Australian Government
Productivity Commission

Water entitlements and planning

Supporting Paper A

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GUIDE TO THE SUPPORTING PAPERS *(AND DESCRIPTOR)*

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Contents

Key points

- Water entitlements (and other access rights) and planning arrangements are the basis for allocating water resources among consumptive water uses (such as irrigation, industry, urban, stock and domestic) and the environment. They aim to promote water supply security, investment confidence and sustainable and efficient water use.
  - Under the National Water Initiative (NWI), States and Territories committed to establish water access entitlements and planning frameworks that adhere to specific principles on the basis this would optimise economic, social and environmental outcomes.
- The fundamental elements of the NWI framework are largely in place.
- Reforms to water access entitlements and planning should be maintained and enhanced. Key areas that warrant further attention in a renewed NWI include:
  - ensuring water entitlements and planning arrangements consider all key water uses, including those by minerals and petroleum industries and interception activities, and all water sources, including alternative water sources such as stormwater. A fit-for-purpose accounting and measurement regime and risk-based decision making are required to better manage water use under the entitlements framework, particularly for interception activities
  - ensuring that water planning adopts best-practice principles, including that it is fit for purpose, recognises the needs of Aboriginal and Torres Strait Islander people, clearly specifies environmental objectives and outcomes, is based on an assessment of the trade-offs between environmental, social and economic outcomes, involves appropriate engagement with stakeholders and communities, and is independently reviewed
  - establishing contemporary water plan processes that account for climate change. This should include provisions in water plans to deal with water scarcity arising from drought, including priorities for water sharing and actions relating to meeting critical human and environmental water needs. In relatively undeveloped and developing areas, there is an opportunity to set consumptive and environmental shares in ways that manage the risk of future resource reductions. And in fully developed systems, triggers could be identified that indicate the need to rebalance environmental and consumptive uses and reset the objectives from time to time.

The main function of water access entitlements and planning arrangements is to allocate water resources among consumptive uses (such as irrigation, industry, urban, stock and domestic) and between consumptive uses and the environment. Entitlements provide water users with a right to extract water from a specific resource. Water planning establishes and documents the management arrangements for specific water resources, including how much water will be available for extraction (consumptive use) under different conditions, and the rights and obligations of entitlement holders. These arrangements aim to promote water supply security, investment confidence and sustainable, and efficient water use.

Under the National Water Initiative (NWI), and its predecessor the COAG 1994 Water Reform agenda, States and Territories committed to establishing entitlements and planning frameworks comprising specific principles. Looking ahead, a renewed NWI needs to ensure that these frameworks provide sufficient guidance to enable communities to deal with future challenges — to contend with drought and withstand shocks, and adapt to a changing climate baseline.

This supporting paper describes water entitlements and planning reforms spanning several decades (section 1). It then discusses areas that warrant further attention and proposes advice for a renewed NWI (sections 2 to 4).

1 Water entitlements and planning reforms, and progress

Before the 1980s, State and Territory Governments generally used administrative approaches to allocate water (PC 2017, p. 68). Under these arrangements, governments handed out often ill-defined water rights based on land area and types of water use (for example, rights lacked clarity, flexibility and consistency (NWC 2009, p. 104)). This provided little incentive for efficient water use and had little regard for the adverse effects of water extraction and use on the environment and downstream entitlement holders.

Over the decades from then, rising demands on water resources, water scarcity in many parts of Australia and environmental degradation have raised awareness about the importance of managing water resources efficiently and sustainably (*Report:* chapter 2).

The first steps towards a more sustainable water management regime began in the 1980s when New South Wales, Victoria and South Australia initiated state-based reforms (NWC 2011, p. 41). These involved the establishment of secure water access entitlements and the development of a market-based system of water allocation.

In 1994, COAG recognised that water trading would enable water use to 'maximise its contribution to national income and welfare' and agreed to establish a system of tradeable entitlements to allow water to flow to higher value uses subject to 'social, physical and ecological constraints' (COAG 1994, p. 2). Prolonged drought and extreme water scarcity in many parts of Australia in the 2000s reinforced the need to manage water resources efficiently and sustainably.

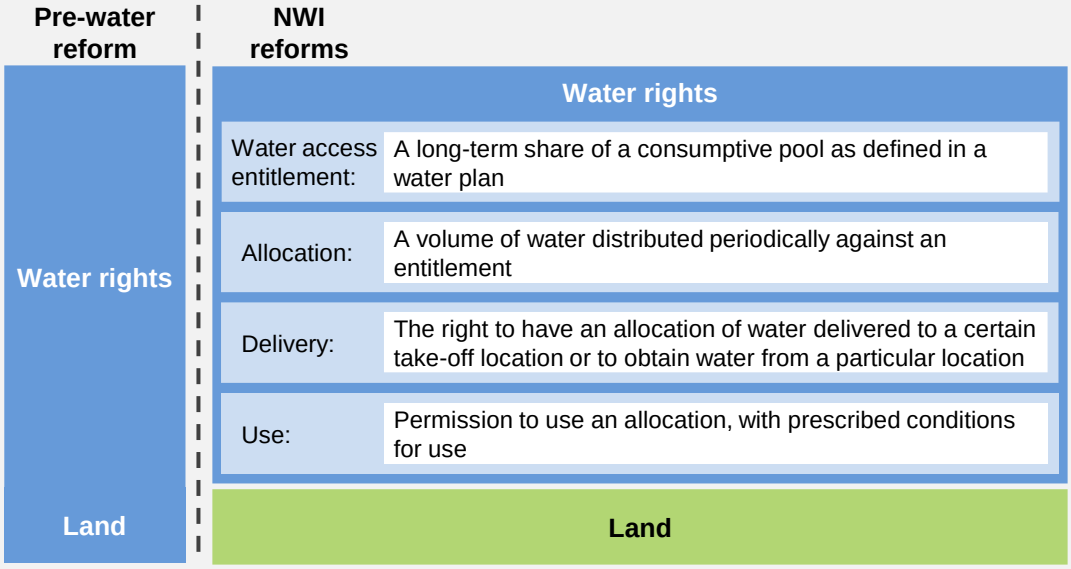
1.1 The NWI built on and extended previous reforms

The NWI built on previous reforms. Under the NWI, statutory-based water access entitlements establish a property right to water — effectively as a share of the available resource. This is intended to deliver investment confidence and security for the environment and consumptive users. The NWI outlines a list of features that entitlements should exhibit (box 1).

Box 1 The National Water Initiative added more detailed commitments about water access entitlements

In the past, a water right bundled together a range of permissions under one licence. These included the right to take water, the right to have a water allocation delivered to a certain take-off location or to obtain water from a particular location, and the right to use it on an area of land. (figure below).

The National Water Initiative (NWI) built on earlier reforms by providing more detailed commitments about entitlements. It aimed to separate entitlements from land title to facilitate water trading. This separation allowed irrigators to sell entitlements (and/or seasonal allocations) while maintaining access to infrastructure, and lifted impediments to, and approval times for, trade. It also allowed water users, more broadly (such as, irrigators in connected systems, urban water users and governments) to purchase entitlements (or allocations) independently of land.



Characteristics of water access entitlements

Under the NWI, parties agreed that consumptive use of water must require a water access entitlement that is statutory-based to create secure property rights to water. Specifically, the NWI states that entitlements must be separate from land, described as a perpetual or open-ended share of the consumptive pool as determined by the relevant water plan, and:

i) specify the essential characteristics of the water product;

ii) be exclusive;

iii) be able to be traded, given, bequeathed or leased;

iv) be able to be subdivided or amalgamated;

v) be mortgageable (and in this respect have similar status as freehold land when used as collateral for accessing finance);

vi) be enforceable and enforced; and

vii) 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.

Characteristics of water access entitlements are aligned with those of efficient property rights.

Sources: NWI paragraphs 28, 31; Productivity Commission (2017, p. 70).

Parties also agreed to prepare statutory water plans for surface water and groundwater management systems, which govern the management of entitlements in that system. Water planning is the process which sets the balance between consumptive and environmental uses in a water system, through establishing the share of water available for each and the rules for system management and trading (box 2). It involves community and stakeholder engagement, and should seek to use the best available scientific knowledge and socioeconomic analysis.

Box 2 **National Water Initiative: water planning**

Water planning is the process whereby trade-offs are made by communities and other stakeholders between economic, social and environmental considerations in sharing and managing the available water resources.

Under the National Water Initiative (NWI), parties agreed that it is each jurisdiction's responsibility to determine the need for water plans for specific areas based on an assessment of the level of development of the water system (including the extent to which water in the system is allocated for consumptive use), projected future consumptive demand, and the risks of not having a detailed plan (including to the health and condition of the water system).

The NWI commits governments to achieving an appropriate balance between consumptive and environmental use through water planning, and through recovering water in overallocated systems. The consumptive share includes water for both rural and urban use; changes in demand for urban water will flow into planning decisions.

Parties also agreed on specific characteristics and components that would guide jurisdictions in preparing water plans. For example, the NWI notes that plans should include (among other things) consideration of environmental and other public benefit outcomes, Indigenous water use, water interception activities and the level of connectivity between surface and groundwater systems. It also notes that water planning processes are to include stakeholder engagement, the application of the best available scientific knowledge, socioeconomic analyses and transparent consideration of use, environmental, cultural and other public benefit issues.

The statutory nature of water access entitlements and water plans, which underpin extraction limits and water access entitlements, promotes supply security by providing legislative protection against arbitrary removal or attenuation of rights.

Sources: NWI paragraphs 36-57; Productivity Commission (2017, p. 71).

1.2 The fundamental elements of the NWI remain largely in place

In 2017, the Commission reported that the fundamental elements of the NWI framework related to entitlements and planning were largely in place, however, further effort was required to meet the intent of the NWI (PC 2017, p. 71). Reviews of some water plans have shown deficiencies (NRC (NSW) 2019, pp. 2–3), and in some cases, the integrity of entitlements regimes have been undermined due to issues with compliance and metering (SP E *Integrity*).

However, most jurisdictions have largely achieved or, in the case of ongoing NWI commitments, are largely meeting most of those relating to water entitlements and planning (*Assessment*).

- All jurisdictions (except Western Australia and the Northern Territory) have established statutory-based entitlements that are fully consistent with the NWI.
- Water plans have been established for the majority of areas of intensive water use, although the coverage between jurisdictions varies (PC 2017, p. 71; SP C *Environment*). Under these plans: trade-offs have been made between consumptive and environmental use with water for consumption identified and capped; provisions have been made for the environment; and system operating rules have been agreed — based on the best information available at the time and with community and stakeholder engagement.

