). Portfolio management statements are routinely available (at the above website); these outline the potential approach to the use, carryover and trade of Commonwealth environmental water at a catchment-scale.

1.3. The Basin Plan

The Basin Plan developed by the Murray-Darling Basin Authority (MDBA) is a high-level plan for ensuring that the Basin's water resources are managed in an integrated and sustainable way.

Key components include:

- environmentally sustainable limits on surface water and groundwater use (referred to as 'sustainable diversion limits' or SDLs).

- an environmental watering plan
- a water quality and salinity management plan
- water resource plan requirements
- water trading rules
- a monitoring and evaluation program

The environmental watering plan provides a framework for planning and coordinating environmental water use across the Basin. It includes:

- overall and particular environmental objectives
- targets to measure progress against the objectives
- principles to be applied in environmental watering
- methods for identifying environmental assets, ecosystem functions and their water requirements
- principles and method to determine priorities for applying environmental water.

The environmental watering plan also requires the development of:

- a Basin-wide environmental watering strategy by the MDBA, by November 2014
- long-term watering plans for each water resource plan area by Basin States, within 12 months of the Basin-wide environmental watering strategy being published
- annual environmental watering priorities for each water resource plan area by Basin States, by 31 May each year
- Basin annual environmental watering priorities by the MDBA, by 30 June each year.

1.4. Statutory obligations on the use of Commonwealth environmental water

The Water Act requires that Commonwealth environmental water is managed to protect or restore environmental assets, so as to give effect to relevant international agreements.

The Water Act defines environmental assets as water-dependent ecosystems, ecosystem services, and sites of ecological significance. Water-dependent ecosystems include wetlands, streams, floodplains, lakes and other bodies of water, salt marshes, estuaries, karst and groundwater systems.

Relevant international agreements include the Ramsar, Bonn, Desertification, Biodiversity and Climate Change conventions, and Migratory Birds agreements with Japan, China and the Republic of Korea.

These agreements cover a broad range of issues. For example, the Biodiversity Convention requires Parties to rehabilitate and restore degraded ecosystems, and to adopt measures for the recovery and rehabilitation of threatened species. It also promotes the protection of ecosystems, natural habitats and maintenance of viable populations of species in natural surroundings.

Parties to the Ramsar Convention have committed to designate suitable wetlands for the List of Wetlands of International Importance ('Ramsar List') and ensure their effective management; to work towards the wise use of all their wetlands; and to cooperate internationally concerning shared wetland systems and species.

A broad range of environmental watering actions therefore would give effect to these agreements.

The Water Act also requires the CEWH "to perform its functions and exercise its powers consistently with and in a manner that gives effect to the Basin Plan", and specifically, that Commonwealth environmental water is managed in accordance with the Basin Plan's environmental watering plan.

Obligations on the use of Commonwealth environmental water under the Basin Plan include:

- to undertake watering consistently with the environmental objectives
- to act consistently with the Basin-wide environmental watering strategy
- to have regard to the Basin annual environmental watering priorities, and to provide the MDBA with a statement of reasons for any Commonwealth environmental watering that is not in accordance with these priorities
- to act in accordance with the Principles to be applied in environmental watering
- to provide Basin States with information on Commonwealth environmental water holdings to assist in the preparation of annual environmental watering priorities
- to have regard to the water quality and salinity targets for managing water flows.

There are also obligations relating to Commonwealth environmental water trading activities and to monitoring, evaluation and reporting.

The Basin Plan's environmental watering plan requires that the MDBA consult with the CEWH in developing the Basin-wide environmental watering strategy and Basin annual environmental watering priorities, and that Basin States consult with the CEWH in developing long-term watering plans and annual environmental watering priorities.

1.5. Accountability and good governance

The CEWH must comply with the specific requirements and standards of Commonwealth legal, policy and environmental frameworks, including the *Financial Management and Accountability Act 1997*, the *Public Service Act 1999* and the *Environmental Protection and Biodiversity Conservation Act 1999*. Operating consistently with this framework will contribute to the capacity of the Office to uphold high standards of public sector governance, including accountability, transparency, integrity, risk management, stewardship and efficiency in the management of environmental watering activities.

This framework also informs the development of the Commonwealth Environmental Water Office's Business Plans, which are published annually (www.environment.gov.au/ewater) and support the Office's commitment to transparency and accountability.

1.6. Roles in environmental water management under the Basin Plan

As established by the Basin Plan, the MDBA is responsible for the overall framework for environmental water management to achieve the overall objectives for the Basin's water-dependent ecosystems. A key part of this role relates to working with environmental water managers, site managers and river operators to identify demands for environmental water across the Murray-Darling Basin.

The Office manages the Commonwealth's environmental water holdings, and works with other environmental water holders and managers, to meet environmental demands across the Murray-Darling Basin as efficiently and effectively as possible. Further information on how the Commonwealth matches environmental water supply with environmental demands is outlined in Sections 4–6 of this document.

