CONSULTATION DRAFT

NWI Policy Guidelines for Water Planning and Management

CONTENTS

1. Acknowledgements

These guidelines were jointly developed by a working group of the following agencies, working under the auspices of the Council of Australian Governments:

Australian Capital Territory	Department of the Environment, Climate Change, Energy and Water
New South Wales	Department of Environment, Climate Change and Water
Northern Territory	Department of Natural Resources, Environment, the Arts and Sport
Queensland	Department of Environment and Resource Management
South Australia	Department of Water, Land and Biodiversity Conservation
Tasmania	Department of Primary Industries, Parks, Water and Environment
Victoria	Department of Sustainability and Environment
Western Australia	Department of Water
Commonwealth	Department of the Environment, Water, Heritage and the Arts
	Murray-Darling Basin Authority
	National Water Commission

2. Introduction

Water resource management in Australia faces a number of challenges. The public increasingly expects the water resource base to be managed sustainably, to maintain the future viability of the resource and all who depend on it. This means resolving issues such as overallocation, increasing demand, decreasing and less certain supplies in some areas due to climate change and poor pricing approaches. Effective water planning needs to provide certainty about the terms of access for consumptive users and the environment through an evidence-based, participatory and transparent process. Water planning is central to dealing with (or preventing) the challenges of stressed water systems through both maintaining the viability of the resource and managing access to the resource to ensure water is properly valued.

In 2004 the Council of Australian Governments (COAG) agreed to the National Water Initiative (NWI) in recognition of the continuing national imperative to increase the productivity and efficiency of Australia's water use, the need to service rural and urban communities, and the need to ensure the health of riverine and groundwater dependent ecosystems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction (clause 5, NWI).

Prolonged and severe drought in southern Australia, the onset of climate change, growing demand and the legacy of past decisions are all placing a strain on available water resources. This reinforces the urgency for implementing commitments in the NWI.

These policy guidelines were commissioned in 2008 by COAG as part of its three-year work program on water to facilitate the development and implementation of NWI-consistent plans, building on experience gained to date. The guidelines have been developed by officers from Commonwealth, state and territory water agencies, including the Murray–Darling Basin Authority and the National Water Commission. The guidelines are designed to sit alongside the NWI and provide more detail on water planning aspects. Consistent with the NWI, the policy guidelines are intended to be relevant nationally for all water systems. The guidelines recognise that legislative and administrative arrangements for water resource management differ in each jurisdiction.

These guidelines highlight good practice approaches to planning and management. They are based on the NWI commitments but provide more detail about the issues to be considered. Given the variety of water resources and levels of use around Australia, the guidelines are not intended to be prescriptive. They are relevant to urban bulk water supply but do not address urban water beyond the bulk water off-take.

The objective of these guidelines is to assist all jurisdictions' water planners, policy makers and interested stakeholders in developing and implementing NWI-consistent water planning and management arrangements. The guidelines may also inform authorised agencies with a water management and planning audit function.

2.1. Definitions

The terms below that are used in these guidelines are intended to revise or build on the corresponding terms used in the NWI (Schedule B(i) and B(ii)).

Total resource is the total water available within a given resource at a given time or during a defined planning period. It may be described in a number of ways, for example as a long-term average with a confidence interval. It may also be referred to as the total pool.

Consumptive pool is the portion of the total resource that may be made available for consumptive use at a given time or during a defined planning period, either through water access entitlements or other statutory rights (for example, stock and domestic use, fixed term water licences) or unregulated use such as some interception activities.

Environmental and other public benefit outcomes that are specified in water plans may include a number of aspects such as:

- environmental outcomes: the maintenance of key environmental assets and key ecosystem services and functions (such as biodiversity and water quality)
- other public benefits: mitigating pollution, public health (for example, by limiting noxious algal blooms), Indigenous and cultural values, recreation, fisheries, tourism, navigation and amenity values.

Sustainable water extraction regime is the maximum level of water extraction allowable in a particular water resource (including the volume, timing, location and management of flows and extraction) that ensures that the environmental and other public benefit outcomes of the water plan can be met at an agreed level of risk.

Overallocation refers to situations where, with allowable full development of water access entitlements and all other forms of authorised[1] use in a particular system, the total volume of water able to be extracted by entitlement holders and other authorised users at a given time exceeds the sustainable water extraction regime for that system.

Overuse refers to situation where the total volume of water actually extracted in a particular system at a given time exceeds the sustainable water extraction regime for that system.

For more clarification about the different terminology relating to water entitlements used by the states and territories, please see: <http://www.nwc.gov.au/resources/documents/Dictionary-Water-Entitlement-terms-PUB-0406.pdf >

A searchable dictionary is available at <http://dictionary.nwc.gov.au/water_dictionary/ >

[1] An authorised use is any water use that is allowed through statutory rights and includes uses specifically excluded from licensing systems.

3. Planning

Clause 37 of the NWI commits states and territories to water planning that will provide for:

a) secure ecological outcomes by describing the *environmental and other public benefit outcomes* for water systems and defining the appropriate water management arrangements to achieve those outcomes, and

b) resource security outcomes by determining the shares in the *consumptive pool* and the rules to allocate water during the life of the plan.

Schedule B(i) of the NWI defines a water plan as:

> *statutory plans for surface and/or ground water systems, consistent with the Regional Natural Resource Management Plans, developed in consultation with all relevant stakeholders on the basis of best scientific and socio-economic assessment, to provide secure ecological outcomes and resource security for users.*

For the purpose of these guidelines, a water plan is a legally enforceable plan (noting that a plan may be a single legal instrument or a number of legal and policy instruments working together) that defines the allowable level of diversion or take of water from a defined water resource that is environmentally sustainable, and sets out the arrangements for sharing the water available for consumptive use among competing users. These guidelines do not address water sharing at the retail level (such as among urban consumers).

Whilst different approaches are possible, water planning is essentially the vehicle for the setting of sustainable environmental, social and economic objectives for the management of water resources. Effective water plans establish the rules to meet environmental objectives and for users to share water resources by providing certainty of access to a share of water over an agreed timeframe. The planning process should aim to meet environmental and consumptive needs within an evidence-based, participatory and transparent process. Potential and emerging threats to the resource, including climate change, need to be taken into account in the water planning process.

Water planning is central to dealing with the challenges of stressed water systems. It imposes a discipline to clearly define environmental objectives and strategies. The process also brings accountability for achieving those objectives.

3.1. Water planning principles

Figure 1 below sets out the generic steps to be taken in water planning. These may vary according to the scale of the planning task.

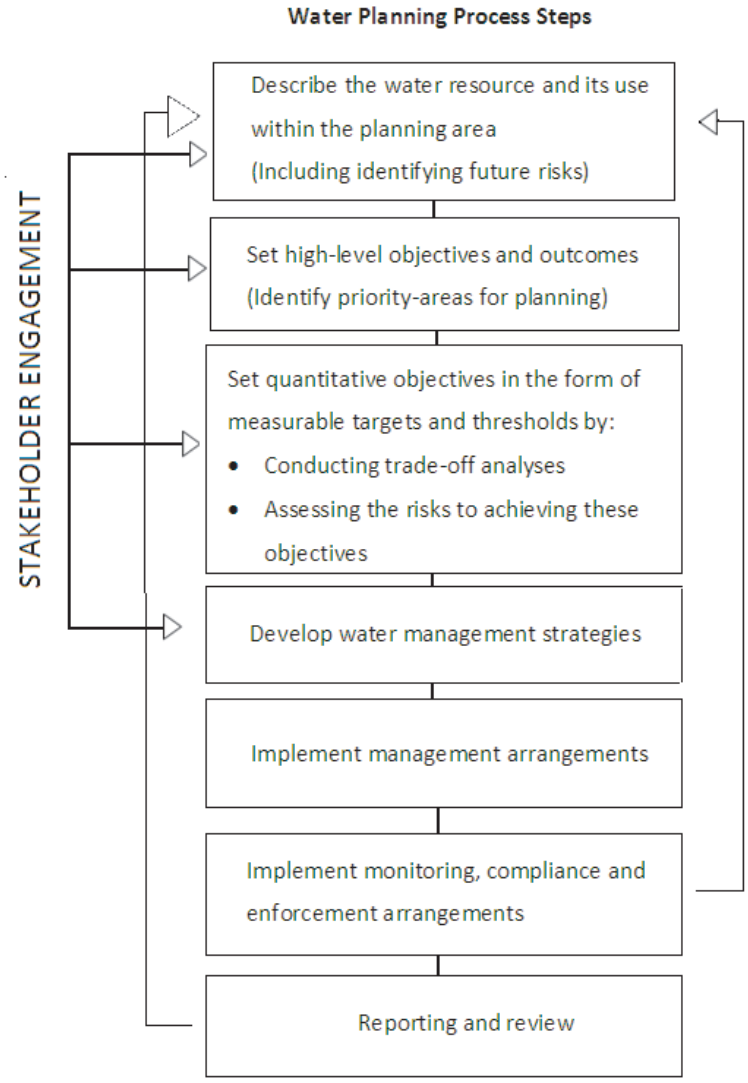


Figure 1: Water Planning Process

A number of overarching principles for water planning are as follows:

- *All water plans should have a statutory base.* This can be achieved in a number of ways, for example through a single legal instrument (such as with water sharing plans in New South Wales), a number of instruments (as with water resource plans and resource operations plans in Queensland), or a number of instruments and policies (such as Sustainable Water Strategies, bulk entitlements and management plans or rules in Victoria; and in licences controlled by water allocation plans in Western Australia).

- *Water planning processes should consider all forms of water use, including those that are not currently subject to water access entitlements.* Where the amount of water likely to be intercepted by particular activities without a water access entitlement during the planning period is, or could be, material to the water budget, the impacts of those activities should be accounted for within the consumptive pool. That is, the environment should not bear the risk for increases in interception activities. Water use by the forestry, mining/petroleum and energy sectors should be brought into the water planning process for a consistent, integrated approach to water resource management.
- *Monitoring is essential.* Water management requires reliable information about the resource and its use. Water monitoring, including metering, should be implemented using a risk-based approach. In high-use, high-risk systems, there may be a justification for metering of most water uses. In low-use, low-risk systems, a less intensive monitoring regime can be justified. Metering is also important for compliance and billing purposes.
- *Surface and groundwater should be managed in an integrated manner.* The NWI requires an assessment of the connectivity between surface (including overland flow) and groundwater systems. If it is shown that the connectivity between these two systems affects the management of the water resource, surface and groundwater should be managed as a single resource. Ideally, this should be through a single plan or at least through plans that refer to each other in an integrated way.

  In such areas, the entitlement and allocation system needs to consider the available water as a single resource. This does not preclude having separate surface and groundwater entitlements, but the impact of one type of entitlement on the other needs to be quantified and factored into transactions. If there is insufficient information to quantify the impact, then a precautionary approach[2] should be taken which, in practice, means that it should be assumed that the system is highly connected.
- *Indigenous water needs should be recognised.* The planning processes should consider Indigenous needs in relation to water access and management, incorporating Indigenous social, spiritual and customary objectives and strategies; respecting traditional knowledge; and taking account of the possible existence of Native Title rights. Access to water for commercial uses may also be important to many Indigenous communities.
- *Rights of existing uses and users should be recognised.* The water planning process should recognise the rights of existing authorised water users to a share of the resource.
- *All water access rights should be clearly defined.* Water access rights are conferred under a state or territory law. These rights authorise the holding or taking of water from a water resource. They cover a range of instruments, including water access entitlements (a tradeable share of the resource), stock and domestic rights, licensed

[2] A precautionary approach recognises that the absence of full scientific certainty shall not be used as a reason to delay action where there is a risk of irreversible harm.

use and other forms of authorised use such as riparian rights. The nature of rights should be clearly defined, including their nature, extent and duration, and any caveats such as on use or trade.