1.3 Entitlement and planning reforms have provided benefits

Water access entitlements have contributed to economic benefits

Water access entitlement reforms have created secure property rights to water — which are a prerequisite to water markets and trading (SP B *Trading*) — and have generated significant economic benefits.

For individuals, entitlement reform has led to statutory-based assets, which irrigators and other water users can trade or use to borrow against. This has offered irrigators more choice and flexibility in managing their businesses and has facilitated longer-term investment planning (PC 2017, p. 74).

At a sector-wide level, secure entitlements have enabled water trading that generates hundreds of millions of dollars in economic benefits each year. Economic modelling showed that water trading in the southern Murray–Darling Basin (MDB) increased Australia's GDP by $220 million in 2008-09 through reallocations of water used in agriculture (NWC 2010, p. v). The benefits of water trade are discussed further in SP B *Trading*.

Several participants to this inquiry expressed support for the NWI entitlements framework, noting that the reforms have created benefits for water users, including improvements in productive and sustainable water use, and economic and social outcomes (CICL, sub. 7, p. 1; AgForce, sub. 24, p. 3; NSWIC, sub. 27, p. 10).

Planning processes have enabled more transparent and inclusive decision making…

Planning processes have been vital in promoting public confidence in planning decision making. Robust and transparent processes are particularly important when trade-offs need

to be made between environmental, social and economic outcomes (PC 2017, p. 74). Processes have been improved through:

- legislation governing water planning, which requires community engagement, and transparent development of water management arrangements and water plans
- hydrological, environmental, social and economic assessments at the plan development stage, and the use of socioeconomic analysis and scientific information to assist in establishing the balance between consumptive and environmental use, and the rules for system operation
- established engagement processes to ensure stakeholders have the opportunity to participate in planning arrangements
- inclusion of clearer and more measurable objectives (PC 2017, pp. 75–76).

While inquiry participants submitted their support for transparent and inclusive water planning (such as Sydney Water, sub. 94, p. 9) some noted that there is scope to increase transparency. For example, the National Farmers' Federation (sub. 42, p. 16) stated that 'planning to date has failed to make transparent trade-offs between costs to farmers and environmental benefits'. This is discussed further in section 3.

… and improved environmental outcomes

Estimating the extent to which planning reforms have improved environmental and ecological outcomes is complex, however, it is generally considered that reforms have contributed to reduced stress on water systems and promoted a more sustainable approach to water management (SP C *Environment* discusses this in more detail). In part, the following reforms have contributed to this.

- The establishment of the environment as a legitimate user of water resources and the protection of the environment's share of water in systems with water plans (PC 2017, p. 76). This protects the environment from further degradation and reduces associated future costs.
- In overallocated systems, pathways to a more sustainable balance between consumptive and environmental use have been established — although further work is required before this is achieved.
- Water plans have largely been based on the best available scientific research at the time (Waldron, Tan and Johnson 2018, p. iv).
- Processes have been established that incentivise integrated management of surface water and groundwater — for example, conjunctive plans or surface water and groundwater plans that recognise the interactions between the two.

In summary, entitlements and planning reforms have provided significant benefits. The introduction of secure property rights has generated economic benefits at the individual level and at a sector-wide level. Planning processes have promoted more transparent and inclusive

decision making. They have also identified a balance between consumptive and environmental water use, and have clearly established the consumptive pool and associated rules for consumptive take. Overall, water plans have provided a firm foundation for more sustainable water resource management.

However, despite the progress that has been made, there are a number of areas that warrant further attention. These have been brought to the fore as recent challenges have exposed weaknesses (for example, the recent drought) and lessons are being learnt from addressing them. These are discussed in the following sections.

2 Managing all key water uses under the entitlements framework

As noted above, the entitlements framework outlined in the NWI has been fundamental to the integrity of the water management framework and was a necessary prerequisite for effective water markets and trading. It provided a clearly defined regime of water property rights that has underpinned water reform in Australia.

A renewed NWI should require jurisdictions to recommit to the key outcomes and actions related to water access entitlements. This includes ensuring that entitlements are statutory-based, provide a perpetual or open-ended share of the consumptive pool, and are separate from land.

However, there is scope to improve the entitlements framework further in a renewed NWI. The intent of the NWI is for entitlements and planning arrangements to address the needs of all water users; however, to date, much focus has been on high volume users in the agricultural, industrial and urban sectors (NWC 2014, p. 1). A renewed NWI should support an entitlements and access rights framework that is fit for purpose, better incorporates the minerals and petroleum industries and alternative water sources, and guides the management of interception activities.

2.1 An entitlements and access rights framework that is fit for purpose

The NWI recognises that in some instances, differences in entitlement provisions may be justifiable. There are provisions that allow for 'fixed term or other types of entitlements where demonstrably necessary'[1], with ongoing monitoring processes to assess associated risks expected with development and increased demand on resources, including moving towards fully NWI-consistent entitlements if necessary.[2]

1 NWI paragraph 33(i).

2 NWI paragraph 33(ii).

Entitlements and access rights can differ across (and within) jurisdictions, reflecting differences in the level of development and complexity of water systems and varying levels of associated risks.

Given that there are many remote areas in Australia where there is little current development, the Commission considers that jurisdictions should have some flexibility in how they implement their regimes in these areas and that entitlement and access rights frameworks should be fit for purpose to achieve this (*Report*: chapter 5) — capturing the intent of the current NWI provisions. In relatively undeveloped water systems, fully NWI-consistent entitlements (that are, for example, separate from land and perpetual) may not be necessary as demand for the resource is low and water sources may be poorly understood. In these cases, all extractions should be either managed under statutory access rights (such as stock and domestic) or licensed appropriately under relevant water legislation. And monitoring processes should be developed to assess how further development and increased water take affects water resources, including any associated risks. However, as governments allow systems to be developed, fully NWI-consistent entitlement systems should be implemented.

To support this, a fit-for-purpose water accounting and measurement regime is required (SP E *Integrity*).

2.2 Incorporating minerals and petroleum industries into entitlement and planning arrangements

The NWI includes a special provision for the minerals and petroleum industries. Under the NWI, parties agreed that:

> … there may be special circumstances facing the minerals and petroleum sectors that will need to be addressed by policies and measures beyond the scope of this Agreement. In this context, the Parties note that specific project proposals will be assessed according to environmental, economic and social considerations, and that factors specific to resource development projects, such as isolation, relatively short project duration, water quality issues, and obligations to remediate and offset impacts, may require specific management arrangements outside the scope of this Agreement.[3]

This special provision was intended to provide flexibility in entitlements and planning arrangements for minerals and petroleum sectors, given the nature of the sectors' water extraction requirements and operating environments (box 3).

3 NWI paragraph 34.

Box 3 Understanding the nature of minerals and petroleum industries' water use

Water use by minerals and petroleum industries can have unusual characteristics that differ from other water users. The Minerals Council of Australia (sub. 102, pp. 8–9 and sub. DR193, p. 9) provided several examples of the more unusual characteristics of water use.

- The industry can use saline or hypersaline water, which is not fit for any purpose other than industrial applications. In many cases, operations treat this unusable water to make it suitable for site processes.
- Water can be accessed for safe operation but not consumed. For example, dewatering activities (that make mines safe for operation) can lead to 'incidental' water take — that is, water take that is not necessarily within the control of the mining operations and is not used or consumed.
- Some water take (such as dewatering volumes) can vary by year, depending on a range of factors including local geology, groundwater characteristics and rainfall patterns. However, state authorisations generally require companies to hold water licences that are set at the maximum predicted annual water take over the anticipated life of an operation. This often includes a large contingency volume built into water licences, which can be many times higher than the actual annual water take. That is, annual allocations designed for the agricultural sector may not be fit for purpose for some water take by the minerals industry.

And many operations are located in remote areas where water systems are undeveloped. In some cases, there may be no knowledge of whether groundwater exists in exploration sites:

> The flexibility required by mineral explorers is unique to the Industry, as, for example, by definition, greenfield mineral exploration occurs where there is no prior knowledge of what is underground, to try and make a successful geological discovery. (AMEC, sub. DR119, p. 3)

The Minerals Council of Australia reiterated this and highlighted the following unique circumstances and practical barriers facing the integration of the minerals industry:

- [The industry operates in] regional or remote areas where water resource plans may not be place, markets may be thin or not well developed …
- Proponents may prove up new water resources that sit outside planning frameworks
- Geologically/geographical constraints [make water] market development unviable (e.g. certain remote areas). (MCA, sub. DR193, p. 7)

The Australian Petroleum Production and Exploration Association noted that the oil and gas industry also treats some of the water it uses and supplies it to other users:

- Water is used in all stages of an oil and gas project from exploration to development. Water is used for well drilling, field development, infrastructure and construction, hydraulic fracturing, and other activities
- The volume and type of water used is highly dependent on the geology and requirements of a field
- The oil and gas industry is also a water provider to local users, treating the water associated with gas production and supplying it to farmers, local governments and other users. (sub. 73, p. 11)

Most jurisdictions have incorporated minerals and petroleum industries into entitlements frameworks

In 2017, the Commission recommended that State and Territory Governments ensure that entitlements and planning arrangements explicitly incorporate extractive industries, including ensuring that entitlements for extractive industries are issued under the same framework that applies to other consumptive users (unless there is a compelling reason otherwise) (PC 2017, p. 98). The Commission found that incorporating minerals and petroleum industries into entitlements frameworks (in jurisdictions where it has not already occurred) presents benefits, which are discussed in more detail below.

Since 2017, there have been developments in this area (*Assessment*). These have largely been in the Northern Territory, where minerals and petroleum activities were brought into the legislative framework. This enabled water use associated with these activities to be regulated in the same way as all other water uses. Prior to this, minerals and petroleum operations did not require water entitlements in the Northern Territory.

At this stage, most jurisdictions have incorporated minerals and petroleum industries into their entitlements and planning arrangements in some way. However, where this has occurred, jurisdictions have taken different approaches, and the extent of incorporation varies (box 4). Arrangements in New South Wales, Victoria and the Northern Territory provide examples of how minerals and petroleum industries have been fully integrated into entitlements frameworks (box 4). However, issues in understanding and managing the cumulative impacts of minerals and petroleum activities may still remain. For example, one audit found that unquantified loss of surface flows was associated with underground coal mining in New South Wales (Alluvium 2017, p. i).

Alternative arrangements remain in Queensland, where resource tenure holders may apply for rights to take 'associated water', which differ from rights to take 'non-associated water'. Associated water refers to any groundwater that is taken or interfered with while (or as a result of) carrying out authorised activity on the resource held, such as mine dewatering activities (PC 2017, p. 87). While associated water take requires a licence, the amount of water take permitted is not determined by water plans and allocations. For example, the Adani coal mine was granted an associated water licence under the *Water Act 2000* (Qld) to take an unspecified volume of water until 2077 (Queensland Government 2017, pp. 1–2).