The key components, roles and responsibilities in environmental water management, as established in the Basin Plan's environmental watering plan, and the relationships with the management of Commonwealth environmental water are summarised below and in Figure 1.

a) The environmental watering plan's environmental management framework directly informs the management and use of Commonwealth environmental water:

   i. Basin States' long-term watering plans will inform the development of a long-term portfolio management strategy for Commonwealth environmental water, which will seek to put the environmental demands expressed in these plans into a Basin-wide context and describe how Commonwealth environmental water will be used to help meet this demand through use, carryover and trade over multiple years;

ii. The Basin-wide environmental watering strategy will, once it is made by the MDBA, inform the long-term portfolio management strategy for Commonwealth environmental water;

iii. Basin and catchment-scale annual environmental watering priorities (developed by the MDBA and state governments respectively) will inform the annual portfolio management of Commonwealth environmental water. The Office's annual water use options documents and portfolio management statements describe how Commonwealth environmental water will help meet this demand within the context of its long-term strategy.

b) When making decisions on the use of Commonwealth environmental water, the Office will have regard to the Basin annual environmental watering priorities and seek to contribute to them, subject to operational arrangements and the accountabilities established in the Water Act and other relevant legislation. This framework will guide these decisions and ensure they are aligned with the requirements of the environmental watering plan (i.e. its objectives, targets, principles and methods).

c) Commonwealth environmental water may be used to help meet other priorities, in addition to the Basin annual environmental water priorities, just as state government environmental water may be used to help meet Basin annual environmental watering priorities.

d) Community consultation on environmental demand will occur in development of the Basin States' long-term watering plans and the Basin States' and the MDBA's annual watering priorities. The Office will participate in those processes (drawing on its long-term portfolio management strategy, its adaptive management processes, and other relevant information) and will be open to proposals for use of Commonwealth environmental water from all stakeholders.

e) The use of Commonwealth environmental water will be coordinated with the delivery of state government environmental water (both planned and held) and other water (e.g. irrigation, conveyance, stock and domestic) to maximise effective and efficient use. Coordination may occur through environmental watering schedules and other agreements, and ongoing collaborative arrangements with Basin States.