- *All decision making should be transparent and explicit.* Stakeholders should be able to identify and understand how environmental and other public benefits and social and economic objectives are identified. The decisions that balance the water requirements for the environment with the water demands of consumptive users should be made clear. This should involve actively and transparently considering and settling the trade-offs between competing outcomes for water systems, using best available science, social and economic analysis and community input, and addressing impacts on affected entitlement holders and communities. Similarly, all objectives and outcomes included in water plans should be explicit so their achievement is measurable.
- *Stakeholders should be engaged throughout the planning process.* The planning process should actively involve consultation with the local community, including Indigenous people, and other relevant stakeholders, and identify all water use values and associated water regime requirements. There should also be an emphasis on building a community understanding about the water and related resources. In order to be transparent, the process by which objectives and outcomes of water plans are identified should be made publicly available, including the information base upon which trade-offs and decisions are made.
- *Consider other relevant plans*. This may involve harmonising individual water plans with relevant regional natural resource management plans. Cross-border water plans should preferably be developed on the same planning cycle and with cross-border consultation.
- *Use knowledge-based decision making.* All available relevant data, information and knowledge about the water resources of the planning area and the associated environmental, physical, social and economic environment, should be collated, documented and made publicly available. Water plans should be underpinned by best available scientific knowledge and socio-economic analyses.
- *Apply a risk-based approach.* Risk-based approaches should be an integral part of all decision-making processes in water planning and should be made explicit. Water planning should put in place mechanisms to manage uncertainty and adapt to improved information and knowledge, including monitoring and reporting. Plans should also be robust to a range of future climate scenarios, and allow for the possibility that water availability may occur outside the planned range. In these cases, plans should include clear rules or processes to describe how such unprecedented or unplanned situations will be managed. This will allow water users to understand and manage their own risk profiles. In highly uncertain water resources, plans should be of short duration or reviewed regularly.
- *Use professional judgement as appropriate.* Where there is limited scientific knowledge and socio-economic analysis to inform the decision-making process, greater reliance on professional judgement is required. Professional judgement is applied to weigh up the level of confidence in the information available and the capacity to manage in the context of the policy direction for the area. The uncertainties and considerations need to be made explicit.

- *Adequate resources.* Water planning and management is a complex business. It requires adequate funding and other resources. The counterpoint to adequate resourcing is to put in place planning and management arrangements that will allow planning objectives and outcomes to be achieved at least cost. For example, water resources with low levels of use may need a less complex plan (see section 3.3).

3.2. Stakeholder engagement

For stakeholders to have confidence in decisions affecting water resources and the wider environment, they need to know that these decisions are based on sound information, have canvassed all relevant issues, and have been subjected to a methodical, transparent and accountable decision-making process.

Consequently, the development of a water plan relies on the participation of relevant accountable agencies, water users and the broader community. The responsibility for making decisions and finalising plans however rests with the accountable agency and/or the relevant Minister. Central to such an approach is a considered engagement process that incorporates clear communication, open access to supporting information and documentation of the decision making process and outcomes.

PRINCIPLES

- *Stakeholder identification.* Stakeholders include a range of interest groups from private water users, to Indigenous representatives, environmental and science groups and the general public.
- *Timing of stakeholder engagement.* Stakeholders should be engaged early in the planning process. Stakeholders may be able to provide key information or contribute new ideas to assist the planning process.
- *Type of engagement.* To engage the range of stakeholders, a number of communication methods may be required, including large and small group meetings and publishing materials in a range of languages. It is important that the objectives of engagement are specified so that expectations are realistic. This includes a clear enunciation of the parameters for engagement, such as what can and can't be accommodated in any consultation process.
- *Adequate information and opportunity for input.* Consultation should be ongoing throughout the planning process with regular updates. Stakeholders should be given adequate time to consider the information base to be used for plans. Consultation processes should be designed to ensure all stakeholders have equal access to information and input in the water planning process.
- *Stakeholder engagement in setting outcomes.* Stakeholders should be given opportunities to comment on the proposed mix of objectives and outcomes being sought in water plans (recognising that the government is the ultimate decision maker on these issues).
- *Consideration of structural adjustment issues.* The NWI commits governments to consult affected water users, communities and industry about adjustment issues

brought about by reduced water availability.

CONSIDERATIONS

- **Manage expectations**

The expectations of stakeholders can affect the success of planning outcomes. What is included within the scope of the planning process should be clearly specified to all stakeholders at the beginning of a process. Stakeholders should have an understanding of the impact that the requirements of one stakeholder will have on the requirements of another. This will facilitate discussion about the objectives and outcomes.

- **Reduce inequalities in bargaining power**

Engagement processes should recognise that different groups have different access to information; support should be planned for this, ensuring that all stakeholders have an opportunity to contribute. For effective engagement, particularly of Indigenous people and those from non-English speaking backgrounds, water planners should begin the process of information and capacity building early in any water planning process. Indigenous and other communities may have a low knowledge base of established water planning ideas, processes and practices. These communities may require appropriate methods for consultation and engagement to allow their knowledge and opinions to be an effective input to the planning process.

- **Language**

The language used in the provision of information can affect the level of understanding of the information. This is particularly the case with scientific concepts, findings and data. Information should be in plain English and focus on what it means for the water planning process.

- **Timing**

There is a need to allow sufficient time for appropriate engagement. A rule of thumb is that at least 12 months should be provided for engaging stakeholders in the planning process when capacity building is required. This gives stakeholders the time they need to develop the skills to participate in a meaningful manner.

- **Stakeholder authority**

Confirmation of the authority of representatives to speak on behalf of stakeholder groups should be established before the engagement process commences.

- **Cultural sensitivities**

Cultural sensitivities and perspectives should be accommodated and an understanding of how these affect the perspectives of stakeholders should be developed.

- **Maintaining engagement**

Stakeholders should be kept informed of developments and provided the opportunity for regular contact. Doing so encourages a sense of involvement and engagement and minimises stakeholder alienation.

3.3. Developing the plan

A key question for water planners is 'when is a plan justified?' A water plan may not be justified in low-use low-risk systems, or perhaps only a very basic plan is needed in these cases, whereas in high development water systems and conservation water systems the development of a detailed plan may be necessary. Increasing pressure on the resource and risks of environmental harm are usually the main drivers for a water management plan. Policy priorities, stakeholder commitments, and rapid changes in demand or climate projections also influence planning priorities. Before planning commences, the purpose, objectives, direction, duration, process and scope of the plan should be established.

Confirming the type of plan to be developed depends on its purpose: what issues need to be resolved, what management approach is possible, and at what scale this management should occur.

Establishing a direction or a position early in the planning process is needed to provide a common focus for the plan and to set a high level objective. This will help to inform the specific objectives for the water resource and the choice of management arrangements to implement the plan.

Confirming the scope of the plan identifies the resource under study, the level of investigation and information to be undertaken, the timeframe for the plan and the nature of project management and program resourcing required.

PRINCIPLES

- *Identify the type and scale of plan required.* The water system classification (see below) can provide guidance on the type, and hence, level, of water planning required – and therefore the extent of any preparatory work undertaken. All plans should have a statutory basis.
- *All plans should specify the sustainable water extraction regime for the system.* Establishing the sustainable water extraction regime will require identification of key environmental assets, and key ecosystem services and functions to be protected, and their water requirements. This will involve at some level the possible impact of future climate variability and the need to consider possible trade-offs between environmental outcomes and consumptive use.
- *Risk-based assessments should underpin the various stages of water planning*. Risk assessments should inform decisions about the type of water plan, the water that is to be included, the objectives and outcomes, and the management arrangements (including indicators and strategies for achieving objectives and outcomes, monitoring, compliance and enforcement).
- *Water plans should specify the period for which they apply.* The timeframe of a plan should be informed by the extent of available information and the level of uncertainty around the future availability and demand for the resource. The selected timeframe needs to balance these factors with the need for certainty. Plans should also detail arrangements for the continuation of plans in the event of unprecedented events.
- *Water plans should include allocation rules.* These rules set out the basis of allocation decisions for the water resource throughout the life of the plan. The rules should be

robust for a range of water availability scenarios and identify trigger points where management actions need to be taken to respond to changes in circumstances. Consideration needs to be given to what sort of events may occur, their likelihood and the potential impact on the water resource. Once this has been determined, then rules can be developed to deal with these events.

The rules should be designed to work for the vast majority of water availability scenarios (for example, in 90-95 per cent of cases) and to optimise water allocation within that range. A good practice is for the rules to be demonstrated prior to plan implementation, so that they are fully understood by water users.

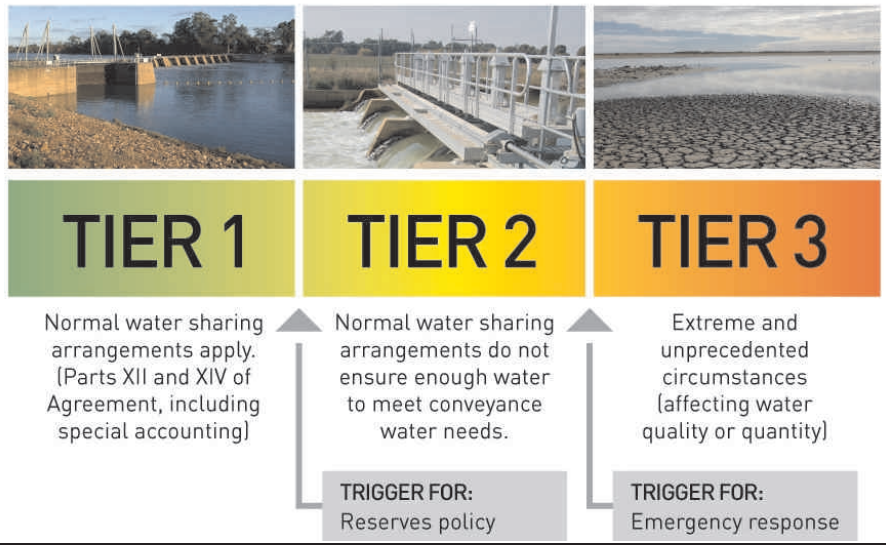
- *Mechanisms for dealing with unprecedented events should be included in plans.* As indicated above, water allocation rules should be robust to cater for most water availability scenarios so that plans are operating under 'normal' conditions nearly all of the time. However, unprecedented events should be contemplated and mechanisms put in place to manage them. This includes identifying roles and responsibilities for the decisions and actions that could be taken. Such actions should be specified within the plan as alternatives to the normal rules and provide for the adoption of alternate water sharing rules. Where relevant, water plans should identify specific triggers for the activation of alternative rules. See Box 1.
- *Indicators need to be established.* Indicators that will show if the water plan's outcomes have been achieved should be included in the plan. The indicators should match the outcome(s) and may be expressed as a range. Ideally indicators should be quantifiable and selected to show whether a range of objectives have been met. For example, the health of a specific wetland could be used as the surrogate for the health of other nearby wetlands. The aim should be to identify as few strategic indicators for the plan as possible, because rules need to be developed that can provide improvements in each one. Indicators should isolate the effects of the plan and the influence of externalities either be quantified or separated.
- *Take into account other natural resource management issues*. To the extent possible, water plans should be consistent with and complement broader natural resource management objectives. Water plans should identify any restrictions on the impacts of infrastructure development or other resource management issues on achieving a sustainable water extraction regime.