However, non-associated water take (water that is taken for use in operations) requires a licence and a specified water allocation under the *Water Act 2000* (Qld).

Some participants expressed support for the alternative arrangements for associated water in Queensland (APPEA, sub. DR127, p. 2; MCA, sub. DR193, p. 6), and some noted that a robust regulatory framework is in place (for example, QRC, sub. DR145, pp. 2–3).

Box 4 Arrangements for minerals and petroleum industries

New South Wales: under section 60I of the *Water Management Act 2000* (NSW), mining activities require a licence for any water taken as part of those activities.

Victoria: the *Water Act 1989* (Vic) applies to any earth resource exploration or extraction activities that intersect groundwater. Minerals industries are required to obtain a 'take and use' licence to secure water access, either from the market or via a new entitlement in areas where unallocated water exists.

Queensland: limited statutory water rights apply to incidental water take or 'associated water' for petroleum, gas and mining production under the *Water Act 2000* (Qld). These rights operate outside water access entitlements and planning frameworks. Exercising these rights is conditional on underground water obligations, which include preparation of an underground water impact report and the requirement to enter 'make good' agreements with landholders whose water bores are affected. Water access entitlements are required for non-incidental take or 'non-associated water' use. Water rights for some mining companies are specified in special agreement Acts.

South Australia: from 1 July 2020, the *Landscape South Australia Act 2019* (SA) replaced the *Natural Resources Management Act 2004* (SA) as the principal framework for managing the state's water resources. This has not affected arrangements for minerals and petroleum industries in South Australia, in regards to water licences. Mining and petroleum operations require a water licence to take water in the same way as other water users would. However, the Minister may authorise the taking of water that may not be authorised under legislation (*Landscape South Australia Act 2019* (SA), s. 105). For example, the Minister authorised the taking of water from wells within the Far North Prescribed Wells Area, for purposes including drilling and construction.

Western Australia: the State's water licensing framework applies to water taken by minerals and petroleum industries, with further guidance on licensing requirements and conditions outlined in government guidelines. Although state agreements for major mining projects can override some legislation, such as the *Rights in Water and Irrigation Act 1914* (WA), most agreements specify that requirements of this Act must be met. The *Collie Coal (Western Collieries) Agreement Act 1979* (WA) is one exception.

Tasmania: mines are required to have a licence under the *Water Management Act 1999* (Tas) to take water from a watercourse or lake, but groundwater does not require a licence unless specified under a water management plan or if it is declared as a Groundwater Area.

Northern Territory: water use by, and associated with, mining and petroleum activities is regulated in the same way as applies to other water uses under the *Water Act 1992* (NT).

Australian Capital Territory: there are no mining (or petroleum) operations in the ACT apart from quarries used for construction materials.

Sources: Geoscience Australia (2020); Productivity Commission (2017, p. 83, 2020b, p. 78); SA Arid Land NRMB (2019, p. 23).

The current arrangements may go some way to address risks to entitlements regimes and the environment, and may be appropriate in relatively undeveloped systems. However, in more developed systems, associated water should be incorporated into Queensland's entitlements and planning framework as demand for the resource would be higher in those areas and understanding of the water source and associated environmental risks would have improved (*Report*: chapter 5).

The special provision for minerals and petroleum industries should be removed

The special provision in the NWI has been an area of stakeholder concern for many years; and associated benefits of incorporating it into one entitlements framework were discussed by the Commission in 2017 (PC 2017, p. 86) and the National Water Commission in 2014 (NWC 2014, p. 3).

- First, it would promote greater transparency, particularly for water allocations and use by the industry. This is important for instilling confidence among other water users that water rights are robust and adequately address risks to entitlement holders and to the environment.
- Second, it would further incentivise trade in more developed systems where markets are well established, leading to water being allocated to higher value uses. Operators in minerals and petroleum industries would be able to trade their entitlements on water markets. This could be beneficial as water demand levels change across a project's lifespan. For example, mining operations can have periods of excess water supply, during which operators may seek to dispose of excess water (BHP, sub. 26, p. 3).

The potential to realise these benefits has increased since the NWI was agreed, as such industries have grown, leading to increased coexistence with other water users (NWC 2014, p. 2; PC 2017, p. 81). Moreover, although water use and consumption by minerals and petroleum industries is low at a national level, it can be significant at a local level (MCA, sub. 102, p. 3). For example, water use by the mining industry accounted for about 2 per cent of total water use nationally in 2018-19 (ABS 2020). But in Western Australia and the Northern Territory it was much higher, at 15 and 13 per cent in 2018-19, respectively.

Participants to both this inquiry and the 2017 inquiry raised concerns about the special provision for minerals and petroleum industries and recognised benefits of incorporating them into entitlements arrangements (box 5). The Australian Government (2019) supported the Commission's recommendation to improve entitlements frameworks, including the incorporation of minerals and petroleum industries, to support investment certainty. A number of participants to this inquiry (for example, LBA sub. DR133, p. 8; IRN, sub. DR136, p. 4; Mackay Conservation Group, sub. DR150, p. 3; NFF, sub. DR178, p. 23) and past reviews also supported the removal of paragraph 34 to integrate minerals and petroleum industries into NWI-consistent water planning and entitlement arrangements (NWC 2011, p. 44, 2014, pp. 37, 40; PC 2017, p. 84).

Although there may be challenges to incorporating minerals and petroleum industries into entitlements and access rights frameworks, these could be overcome with the fit-for-purpose approach described above. For example, operations in remote areas (where water systems are relatively undeveloped) may not require fully NWI-consistent entitlements; and water users in that system may not be subject to a full entitlements regime (*Report*: chapter 5). Most jurisdictions have been able to incorporate non-associated and associated water use by minerals and petroleum industries into entitlement regimes, while also meeting the needs of industry. For example, the Association of Mining and Exploration Companies (sub. DR119, p. 2) noted that 'Western Australia's current water licensing framework is able to achieve

the intended outcomes of the NWI, and provide water security to minerals projects'. Water take by minerals and petroleum industries is included in the Western Australian water allocation and licensing framework (PC 2017, p. 83). And the State takes a risk-based approach to licensing (DWER (WA) 2019, p. 11).

Box 5 Inquiry participants raised concerns about the special provision for minerals and petroleum industries

Some have noted that the special provision means that minerals and petroleum industries do not bear the same risks, and meet the same requirements, as other water users:

> While the announced allocation system applies to licenced water users, it does not apply to non-licenced water users, which includes … the take and interference of groundwater by the coal and gas industries … As the provisions in the Water Act 2000 to manage the effects of drought do not apply to non-licenced water users, the effects of reduced water availability caused by drought are being unfairly shouldered by licenced water users throughout Queensland. (WWF Australia, sub. 50, pp. 2–3)

> Clause 34 of the NWI has still not been fully implemented and the "special circumstances" of the resources sector — gas production and dewatering of mine sites — still trump those of all other groundwater users (farmers, local governments and manufacturers). In Queensland, gas companies have access to unlimited groundwater in spite of significant 3rd party impacts. NSW [New South Wales] regulates more strongly in declared catchments only. NSW exempts mining interception from cease-to-pump rules in groundwater sharing plans that protect environmental water. (LBA, sub. 70, p. 29)

And have led to unfavourable outcomes for communities:

> The LGAQ [Local Government Association of Queensland] believes that water resources assigned to extractive industries should progressively be incorporated into the statutory water planning process. These arrangements have led to unfavourable pricing and supply outcomes for communities and an insecure and unhealthy reliance on mining companies. Having a patchwork of water property rights is inconsistent with the objective of sustainable management of the resource. Untangling historical entitlements and property rights will also pose a range of legal and administrative challenges, so appropriate transitional and assistance mechanisms may need to be applied. (LGAQ, sub. 32, p. 3)

As well as contributed to a lack of transparency:

> More can be done to increase the transparency within which resource access to water is assessed and included in planning processes. Under a drying climate with greater variability in water inflows, there will likely be greater conflicts between competing land uses, especially between resources and agriculture, that will benefit from greater integration of water use from extractive industries into respective state planning frameworks that have clear and transparent rules for extraction consistent with the NWI framework. The current approach under the NWI leaves it exposed to criticisms that there are 'two sets of rules' — one for farmers and the other for the resources industry which is further reinforced by having separate legislative Acts applying to this take. (NFF, sub. 42, pp. 14–15)

The Commission has considered all arguments and retains its view that the special provision for minerals and petroleum industries should be removed. Fit-for-purpose entitlements and access rights regimes would consider special circumstances based on the context of water use; and would not be industry- or user- based. Management of water use through such arrangements would be more effective than relying on separate, and in some cases less transparent, arrangements. A renewed NWI should not include the special provision for the minerals and petroleum sectors and paragraph 34 of the current agreement should be removed in the development of a renewed NWI.

2.3 Alternative water sources

There may be scope to improve the entitlements framework in the context of urban water as well. Under the NWI, entitlements arrangements focus predominantly on surface water and groundwater, without much attention paid to alternative water sources (such as stormwater and wastewater). This has partly been due to problems in managing alternative water sources, such as stormwater, which involves complex interfaces between local governments, water utilities, catchment management authorities and regulators (PC 2017, p. 93, 2020a, p. 20). However, there has been increased interest in water recycling and integrated water cycle management over recent years, and alternative water sources are increasingly viewed as a valuable resource, receiving growing support for their use within the sector (PC 2020a, p. 1; SP F *Urban*).

In some cases, alternative water sources can be managed through simple arrangements such as contracts. For example, treated coal seam gas water that is sold for agricultural use may be managed through contractual arrangements (APPEA, sub. 73, p. 34). Simple arrangements may also be appropriate to support investments in wastewater recycling facilities, where the proportion of urban wastewater being recycled is relatively low (PC 2017, p. 93).

But, in others, there is a stronger case for incorporating alternative water sources into entitlements frameworks — particularly where there is competition for the water resource and/or risks that third parties will be affected as a result of water use, or when significant investment is made based on assumptions that water will be made available.

This may apply to instances where alternative water sources mix with water sources that are covered by entitlements. For example, managed aquifer recharge (MAR) can lead to stormwater and wastewater mixing with water sources held by entitlement holders (box 6). To promote investment in MAR, secure property rights arrangements for alternative water sources are needed. Without them, there is a risk that the water injected into the aquifer could be used by other groundwater users, disincentivising investment.

In addition to MAR, there are also instances where stormwater harvesting would require secure property rights. Stormwater can flow through the assets of more than one local government and therefore may reduce investment security for stormwater harvesting. For example, increased investment in upstream regions would impact the flow and quality of stormwater available to downstream regions. Further, control over stormwater can change as it enters waterways which again can undermine incentives for investment (Frontier Economics 2008, p. 65).