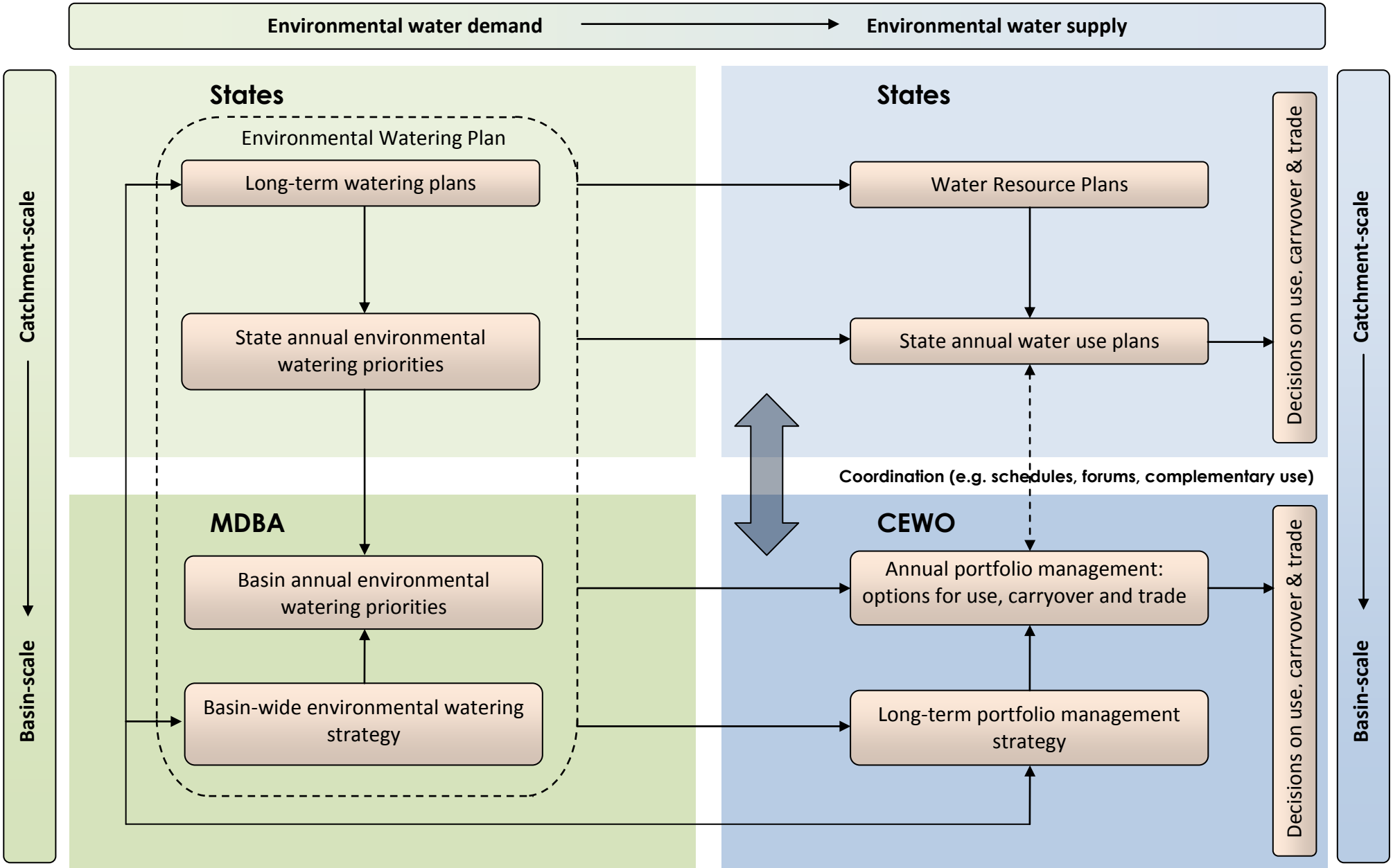

Figure 1: Basin and catchment-scale planning for environmental water supply and demand

1.7. Decisions on the use of Commonwealth environmental water

Within the scope of the Basin Plan's environmental watering plan, the use of Commonwealth environmental water is guided by a process for making determinations on the available water in any given year as outlined in this framework. The process enables matching water availability with environmental demand, using a robust, scientifically defensible rationale, in accordance with multi-year ecological and operational considerations. It is designed to be flexible to changing conditions and knowledge.

This framework helps to ensure that Commonwealth environmental water is used to maximise the environmental outcomes achieved with the volume of water that is available, under the operational constraints that will limit the options for its use. It is based on a clear ecological and management purpose and supported by a consistent decision-making process; one that allows focusing on managing the environmental water portfolio to balance immediate and longer-term needs. Over time, new information and experience will continue to improve this process, in keeping with the tenets of 'adaptive management'.

2. Overall objectives and scope of Commonwealth environmental water use

All Commonwealth environmental watering actions must be consistent with and contribute to the achievement of the environmental objectives of the Basin Plan's environmental watering plan. The overall objectives are:

- *To protect and restore water-dependent ecosystems of the Murray-Darling Basin*
- *To protect and restore the ecosystem functions of water-dependent ecosystems*
- *To ensure that water-dependent ecosystems are resilient to climate change and other risks and threats*

Further detail in relation to these overall environmental objectives is provided in a number of particular environmental objectives. These are listed at Attachment A.

The use of Commonwealth environmental water is only one of a number of reforms, initiatives and activities aimed at achieving a healthy working Basin. The reforms of the National Water Initiative, the establishment of the MDBA, the Basin Plan, water resource plans, land-use practices and natural resource management activities, all play a crucial part, and in many cases will impact upon the effectiveness of the use of environmental water.

Further, Commonwealth environmental water is only one of a number of sources of environmental water across the Basin. There are other environmental water entitlements, such as those held by state governments and managed by the MDBA under The Living Murray initiative, as well as significant volumes of environmental water managed by state governments through the rules in water resource plans.

3. Principles to be applied in environmental watering

Commonwealth environmental water is to be managed in accordance with the environmental watering plan's *Principles to be applied in environmental watering*, described below:

Principle 1—Basin annual environmental watering priorities

Environmental watering is to be undertaken having regard to the Basin annual environmental watering priorities.

Note: There may be reasons why it is not possible in particular circumstances to undertake watering in accordance with these priorities. Under such circumstances, a statement of reasons must be provided to the MDBA why environmental watering has not been undertaken in accordance with the priorities.

Principle 2—Consistency with the objectives in Part 2

Environmental watering is to be undertaken consistently with the environmental objectives.

Principle 3—Maximising environmental benefits

Subject to Principles 1 and 2, environmental watering is to be undertaken in a way that:

a) maximises multiple environmental benefits of environmental watering; and

b) maximises its benefits and effectiveness by:

   i. co-ordinating environmental watering between all holders of held environmental water and managers of planned environmental water; and

   ii. co-ordinating environmental watering with flows regulated for consumptive use; and

   iii. utilising local knowledge and experience; and

   iv. having regard to Indigenous values; and

   v. having regard to social and economic outcomes; and

c) enhances existing flow events, where possible, so as to ensure improvement in the delivery of a full range of flow conditions, including high flow events; and

d) takes into consideration the relative ecological benefits of applying environmental water to achieve one environmental outcome over another environmental outcome; and

e) takes into consideration the variability of the natural flow regime, for example, by mitigating or avoiding seasonal inversion of flows; and

f) incorporates strategies to deal with a variable and changing climate; and

g) enables information to be shared between the Authority, the Commonwealth, Basin States, holders of held environmental water and managers of planned environmental water to ensure efficient and effective use of environmental water.