Box 1 - Water Sharing Arrangements to meet Critical Human Needs in the Murray–Darling Basin

The Murray-Darling Basin Agreement includes mechanisms to deal with the impact of unprecedented low water availability affecting the distribution of water in the southern Murray–Darling Basin. These mechanisms are the so-called 'tiers' for water sharing that are to be addressed in a new Schedule to the Agreement and reflected in the Basin Plan.

The tiers for water sharing provide for responses to be initiated when there is not enough water available to ensure that critical human water needs are met along the River Murray system. In situations where there is enough water available to meet critical human water needs, but the normal sharing arrangements do not ensure sufficient water to *deliver* this water (a shortfall in 'conveyance' water), then the Tier 2 arrangements are triggered. Tier 2 enables the normal sharing arrangements to be modified and contingency measures to be implemented in order to secure sufficient water for conveyance. Tier 3 arrangements are triggered when 'extreme and unprecedented' circumstances affect either the quality or quantity of water available for critical human water needs, requiring an emergency response.

The objective of both Tier 2 and Tier 3 is to facilitate a return to normal Tier 1 arrangements as soon as possible while providing a mechanism to deal with shortages of water in the system.



CONSIDERATIONS

- **Water system classification**

There are three broad classes of water systems for planning and management. These can provide guidance on the extent of water planning required. The classes are:

1. *Conservation water systems* have little or no water resources development, retain a high degree of naturalness, and are designated for protection. They may require significant effort to manage and maintain conservation values. Such systems would generally have rules that control water extraction or changes in flows of surface waters or levels of groundwater to minimise impacts on the conservation values of the water resource. For example, rivers declared under Queensland and New South Wales 'wild rivers' legislation would currently fall into this class.
2. *Low-development water systems* have low levels of demand for water supply and low risks to ecosystems. They can be managed by general or regional management arrangements as well as by simple water plans. Low-development water systems may have a simplified water management approach with some entitlements or specifically authorised uses because a fully developed entitlement system is not cost effective. In such cases, jurisdictions are expected to have "an ongoing process … in place to assess the risks of expected development and demand on resources … with a view to moving these areas to a full entitlement framework when this becomes appropriate for their efficient management" (NWI clause 33ii). Some water systems covered by New South Wales macro water plans are examples of low-development water systems. Unincorporated groundwater areas are also examples of low-development water systems where use is low and water quality is generally low. Such areas feature low development of the groundwater and generally have low yielding aquifers and highly variable water quality.

   The NWI requires that an ongoing process will be in place to assess the risks of expected development and demand on resources. This applies to poorly understood or undeveloped areas; these areas should have a full entitlement framework applied when this becomes appropriate for efficient management.

3. *High-development water systems* are those where current or projected future demand for water is high, or the system is close to or overallocated. In such systems, climate change estimates may suggest a high level of risk to key ecosystem attributes. In these cases, a statutory water plan should identify the trade-offs to be adopted and the management regime to be followed.

   If there is overallocation in such systems, there is a clear expectation under the NWI that water plans will include a pathway for bringing systems back to sustainable levels of water extraction.

- **Identifying the type of plan**

In conservation water systems, a limit on the total allocation should be set; and management should be delivered through individual instruments to protect the resource while still maintaining the security of entitlement for water users.

In low-development water systems, there is less pressure on the resource; however, the knowledge base may be such that a risk management approach to planning is used. Such management would take a low-risk approach to determining the amount of water available, based on the confidence of the supporting information and the capacity to manage the resource in meeting the high-level objective for the plan area.

In high-development water systems, the resource may be allocated up to the limits of sustainability. In such cases, more accurate biophysical and socio-economic information is required to ensure a very precise level of management. Sophisticated modelling of various abstraction scenarios against resource constraints is used to support decisions. Such a management approach allows for periodic varying of the total allocation in response to climate, giving users a secure entitlement to a share of available water. This type of management is supported by contemporary policy instruments to place an appropriate value on water as well as optimise the use of fit-for-purpose water and water from alternative sources. This management approach includes recovery mechanisms where required supported by appropriate metering and monitoring against thresholds mapped to targeted responses.

- **Establishing sustainable water extraction regimes**

In order to establish sustainable water extraction regimes scientific processes and techniques are needed to:

- prioritise ecological assets
- identify and quantify the level of water dependency of these assets (including water quality) using best available knowledge, and a precautionary approach where information is lacking
- specifically for groundwater dependent ecosystems – determine the area of influence of groundwater extraction and changes in water level or piezometric surface that may affect groundwater dependent ecosystems
- assess the risk to the ecosystem, including the susceptibility to water quantity and quality deficiencies of individual ecosystems within a water system
- set resource objectives
- determine the extraction regimes that minimise this risk.

The extent of detail will be relative to the nature of the water resource, the level of risk and the type of plan to be prepared.

3.4. Describing the water resource

The first step in any planning process is to describe the water resource and identify all uses and key users. This involves looking at the:

- current resource base
- current use and users
- outlook for the resource base
- outlook for resource use.

Further details on these aspects are provided below.

3.4.1. Current resource base

PRINCIPLES

A description of the current resource base should include:

- the quantity, quality and variability of all water resources, potable or otherwise. Brackish to saline groundwater resources should be included as some industries are not dependent on potable supplies alone
- the degree of connectivity between surface and groundwater resources, in order to minimise the potential for double-counting
- information on key environmental assets, including groundwater dependent ecosystems and; key ecosystem services and functions (such as biodiversity and water quality), and the water regimes needed to keep them healthy
- information and quantitative assessment of existing interception, and
- the infrastructure assets used to deliver water to the environment or consumptive users.

This information will form the basis of a risk assessment for the current resource, and it will inform the development of future options.

CONSIDERATIONS

- **Water quantity**

Good information on water quantity is fundamental to determining the environmental, economic and social outcomes of water planning. All water sources should be included in an assessment of the current resource base.

- **Water quality**

Understanding water quality and the factors that impact on it is necessary for ensuring

that water used is fit for the specified purpose. In coastal areas, where overextraction can lead to seawater intrusion, groundwater flow regimes need to be maintained to prevent deterioration in water quality which may impact on consumptive use and groundwater dependent ecosystems.

- **Environmental assets and functions**

All available information on the environmental assets of the water planning area, and downstream areas that the water planning could affect, should be considered. This includes assets within and adjacent to the riparian zone, groundwater dependent ecosystems, and estuarine and near coastal environments.

It is important to understand the significance of the assets, their ecological water requirements, and other management needs. Knowledge gaps should be identified and, wherever practicable, addressed.

The Commonwealth, states and territories are working collaboratively to develop a framework to identify and classify Australia's high conservation value aquatic ecosystems (HCVAEs). The key purposes of the framework are: to assist jurisdictions to meet their NWI commitment to identify and manage HCVAEs within their water planning frameworks to protect and enhance their values; and to identify a subset of nationally significant HCVAEs to assist the Commonwealth in focusing its natural resource management investments. The HCVAE framework is expected to be trialled in northern Australia and the Lake Eyre Basin with a view to completing a draft framework in late 2010.

The use of national databases and national methods for identifying environmental assets and functions should be supplemented by state and locally held information. Some sites may not be 'nationally' significant, but they can have particular importance to local communities.

3.4.2. Current use and users

The use and users of water can be characterised in terms of key groups. Plans should identify the quantity of water used by each group, and the linkage between water use, users and the specific instruments providing for such use should be detailed.

PRINCIPLES

- *Multiple use.* The reality that water resources have multiple demands placed upon them should be reflected in the assessment. In addition to water for the environment (see 3.4.1), the characterisation of uses and values of water should include the following consumptive and non-consumptive uses:
    - primary industries (irrigation, including conveyance water; on-farm use; stock watering; aquaculture; consumption of fish and shellfish)
    - recreational purposes (primary recreation, secondary recreation, visual appreciation)
    - water for domestic use
    - emergency water

- water used to fulfil management objectives (such as salinity management)
- industrial use (such as mining, manufacturing)
- maintaining cultural and spiritual values.

CONSIDERATIONS

- **Indigenous water values**

NWI sections 52 to 54 requires that Indigenous water values be included in planning processes, account for native title rights to water under the Commonwealth *Native Title Act 1993*, and account for allocation to traditional cultural purposes. Such purposes may be for Indigenous access to a water source rather than use of the water (for example, the Great Artesian Basin Mound Springs). Other examples of cultural values may include flow requirements to provide water for a billabong so that important ceremonies can be held. Indigenous values and the water regime needed to provide these should be determined through consultation.

Respectful and timely consultation enriches planning by incorporating Indigenous traditional knowledge of interconnectivity and ecological flow requirements for factors such as fish breeding, reed growth and bird breeding. See Box 2.

- **Potential impacts on downstream users and the environment**

The impact of water plans on water resources outside the planning area should be taken into consideration. This includes estuarine and coastal environments where fresh surface and groundwater flows are required to protect ecosystems and other uses (such as seagrass and prawn farming).

- **Identify overallocation and overuse of water resources**

The NWI contains a clear commitment that all parties will address any overallocation and overuse of water resources, and ensure that water plans provide a pathway for substantially addressing this issue by 2010.

Box 2 – Indigenous water values in the Great Artesian Basin

The natural springs and soaks of the Great Artesian Basin have been important to Indigenous people for thousands of years, and they provide important insights into the nature of these features. The development and maintenance of Indigenous culture in much of the Basin depends on sustainable access to Basin water.

In the year 2000, the Great Artesian Basin Strategic Management Plan recognised the need to incorporate Indigenous values and knowledge into management plans. Such plans need to recognise that a different approach to water management may be required due to cultural values and that Indigenous enterprises may have similar water requirements to non-Indigenous enterprises.

In 2008, New South Wales released the Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008*,* which specifically identifies aquifer access licences for Aboriginal cultural and community development. These access licences allow the taking of water by Aboriginal persons or communities for personal, domestic and communal purposes, and for recreational, cultural and ceremonial purposes and have associated performance indicators.

In South Australia in 2009, the Water Allocation Plan for the Far North Prescribed Wells Area recognised the cultural significance of Indigenous water sites such as the traditional Aboriginal economics associated with the Mound Springs. The principles in this Plan complement the *Commonwealth Native Title Act 1993* in the allocation of and accounting for water to native title holders for traditional cultural purposes.

<http://www.gabcc.org.au>
<http://www.artesianaction.com.au/templates/aa_content.aspx?pageID=83>
<http://www.saalnrm.sa.gov.au/Our_Plans_for_the_Region/Water_Allocation_Plan_.aspx>

3.4.3. Outlook for the resource base

The future outlook for the resource base requires a comprehensive look at the range of drivers affecting future resource availability.

PRINCIPLES

- *A risk assessment* (see 'Risk Module') that encompasses a wide range of threats should assess the full range of possible future impacts – including scenarios such as climate change, interception, land use change, bushfires – and it should be outlined in any assessment of water resources.
- *Assessments of future climate* should not necessarily be solely based on the long-term historical average, and the rationale as to what final climate sequence is to be utilised for the plan should be clearly articulated.
- *A range of scenarios should be considered.* Water plans should incorporate and describe, for public review, water resource modelling and testing for allocation under interception, land use, and climate change scenarios. This should also include sensitivity analysis and the accuracy of rainfall and run-off models.