Box 6 Managed aquifer recharge and the case for incorporating alternative water sources into entitlement frameworks

Managed aquifer recharge (MAR) is the process of deliberately injecting water (often stormwater and/or treated wastewater) into a groundwater aquifer for recovery at a future time (often at another location that has access to the same aquifer) (PC 2017, p. 94).

Secure property rights arrangements should be in place for a MAR project to proceed. A key reason for aquifer storage is to enable reliable access to a defined and independently managed volume of water. If there is a risk that water injected into the aquifer could be used by other groundwater users, incentives to invest in MAR projects are reduced. Property rights arrangements for a MAR project would need to provide:

- rights to take water (source water harvesting)
- rights to inject water into the aquifer (aquifer storage)
- rights to extract water from the aquifer (recovery of groundwater)
- rights to use recovered water (SKM 2012, p. 52).

However, establishing these property rights is not always straightforward and the process can involve uncertainties. For example, source water is redefined as groundwater when injected into an aquifer. It then becomes subject to the licensing and allocation provisions of the prescribed or regulated groundwater system (Ward and Dillon 2011, p. 5). Further, where injection and storage of water in the aquifer increases flows out of the aquifer, a loss factor would need to be considered, where the extraction volume is lower than the injected volume.

There are no examples in Australia of fully specified and enforceable rights entitling operators to a secure, non-contentious share of a defined aquifer storage space. Few jurisdictions have policies that provide access to urban source water for MAR. The Australian Water Association stated that:

> There is a need to link the potential for managed aquifer recharge and extraction to existing groundwater frameworks and to ensure that managed aquifer recharge is considered in individual water management plans … further investigations are required into how existing entitlement and licensing frameworks can be modified to facilitate (ground)water banking sustainably. Through implementing water banking systems, groundwater can be recharged within individual aquifers during inter-drought years to enhance water supply security. (sub. 89, p. 11)

However, management frameworks for stormwater are not robust and it remains unclear how stormwater management and harvesting fit into the wider system of water entitlements (PC 2020a, p. 51). Participants to this inquiry noted that alternative water sources (including stormwater) are not fully incorporated into entitlements frameworks (LGAQ, sub. 32, p. 3; AWA, sub. 89, p. 11).

Stormwater has not been a focus of the national water reform agenda more broadly (box 7; SP F *Urban*). Frontier Economics (2008, p. 65) found that there are a number of issues relating to: the roles and obligations of stormwater management, unclear institutional roles and responsibilities, and complex legislative and regulatory barriers. These issues are apparent across jurisdictions (to varying degrees) and could also form a barrier to investment in stormwater harvesting and reuse.

Box 7 Stormwater is not integrated into planning and entitlement frameworks

Integrated water cycle management involves the integration of three urban water services: water supply, wastewater management and stormwater management (PC 2020a, p. 1). The policy frameworks and institutional arrangements for the provision of water supply and wastewater management are generally different to arrangements for stormwater management. For example, in major cities, one entity often manages water supply services and wastewater, and a separate entity often manages stormwater (SP F *Urban*).

The national water reform agenda has focused on improving the delivery of water supply and wastewater services, but has made few commitments to improve stormwater management (PC 2020a, p. 50).

If stormwater management is to be better incorporated into integrated water cycle management, it will need to be subject to a management framework that is sufficiently robust. There needs to be a review of how stormwater management should be undertaken, including:

- the development of a clear framework for charging for stormwater management
- the role of regulation in stormwater management (both economic and environmental)
- how stormwater management and stormwater harvesting fit into the wider system of water entitlements, especially in the Murray–Darling Basin, that may restrict their operation (PC 2020a, p. 51).

The Senate Inquiry into Stormwater Management in Australia recommended that the Australian, State and Territory Governments develop a National Stormwater Initiative, which would establish a national policy framework agenda for stormwater management (Senate Environment and Communications References Committee 2015, pp. 70–71). The Australian Government (2016, p. 4) agreed to this recommendation in principle, but stated that stormwater management priorities could be progressed through existing initiatives such as the Smart Cities Plan. However, the Smart Cities Plan does not include commitments related to stormwater management.

The Commission (2020a, pp. 50–51) found that a review of stormwater management was needed. And that the scope of the review could be broad (beyond the entitlements system), ranging from examining the environmental objectives and developing a framework for pricing, to better understanding the role of regulation in stormwater management (SP F *Urban*). Similarly, the South Australian Government (2017, p. 5) noted that secure property rights alone will not unlock further investment in alternative water sources such as MAR and stormwater.

The review needed for stormwater management and alternative water sources in general is beyond the scope of this inquiry, however, jurisdictions could address these issues in renegotiating the NWI. This includes establishing a process to determine whether alternative water sources can be incorporated into entitlements frameworks, and the extent to which current management arrangements, in practice, create barriers to investment more broadly. A few inquiry participants supported this advice (Mackay Conservation Group, sub. DR150, p. 3; Stormwater NSW, sub. DR169, p. 1).

2.4 A risk-based approach to managing interception

Interception refers to the capture of surface water or groundwater that would otherwise flow, directly or indirectly, into a waterway, lake, wetland, aquifer, dam or reservoir. Under the NWI, parties recognised that a number of land use change activities have potential to intercept significant volumes of surface water and groundwater.[4] And that the integrity of entitlements needed protection from the expansion of certain land use change or interception activities. The NWI provides examples of interception activities, such as the following:

- Farm dams and bores: dams for domestic and stock use within the catchment can reduce runoff volumes, affecting downstream users and the environment (DSE (Vic) 2009, chap. 2, p. 20). Bores that extract groundwater for stock and domestic purposes also have the potential to intercept water that would otherwise be extracted by entitlement holders (SKM 2010, p. 41). Water use for stock and domestic purposes is an access right provided to landholders, and under current arrangements, licensing of stock and domestic water take may only be required where resources become at risk of being overused (AgForce, sub. DR143, p. 3).
- Overland flows or floodplain harvesting: occurs when water flows across a floodplain during a flood or following significant rainfall. Infrastructure (such as pumps, pipes, regulators and supply channels) can be built to take water from the floodplain and transfer it to private on-farm storages for later use (DPIE (NSW) 2019, p. 2).
- Plantation forestry: intercepts water by reducing surface water runoff and groundwater aquifer recharge, and in shallow water areas, directly extracts groundwater. Plantation forestry can use more water than other dryland uses (such as cropping or pasture) (Prosser and Walker 2009, p. 4; SA Government 2009, p. 5).

Impacts of interception activities and land use change can be significant

Interception activities in the catchment can reduce inflows and therefore the volume of water available to both the consumptive pool and the environment. Where the effects are material, they could undermine the integrity of the entitlements system. Many interception activities are undertaken without an entitlement, yet reduce the amount of water available to downstream entitlement holders and the environment (DSE (Vic) 2009, chap. 2 p. 20). As the Institute for Water Futures – Australian National University noted:

> … uncertainty over private water storage, floodplain capture and return flows can undermine the perceived integrity of holders of water entitlements, increase the likelihood of errors in decision-making, and diminishes trust in decision-making by water governance agencies, especially by the owners of water entitlements. (sub. 30, p. 9)

In particular, large-scale land use changes (from a baseline) may change the effects of interception activities, and therefore water availability. For example, if a significant area of

4 NWI paragraph 55.

farmland is converted to large-scale plantation forestry, substantive impacts on relevant water systems are likely to occur (DELWP (Vic) 2019b, p. 384).

The cumulative water take from interception activities can be significant in many catchments. For example, small catchment dams collectively intercepted 11 per cent of stream flows in the Campaspe region in Victoria (DSE (Vic) 2009, chap. 2, p. 20). Sinclair Knight Merz, CSIRO and Bureau of Rural Sciences (2010, pp. ii–iii) estimated the water take of farm dams, stock and domestic bores, floodplain harvesting storages and plantation forests to be about 7300 gigalitres (GL) per year nationally. And predicted that this amount would increase as such activities expanded over time. More recent estimates show floodplain harvesting in the northern MDB to be 210 GL annually (MDBA 2017, p. 19). (The average water take in the MDB was about 12 700 GL annually in the four years to June 2016 (MDBA 2017, p. 33)). In New South Wales, floodplain harvesting was estimated to account for 15 to 35 per cent of the historic surface water take in the State's portion of the MDB, varying significantly between valleys and years (DPIE (NSW) 2020, p. 4). However, estimates are uncertain as water take by these interception activities is often derived from hydrological modelling (SP E *Integrity*).

Jurisdictions have made progress, but more can be done

Under the NWI, parties agreed that interception activities should be subject to specified reporting and assessment measures. The NWI takes a risk-based approach to interception activities, and requires an entitlement for activities that occur in water systems that are fully allocated, overallocated or approaching full allocation, above an agreed threshold (box 8).

Box 8 National Water Initiative approach to managing water interception

Under paragraph 57 of the National Water Initiative, parties agreed to implement measures in relation to water interception in some cases, depending on the level of water system development.

- Water systems that are fully allocated, overallocated or approaching full allocation require:
  - recording of significant interception activities (for example, through a licensing system)
  - a water access entitlement if proposals for additional interception activities are above an agreed threshold size (determined by a water plan)
  - a robust compliance monitoring regime.
- Water systems that are not yet fully allocated, or not approaching full allocation require:
  - identification of significant interception activities and estimations made about the amount of water likely to be intercepted by those activities over the life of a water plan
  - calculation of an appropriate threshold level below which a water access entitlement would not be required
  - regular monitoring and public reporting of progress of the water system towards full allocation or the identified threshold level.

Jurisdictions have made progress in ensuring interception is considered in water management and planning.

- In Victoria, state-wide policies were introduced to manage domestic and stock water use, and included a requirement for all new or altered domestic and stock dams within regional residential areas to be registered with the local water corporation. This intended to provide better information to track potential increases in water interception by farm dams without placing unnecessary demands on farmers. Further, domestic and stock users are also required to register domestic and stock bores and obtain an operating licence for active bores. This was introduced in 2012 (DSE (Vic) 2012, pp. 58–59).
- In New South Wales and Queensland, measures to improve overland flow and floodplain harvesting policy and management have been developed. These include ensuring that floodplain harvesting extractions are included in water access entitlement arrangements.
  - In New South Wales, a *Floodplain Harvesting Policy* has been developed, which sets out a licensing framework for floodplain harvesting in all water sharing plans (DPIE (NSW) 2019, p. 4).
  - In Queensland, a system of authorisations and licences is in place as well. It is anticipated that priority floodplains in Queensland will be licensed and monitored by 2022, as set out under the state's water plans (MDBA 2019a, p. 5).
- In South Australia, water use of plantation forestry is regulated through a state-wide forest water policy framework. The policy recognises that large-scale plantation forestry is an issue for sustainable water resources management. Legislation has also been amended to address the issue in regards to water allocation planning. This included providing two new tools for managing the impacts of commercial forestry: a forest water licensing system; and a more flexible permit system (DEW (SA) 2020).