Principle 4—Risks

Environmental watering is to be undertaken having regard to:

a) potential risks, including downstream risks, that may result from applying environmental water and measures that may be taken to minimise the risks; and

b) risks arising from impediments to the delivery of water to water-dependent ecosystems, including risks of extraction of that water for other uses, and inadequate accounting of water flows.

Principle 5—Cost of environmental watering

Environmental watering is to be undertaken having regard to the quantity of water and other resources required relative to the expected environmental benefits.

Principle 6—Apply the precautionary principle

A lack of full scientific certainty as to whether there are threats of serious or irreversible environmental damage should not be used as a reason for postponing measures to prevent environmental degradation.

Principle 7—Working effectively with local communities

Environmental watering should be undertaken having regard to the views of:

a) local communities, including bodies established by a Basin State that express community views in relation to environmental watering; and

b) persons materially affected by the management of environmental water.

Principle 8—Adaptive management

Adaptive management should be applied in the planning, prioritisation and use of environmental water.

Principle 9—Relevant international agreements

Environmental watering should be undertaken in a way that is not inconsistent with relevant international agreements.

Principle 10—Other management and operational practices

River management and operational practices should be reviewed, and if necessary altered, to ensure that rivers can be managed to achieve multiple objectives, including the environmental objectives.

Principle 11—Management of water for consumptive use

Management of water for consumptive use should, where possible, be undertaken in a way that is consistent with achieving the environmental objectives.

Applying these principles in practice means that, for decisions on the use of Commonwealth environmental water, *inter alia*:

- Water is provided to aquatic ecosystems in consideration of natural variability, seasonality (and other temporal patterns), flow velocity and volumes;

- Development of environmental watering actions must consider the ecological opportunity costs of using that water otherwise at a Basin-wide scale;
- Providing water to critical connecting processes that support ecosystem health is in many cases as important as providing water to high-value sites themselves;
- Development of environmental watering actions involves consideration of using water for multiple benefits and multiple uses wherever possible; and how that water is made available, the impediments to delivery including transmission losses, cost effective use and wider ecological impacts, are considered from a whole-of-system perspective;
- Water is used for a diversity of ecological outcomes throughout the Basin;
- Measures are put in place to ensure that learning from environmental watering takes place and that impediments to desired ecological outcomes are identified and addressed.

4. Determining demand: environmental watering needs

Basin-scale environmental watering needs will determine the demands on the use of Commonwealth environmental water for the protection and restoration of environmental assets. A key input are the Basin annual environmental watering priorities ('Basin annual priorities') developed by the MDBA.

The Basin annual priorities will be published by the MDBA by 30 June each year. The priorities must give effect to the Basin-wide environmental watering strategy (when developed) and be consistent with the environmental watering plan's objectives. The MDBA must develop them in consultation with Basin States and the CEWH, and have regard to:

- long-term watering plans and annual watering priorities developed by Basin States
- advice from river operators
- the views of local communities, including those materially affected by the management of environmental water
- Indigenous values and uses
- optimising social, economic and environmental outcomes.

The Basin annual priorities are expected to establish both the context and key environmental water needs at a Basin-scale through describing the priority environmental values and the desired trend from a whole-of-Basin perspective. However, the nature and form of the Basin annual priorities may evolve over time as determined by the MDBA.

Consistent with the obligations under the Basin Plan, information on the Commonwealth environmental water holdings (including quantity, reliability, security class, licence type, limitations) will be made available to assist in the development of annual priorities. The Office will also participate in the development of, and provide its views on, Basin and catchment annual environmental watering priorities, drawing on adaptive management processes, including its monitoring and evaluation activities.

In addition to the Basin annual priorities, consideration will also be given to local environmental water needs as identified by Basin States, local natural resource management organisations and community (including Indigenous) groups.

5. Estimating supply: water resource availability

The scope of watering actions and the environmental outcomes that can be achieved will be limited by availability of water to achieve these outcomes (or 'supply'). The Commonwealth estimates its supply of environmental water based on factors such as rainfall, flow conditions and forecasts of water allocations.

In determining how much water is available for meeting environmental demands it is important to consider all potential sources of water. Consistent with Principle 3 above, Commonwealth environmental water will, subject to constraints to water delivery, be delivered in conjunction with natural flows, consumptive water, and other sources of environmental water. Table 1 outlines the range of environmental outcomes and portfolio management actions in

scope for Commonwealth environmental water under different levels of water resource availability.