CONSIDERATIONS

- **Known risks need to be assessed**

Modelling or estimating and allocating the resource should include known risks, including climate change. Recent experience in southern Australia indicates that relying on more recent data rather than the entire post-1900 record may be a more realistic, and

conservative, basis for modelling of future scenarios, especially in the south-eastern and western parts of Australia. See Box 3.

- **Other water sources need to be considered**

Opportunities to use other water sources, such as recycled or reclaimed water or brackish and saline water should also be considered under the planning process. The use of such water, where appropriate, may 'free up' potable water for a greater range of uses and users.

- **Setting the pace of change**

As part of the planning process for the water plan, the opportunity costs of the various trade-offs need to be considered. This is particularly so in relation to threats such as climate change. If the available knowledge and data indicate a slightly drier or wetter climate in, for example, 40 years time, then the water plan or planning cycle should incorporate the resulting changes, either now or at a specified time in the future. If drier conditions are predicted, there could be a significant opportunity cost of making adjustments immediately. Similarly, there are opportunity costs of not using water now if a wetter climate is predicted under climate change scenarios.

Box 3 – Climate change assessments

In the past few years, there has been a significant amount of work on climate change in Australia. For example the sustainable yield projects by the CSIRO and others provide a useful benchmark for resource assessment of ground and surface water resources, reporting on possible land management changes, current and future climate scenarios.

To date, these water resource assessments have been completed for the Murray–Darling Basin and Northern Australia. The Tasmanian and south-west Western Australian projects will report in late 2009 or early 2010. CSIRO has used future climate and current development to assess the range of likely climate conditions around the year 2030. Three global warming scenarios are analysed in 15 global climate models (GCM) to provide a spectrum of 45 climate variants for 2030. The scenario variants are derived from the latest modelling for the fourth assessment report of the Intergovernmental Panel on Climate Change. All 45 future climate and current development scenario variants are used in rainfall-runoff modelling; however, three variants – a 'dry', a 'mid' (best estimate –median) and a 'wet' variant – are presented in more detail and are used in river and groundwater modelling.

<http://www.csiro.com.au/partnerships/SYP.html>

3.4.4. Outlook for resource use

The social, technological and economic drivers of changes to the use of water resources should be assessed to develop a picture of the likely future water needs of the catchment.

PRINCIPLES

- *Future drivers for water use.* A wide-ranging assessment of future drivers for water use is needed, taking a whole of economy and society perspective and incorporating changes in demand for water such as from land use, population and climate changes. See Box 4.
- *Changing community attitudes.* The outlook for resource use needs to consider the

likely direction of community sentiment about sustainability of resource use and likely preferences for the types of use. In terms of extractive use, the NWI commits parties to using fully functioning markets to ensure the most effective water resource allocation.

Box 4 – Future drivers of water use

Whilst it is not possible to predict exactly what the future drivers of water use will be, scenario planning is a means by which possible futures and their water use implications can be explored. Scenario planning for water use involves projecting population, climate and other key variables, making clear assumptions about other drivers, inferring impacts on supply and demand, and generating scenarios. This approach allows possible future issues with water management to be considered and factored into planning processes now.

Future planning scenario work, such as that by CSIRO, provides useful insights into the future drivers of water use.

<http://www.cse.csiro.au/publications/2002/fulldilemmasreport02-01.pdf >

CONSIDERATIONS

- **Future Indigenous use**

The NWI requires water plans to take account of the possible existence of native title rights to water.

- **Climate change**

Climate change impacts will not only affect resource availability but also the extent of demand. Available information on the impacts of climate change should be incorporated into the planning process as this will directly impact on environmental, social and economic outcomes.

- **Changing land use**

One of the challenges in water resources planning is to predict the system's response to a given rainfall, especially in ungauged catchments. Calculating this response is normally done through a rainfall–runoff model or other hydrologic techniques if adequate data are not available to configure and calibrate such models.

This becomes more difficult when predictions of different land use change need to be incorporated, as the amount, location and timing will all impact on the rainfall–runoff response and hence water availability. Although existing models and techniques can account for these changes, an important consideration is how the model parameters or techniques could change under different land uses; a sensitivity analysis is required to assess this.

- **Sensitivity analysis**

When using simulation models that can integrate hydrological, water-quality, land use and socio-economic aspects of resource management, a sensitivity analysis is required to

help understand how the outputs of the model respond to changes in inputs. For such models to be useful in predicting the effects of management actions, the sensitivity of predictions to uncertainties affecting them should be understood and quantified as far as possible.

Sensitivity analysis helps identify the input parameters that should receive the most attention. Assessment of sensitivity and uncertainty is closely associated with the selection of model structure and estimation of the model parameters.

3.5. Setting objectives and outcomes

Water plans should include high-level statements of objectives that encompass government and community views about how the resource is to be managed for environmental and human benefit. Specific outcomes, both for the environment and other public benefit outcomes, and for resource access should also be explicitly identified, as required by the NWI.

PRINCIPLES

- *Set planning timeframe*. The time period covered by the plan should be considered at the outset of any process developing objectives and outcomes for water plans. This requires balancing the security of tenure of water users with the flexibility of plans to adapt to changing water regimes.
- *Set high-level strategic objectives for water plans*. These should set the broad direction for water resource management. For example, a water plan in an irrigation area will have different objectives to a 'wild rivers' area – and yet both of these objectives are appropriate.
- *Set measurable outcomes*. To be effective, outcomes for the environment, public benefit and consumptive use need to be measurable. The plan should set outcomes that are to be achieved over the life of the plan, including an adequate description of both outputs and outcomes to ensure progress can be assessed.
- *Assess the trade-offs and risks* for a credible range of competing outcomes from water resource use, using best available science and a socio-economic analysis of possible impacts on affected water users. The opportunity cost of basing planning on overly conservative future possible water availability should be considered during the trade-off process.
- *Use thresholds.* Plans should specify the acceptable level of risk of not achieving the outcomes set out in the plan. Where relevant, threshold values should be set, which become triggers for management action if they are breached.

3.5.1. Conceptual framework for establishing a sustainable water extraction regime

PRINCIPLES

- *The sustainable water extraction regime should preferably comprise three interrelated elements* as follows:

  a) *An optimal range including a volumetric target*. This range describes the long-term maximum level of consumptive use that will allow the plan's environment and other public benefit outcomes to be achieved. Such a range could be calculated in a number of ways, including using a long-term rolling average, or a formula based on modelling. The approach will vary with a number of factors, including the level of knowledge and whether the resource is a regulated or unregulated surface water system or a groundwater system.

  b) *The probability of achieving water extraction within the optimal range.* Given the variability of systems and the imperfect state of knowledge, it is necessary to consider how often the level of consumption could fall outside this optimal range before the achievement of outcomes is put at an unacceptable risk. Water planning should aim to ensure that the optimal range of water extraction is not exceeded more often than some predetermined frequency. For example, a scientific analysis might suggest that if water consumption is maintained within the optimal range with a 90 per cent probability, it is highly likely that the environmental outcomes sought in the plan will be achieved.

  c) *A threshold* – or trigger point – that indicates the level of consumptive use above which there is an unacceptable risk of compromising the outcomes of the plan. If the level of use results in the threshold or trigger point being exceeded, then remedial management action of some kind is required. If use above this trigger point continues, then the water system is deemed to be overused. This threshold or trigger will be a higher level of water extraction than the volumetric target in point (a). Such a threshold could be set in a number of ways, for example:

    - as a proportion of the target at (a)
    - as a minimum volume
    - as a formula based on modelling
    - as a surface pressure target (in confined groundwater systems).

    Again – the choice of the appropriate method for calculating will vary depending on the nature of the resource and other factors.

  By using the three elements in (a)–(c) above, it should be possible to optimise the level of water use within even a variable system. That is, the level of use can be maintained as high as possible with a low probability of being in the zone of unacceptable risk to environmental outcomes.

  It is also possible to include a socio-economic threshold or trigger point below the lower bound of the optimal range. This would be the point below which the water available for use is insufficient to meet the socio-economic outcomes of the plan.

  The elements at (a)-(c) above apply in the development of sustainable water extraction regimes. They will, therefore, also be an important consideration in the calculation of water allocation levels in a particular water year during the life of a plan.

  Figure 2 below presents a conceptual model of triple-bottom-line benefits relative to a

range of water extraction regimes using the elements described above. The two thresholds in the diagram mark the upper and lower limits to the sustainable water extraction regime.

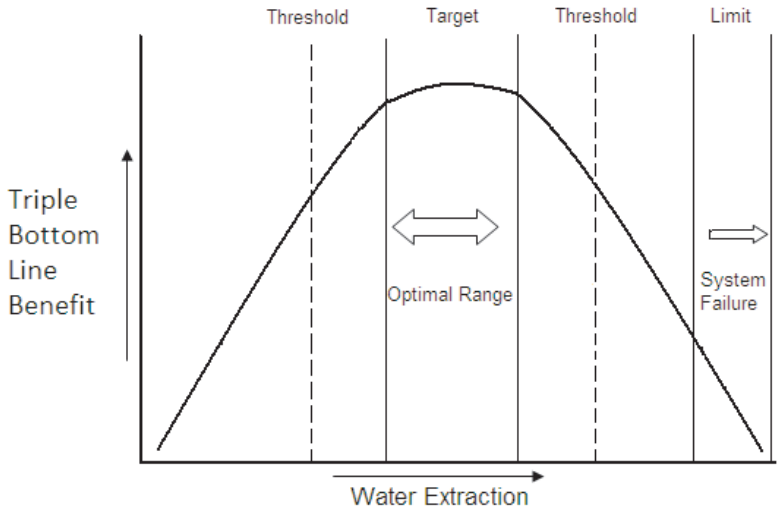


Figure 2: Conceptual model for optimisation of the water resource extractions relative to triple-bottom-line benefits

Ecosystems generally do not respond in an on–off manner to changing water availability. In particular, the risk that ecosystems will not be able to provide important services increases as water availability decreases, sometimes to the point where the ecosystem cannot recover. In addition, the response of ecosystems to water extraction may not be linear, and it is difficult or costly to recover beyond thresholds.

Figure 2 is a combination of Figure 3 and Figure 4 below, which show the threshold and target values for ecosystem services and socio-economic benefits respectively. In Figure 3, the extraction of more water than the threshold point may result in a permanent loss of ecosystem services and should be avoided.

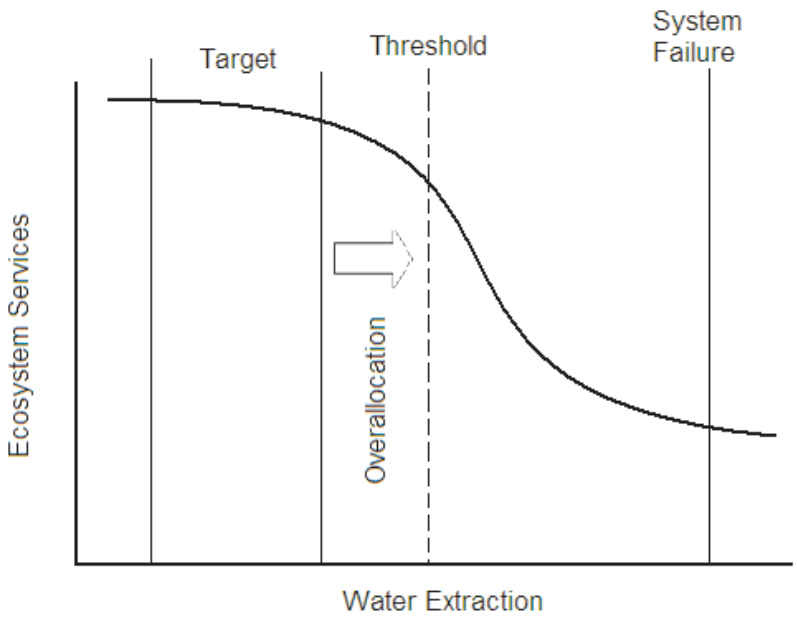


Figure 3: Ecosystem response to changing water extraction levels. The decrease in ecosystem services is represented as a smooth line, but in practice, there may be step changes. It is worth noting that the loss of ecosystem service at the threshold point does not (usually) occur at the first unprecedented climatic event that places a strain on the system. Therefore, when considering thresholds, it is important to consider how often water use can go beyond this level before an ecosystem service is at an unacceptable level of risk. For example, an unacceptable level of risk may be the threshold being exceeded more than one year in 10.