However, jurisdictions have not fully met the objectives and outcomes of the NWI in relation to managing interception (*Assessment*). For example, Lifeblood Alliance (sub. 70, p. 3) noted that interception activities are not adequately incorporated into entitlements frameworks, even in water systems that are fully allocated or overallocated. Several inquiry participants highlighted the need to incorporate significant interception activities into entitlements and planning frameworks (box 9).

There are issues with accurately estimating interception activities and ensuring entitlements are introduced so that such activities are subject to the same level of compliance as other entitlement holders. For example, in New South Wales, specifying floodplain harvesting as a licensed form of water take requires accurate measurement of water harvested (DPIE (NSW) 2019, p. 6). Water harvested from floodplains must be formally accounted for in the system so that licence volumes can be determined and floodplain harvesting can be effectively monitored. However, there is a lack of accurate monitoring and information on the impact of floodplain harvesting on water availability within catchments (SP E *Integrity*).

Box 9 Inquiry participants emphasised the need to incorporate interception activities into entitlement frameworks

Some participants considered that interception activities should be treated as extractions, and therefore need to be accounted for and included in entitlement regimes:

> The need to ensure that all water interception activities are included in the water entitlements framework is critical. The 2017 review highlighted the need to ensure that extractive industries are included, the same applies to forestry and plantation development. Both can have impacts on water availability (NIC, sub. 13, p. 7)

> The recent changes to regulations with respect to allowing floodplain harvesting do not take into account the impacts on inflows to the river systems. The interception of water before it reaches river channels should be counted as extraction having equal impact compared to diversions out of river channels, and these extractions should be measured and included in total water accounting for the Barwon—Darling system. (Jensen, sub. 39, p. 9)

Some, such as the Environmental Defenders Office, recognised that work is underway to include interception activities:

> Government has announced plans to improve measurement of water diversions … particularly given the large volumes of diversions attributable to floodplain harvesting. It also remains to be seen whether the government will meet its stated commitment to ensure all water entitlements in the Queensland MDB are accurately metered by 2025 (noting that not all legal extractions are linked to an entitlement). (sub. 54, p. 6)

The Australian Forest Products Association stated that benefits of some interception activities (plantation forestry) should be considered if included in entitlements arrangements:

> All policy on water interception must … be underpinned by sound, repeatable and reliable science and take into account issues of water quality as well as water quantity … Any inclusion of land use change to plantation forestry in a water entitlement system must consider the differences between the physical extraction of water from the water supply system by humans and the natural interception of water by plants.(sub. 19, p. 2)

Accurate estimations of, and information on, interception activities should be improved and interim measures need to be established while this work takes place. Such measures would vary depending on the circumstances — however, they could include policies that limit impacts of interception activities. For example, an interim measure for floodplain harvesting could be to establish decommissioning principles for infrastructure that is unlicensed or has a significant impact on the environment and water users (MDBA 2019b, p. 18). Interim measures would need to be regularly reviewed and revised as more information becomes available, or when interception activities can be accurately estimated and included in entitlements regimes.

Processes to monitor and respond to land use changes are also required — these have largely been established by jurisdictions. For example, in Victoria, land use change and its impacts on the water balance are monitored; forestry developments over set thresholds require approval; and legislative reform has been implemented, which enables the Minister for Water to declare intensive management areas (DSE (Vic) 2012, p. 7). In the ACT, any significant land use change is subject to an environmental impact assessment, which includes any impacts on water resources (Greenwood 2017, pt. I, chap. 3, p. 16).

Recommitting to a risk-based approach

As discussed above, the NWI states that interception should be incorporated in entitlements frameworks through a risk-based approach.

Effective management of interception activities will become more important as Australia's climate changes over time, particularly for systems that are expected to have less water (*Report:* chapter 2). As this occurs, the effects of interception activities on water resources (and availability) are likely to become more material. In addition, to address climate change, there may be some land use changes that occur in the future that would increase interception — such as large-scale tree planting to remove carbon dioxide from the atmosphere (Hobbs and Kilvert 2020).

While the risk-based approach outlined in the NWI is sound, more needs to be done to ensure it can be effectively applied in practice. This includes the establishment of accurate measurement regimes that enable monitoring of changes in risks over time.

In renewing the NWI, jurisdictions should recommit to a risk-based approach, as set out in paragraphs 55-57, and improve measurement and accounting of interception activities to support the implementation of entitlements arrangements for these activities (SP E *Integrity*). In particular, measurement regimes and accounting practices need to be fit for purpose, and interim measures may need to be established. A number of inquiry participants supported this advice (for example, IWF, sub. DR120, p. 5; AgForce, sub. DR143, p. 2; Mackay Conservation Group, sub. DR150, p. 3; Wentworth Group of Concerned Scientists, sub. DR152, p. 2; NFF, sub. DR178, p. 23; SunRice and RGA, sub. DR181, p. 10).

NWI RENEWAL ADVICE 6.1: MANAGING WATER USE UNDER THE ENTITLEMENTS FRAMEWORK

In renegotiating the National Water Initiative, jurisdictions should recommit to the key outcomes and actions related to water access entitlements, which have been fundamental to the integrity of water management and a necessary prerequisite for water markets and trading. This includes ensuring that entitlements are statutory-based, that they provide a perpetual or an open-ended share of the consumptive pool, and that they are separate from land.

Entitlements and access rights frameworks should be fit for purpose — acknowledging that fixed-term or other types of entitlements may be appropriate in some relatively undeveloped systems. However, as systems are being developed, fully NWI-consistent entitlements frameworks should be put in place.

To improve on the entitlements and access rights framework, jurisdictions should:

- remove the special provision for minerals and petroleum industries in water access and planning arrangements to support better incorporation of these industries into water access entitlements frameworks that apply to other consumptive users
- establish a process to determine whether alternative water sources (including stormwater and recycled water) can be incorporated into water access entitlements frameworks, and the extent to which current management arrangements for alternative water sources create barriers to investment
- adopt a risk-based approach to managing significant interception activities under water access entitlements frameworks with the expectation that these activities would be fully incorporated into entitlements frameworks in at least all fully and overallocated systems. In developing systems, a risk-based approach would include fit-for-purpose measurement and accounting of interception activities, and monitoring of the ongoing efficacy of the use of interim measures.

3 Contemporary best-practice water planning

The NWI states that water planning is an important mechanism to assist governments and the community make decisions regarding water management and water resource allocation to meet environmental, social and economic objectives.[5]

The NWI provides direction on water plans and planning processes. To facilitate the development and implementation of NWI-consistent plans, COAG commissioned the *NWI Policy Guidelines for Water Planning and Management 2010*.

As discussed in section 1, water planning reforms have provided significant benefits. To ensure these benefits are maintained, State and Territory Governments should recommit to the existing planning frameworks through a renewed NWI.

5 NWI paragraph 36.

However, there has been considerable experience in water planning from when the NWI was agreed in 2004 — both by jurisdictions individually and by the MDB jurisdictions through their Basin Plan implementation and through recent severe droughts. As a result, there is now a body of contemporary best practice that should be drawn on in a renewed NWI (and reflected in updated guidelines) to enable fit-for-purpose water planning in the future.

This section discusses key principles for water planning to include in a renewed NWI that reflect this experience. Additional elements that address climate change are discussed in section 4.

3.1 Water planning that is fit for purpose

The water system classification (*Report*: chapter 5) provides a framework for fit-for-purpose water planning across different systems. The NWI requires that jurisdictions 'determine whether a plan is prepared, what area it should cover, the level of detail required, its duration or frequency of review, and the amount of resources devoted to its preparation based on an assessment of the level of development of water systems, projected future consumptive demand and the risks of not having a detailed plan'.[6]

In relatively undeveloped systems, there is less pressure on the resource and a simplified approach to planning may be adopted. In these circumstances, 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'.[7]

Importantly, having some basic precautionary measures in place would help mitigate any risks and guide when this move to more detailed planning and entitlements frameworks should occur. This could include setting a precautionary interim limit which, when reached, would trigger a more formal planning process.

As the level of development increases, more effort and resources will be required for water planning. Fully developed and overallocated systems have high levels of demand for water, and in the case of overallocated systems, the level of consumptive water use compromises key environmental assets (*Report*: chapter 5). Under the NWI, water plans must define pathways for returning to a sustainable level of water extraction that will protect agreed environmental assets in overallocated systems.

6 NWI paragraph 38.

7 NWI paragraph 33(ii).

3.2 Recognising the needs of Aboriginal and Torres Strait Islander people in water planning

Under the NWI, jurisdictions agreed that water access entitlements and planning frameworks would recognise the needs of Aboriginal and Torres Strait Islander people in relation to water access and management. The focus under the NWI is on recognising and providing for cultural values in water plans through engagement.

Progress has been slow on Indigenous access to water, and more can be done to achieve the NWI outcomes (SP D *Cultural Access*).

In terms of the water planning process, this requires:

- good engagement with Traditional Owners
- incorporating cultural values into water plans, and including clear, measurable and well-informed Indigenous cultural objectives and outcomes (SP D *Cultural Access*) (PC 2017, p. 103). These should be specified in a way that can be monitored and reported against.

Further, many Aboriginal and Torres Strait Islander communities have articulated their aspirations for unconstrained water use (that is, for both cultural and economic purposes). As discussed in SP D *Cultural Access*, where there is agreement between governments and Aboriginal and Torres Strait Islander communities that consumptive access to water is the best way to support Aboriginal and Torres Strait Islander economic development, that access should be facilitated as efficiently and transparently as possible within existing water entitlement frameworks. Where the consumptive pool is fully allocated, water should be bought from entitlement holders on the market to retain system integrity. In relatively undeveloped and developing water systems where the consumptive pool has not been fully allocated, governments should consider if reserves for exclusive use are appropriate as part of the water planning process.

3.3 Clearly specifying environmental objectives and outcomes

Water planning is intended to provide for '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'.[8]

Outcomes and objectives define the basis for determining how much water is expected to be required for the environment and guiding environmental management. Objectives provide a broad description of what a plan is aiming to achieve and agreed outcomes are the specific outcomes being sought by stakeholders.

8 NWI paragraph 37(i).

Under the water planning process, the goal is to protect the key environmental assets and functions agreed by stakeholders. To achieve this goal, environmental outcomes should be specific and defined well, with clear long-term performance indicators to enable monitoring of outcomes and objectives. Environmental objectives and outcomes should also be transparent, logical and easily understood by stakeholders. Establishing agreed outcomes also requires effective engagement with stakeholders.