Table 1: Environmental outcomes and portfolio management options in scope under different levels of water resource availability

	Very Low	Low	Moderate	High	Very High
Environmental outcomes in scope	- Avoid critical loss of species, communities and ecosystems - Maintain key refuges - Avoid irretrievable damage or catastrophic events	- Support the survival and viability of threatened species and communities - Maintain refuges - Maintain environmental assets and ecosystem functions.	- Enable growth, reproduction and small-scale recruitment for a diverse range of flora and fauna - Promote low-lying floodplain-river connectivity - Support medium flow river and floodplain functional processes	- Enable growth, reproduction and large-scale recruitment for a diverse range of flora and fauna - Promote higher floodplain-river connectivity - Support high flow river and floodplain functional processes	- Enable growth, reproduction and large-scale recruitment for a diverse range of flora and fauna - Sustain higher floodplain-river connectivity - Support high flow river and floodplain functional processes
Portfolio management options in scope	- Allow drying to occur, where appropriate - Water refuges and sites supporting threatened species and communities - Undertake emergency watering at specific sites of priority assets - Use carryover volumes to maintain critical needs	- Allow drying to occur consistent with natural wetting-drying cycles. - Water refuges and sites supporting threatened species and communities - Provide low flow and freshes in sites and reaches of priority assets - Use carryover volumes to maintain follow-up watering	- Prolong flood/high-flow duration at key sites and reaches of priority assets - Contribute to the full-range of in-channel flows - Use carryover to provide optimal seasonal flow patterns in subsequent years	- Increase flood/high-flow duration and extent across priority assets, where feasible - Contribute to the full range of flows incl. over-bank, where feasible - Use carryover to provide optimal seasonal flow patterns in subsequent years	- Maintain flood/high-flow duration and extent across priority assets, where feasible - Contribute to the full range of flows incl. over-bank, where feasible - Use carryover to provide reserves for future years

6. Matching supply with demand: informing environmental watering actions

6.1. Determining the purpose of watering actions

In order to manage Commonwealth environmental water effectively under the variable climate in the Basin, it is necessary to consider the environmental outcomes and portfolio management actions that are appropriate for different combinations of environmental demand and water resource availability. Table 2 identifies the spectrum of watering event purposes under different combinations of environmental demand and water resource availability.

For example, where environmental assets require water urgently to prevent ecological decline, and water resource availability is low (such as during extended drought conditions) the purpose is limited to avoiding damage to the assets through the types of actions described in Table 1. Conversely, where environmental assets require flows in the coming year, and water resource availability is higher, the watering action may improve the health and resilience of that ecosystem.

Table 2: Purpose of watering events varies under different combinations of environmental demand and water resource availability across the following spectrum

Avoid damage to key environmental assets	Ensure ecological capacity for recovery	Maintain ecological health and resilience	Improve the health and resilience of aquatic ecosystems	Build future capacity to support ecological health and resilience

The process for matching environmental demands with water resource availability will be refined and enhanced over time, aided by the development of associated decision-support tools. A robust decision framework that matches available water to the highest priority requirements given prevailing conditions and the environmental watering plan objectives should be capable of considering multi-year ecological needs and be responsive to changing circumstances. Multi-year considerations include hydrological variability, wetland wetting-drying cycles, breeding/recruitment cycles, the need for follow-up flows, the condition of the assets, and complementary works and natural resource management that may help to maximise outcomes.

6.2. Portfolio management in different supply and demand scenarios

As environmental demands become less immediate and more environmental water becomes available, the environmental outcomes within scope in Table 1, progress from damage avoidance to maintenance of refuges and the capacity for recovery, to maintaining health and resilience, to an expansion of healthy ecosystem (Table 2). As channel flows and flood volumes and frequencies increase, longitudinal and lateral connectivity are progressively provided to a greater range of habitats, so that a greater range of watering options is possible.

In progressively wetter conditions a more holistic, a whole-of-system approach becomes more feasible. However, it is important that such an approach be considered in all scenarios. For example, under dry conditions a systems approach might involve using water at sites spread broadly across the Basin to promote a broad system-wide recovery. Water for refuges would be provided in consideration of other refuge sites in the vicinity and across the Basin for the relevant species or ecological community.

Under dry conditions where assets require water urgently, environmental water use should focus on **avoiding damage,** by maintaining refuges and supporting the survival and growth of threatened communities to ensure a capacity for recovery when wetter conditions return. In-channel flows and wetland watering regimes would be focused on lower flows. Watering actions would be spread across the Basin to help ensure capacity for system-wide recovery, and recovery in as many ecosystem types as possible. Some limited small-scale recruitment could be supported for species that tend to reproduce in low flow conditions.

A dry year may occur after a sequence of wet years, in which case floodplain habitat that requires periodic or infrequent flooding may benefit from a drying phase. Provided that sufficient water is available to support refuges in the following few years, sales of allocations may be considered as a means of realising value that could be used in the future.

Under moderate environmental demand and resource availability conditions, **maintaining** the ecological health and resilience of the system should be the focus, by supporting survival, growth, reproduction and small-scale recruitment. Flows would be focused in-channel, while some limited river-floodplain connectivity and inundation may be desirable in low-lying floodplain areas.