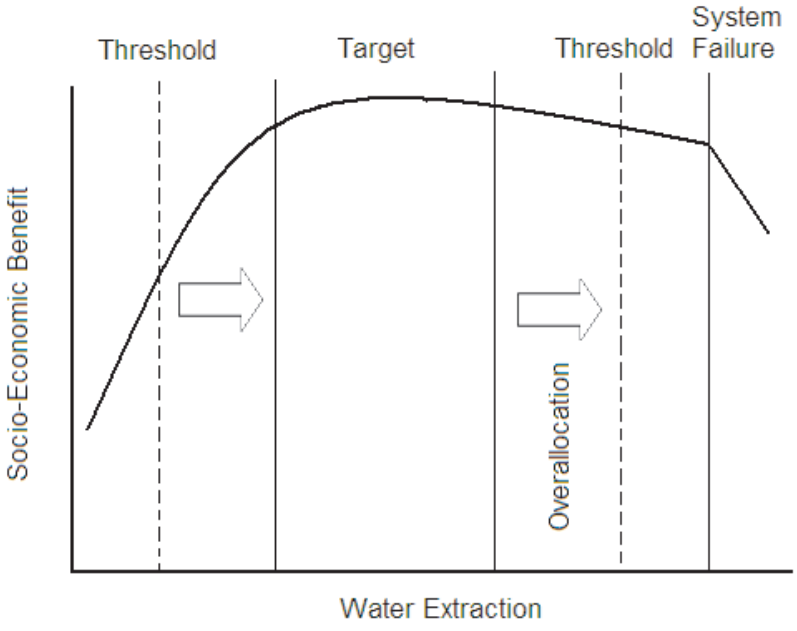


Figure 4: Socio-economic response to changing water extraction levels. The overall socio-economic benefit gradually increases as water extractions increase due to the relative importance of increased economic production from irrigated agriculture. Beyond the upper boundary of the target range, the overall socio-economic benefits will decline steadily to the point of system failure from a socio-economic perspective. After this point the socio-economic benefits will decline steeply.

3.5.2. Assessing trade-offs

Decisions relating to the distribution of water resources will always involve trade-offs. The term 'trade-off' is often used differently by different people and in different contexts. For the purposes of these guidelines, a trade-off is required when the demand upon the water resource exceeds the supply, and decisions are required to limit the allocation of the resource among users, and/or limit the water to meet environmental objectives. Generally, a level of water to meet minimal environmental needs and a level to meet minimal domestic supply will provide the boundaries for trade off decisions. For a water plan to arrive at the optimal mix of outcomes from a public perspective, trade-offs need to be made transparently and using adequate information.

Decisions about setting policy objectives should also be transparent and integrated with other relevant planning and management frameworks so as to avoid conflicts. The following diagram (from <www.nrmtradeoffs.net.au>) shows how to identify and manage current, emerging and future trade-offs.

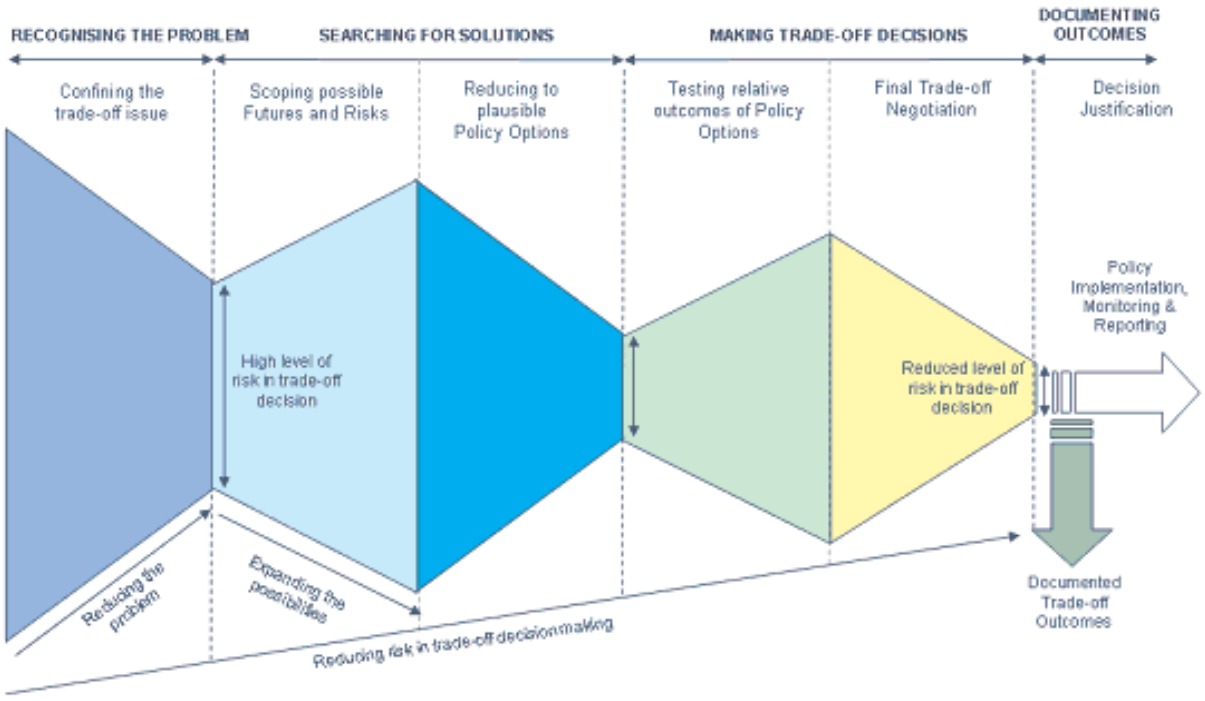


Figure 5: Policy process for natural resource management trade-offs.

As indicated in the diagram above, the process of considering trade-offs in setting outcomes is linked to assessing and managing risk. The process of trying to *optimise the benefits* of the water resource is effectively the same as developing a plan to *minimise the risks* associated with water sharing to the greater community and environment. Examining the risks that may arise under different water availability and use scenarios may help assess trade-offs. Risks (for example, to the environment, or the economy) could be assessed to characterise the consequences associated with different water sharing scenarios (refer to Module A for more detail on this). The scenario that has the lowest total risk associated with it (say in terms of environmental impact) may also be the optimal way of sharing the limited resource.

Professional judgement and expertise have a valid place in assessing trade-offs (clause 36). This is especially the case when information gaps do not allow quantitative assessments to be made. Transparency is important if professional judgement is relied onto allocate water: any assumptions should be identified and reasons for decisions should be provided.

3.6. Management arrangements

Once the detailed outcomes for the plan have been documented and agreed, the arrangements for allocating and managing water to meet those outcomes is required.

PRINCIPLES

- *Water for consumptive use should be allocated to water users by tradeable water access entitlements* with characteristics set out in the NWI. This will allow entitlement holders to make their own investment decisions, and over time, it will allow water to move to its highest value use.
- *Other forms of extraction for consumptive use* – such as use exempted from requiring a licence, licensed use, or statutory use – should be the exception, not the norm. Where available, the choice of licensing or management method should be an explicit decision that has accounted for the costs and benefits of each approach, including impacts on entitlement holders and the environment.
- *Water should be allocated and accounted for only once.* Allocation of water for consumptive use should take into account surface and groundwater connectivity in a particular water resource.
- *A risk-based approach to allocation* is necessary and should be consistent with meeting the explicit outcomes and targets set out in the plan. For example, water resources should be allocated conservatively where there is high uncertainty about the resource and whether environmental outcomes will be achieved.
- *Assigning risks for dealing with overallocation or changing allocations*. If the plan requires a significant reduction in consumptive water use in order to meet its environmental outcomes, this should occur transparently and consistently with the NWI risk assignment framework and any subsequent agreements by governments[3].
- *Efficient water market arrangements* should be in place to allow well-informed, low-cost trading of water access entitlements.
- *The recovery of efficient water planning and management costs,* which can reasonably and accurately be attributed to water users, should be pursued.

  Note: these guidelines do not currently address the issue of water markets or pricing principles.

[3] Such as those set out in the Intergovernmental Agreement for Murray–Darling Basin reform <http://www.coag.gov.au/coag_meeting_outcomes/2008-07-03/docs/Murray_Darling_IGA.pdf>.

3.6.1. Water access entitlements

The NWI provides that water access entitlements should:

- specify the essential characteristics of the water product
- be exclusive
- be able to be traded, given, bequeathed or leased (note, however, the exception of trading groundwater between aquifers)
- be able to be subdivided or amalgamated
- be mortgageable (and in this respect have similar status as freehold land when used as collateral for accessing finance)
- be enforceable and enforced
- be recorded in publicly-accessible reliable water registers that foster public confidence and state unambiguously who owns the entitlement and the nature of any encumbrances on it
- clearly indicate the responsibilities and obligations of the entitlement holder in accordance with the water plan relevant to the source of the water
- be able to be cancelled at Ministerial and agency discretion only where the responsibilities and obligations of the entitlement holder have clearly been breached
- be able to be varied, for example to change extraction conditions, where mutually agreed between the government and the entitlement holder
- be subject to any provisions relating to access of water during emergencies, as specified by legislation in each jurisdiction.

This section provides further information about the management of water access entitlements that is applicable to both surface and groundwater resources.

PRINCIPLES

- *Secure, clear and nationally compatible water access entitlements.* When deciding on entitlement structures to ensure a fair, efficient and orderly distribution of water resources, the objective should be to provide users with planning confidence now and in the future regarding the availability and security of water entitlements. Surface and groundwater resources should be managed to optimise economic, social and environmental outcomes. Entitlements need to be clearly specified (including reliability) and transferable if the benefits from consumptive use are to be maximised. The level of security should be sufficient to provide users with the information they need to make efficient investments.
- *Issuing of licences under a new statutory water plan.* When a statutory water plan is being developed for an area for the first time, the issuing of entitlements should be within the capacity of the resource, and where practicable, issuing of new entitlements through market-based mechanisms should be considered:

- while there should be no automatic claim to new entitlements, the rights of bona fide existing water users, including Indigenous people, should be considered;
- if there is a case for issuing subsidised entitlements then this should be made transparent. The practice of relying on 'history of use' as a basis for determining such entitlements should be carefully applied so as not to perpetuate any inefficient past practices.