The process of specifying environmental objectives and outcomes is discussed further in SP C *Environment*.

3.4 Trade-offs should reflect the relative values that communities place on environmental, social and economic outcomes

Several inquiry participants and reviews stated that environmental, social and economic outcomes are not balanced in decision making for water plans, or that approaches taken in practice are contrary to legislative objectives. For example, it was noted that governments are often too focused on achieving volumetric outcomes, rather than optimising environmental, social and economic outcomes (NSWIC, sub. 27, p. 21; NFF, sub. 42, p. 9). The Coleambally Irrigation Co-operative Limited (sub. 7, pp. 3–4) also considered that governments do not place as much weight on social and economic outcomes compared with environmental outcomes. In contrast, in New South Wales, an investigation found that, in some cases, economic interests were prioritised over the environment (ICAC (NSW) 2020, p. 9). Legislation in some jurisdictions may also prioritise environmental outcomes over others (such as the *Water Management Act 2000* (NSW)), although actual practice may differ.

Best-practice water planning should aim to optimise the overall benefits that a water resource provides, given competing water uses. This requires some trade-offs between environmental, social and economic outcomes, particularly in water systems that are more developed or in determining a recovery pathway for overallocated systems. For example, increasing water allocations for consumptive use may improve economic outcomes for water users, but could stress the water resource and the environment that depends on it.

In making trade-offs, the relative values that communities and stakeholders place on environmental, social and economic outcomes should be considered and reflected in water planning decisions. Several principles should frame the process.

- Effective community partnerships and engagement processes, particularly with communities that will be affected. Communities should be put at the centre of decisions regarding their future, and be adequately involved in decisions that may potentially have material implications on their lives (Sefton et al. 2020, p. 15). Broader stakeholders, which may include individuals and interest groups located outside of the designated water planning area, will also need to be consulted (SP C *Environment*). While processes to support effective community partnerships and engagement may vary in different circumstances, a principles-based approach that captures the core values of engagement could guide best practice water planning. This is discussed further in SP J *Engagement*.

- Processes must be informed by the best available environmental, social and economic data, which will assist in examining trade-offs under different climatic scenarios. This can include non-market valuations of environmental and social outcomes or socioeconomic analysis (box 10). These valuations could inform benefit-cost analyses regarding trade-offs.
- Consideration of all economic, social and environmental values associated with the system, including dependent downstream environments and industries. For example, CSIRO highlighted the downstream implications for estuaries and coastal regions in relation to the potential for irrigated agriculture within Australia's tropical river catchments (sub. DR149). However, AgForce cautioned that 'end of system flows for environmental purposes … should reflect actual environmental needs and not impose significant socio-economic opportunity costs on local landholders through unnecessary restrictions on consumptive uses' (sub. DR143, p. 4).
- Transparency about all aspects of decision making.

Box 10 Examples of non-market valuation techniques

There are a range of techniques that may be used to value environmental and social outcomes. Commonly, market-based methods are used to estimate changes to economic values by analysing direct and observable market interactions.

However, where markets do not exist, or where markets fail to fully value resources or outcomes, non-market valuation techniques can be used. These techniques are helpful for estimating environmental and social costs and benefits of alternative policy or planning options. Broadly, there are two methods.

- **Revealed preference** methods use observations of purchasing decisions and other behaviour to estimate non-market values. Methods include:
  - travel-cost methods, which use expenditure and travel time to impute the value that individuals place on particular sites, such as national parks
  - hedonic pricing methods, which aim to isolate the influence of non-market attributes (such as proximity to parks) on the price of related goods (such as houses).
- **Stated preference** methods impute values by asking people to make choices between policy options, typically through surveys. Methods include:
  - contingent valuation, which values an outcome as a whole, usually asking individuals whether or not they would pay a set amount of money for a specific outcome
  - choice modelling, which estimates implicit prices for the attributes of an outcome by asking individuals to choose between options with varying attributes and costs.

Non-market valuation methods (particularly stated preference) have influenced environmental policy in Australia, as they can generally provide objective estimates of the value that a community places on environmental and social outcomes. However, as with all valuation and assessment tools, best practice application needs to be fostered and analyses available for public review.

Sources: Baker and Ruting (2014); Kragt (2009).

3.5 Independent reviews of water plans

Some inquiry participants highlighted the importance of independent reviews of water plans. For example, the Inland Rivers Network noted that:

> Importantly, within each jurisdiction, there is need for independent statutory review of their water plans. This ensures responsive, robust plans underpin the NWI and genuine achievement of its environmental outcomes. (sub. 86, p. 6)

Some jurisdictions undertake independent reviews of water plans. For example, in New South Wales, the Natural Resources Commission independently reviews plans to: determine if environmental, social and economic outcomes have been achieved; recommend if a plan should be extended or replaced; and recommend changes to provisions if the plan is replaced (NRC (NSW) 2020). In Victoria, under the *Water Act 1989* (Vic), s. 22I, the Minister must review a Sustainable Water Strategy 10 years after it was endorsed, and/or review it at any time before then, to determine whether or not intended timelines and targets have been met.

In the MDB, water resource plans (WRPs) that were developed by MDB jurisdictions had to be accredited by the Commonwealth Minister responsible for water. The Murray–Darling Basin Authority (MDBA) independently assessed the WRPs and provided advice for accreditation. However, the process required plans to meet many requirements, was lengthy and suffered many delays. For example, it took seven years for the draft ACT WRP to be accredited (Knee and Butt, sub. 56, p. 1). The Commission (2018, pp. 193–194) found that the accreditation process resulted in unnecessary costs and potentially made adaptive management more difficult. Such costs may have outweighed benefits. However, processes must also be robust enough to ensure reviews are of high quality, not rushed and fit for purpose. Reviews should provide net benefits.

Independent reviews of water plans are important because they improve transparency and hold governments to account, and they identify areas for improvement. Review processes may also provide opportunities to involve communities and to access more (and more diverse sources of) information, for example, through community submissions. For example, the review of the *Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012* received 1231 submissions from the public in response to the draft report (NRC (NSW) 2019, p. 1).

Overall, including principles for independent review of water plans in a renewed NWI would improve water planning. While the review processes would be determined by jurisdictions, the NWI could set out principles for reviews to promote their need to: be robust and fit for purpose, focused on achieving net benefits and involve community participation.

4 Addressing climate change in water planning

Under the NWI, water plans aim to provide certainty to entitlement holders and the environment (and thereby encourage investment). The NWI commits governments to

achieving an appropriate balance between environmental and consumptive uses through water planning, and through the recovery of water for the environment in overallocated systems. Water for the environment is provided in every system as planned environmental flows established through setting rules on water extraction or release from storages and including opportunistic unregulated flows and spills. In a number of regulated systems, the environment is also provided with held environment water.

The water planning process will be challenged by climate change. Climate change for most of Australia is likely to mean reduced catchment inflows and more frequent, longer and more severe droughts. While all users will be affected, these changes will, in general, disproportionately affect the share of water for the environment because unregulated flows and spills, for example, are more susceptible to the impact of climate change (DSE (Vic) 2009, p. 29). Over time, in a number of systems, it is possible that the balance that had been negotiated and agreed at the outset of the water plan will no longer be appropriate and the environmental, economic and cultural objectives will no longer be able to be achieved. This will be of particular concern in fully developed catchments where markets operate and where there is significant competition for water, and in systems where governments have recovered water for the environment — sometimes at great expense amid significant community controversy and concern.

Governments have recognised the issue and have developed a module to the NWI containing policy guidelines for water planning and management. The module, titled *Considering Climate Change and Extreme Events in Water Planning and Management*, contains information on regional climate projections, tools that can assist planners to understand the associated risks, and approaches to incorporating climate change into water planning (such as making sure that planning cycles are short enough for new knowledge to be incorporated effectively and supporting an active trading market to enable water users to manage their own risks). As well as water resource planning, the module covers water supply planning, for example, through material on diversifying towards water sources that are less climate dependent, such as recycled water, reused stormwater and desalinated water.

In 2017, the Commission concluded that the module does not go far enough to ensure that water planning adequately accounts for climate change (PC 2017, p. 91).

Participants to this inquiry also raised concerns about climate change and the adequacy of water planning (MDBA, sub. 23; IWF, sub. 30; EDO, sub. 54). For example:

> NSW has been slow to take account of the reality of a changing climate in any meaningful way in its water plans and policies. Despite a series of drought conditions currently, and during, the last 15 years NSW persists in using pre 2004 drought as a baseline in its water allocations. (IRN, sub. 86, p. 4)
>
> Very few connected systems' plans adequately consider the impacts of climate change and water scarcity in the context of conjunctive management. (IAH, sub. 15, p. 2)
>
> While water reform has achieved positive results for some objectives of the NWI, it is to the growing complexity of water issues combined with climate change and poor planning, not initially foreseen in 2004, that improvement and flexibility is needed. (FLoW, sub. 76, p. 3)

In the Commission's 2018 inquiry into implementation of the Murray–Darling Basin Plan, similar concerns were expressed by a number of stakeholders in relation to the Basin Plan.

However, while there is significant concern that water planning currently does not take adequate account of climate change, there are few clear views about what adequate account means and how it should occur. The approach recommended by the Commission aims to enable entitlement holders and the environment to contend with drought within the term of a water plan (given this is likely to be a more dominant feature in the future), and, over the longer term, adapt the water plan to a changing climate. The approach to the latter is different in water systems that are relatively undeveloped or still developing. These systems are not yet at full allocation and there is currently opportunity to set the consumptive and environmental shares in ways that manage the risk of future resource reductions. In fully developed systems, all water is currently allocated either to consumptive users or the environment and, in the event of significant reductions in the available resource, decisions will have to made about if, when and how the balance should be reviewed and new objectives set.

The following discussion focusses on these three key additions to existing water plan processes to deal with climate change:

- provisions to deal with drought (section 4.1)
- setting consumptive shares in relatively undeveloped and developing areas (section 4.2)
- water plan reviews and changing the balance between consumptive use and environmental use in response to climate change in fully developed systems (section 4.3).

The approach taken to include climate change should be specific to the context, and recognise the level of development and risks in that system.

Finally, section 4.4 discusses principles for climate change modelling and data.

4.1 Provisions to deal with drought

The Millennium Drought and the recent drought in New South Wales and Queensland revealed a number of shortcomings in the current water management arrangements in information, planning and compliance that exacerbated the impact of these droughts on environmental assets and other water users. The clear lesson from these is that future water plans must include very well-defined provisions for dealing with these scenarios, ensuring they have been negotiated and clearly understood by both entitlement holders and communities.