Under wet and very wet conditions, larger natural flow volumes should enable Commonwealth environmental water to **improve** the health and resilience of ecosystems by contributing to floodplain inundation and to larger-scale recruitment. This is achieved by increasing the frequency, volume, duration, and extent of flooding events, and possibly by influencing their timing. Contributing to the full-range of natural flow variability should become possible, in particular flows at the upper end of the hydrograph, including bank-full and perhaps limited over-bank flows for a range of sites. River-floodplain connectivity would be provided to more elevated areas than is possible under drier conditions. Critically, any environmental watering actions contributing to high-flow events would be within the operational and management rules for water delivery.

As a larger volume of water is available in wetter conditions, and environmental requirements are increasingly met by natural high river flows or floods, it becomes appropriate to make greater use of carryover options to ensure that water is available for future years.

The approach that is implemented is determined on a catchment-by-catchment basis, and in some cases on a sub-catchment basis, subject to the water resource outlook and the individual requirements of the environmental assets located there. The biogeographic, topographic, resource use, and climatic context, as well as the volume of water that can actually be delivered, are all considered. The decision to provide environmental water considers previous watering decisions, flow history and follow-up water requirements for environmental assets and ecosystem functions.

7. Developing, implementing and monitoring water use options

Building from this approach to matching environmental demands and water resource availability, there are a number of key steps involved in decisions on the use of Commonwealth environmental water.

Step 1: Develop options for the use of environmental water

This step identifies options in scope for meeting environmental demands so that when the Basin annual priorities are published by the MDBA, there are a range of alternative watering actions to choose from in order to contribute to those priorities. Potential watering options are identified and developed in cooperation with the MDBA, state government agencies, other environmental water managers, local groups (such as catchment management authorities, natural resource management boards and environmental water advisory groups) and landholders. The Commonwealth Environmental Water Scientific Advisory Panel provides advice on the development of water use options, while the Commonwealth Environmental Water Stakeholder Reference Panel provides advice on engaging with local and community interests in the use and management of Commonwealth environmental water.

Water use options must be developed for the purpose of protecting or restoring environmental assets in accordance with s. 105(3) of the Water Act and contribute to the achievement of the environmental watering plan's objectives. Consideration is also given to:

- the volumes of all environmental water likely to be available (from Commonwealth water and all other sources);
- environmental watering needs, including the Basin-wide environmental watering strategy (when made);
- expected outcomes, risks and contingency allowances for each option;
- multiple-use scenarios across jurisdictions;
- trigger points and cut-off dates associated with natural events;
- Basin-wide strategies for particular species/ecological communities; and
- constraints to water delivery (e.g. trading rules; channel capacity, third party impacts).

Water use options identify the flow types relevant to the watering requirements (base flows, freshes, bank-full flows, over-bank flows) and the relevant levels of water resource availability to which the water use options relate (see Section 5).

The outcome of this step is an understanding of the range of options open to the Office, including for cooperative watering across the Basin.

In undertaking annual environmental water supply planning (see Figure 1), the Office produces water use options documents annually, while portfolio management statements on the approach to managing the Commonwealth's water holdings, with respect to use, carryover and trade, are published for each catchment. Both are available from www.environment.gov.au/ewater.

Step 2: Assessment of watering options

A set of five criteria, which is the main mechanism by which the Office acts in accordance with the *Principles to be applied in environmental watering*, has been developed to assist in assessing water use options (Attachment B). These criteria are summarised below:

- the ecological value of the targeted asset(s)
- the expected outcomes from the proposed watering action
- the potential risks of the proposed watering action
- the long-term sustainability of the targeted asset(s) including appropriate management arrangements
- the cost, both in water and other resources, and operational feasibility of undertaking the proposed watering action.

The precautionary principle is central to assessing the potential benefit of watering options against these criteria. Consistent with Principle 6 (see Section 3), a lack of full certainty regarding the threat of serious or irreversible environmental damage is not a reason to postponing a watering action that would seek to avoid such degradation.

The assessment of environmental watering options is a key input into decisions on environmental water use. It is also important to compare options not just as one watering action versus another but as one event versus all others that could be achieved with the same volume of water. An assessment of the opportunity cost should be undertaken of using water relative to opportunities for carrying water over for future use; trading water from one catchment to another; or selling water and using the proceeds to purchase water in a different catchment or at a future time.

Step 3: Environmental water delivery

Based on the assessment against the criteria, decisions will be made to make Commonwealth environmental water available for specified actions reflecting seasonal, operational and management considerations.

The CEWH will enter into arrangements with the relevant state governments, and with other environmental water holders, managers or catchment management authorities as appropriate, to optimise delivery of water for the environment. The delivery phase also involves coordination with river operators.

The purpose of this step is to ensure complementary and cost-effective use of water. Discussions with delivery partners include the nature and location of use and the opportunity for multiple uses. These discussions ensure that water from a variety of sources can be provided in appropriate volumes to achieve the agreed ecological objectives and that sufficient contingency water is available across the Basin for follow-up watering. A variety of mechanisms for coordinating environmental water use are utilised by the Office; these are designed to be fit-for-purpose and recognise the respective roles and responsibilities of all partners. The outcome of this step is that water is provided in appropriate volumes to meet agreed objectives and to manage risks.