- *Recognise that interception activities may erode entitlements.* Interception activities should be identified, and potential impacts should be quantified and managed to address the impacts on water access entitlement holders and the achievement of environmental outcomes.
- *Issuing entitlements in water resources that are not fully developed.* Additional rights to water should not be issued in water resources that are at risk of overuse. The NWI supports the issuing of further water access entitlements through the market (for example, by a public auction, or by direct sale or a tender process where market prices have been established).
- *Brackish and saline water.* As the use of such water is limited in comparison to potable water, the cost structure of the entitlement and the ability to trade such water would need to be incorporated into any plan. However, management difficulties should not preclude the inclusion of brackish to saline groundwater in the planning process.

CONSIDERATIONS

- **Entitlements in connected systems**

Several entitlement scenarios exist for connected systems, which require different approaches:

- systems where entitlements are still being granted in both surface water and groundwater
- systems where entitlements to surface water are no longer being granted and surface water users can use their full entitlement, but groundwater entitlements are still being granted
- systems where entitlements to surface water are no longer being granted and surface water users can use their full entitlement, and no more groundwater entitlements are being granted
- systems where entitlements to surface water are no longer being granted and surface water use is 'capped' at a certain level, but groundwater entitlements are still being granted
- systems where entitlements to surface water are no longer being granted and surface water use is 'capped' at a certain level, and no more groundwater entitlements are being granted
- systems where entitlements to both surface water and groundwater are no longer being granted, and use of both surface water and groundwater is 'capped' at a certain level.

Planners should be conservative in allocating access to shared water in systems where the degree of connectivity is relatively unknown. In highly connected areas, consideration

should be given to establishing a single licence rather than issuing separate surface and groundwater licences.

The success of this management regime would be highly dependent on being able to monitor use of shared water and enforce any restrictions on access to this water. These monitoring and enforcement costs could be considerable and would need to be factored into any benefit–cost analysis of altering existing arrangements. Planners should be conservative in allocating access to shared water in systems where the degree of connectivity is relatively unknown.

- **Trading in connected systems**

Trade will primarily occur in systems that are fully allocated or otherwise capped through a mechanism to allow a market to develop but is not restricted to such areas.

In connected systems there is the ability to trade between surface and groundwater systems, though consideration needs to be given to the time lag between water movement and variability in water quality and any defined limits on extraction in the destination water source.

When trading within a groundwater system similar concerns may apply, but this should not restrict such trade. Trade can occur as long as essential criteria are met, such as a lack of interference from other users, and maintenance of overall groundwater levels and appropriate discharge to groundwater dependent ecosystems or similar. Such problems are not dissimilar to capacity constraints in surface water systems.

It is essential to ensure that all systems that allow trade have in place monitoring, measuring and compliance regimes, including (in accordance with NWI clause 87ii) meters on extraction points. This will reduce the illegal taking of water and minimise the impact this has on the market. Improving the certainty of entitlement and reducing the costs of assessment should assist the transparent operation of informed markets.

- **Unregulated and ephemeral streams**

The nature and impact of a water access entitlement on environmental water management needs to be considered at a variety of scales, for example, whole-of-catchment, river reach or individual wetland. This means that environmental water managers need to have flexibility in their operations to, for example, utilise an event-based flow, rather than relying exclusively on entitlements. This would mean that the planning process would need to incorporate this ability so that responses can be made to events before they arise. In doing so it is important that such ‘rules of take’ are clearly articulated with common-sense language that can be easily understood and applied to the local context. Also, any potential third-party impacts of varying access rules should be identified and addressed.

These ‘rules of take’ would also apply to other users and be clearly detailed in the water access entitlement. For example, once flows diminish below a certain level, no more extraction can occur. Such a restriction on extraction could also be applied to groundwater extraction to help ensure the maintenance of baseflow.

- **Urban water**

Where water plans are developed for water resources that are also utilised for urban water supply, the demands for water from urban water users and the impact of their use needs to be considered. However, in most cases the urban water supply is managed by

a supply company. The company is a major entitlement water holder (or bulk entitlement holder) and needs to be considered as part of the overall assessment of existing and future demands on the water resource. The demand predictions for urban water supply and any demand management actions at the end user level such as urban water restrictions are not necessarily part of the water plan but are considered by the supply company or the government agency responsible for water security.

Where urban water users access local managed water resources, for example groundwater or stormwater to supplement their reticulated water supply, the water plan for that water resource needs to consider sustainable levels and manners of take from that resource. In such situations, the urban water users become entitlement holders for the purpose of that plan. A water plan should be able to regulate stormwater take and use, similar to managing surface water.

- **Estuary and coastal management**

Consideration should be given to the freshwater requirements in estuaries for both commercial and environmental needs, for example, oyster farmers and sea grasses. Whilst a specific entitlement may not be required, the water requirements should be accounted for in the water budget.

- **Tidal pools**

Water extraction from tidal pools can have a significant effect on salt-water intrusion during dry periods and on users of the resources. It is important that this extraction is covered by a water access entitlement regime.

The water planning process should consider the rates of inflow to the tidal pool, salinity levels within the tidal pool itself and define access rules that consider equity with upstream user access and amongst users within the tidal pool.

- **Imported water between catchments**

Where a water plan concerns a water resource that is utilised outside its catchment through water supply infrastructure, the plans covering both the resource of origin and the receiving water resources need to address the impact of the use of this imported water on the local water resource and other natural resources. The plan can set rules about the manner in which the imported water needs to be extracted, stored or applied to minimise the risk of negative impacts, such as perched watertables, salinisation or impacts on environmental assets. Plans should also consider the movement of water between systems for disposal purposes, such as re-injection or excess water disposal.

The preferred approach is to have some high-level principles in the plan covering the water resource of origin. The plan should also, where necessary, contain access rules concerning the extraction of the water that will be taken outside the catchments. It needs to consider the impact of completely removing volumes of water from the natural catchment, therefore focusing on the impact of taking the water from the resource for use in the other catchments. The water plan covering the receiving water resources can provide the more detailed conditions for the storage and use of the water. These can be integrated on water use approvals or use licences for the native water resources used alongside the imported water.

3.6.2. Providing for Indigenous water use

The NWI commits parties to provide for Indigenous access to water resources through inclusive planning processes that incorporate Indigenous social, spiritual and customary objectives. Water plans are also to take account of the possible existence of native title rights to water resources.

PRINCIPLES

- *Indigenous water needs* are likely to cover both cultural and economic uses of water, and these uses may overlap.
- *Cultural needs* may include specific features of some environmental flows and/or maintaining groundwater dependent ecosystems.
- *Provision of water to meet Indigenous water needs should utilise existing mechanisms* where possible, including:
  - for cultural purposes, as part of the water that is allocated to meet environmental and other public benefit outcomes. Such water may be in the form of 'rules based water' that is provided for in environmental water regimes, or it may be in the form of non-tradeable water access entitlements or licences whose use is prescribed for the achievement of environmental and other public benefit outcomes
  - for commercial purposes, Indigenous water users can access water through statutory authorisations. In some instances, governments may choose to provide assistance with such access, for example community water supply.
- *In water systems that are not yet fully developed,* consideration should be given to setting aside a portion of the unallocated consumptive pool to provide for possible future Indigenous water access.
  - The gifting of water access entitlements for economic use is potentially at odds with the market-based approach encouraged in the NWI (although it does reflect the approach taken historically with water use development in much of Australia).
  - If such an approach is adopted, it is recommended that the costs are publicly reported, as is the case with other community service obligations in the NWI.
- *Water accounting*. Water to meet Indigenous needs should be included in the water account for all water plans.

3.6.3. Environmental water

The NWI states that water that is 'provided' to meet agreed environmental and other public benefit outcomes as defined within relevant water plans is to:

i) be given statutory recognition, have at least the same degree of security as water access entitlements for consumptive use and be fully accounted for

ii) be defined as the water management arrangements required to meet the outcomes

sought, including water provided on a rules basis or held as a water access entitlement

iii) if held as a water access entitlement, may be made available to be traded (where physically possible) on the temporary market, when not required to meet the environmental and other public benefit outcomes sought and provided such trading is not in conflict with those outcomes.

PRINCIPLES

- *Environmental water security.* Water from entitlements used to provide in-stream flow for the environment should be given the same statutory recognition and have at least the same degree of security as water access entitlements for consumptive use and be fully accounted for.

  As stated in clause 30 of the NWI, regulatory approvals enabling water use at a particular site for a particular purpose will be specified separately to the water access entitlement.

- *Allocations to the environment.* Water for the environment should be allocated through an appropriate mix of 'rules based' water and access entitlements or allocations, which will vary depending on the type of water or regulatory system.

- *Explicit provisions.* The sustainable water extraction regime and associated arrangements (such as environmental works and measures) required to achieve the environmental outcomes of a water plan should be explicit.

- *The level of risk to be transparent*. It is essential that the level of risk to environmental assets and functions under the environmental water provisions in the plan is clearly identified. This includes transparency in the trade-offs that lead to the environmental water provisions and how they are derived from the environmental water requirements.

- *Environmental water manager.* An environmental water manager should be given statutory responsibility for the overall achieving of environmental outcomes within a water plan area, including periodic public reporting of progress towards those outcomes.

CONSIDERATIONS

- **Sources of environmental water**

It should be recognised that water to supplement environmental provisions may be sourced from a range of public and private owners, and this should be applied in a cooperative fashion towards achieving the environmental outcomes set out in a plan.

- **Unregulated streams**

In managing the environmental needs in unregulated systems, the planning process needs to consider a limit or threshold below which a management response will occur, for example, to cease extraction or require by-flow valves to be opened. Unregulated streams are generally not controlled by a major regulating storage and therefore releasing water is often not a management option. Accordingly a conservative approach should be taken in allocating water for consumptive use and this should consider both current and future

flows.

- **Ephemeral streams**

Management of ephemeral streams by volume is difficult, and individual management strategies need to be developed. Consideration needs to be given to the maintenance and diversity of existing species and the water quality required. Consideration also needs to be given to winter-fill diversions that may impact on native fish migration and spawning as well as other physical processes as channel scouring and silt removal.

- **Estuarine and coastal environments**

Water quality issues in estuarine environments are complex due to the internal mixing of fresh and saline waters, and biota have differing tolerances to fresh and saline waters. This makes the ecological response more difficult to predict.

Issues to be taken into account include the impact of reduced flow on the potential closure of the mouth of estuaries, fish migration, flushing water quality and the salinity profile. Similarly, issues such as the socio-economic impact of water uses are a significant consideration due to the many competing uses for water within and between estuarine water users and those that may exist upstream.

Hence a risk-assessment methodology needs to be developed that determines the amount of fresh water an estuarine system needs to prevent damage to the ecosystems. This involves definition of the issues, changes to the flow regime and the value and vulnerability of the estuary.

3.6.4. Groundwater specific management

The NWI applies to both surface and groundwater. The NWI term *water system* is defined as:

> a system that is hydrologically connected and described at the level desired for management purposes (e.g. subcatchment, catchment, basin or drainage division and/or groundwater management unit, sub-aquifer, aquifer, groundwater basin).

Many parts of Australia rely on groundwater as their principal source of water. In areas that rely largely on surface water, groundwater has often been used to supplement supply for irrigation purposes, or as a source of stock and domestic water. However, with the drying of the landscape in many parts of Australia groundwater is now the main source of water for communities. Many groundwater systems are interconnected with surface water systems.

PRINCIPLES

- *Groundwater infrastructure should be licensed or otherwise authorised.* Management of individual water bores is an integral part of groundwater system management. Extraction from one bore can have a significant effect on the performance of another, and a poorly constructed bore can impact on the water quality of an aquifer. The approvals process for individual water bores should consider the nature of the aquifer and location of the bore in relation to other bores in determining whether the licence application should be approved.