The *NWI Policy Guidelines for Water Planning and Management* include principles for allocation rules and mechanisms for dealing with unprecedented events.

> 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. (COAG 2010, p. 13)

However, some water plans have been found to be deficient in this area during the recent drought. For example, in the Barwon–Darling, the Natural Resources Commission noted:

> An intense drought, significant upstream water extraction, an apparent climate shift and the rules in the *Water Sharing Plan for the Barwon–Darling Unregulated and Alluvial Water Sources 2012* (the Plan) have all contributed to poor ecological, social and cultural outcomes. (NRC (NSW) 2019, p. 1)

This sentiment was echoed by Vertessy et. al. (2019, p. 12):

> In recent times, one of the main impacts on the frequency, magnitude and duration of low flows in the Barwon–Darling River, which have high ecological importance, is the change in the behaviour and use of A Class diversion licences. Relaxing constraints on water access and providing more flexible "carry-forward" arrangements under A Class licenses in the 2012 Barwon–Darling Water Sharing Plan has led to significant increases in the extraction of water during low flow periods.

Participants to this inquiry also raised concerns about the experience during the recent drought, particularly in New South Wales (box 11 and *Assessment*).

Another concern in New South Wales is the practice in some catchments of allocating water based not only on the available water in storage but also on expected inflows. This has significant risks in the context of drought, especially where estimates of expected inflows are not highly conservative. Experiences in western New South Wales in 2018-19 illustrate this risk.

> In NSW, some annual water entitlements are allocated on a 'debit' system based on water in storage. However, allocations from other rivers (e.g. Macquarie River) are based on projected inflows, a 'credit' system, that allocates water that has not yet fallen in the catchment, and risks failure in a drying climate. This was demonstrated in western NSW in 2018-19 as a number of towns ran out of water in part because of overly optimistic allocations for irrigation. The NWI should require the more conservative 'debit' based water allocation systems in a drying climate. (Wentworth Group of Concerned Scientists, sub. 68, p. 4)

To the extent possible, water plans should include clear priorities and actions for drought scenarios. To do this, water planners need to understand needs during a drought, including critical human water needs, the need for conveyance water, cultural requirements, critical environmental needs (such as low flows, connectivity, flow sequencing) and the quality of the water required, and groundwater linkages (baseflows in rivers and streams and utilisation as drought reserves).

Box 11 **Inquiry participants highlighted concerns about the adequacy of water planning during the recent drought**

A number of inquiry participants highlighted concerns about water planning during the recent drought. For example:

> Recent drought and extreme events experienced across the Basin demonstrate the need for better planning across jurisdictions, and more formalised and coordinated processes to manage the on-ground impacts of climate change on critical human and environmental water needs. (MDBA, sub. 23, p. 8)
>
> Recent examples of rare events have highlighted the need to plan for more extreme conditions than may have been typical previously. (Engineers Australia, sub. 63, p. 6)
>
> … the extensive and devastating drought that occurred in between its [The Commission's] inaugural review of the NWI and this review has exposed serious shortcomings in drought preparedness, response and resilience that has posed a serious threat to communities including those who have never experienced drought conditions before. … much more urgent action is required to plan for and forecast the negative impacts of climate change on water resources and related infrastructure than has previously been the case. (LGNSW, sub. 75, p. 4)
>
> It is clear from the experience of communities, particularly those in NSW, that water plans have not been effective at managing extreme events such as severe drought. … This can largely be attributed to the principles of the NWI having not been applied, and an absence of clear and reliable water plans being in place. (MDA, sub. 78, p. 5)

Participants also noted that the impacts of this have been severe:

> In 2016, all NSW dams were full. By the end of 2018 they were empty because all the water had been handed out to general security water customers, not stored for drought protection. The impacts on towns, downstream users and the environment have been severe. (LBA, sub. 70, p. 15)

Importantly, water plans need to include clear provisions to deal with low flows and clarify priorities for water sharing and actions for critical human water needs, critical environmental requirements and other needs. Participants highlighted the importance of specifying a hierarchy with critical human water needs as the first priority (for example, LGNSW, sub. DR147, p. 13; Shearman, sub. DR126, pp. 4–5), and noted there needs to be clear guidance on acceptable levels of drought security for different water users and the environment (Engineers Australia, sub. DR141, p. 1). This requires identifying environmental needs across the hydrograph and codifying environmental management in water plans based on clearly defined triggers. This should also include rules for a first flush event in some rivers. A trigger could be based on flows, periodic watering requirements and/or environmental conditions, for example. In these periods of low flows, planned environmental water can provide a number of benefits to other users and the local community, such as providing conveyance flow for downstream critical human water needs, and freshening water quality for downstream areas. The expected outcomes of planned water in these periods of low flows should also be understood and specified where this water provides for multiple community benefits.

The Lifeblood Alliance also highlighted the need for water planning to include rules and triggers to help manage drought:

> There is a need to support "break out events" for nature like first flushes events into the regulatory and policy framework as part of the ongoing management of drought … Decision rules and

> trigger points should be designed to ensure that, in times of extreme water scarcity, critical human and environmental needs are met and the basic requirements of other economic, social, and environmental uses are considered. There needs to be some specification into the conditions that would lead up to such triggers occurring so that vulnerable biological communities can disperse and re-populate areas following the extreme event. (sub. 70, pp. 10–11)

The priorities, actions and rules in water plans (including rules for planned water) need to be negotiated and agreed at the outset of the plan, and clearly understood by both entitlement holders and communities.

In some extreme scenarios, water managers may face scenarios not detailed in water plans. Having appropriate agreed low flow triggers and rules detailed in plans should minimise this occurrence. Nonetheless, water plans should set out clear roles and responsibilities for extreme circumstances, including the possibility of Ministerial intervention, and a clear process and triggers for when ministerial intervention is warranted. The process needs to be robust, clear and transparent. Communities should know when the water plan will be switched off and the preconditions, as well as the process for returning to the water plan. In addition, there needs to be a clear hierarchy of uses for water, prioritising critical human water needs, then critical environmental needs.

The environmental manager also has some key responsibilities in dealing with water scarcity, including ensuring that the environmental priorities for protection are clear, that they are making best use of the environmental water that is available and that complementary waterway management actions are undertaken to enhance the resilience of the system and enable recovery when the drought breaks.

Water quality — a critical consideration during water scarcity

In 2017, the Commission noted there is scope to revise the NWI to better reflect interactions between water quality and quantity in water planning (PC 2017, p. 98). Water quantity management and water quality management are both critical for maximising the economic, environmental and social benefits that the community derives from Australia's water resources.

This is particularly significant during times of drought, as the lack of available water also impacts on the quality of the water. For example, drought may create the conditions for algal blooms or high salinity levels and low dissolved oxygen. This will affect all users of the systems, not only the environment. Drought can also affect stock and domestic supply and town water supplies that are the main or emergency water source for communities.

Since 2017, the Australian, State and Territory Governments have progressed several measures to better integrate water quality into planning.

- The *National Water Quality Management Strategy* is the principal collaborative national mechanism for the management of water quality. An update of the *National Water Quality Management Strategy*, released in 2018, brings a greater focus on the integration

of water quality and quantity in water planning and management (Australian Government 2018).

- In the MDB, jurisdictions have developed water resource plans under the Basin Plan, which include a water quality management plan.

Nonetheless, many participants indicated that water planning and management is too heavily focused on water quantity and that more should be done to integrate water quality issues into water planning (box 12).

Box 12 Inquiry participants emphasised the need to better integrate water quality issues into water planning

A number of inquiry participants highlighted the need to better integrate water quality in decision making:

> The EDO notes that the "Objectives" and "Key Elements" of the NWI do not explicitly mention water quality, and more generally that it tends to be separated out from other water planning and land use legislation. However, water quality is often linked to water quantity and/or development (of different stripes) and accordingly ought to be dealt with in a more integrated fashion. Similarly, binding water quality objectives for rivers and aquifers need to be built into jurisdictional legislation. (EDO, sub. 54, p. 22)

> The management of water quantity and quality are vital to securing economic, environmental and social outcomes for Australia. And yet, these two issues have rarely been sufficiently connected. … where water quality has been included in water management decision making, the focus has tended to be on salinity. While important, salinity is only one of several relevant quality issues, particularly regarding groundwater and its management … What is needed is better utilisation of low cost, but regular and wider scale hydrogeochemistry studies and data to better inform water planning, trading and management decisions. Because water quality processes are dynamic, such work needs to be regularly conducted. Furthermore, such studies need to go beyond isolated attention to single issues, and be pursued in a more coupled and integrated way. (Holley et al., sub. 46, pp. 3–4)

> Update guidance on water sharing issues, including the importance of setting environmental, quality and flow goals when developing water plans. (Sydney Water, sub. 94, p 4)

The NSW Water Directorate recognised the importance of water quality during drought:

> While water resources policy tries to address the competing pressures on water availability, water quality also needs to be taken into account. Often, the lack of water, such as through a drought, will also impact on the quality of the available water. This can be critical when planning for emergency situations. (sub. 37, p. 6)

And the Minerals Council of Australia emphasised the need to have flexibility to recognise water of varying quality in planning, recommending:

> Greater flexibility in water resource planning to consider new information and accommodate water resources of varying quality with a price signal that encourages the use of lower quality water. (sub. 102, p. 4)

The Commission sees no reason to change its previous position. The limited mention of water quality in sections of the NWI relating to water planning has become increasingly conspicuous and out of step with contemporary water management issues.

There is scope to better reflect interactions between water quality and quantity in water planning in a renewed NWI.

The key outcome sought is that water planners consider risks related to water quality during the process of water planning, and make any necessary linkages with plans, actions and regulatory requirements undertaken through natural resource management and environmental protection frameworks. This would improve the cost-effectiveness of water resource management in the long term. In particular, water planners should include water quality in drought scenarios — ensuring quality is included in the hierarchy of uses and considering water quality and flow requirements for critical human water needs and priority environmental assets.

4.2 Incorporating climate change into water planning in relatively undeveloped and developing areas

In moving to a full entitlement framework, effective water planning processes in relatively undeveloped and developing areas need to consider climate change, and the impact on future surface water and groundwater availability. This will increase transparency of planning decisions, reduce the risks of future overallocation, help to maintain the reliability of entitlements and allow water users to better manage their risks.

In relatively undeveloped and developing areas, the water planning process should apply contemporary best practice and include:

- using the best suite of available regional climate change projections over a long timeframe (at least 20 to 30 years) to set:
  - the consumptive pool and the reliability of consumptive entitlements so reliability is not eroded over the outlook period (this should include any entitlements to be set aside for Traditional Owners)
  - the environmental share and ensure that the operating rules are robust enough to maintain the agreed environmental objectives over the full outlook period and likely range of seasonal conditions
- providing for carryover if it can be accommodated in the system.