As the agreed contribution of each partner to watering actions may be subject to specific conditions (e.g. natural flow events), it is important to coordinate closely with all partners, including state governments and the MDBA (in relation to The Living Murray program and in relation to its overall system management responsibilities), when triggers and cut-off points eventuate.

Arrangements for managing water differ across the Basin. There is no one-size-fits-all approach. In regulated rivers, water is delivered as river flows or moved to the location it is needed using water trading. Water may be delivered as river flows, managed through infrastructure to particular sites or pumped from the river to a site. Use of water in these ways must be within operational arrangements that take account of the delivery constraints of infrastructure and rivers. In unregulated rivers, water generally cannot be ordered or actively delivered to achieve specific in-stream or wetland outcomes. To date Commonwealth environmental water has been left in-stream during unregulated flow events for local and downstream benefits. In some circumstances water shepherding may be required to ensure that in-stream environmental flows are protected from consumptive uses.

The Office may seek to formalise delivery arrangements by entering into agreements with delivery partners on environmental water use or through environmental watering schedules (provided for in the Water Act and Basin Plan). Such agreements may cover a range of time periods, including longer-term agreements across water years that provide pre-agreed releases for multiple events, subject to water availability and other conditions.

Details of the Commonwealth's environmental water holdings and use are available throughout the year and updated regularly on the website at www.environment.gov.au/ewater.

Step 4: Monitoring, Evaluation, Reporting and Improvement

The Office has published a *Commonwealth Environmental Water - Monitoring, Evaluation, Reporting and Improvement Framework*. This framework sets out the Office's approach to monitoring and evaluation to demonstrate the outcomes of Commonwealth environmental water use, meet reporting requirements and support adaptive management and improvement. The framework is available at www.environment.gov.au/ewater.

Attachment A – Environmental objectives for water-dependent ecosystems

To protect and restore water-dependent ecosystems of the Murray-Darling Basin

- To protect and restore a subset of all water-dependent ecosystems of the Murray-Darling Basin, including by ensuring that:
    - declared Ramsar wetlands that depend on Basin water resources maintain their ecological character; and
    - water-dependent ecosystems that depend on Basin water resources and support the lifecycles of species listed under the Bonn Convention, China-Australia Migratory Bird Agreement, Japan-Australia Migratory Bird Agreement or Republic of Korea-Australia Migratory Bird Agreement continue to support those species; and
    - water-dependent ecosystems are able to support episodically high ecological productivity and its ecological dispersal.
- To protect and restore biodiversity that is dependent on Basin water resources by ensuring that:
    - water-dependent ecosystems that support the lifecycles of a listed threatened species or listed threatened ecological community, or species treated as threatened or endangered (however described) in State law, are protected and, if necessary, restored so that they continue to support those life cycles; and
    - representative populations and communities of native biota are protected and, if necessary, restored.

To protect and restore the ecosystem functions of water-dependent ecosystems

- That the water quality of Basin water resources does not adversely affect water-dependent ecosystems and is consistent with the water quality and salinity management plan.
- To protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that:
    - the diversity and dynamics of geomorphic structures, habitats, species and genes are protected and restored; and
    - ecological processes dependent on hydrologic connectivity:
        - longitudinally along watercourses; and
        - laterally between watercourses and their floodplains (and associated wetlands); and
        - vertically between the surface and subsurface;

      are protected and restored; and
    - the Murray Mouth remains open at frequencies, for durations, and with passing flows, sufficient to enable the conveyance of salt, nutrients and sediment from the Murray-Darling Basin to the ocean; and

- the Murray Mouth remains open at frequencies, and for durations, sufficient to ensure that the tidal exchanges maintain the Coorong's water quality (in particular salinity levels) within the tolerance of the Coorong ecosystem's resilience; and
- as far as practicable, water levels in the Lower Lakes are maintained above 0.4 metres Australian Height Datum for 95% of the time and above 0.0 meters Australian Height Datum at all times; and
- barriers to the passage of biological resources (including biota, carbon and nutrients) through the Murray-Darling Basin are overcome or mitigated.

- That natural in-stream and floodplain processes that shape landforms (for example, the formation and maintenance of soils) are protected and restored.
- To support habitat diversity for biota at a range of scales (including, for example, the Murray-Darling Basin, riverine landscape, river reach and asset class).
- To protect and restore ecosystem functions of water-dependent ecosystems that maintain populations (for example recruitment, regeneration, dispersal, immigration and emigration) including by ensuring that:
  - flow sequences, and inundation and recession events, meet ecological requirements (for example, cues for migration, germination and breeding); and
  - habitat diversity, extent, condition and connectivity that supports the life cycles of biota of water-dependent ecosystems (for example, habitats that protect juveniles from predation) is maintained.
- To protect and restore ecological community structure, species interactions and food webs that sustain water-dependent ecosystems, including by protecting and restoring energy, carbon and nutrient dynamics, primary production and respiration.