- *Managing non-renewable groundwater resources.* Non-renewable groundwater systems are those where recharge is significantly lower than that in the geological (historical) past or where groundwater aquifers have been cut off from recharge by geological events and have not been recharged for thousands, if not millions, of years. The use of non-renewable groundwater is increasing in a number of Australia's arid areas, especially to satisfy the demands of the mining industry.

  Non-renewable groundwater systems require different management regimes from recharging groundwater systems. This may include individual assessments for each new development to determine the impact on other uses and the environment rather than a full-scale management plan in the short-term. A management plan in the longer term is desirable for these areas.

  Decision-making should be transparent when it concerns the 'mining' of groundwater. Criteria should be set outlining the conditions under which 'mining' of the resource is acceptable. For example, it may be considered acceptable to allow groundwater 'mining' up to a certain percentage of the overall resource provided there are no adverse impacts on the users of the resource and groundwater dependent ecosystems.

Box 5 – Managing non-renewable groundwater

The Water Allocation Plan for the Far North Well Prescribed Wells area in South Australia recognises the importance of the petroleum resources contained within the Cooper and Eromanga basins. It is acknowledged that groundwater is co-produced as part of the process of extracting the hydrocarbons: currently this is up to 17 megalitres of groundwater per day.

The plan also acknowledges that this co-produced water is used for processing operations, drilling, water supply for the township of Moomba and road maintenance.

The amount of co-produced water peaked in 1994 at 34 megalitres per day. As the level of petroleum activity is expected to increase significantly over the next five years, this peak has been used as a basis for 'allocating' water to the petroleum industry.

Rather than assigning an individual 'allocation' or entitlement to each current field or future petroleum well, a specified consumptive pool of 60 megalitres per day (out of a long-term total estimated extraction of approximately 474 megalitres per day) has been set aside in the plan for this purpose. This is based on an expected demand of 40 megalitres per day plus a buffer of 20 megalitres per day to allow for future operations as an objective to not restrict petroleum production due to co-produced water restrictions.

The taking and use of this water as a by-product of petroleum production is licensed by purpose in an area specified by the petroleum production license, subject to annual reporting of total volume used for that purpose by Primary Industries and Resources South Australia under the South Australian *Petroleum Act 2000*. Water allocated for these purposes can be transferred for similar purposes only.

3.6.5. Interception

When surface and groundwater flows are intercepted downstream water users, including the environment, can be adversely affected. Management of interception is one of the objectives of the NWI, with parties to have in place comprehensive arrangements to manage interception activities no later than 2011.

The objective of these guidelines in dealing with interception activities is to ensure

effective nationally consistent policies on management of interception activities that pose a risk to the integrity of the water access entitlements system and the achievement of environmental objectives.

Some key definitions for interception are:

Interception activities: land use change or other activities that involve the capture or use of water that occurs outside of the water access entitlements system. Interception occurs when flows of surface water or groundwater are stopped, reduced or redirected. Interception activities can include authorised uses such as stock and domestic dams or bores, other uses such as commercial plantations, environmental plantings, stormwater harvesting, changes in land use, and natural events such as bushfires (which result in increased interception during the recovery phase).

Threshold levels of interception: an explicit limit of water use identified in a water plan to accommodate growth in interception impacts within a particular system, above which the level of interception has a material impact on the integrity and security of the water access entitlements system or the achievement of environmental outcomes. Activities that could result in this level of interception being exceeded require a management response to ensure this does not occur.

PRINCIPLES

- *Management responses to interception activities should:*
  a) be commensurate with the level of risk posed by an activity to the integrity of water access entitlements or the achievement of environmental outcomes of the particular catchment or aquifer
  b) recognise the potential social, economic and environmental implications of management actions
  c) be as simple and efficient as possible whilst minimising transaction costs
  d) be complementary with existing management activities undertaken within each jurisdiction, and
  e) avoid retrospective measures where possible.
- *Access to water should generally be through the water access entitlement system.* The water market is the best method for allocating water to significant water users. Water intercepting activities that are significant water users[4] – or are expected to become so during the life of a plan – should be brought into the water access entitlements system.
- *A risk-based approach to the assessment and management of impacts of interception activities should be adopted.* Guidelines for conducting risk assessments are included

[4] Significant water use is that which has, or will have, a material impact on the water resource. The impact of the water use can be observed in the water accounts.

in the Risk Module. In systems that are deemed to be high-risk, all water required for future growth in interception activities above an appropriate threshold should be accessed from the consumptive pool if the potential for expansion of those activities would impact on the water security for other uses, including the environment. Any licence or water access entitlement should offset the full impact of the interception activity on the water resource.

Lack of full scientific certainty should not be a reason for postponing appropriate action to manage interception activities.

- *The assessment and management of risks posed by interception activities should be underpinned by appropriate monitoring, compliance, public reporting and auditing arrangements.* Compliance arrangements should include: risk-based, best practice monitoring and metering; public reporting; and appropriate deterrent and enforcement actions. Monitoring levels of interception activity is needed for transparency, assessing compliance with regulatory requirements and providing resource information to assist with management. This need has been linked to a need for resourcing and cost recovery mechanisms to enable the appropriate management response.

CONSIDERATIONS

- **Determining the level of risk posed by interception activities**

Planners should assess the level of risk posed by interception activities, including:

a) the geographic location of the risk arising from specific interception activities within a particular catchment or aquifer
b) the hydrological characteristics of water intercepted or used by each interception activity
c) projections for growth in interception activity over the planning period
d) the social, economic and environmental impacts of interception activities.

- **Setting thresholds**

The level of growth in interception, if any, that is allowed for by a given threshold should be lower in water systems that have high competition for water.

A threshold for the cumulative impact of interception activities should be set for the whole system. There may also be a need to set specific thresholds for particular interception activities, depending on the significance of those activities within the catchment, subcatchment, aquifer or other defined management area.

- **Determining management responses commensurate with the level of use**

Implement appropriate management actions as follows:

a) Where feasible and cost-effective, implement mitigation actions to maintain the impact of interception activities below the threshold level during the planning period.
b) To the extent that mitigation measures are unlikely to be effective, provide for the orderly, equitable and transparent transition of interception activities in the unlicensed part of the consumptive pool to activities in the licensed consumptive pool. This ensures no net increase in consumptive use by requiring water access

entitlements to be held to offset the potential impact of interception activities above the appropriate threshold.

NOTE: The holding of a water access entitlement may involve the direct purchase and transfer of an existing water access entitlement that is not tradeable for the term of the impacts of the interception activity. The water access entitlement should be the appropriate category with characteristics that reflect the impacts of the interception activity. Where the impact of the interception activity is perpetual or ongoing, the offset water access entitlement may be required to be permanently retired.

c) Alternatively allow for the increase in interception activities through the granting of a new water access entitlement. Providing this is done in a transparent and quantified manner, does not decrease the likelihood of achieving environmental outcomes and is done in full consultation with all affected parties. Such an approach should only be contemplated where:

   i. the transaction cost of imposing a requirement to hold water access entitlements is demonstrably high or a market is not sufficiently established
   ii. the risks to the water resources are demonstrably low
   iii. there is no significant risk associated with the achievement of environmental objectives, and
   iv. there is a clear economic benefit in so doing.

   NOTE: an example of where this may be applied is in relation to stock and domestic use in areas of low population density.

- **Policies and incentives that drive increased water interception.**

External policies such as the differential taxation treatment of land-based activities and programs for implementing sustainable landscape management practices can result in an incentive for increased interception of water resources. This may potentially impact on the integrity of water access entitlements and the achievement of environmental objectives.

Provided there are sound, risk-based approaches to the management of interception in place and the ability to adjust regulatory arrangements in response to emerging risks, then the impact of some external policies can be managed. In some cases this may require the ability to quickly put in place interim and short-term controls – such as moratoriums – while water plans are developed or amended in response to the emerging risk. In other cases, the external policies may have a higher priority and tradeoffs may be required. It is also incumbent on governments, when introducing new policies, to make sure that the implications of those policies are properly understood and the appropriate consultation has occurred.

3.6.5.a Plantations

Plantation forestry is a water interception activity with largely unregulated water impacts in Australia. In order to fully account for water use by major users, water planning needs to recognise that plantation forests may intercept more water compared to other land uses such as pasture. Changing land use from pasture to plantation may affect a change to

rainfall runoff characteristics. Such changes may be desirable, for example in the mitigation or remediation of the impacts of saline groundwater.

Where a plantation's root zone has access to groundwater resources, it will compete for water with other groundwater users. Whilst the volume of rainfall runoff during periods of low rainfall is often negligible, access to groundwater cannot be actively rationed in times of low rainfall and runoff availability, as it can be for activities that are part of the licensed consumptive pool.

For the purposes of this framework, plantation forestry refers to forest plantings that are grown for the production of timber or non-timber products for commercial purposes, including as carbon sinks.

Access to water for commercial purposes should generally be through the water access entitlement system. For example, all future plantation developments and rotations may be required to hold an offsetting water access entitlement on the basis that this is a commercial use that impacts on other uses. Access to water for commercial purposes should generally be through the water access entitlement system. For example, all future plantation developments and rotations may be required to hold offsetting water access entitlements in highly developed water system on the basis that they pose a risk to the integrity of the water access entitlements system and the achievement of environmental principles.

Box 6 – Managing the water resource impacts of plantation forests in South Australia – A Statewide policy framework

In June 2009, the South Australian Government released the Statewide policy framework, *Managing the water resource impacts of plantation forests*.
<http://www.dwlbc.sa.gov.au/water/plantation_forests/index.html>

The policy framework will contribute to addressing an important component of the broader NRM challenge i.e. to ensure the ongoing viability of surface and groundwater resources that sustain the environment, industries, communities and regional centres across South Australia.

The framework sets high-level principles and provides guidance to agencies to ensure that the water resource impacts of plantation forests are identified and managed within sustainable limits.

Plantation forest water resource impacts are to be fully accounted for within the water budget of a management area where forestry impacts are considered to be significant. This includes all components of forest water use, including interception of groundwater recharge (and surface water yield) and direct groundwater extraction.

The policy framework promotes the use of appropriate management tools and provides a decision support tool to help planners and decision-makers work out the best option to manage the water resource impacts of forests in a specific set of circumstances, recognising that forests use water differently to irrigated agriculture and other water uses.

PRINCIPLES

- *Means of managing the risk of existing and future increases in water interception from plantation development include:*

- where systems are significantly below full allocation, setting threshold levels using a risk-based approach. For example, by setting a percentage limit of area of plantations per catchment and
- where catchments are approaching, at, or past full allocation, requiring a water access entitlement be held to offset water use of plantation forestry above an appropriate threshold level.

- *Decisions not to require offsetting water access entitlements should be justified* on the basis of a risk assessment that considers possible impacts on the achievement of environmental outcomes and on water access entitlements or other authorised water use.

CONSIDERATIONS

- **Existing plantations**

In areas where a decision has been made that plantations are required to hold offsetting NWI consistent water access entitlements, there are a range of issues to consider.

To avoid claims of retrospectivity, plantation owners should preferably not be required to purchase an entitlement during the remaining life of existing plantations. As an alternative, it would be acceptable to simply account for this use within the consumptive pool, or to issue a non-tradeable entitlement for the remaining life of the plantation.