To ensure that water-dependent ecosystems are resilient to climate change and other risks and threats

- That water-dependent ecosystems are resilient to climate change, climate variability and disturbances (for example, drought and fire).
- To protect refuges in order to support the long-term survival and resilience of water-dependent populations of native flora and fauna, including during drought to allow for subsequent re-colonisation beyond the refuges.
- To provide wetting and drying cycles and inundation intervals that do not exceed the tolerance of ecosystem resilience or the threshold of irreversible change.
- To mitigate human-induced threats (for example, the impact of alien species, water management activities and degraded water quality).
- To minimise habitat fragmentation.

Attachment B – Criteria for assessing options for Commonwealth environmental water use

The use of Commonwealth environmental water must be consistent with the requirements of the *Water Act 2007* (relevant functions are outlined in section 105). This includes Commonwealth environmental water holdings being managed in accordance with the Murray–Darling Basin Plan's environmental watering plan.

A long-term framework for determining the use of Commonwealth environmental water has been developed in consultation with delivery partners, interested stakeholders/experts and with our Environmental Water Scientific Advisory Panel (available at www.environment.gov.au/ewater). This framework has been revised to align with the Basin Plan.

The framework sets out an approach to determining the purpose for individual watering actions depending on environmental demands and water resource availability. Proposed watering actions will need to be supported by available evidence (including local knowledge) and be consistent with the approach set out in the framework. Through adaptive management, the Commonwealth Environmental Water Office will consider any opportunities for a more informed and diverse range of water uses as knowledge and modelling improves.

Commonwealth environmental water is used to supplement existing flows and is coordinated with consumptive water and other environmental water. Proposals for use of the water will not be agreed if this use substitutes for other water including historical system operations (e.g. provision of water for conveyance, stock and domestic, or planned environmental water). Local communities are able to submit their own proposals or ideas for the use of environmental water (available at www.environment.gov.au/ewater).

Consistent with the Basin Plan's environmental watering plan, all Commonwealth water use must contribute to the achievement of one or more of the following objectives:

- to protect and restore water-dependent ecosystems of the Murray-Darling Basin; and
- to protect and restore the ecosystem functions of water-dependent ecosystems; and
- to ensure water-dependent ecosystems are resilient to climate change and other risks and threats.

All watering actions are then assessed against the following criteria:

1. The ecological values of the targeted asset(s).

Issues considered include:

1.1 the presence of threatened species and ecological communities, and listed migratory species; and
1.2 the ecological and conservation values of the assets(s) including those recognised by international agreements.

2. The expected outcomes from the proposed watering action

Issues considered include:

2.1 the extent to which the watering action will contribute to the achievement of Basin annual environmental watering priorities;
2.2 how well defined and realistic the expected ecological outcomes are for the proposed watering action;
2.3 the consistency of the watering action and expected outcomes with the relevant water resource availability scenario;
2.4 the current health of the asset(s);
2.5 the improvement in health of the asset(s) as well as connected system benefits, expected from the watering action;
2.6 the change in the health of the asset(s) expected if environmental water is not provided including with regard to the long-term environmental water requirements of the asset(s) relative to recent hydrological conditions; and
2.7 the potential ancillary social, cultural and economic benefits from undertaking the watering action.

3. The potential risks of the proposed watering action

Issues considered include:

3.1 how thoroughly the potential risks have been assessed for the proposed watering, including with regard to the Basin Plan's water quality and salinity targets for managing water flows;
3.2 the adequacy of measures proposed to minimise these risks; and
3.3 the likelihood and consequence of variance from the expected ecological outcome (including negative impacts on biota and water quality).

4. The long-term sustainability of the targeted asset(s) including appropriate management arrangements

Issues considered include:

4.1 the feasibility of delivering environmental water to the targeted asset(s) over the long-term;
4.2 the adequacy of long-term management and delivery arrangements;
4.3 the existence of complementary natural resource management activities supporting the long-term management arrangements, including those that improve water quality; and
4.4 the effectiveness of monitoring, evaluation and reporting arrangements for the watering activity including clear links to the defined expected outcomes.

5. The cost, both in water and other resources, and operational feasibility of undertaking the proposed watering action

Issues considered include:

5.1 the amount of Commonwealth water and other resources needed, including relative to the contribution of the State and delivery partner to (i) the watering action and (ii) subsequent monitoring of actions and outcomes;
5.2 the arrangements for the delivery of water to the targeted asset(s), including the potential for transmission losses and the adequate accounting of flows;
5.3 the opportunity to supplement natural flows or coordinate with other water releases (including consumptive and other environmental water);
5.4 the operational feasibility of undertaking the watering action (e.g. channel capacity, infrastructure constraints, third party impacts etc.).