At the time of establishing a new rotation on an existing site, there is an argument on the grounds of competitive neutrality that the owners of both existing and new plantations should purchase the necessary offsetting entitlements. If governments decide to issue free entitlements, then:

- this should be effective immediately (that is, possibly before the end of the existing rotation) as this will more quickly attune those owners to the responsibilities associated with water ownership and management and
- such decisions should only occur following consultation with all existing water entitlement holders, whose asset values are likely to be impacted.

- **Offsetting plantation water use**

The type and amount of water entitlements necessary to offset the water use of a particular plantation should be consistent with the hydrological impact of the plantation. In this context, the following issues should be considered

- water impacts will vary during the life of a rotation
- water use by trees cannot be actively rationed in times of low water availability, and the impacts of evapotranspiration on nearby water sources tend to increase in drier periods
- in general, high reliability surface water or groundwater access entitlements will be necessary to offset plantation water use (or an equivalent amount of low reliability entitlements calculated using an appropriate exchange rate) and
- the actual quantum of entitlements required should be based on best available

science. In the absence of a comprehensive hydrological study for each situation, the use of realistic estimates will be necessary.

- **Trading water entitlements**

Water access entitlements that are purchased on the market to offset the water impacts of plantation forestry should be tradeable back onto the market when the water impact has ceased (that is, at the end of the rotation if a future rotation is not planned). For this reason, no special class of entitlement may be required, but rather an ability to ensure the required entitlement is held by the proponent and 'shelved' for the period it is offsetting any water impacts.

3.6.5.b Stock and domestic water use

Neither stock nor domestic use are defined consistently across jurisdictional legislation.

PRINCIPLES

- *Source water should minimise the hydrologic impact.* This should be implemented where practical and economically viable. This may involve preferentially sourcing stock and domestic water from reticulated systems where available, or relying on groundwater rather than dams to improve the efficiency of water use by minimising evaporation losses.
- *Clearly define rights.* Rights to stock and domestic water use should be well defined. If the rights are not defined volumetrically then the boundaries between stock and domestic use and for example stock intensive use should be clearly defined.
- *Volumetrically account for stock and domestic use in water budgets.* Volumetric accounting should be based on information where it is available, or alternatively on realistic estimates of water use.
- *Monitoring activities should be implemented.* Monitoring activities should be conducted to ensure water use is for genuine stock and domestic purposes. In some high-risk catchments, for example around peri-urban areas, there may be justification in metering stock and domestic use for compliance purposes.

CONSIDERATIONS

- **High transaction and management costs**

Consider the costs and benefits of monitoring and compliance in low-use systems. The extent of the impact on the environment and other consumptive uses should be taken into account.

- **Site-specific impacts of capture of overland flows**

There may be site-specific impacts, such as on nearby wetlands or water dependent ecological communities.

- **Peri-urban water use**

Activities in the peri-urban zone can use significant amounts of water, sometimes accounting for a third or more of use within a catchment. The requirements for stock

use are different in peri-urban areas to traditional agricultural stock use, and there is a need to review the nature and level of water access and use in these areas, including the nature of local government regulations.

3.6.6. Mining and other extractive activities

Mining and other extractive industries have a large, localised, incidental water use or impact associated with ore production or hydrocarbon extraction. It may be additional to operational requirements, and it may include water supplied for mine sites and mining towns. This needs to be accounted for in the water budget.

Such operations can disrupt groundwater flowlines and can cause local contamination of the aquifer (and surface water) well beyond the life of the operation.

Clause 34 of the NWI allows for special water management arrangements to be put in place for mining and other extractive industry activities where needed. However, the NWI does not preclude parties from including these industries in their water planning regimes.

The increased incidence of third-party impacts from mining operations closer to populated areas suggests that the water use impacts of extractive industries should be integrated within the wider water planning process.

Under the COAG work program, parties have agreed to adopt regulatory mechanisms that ensure that:

- the impacts of activities outside the water entitlement system that could interfere with the integrity of an aquifer (for example, drilling or excavation) are understood prior to approval, and
- arrangements are in place to ensure that the legitimate water access rights of existing water users are protected.

PRINCIPLES

- *All water sources need to be considered.* Whenever possible, all water sources should be considered for mining operations. High quality water should be used only where it is essential or where no other suitable source is available. This should also include the use of surplus 'onsite' water.
- *The water resource impacts of mining and other extractive industries need to be managed.* This can be done as part of an environmental impact study or other process to gain authorisation, and consideration needs to be given to:
  - the cumulative effect of all operations
  - the protection of water quantity and quality (including beyond the life of the mine)
  - what type of monitoring and evaluation is required
  - whether offsets are required to minimise the impact of the operations.
- *All water use by mining and other extractive industries,* including energy generation, should be authorised and accounted for in water budgets and managed under regulatory arrangements that are part of, or consistent with, water plans.

- *Mining operations do not have a right to all the precipitation or overland flow* that falls on, or crosses, their land. This is the same for all land owners or users. Mining operations also need to ensure that any water leaving the operation is of suitable quality.

CONSIDERATIONS

- **Mining companies are both a user and supplier of water.**

Due to the nature of the operation, mining is a consumptive user of water; but due to the incidental extraction of water as part of the mining process, mining companies may be in a position to supply water for both internal and external use.

- **Water planning and management processes have been designed for other uses**

Current water planning and management processes have been established primarily to manage irrigation and urban use, including industrial uses. In light of this, the current entitlement system in some jurisdictions may not be appropriate for the mining industry.

The mining industry is a consumptive user of water, and also takes water that enters a mine as a result of dewatering the incidental aquifers. In either case, this water should be accounted for and licensed either through an existing licence category of an appropriate volume and appropriate security or through development of a special type of entitlement, as provided for under clause 34 of the NWI. This entitlement would allow the mining operation to transfer the incidental water entering its operation to other users by a private contractual arrangement. This water can either be issued to the mining operation upon application or, in high competition water sources, sourced from the water market.

The mining industry should become part of the wider planning process. Where geographically feasible the industry may become part of the water market and could aid in the supply of water for urban or agricultural use.

- **Changes to the water regime.**

Where mining results in changes to the water regime that impact on environmental water needs, arrangements to maintain environmental assets over an appropriate time frame are needed. In some cases springs impacted by dewatering may need to be supplemented, in other cases release of excess water needs to be managed to limit inundation or water quality impacts to riparian zones or receiving wetlands.

Where appropriate, a mining operation could be granted an 'offset entitlement'. In areas where it is impractical to supply water to other users or where the water quality is unsuitable, the mining operation could purchase, for example, high security water entitlement(s) that would be held for use as environmental flows.

- **Application of future water entitlements to mining and other extractive industries**

Mining operations are usually long-term ventures, and the water impacts of mining operations are often unaccounted for under legislative arrangements. Applying a requirement for licensing entitlements due to ongoing mine expansion may be appropriate in some circumstances to ensure all water extracted from a water source is fully accounted for and licensed.

In some instances, exemptions may apply. For example, these may be based on the size of

the operation, the purpose of the operation, or the period of the operation (with there potentially being a difference if it is short or long term). Nevertheless, a baseline of water extraction should be established. Entitlements should then be required for any additional extraction, subject to reasonable exemptions, particularly for small industries that extract minimal volumes of water.

Finally, exemptions could be phased out over the life of a water resource plan, in a way that gives industry time to fully account for and acquire their water without inadvertently affecting the water market over a shorter term.

- **Reporting on water use**

Integration with other planning and approval frameworks is required to ensure mining ventures report on their water use. It may also be possible to draw from industry frameworks. Compliance and enforcement provisions may be required in legislation to give powers to officers to verify mining water use reporting. Management plans need to be regularly reviewed as the production from the mine increases to help ensure that there are no unintended consequences for other users or the environment.

- **Measuring water use**

Mining operations are currently able to measure most of the water used or extracted as part of their activities. These measurements need to be extended so that water use or extraction in all parts of the operation is accounted for.

Management plans need to be regularly reviewed as information of water use from mining and other extractive industries operations becomes available.

3.6.7. Statutory uses

Under the NWI, it is preferred that water use be managed through water access entitlements, however, the NWI does note that it may be appropriate for some use to continue under other forms of statutory authority. There may be scope in some water planning processes for some low-impact activities to continue under access arrangements or rights authorised or exempted by legislation where water access entitlements are not required. Examples of such use might include basic landholder rights and water for fire-fighting.

PRINCIPLES

- *Statutory authorisations should be removed if necessary*. If a statutory authorisation for a particular use (such as stock and domestic use) operates to displace a requirement that a water licence or water access entitlement be held for the use, and if application of the principles for management of interception indicate that growth under the statutory authorisation is a risk to planned outcomes, then the statutory authorisation should be removed.

CONSIDERATIONS

- **Temporary access**

In some cases it may be desirable to allow temporary uses of water under statutory arrangements, such as for fire fighting.

- **Remote areas**

Rather than move to a full licensing regime issues tradeable water entitlements it may be appropriate to continue to provide for statutory use or rights in remote areas characterised by low water-use land uses.

- **Trial while resource being 'proven'**

Where the quality or reliability of the water is being assessed through trials, a conservative approach should be adopted to initial licensing and subsequent issuing of entitlements. Examples include the testing of recycled, reclaimed, brackish or saline water for suitability for particular uses.

3.7. Monitoring

A monitoring program should be included in the plan to provide an ongoing assessment of whether the management objectives are being achieved, including the adequacy of the water operational rules. The design of the monitoring program should take into account available resources (for example, labour, expertise, equipment).

In establishing a sustainable water extraction regime, a water plan should set a number of outputs or performance indicators by which the outcomes of the water plan can be measured. Possible examples include: maintenance or improvements in water flow regimes and water quality condition, or achieving specific targets in relation to Indigenous access, recreational use or river navigation.

PRINCIPLES

- *Monitoring programs should provide a mechanism for increased (spatial and temporal) data capture at low cost.* For example, consider equipping private bores with capacity to record level and use. Telemetry (as opposed to data logging) is seen as very expensive though it may become a long-term practical proposition.
- *Expanding groundwater monitoring (for resource condition) and bore metering networks.* Monitoring of the resource condition is required to ensure the ongoing health of the resource and to help ensure ongoing benefits for all users. According to the National Water Commission (2006) only 20–40 per cent of major groundwater users are currently metered. Much of this metering would be located in high groundwater use areas, such as irrigation areas, or for specific environmental assets.
- *Appropriate degree of monitoring.* The level of monitoring should be proportionate to the nature of the water resource and its use. In high use areas or where there are significant environmental assets, extensive bore networks, gauging stations and regular monitoring are required. In lower use areas, fewer bores, stations and less

monitoring will be required, but this should be reviewed regularly.

4. Reporting and review

Under Clause 80 of the NWI, the Parties agree that the outcome of water resource accounting is to ensure that adequate measurement, monitoring and reporting systems are in place in all jurisdictions. This is to support public and investor confidence in the amount of water being traded, extracted for consumptive use, and recovered and managed for environmental and other public benefit outcomes.

Annual reporting arrangements should include reporting on the water rules. This includes whether they were activated in a particular year, the extent of implementation, and effectiveness of the use of resources in the context of the environmental and other public benefit outcomes sought and achieved.

As noted at the beginning of these guidelines, water planning is a cyclical process and review is an important component of this. Ideally, the review process will identify lessons that can and have been learned from the previous season or water planning period. Similarly, specific identification of the actions taken to address issues that threatened to, or did, compromise the achievement of specified objectives and outcomes should be included in the reporting and review process.