Taking this approach means that, in the near term, there may effectively be unallocated water (that is, water that is neither part of the formal consumptive pool nor part of the formal environmental share required to maintain agreed environmental outcomes). Over time, the impact of climate change is likely to reduce the availability of this ‘spare’ water.

Unallocated water could be managed in a number of ways.

- In areas where climate change predictions have a high degree of uncertainty or where there is less information about the surface water and groundwater systems, the water could be reserved from consumptive use to accommodate these uncertainties. Effectively, the environment would benefit from this in the short term until the ‘spare reserve’ no longer exists.

- In the short term, the water could be made available for consumptive use subject to user demand. For example, water managers could make additional water available on a casual basis or for a clear set period (rather than as a perpetual entitlement). If this was to be the case, care would need to be taken to ensure that users understood the temporary nature of this water, that there would be no guarantees of its future availability, and that governments would incur no liability if its availability were to diminish.

4.3 Water plan reviews and rebalancing environmental and consumptive uses in fully developed systems

Water plans are subject to review processes, often every 10 years, with the national policy guidelines suggesting that this would include reviewing the balance between environmental and consumptive uses. However, processes to adjust the relative shares of environmental and consumptive uses in response to permanently lower resource availability are likely to be contested in fully developed systems, particularly where that process is unclear. And reviews of the relative shares every 10 years could create unnecessary costs and controversy where no changes are needed. It is important that there is clarity so that water users are able to plan and invest without facing unnecessary costs and uncertainty about how much water will be available to them.

It is important that plan reviews take place regularly to ensure improved optimisation of management within the current agreed balance. This should be the focus for regularly scheduled reviews.

In addition, there needs to be a process to review the balance between environmental and consumptive uses during plan reviews when there is clear evidence that rebalancing is required.

These processes are discussed further below. They are most relevant for comprehensive water plans in fully developed and overallocated water systems (*Report*: chapter 5).

Improving water use and system operation to meet the objectives

Regular water plan reviews should aim to improve the overall operation of the water system to better meet the agreed environmental and consumptive objectives within the agreed allocations. In this instance, a plan review should be an evolution based on continuous learning and new information. The scope of the review should be clear — in particular, that it is not addressing the balance between environmental and consumptive uses each time. Rather the focus is on improved operations within the current balance. For example, in Queensland, Ministerial Reports are required at least every five years to report on the effectiveness of the plan in meeting its outcomes.

The process needs to include engagement with all stakeholders, particularly where possible changes in rules can have an impact on third parties (for example, through impacts on the reliability of entitlements, access or the environment).

There are ways to improve system operations without changing the balance. For example, the Bulk Entitlement (Campaspe System — Goulburn–Murray Water) Conversion Order 2000 was amended to improve the flexibility in the delivery of passing flows[9] (DELWP (Vic) 2019a). More flexibility around passing flows was beneficial to the environment and downstream communities during low flow periods. This is because passing flows can be accumulated and held in storage, and then released as 'flushes' designed to maximise benefits (DELWP (Vic) 2017, pp. 27, 31). These changes imposed no additional costs and enabled improved system operation to meet environmental and other objectives.

Resetting the objectives: rebalancing environmental and consumptive shares in the context of structural change in water availability

There also needs to be a process to review the objectives of a water plan and reconsider the balance between environmental and consumptive uses during plan reviews when there is clear evidence that this is required.

It is important to recognise that structural changes in water availability change the trade-offs possible between environmental and consumptive water uses, and mean that at some point, the currently agreed balance may no longer meet the objectives set for either the environment or consumptive users. As a result, there may be a need to revise the objectives and reset the balance between environmental and consumptive uses of water from time to time.

In making these trade-offs it should not be assumed that the consumptive or environmental objectives that were originally set in water plans remain appropriate for a drier climate. Historical objectives for irrigation water use or maintenance of agreed environmental assets should not limit future objective setting. This is because the feasibility of achieving any specific past objective could be significantly reduced under a drier climate and the cost of addressing this, if possible at all, may be high as increasingly scarce water would have to be reallocated from other uses.

Accordingly, managing the water resource in the best interests of the community overall might entail revising environmental objectives, for example, by accepting that some wetlands and streams will transition to a different flow regime under a drier climate. As the NSW Irrigators' Council noted:

> With significant reductions to inflows over the past 20 years, community expectations of achieving the rivers experienced in the previous century are likely unattainable. Whilst it may be

9 Also known as 'system operating water', it is water released from storages to operate river and distribution systems, provide for riparian rights and maintain environmental values and community benefits (DSE (Vic) 2009, p. 77).

> confronting, realistically, the only feasible option is managing for the rivers of the present and future, not the past, given changing patterns of inflows. (sub. DR158, p. 6)

An ongoing reduction in water availability will have consequences for consumptive uses as well, with some potentially no longer able to be met. The key issue is that under a drier climate, at some point, the current agreed objectives for the environment and consumptive use may need to be reviewed.

Having a clear mechanism to review the objectives and reassess the balance between environmental and consumptive uses will provide clarity so that water users are able to plan and invest without facing unnecessary costs and uncertainty. And undertaking the process only when it is clear that it is required will avoid unnecessary costs and controversy where no changes are needed.

Some inquiry participants supported the need for rebalancing, whilst others raised concerns. (box 13).

Failure to revise the objectives and reset the balance when required would risk the balance becoming out of step with what is in the best interests of the community overall, and embed unrealistic expectations about what objectives can be met with reduced water availability. Water planning decisions would likely become more contested, particularly where the process is unclear.

The need to review the objectives and reassess the balance could be indicated by a trigger. There are a range of triggers that could be considered, including a hydrological trigger and ecological trigger (box 14). Participants also identified other potential triggers. For example, the MDBA suggested triggers could also be based on a failure to meet minimum requirements for critical human water needs, a decline of access and reliability of water licenses, or water quality targets that are consistently unable to be met (sub. DR186, p. 4). The Wentworth Group of Concerned Scientists noted:

> … triggers [based on ecological and socio-economic outcomes including cultural requirements] should be used in water planning to define the overall balance between environment and consumptive use. These triggers should not apply on a once-off basis — there needs to be a series of environmental and socio-economic triggers that once crossed, require a rebalancing of environmental and consumptive use in a successive process. (sub. DR152, p. 5)

In some cases, a combination of different triggers may also be appropriate.

Box 13 Inquiry participants' views on rebalancing

A number of inquiry participants supported the need for rebalancing:

> We also endorse … the Draft Report's statement there needs to be a change in the balance between consumptive use and environmental use in response to climate change in highly-developed systems. (IWF, sub. DR120, p. 3)
>
> To account for climate change, the National Water Initiative should establish a framework where environmental and socio-economic objectives to be defined, agreed, prioritised and implemented for each catchment in light of plausible future climate change scenarios. This requires best available science to inform an assessment of the range of objectives can be supported given resource availability under a range of scenarios and a process for triage to arrive at priorities. … Final agreement of the outcomes and priorities within each catchment is a social/political decision. (Wentworth Group of Concerned Scientists, sub. DR152, p. 5)
>
> … through this region's lived experience of the millennium and recent drought, we whole heartedly support the Commission's advice that there is a need to re-visit the drought response notably in inland regional NSW to ensure that suitable triggers for rebalancing environmental and consumptive shares of water are identified in response to climate change and in preparedness for future extreme drought events. (CNSWJO, sub. DR164, p. 4)
>
> We support the implementation of both hydrological and ecological triggers as mechanisms to initiate the reassessment of balances between environmental and consumptive water uses and whether they are meeting objectives. This avoids issues slipping through the cracks as we see regularly with our current system. (Mackay Conservation Group, sub. DR150, p. 3)

But some thought that a more pre-emptive approach is required:

> … waiting until there is "sufficient evidence" … that the agreed balance "may no longer meet objectives" … is inadequate given the scope and magnitude of projected change, and the implications of that change across much of Australia. Revising water plans builds social legitimacy for proposed changes, alongside developing a clearly agreed upon pathway for change, takes substantial time, especially in the context of likely zero-sum reallocations of an already finite water resource. (IWF, sub. DR120, p. 4)

Participants also highlighted the impact of climate change on planned environmental water:

> The environmental share is likely to be disproportionately impacted by climate change and any rebalancing has to take this as a starting point. … the NWI could provide much clearer guidance for jurisdictions about what is an equitable, reliable share of water for the environment in the first place. A river needs a guaranteed share of its own water before any water is allocated for consumptive use (LBA, sub. DR133, pp. 10–11)
>
> There are potential detrimental impacts to planned environmental water arising from climate change. While some elements of planned environmental water (such as end of system targets, dam release rules and contingency allowances) are provided prior to water being allocated to licence holders, and are likely to remain secure under reduced water availability, other elements, such as the water volumes in excess of extraction limits, may be undermined. NSW considers that the issue that the Productivity Commission should be considering is the balance between planned environmental water and water allocated to licence holders, in the context of climate change. (NSW Government, sub. DR138, p. 16)

Others did not support the concept of rebalancing. For example:

> The NFF does not support the concept of rebalancing consumptive and environmental shares and cannot see how it would be applied on-ground. If poorly implemented, there is a significant risk that it would undermine the security and reliability of landholder property rights. (NFF, sub. DR178, p. 9)

(continued next page)

Box 13 (continued)

> The threat alone that at some point in the future the security/reliability of entitlements may be undermined through a rebalancing process poses a significant risk of discouraging investment in irrigated agriculture and ultimately undermines the feasibility of the sector. (SunRice and RGA, sub. DR181, p. 7)
>
> 'Rebalancing' shares of water is commonly understood among anti-irrigation and environmental stakeholders as reducing the water available to irrigated agriculture. This is not the answer to reduced inflows through climate change. 'Rebalancing' shares of water in this way should not be required in response to climate change if sound systems of water allocation and priority of use are in place (such as in NSW), which automatically reduce the share of water to consumptive users to reflect water availability and critical higher priority needs. (NSWIC, sub. DR158, p. 6)

The National Irrigators' Council emphasised the need for all water users to share the burden of reduced water availability:

> All water users must play a role in delivering efficiencies across the entire system. This will include environmental water (planned and held), river operations, urban water/town water, stock and domestic, irrigation water and extractive industries. All parts of the system must share the burden of climate change and the resultant pressures on the system. (sub. DR174, p. 16)

In developing triggers, it is important that they are 'scientifically robust, evidence based, transparent and provide certainty for communities and water users' (MDBA, sub. DR186, p. 2). Any rebalancing due to climate change should occur only when there is sufficient evidence to support the change, with a trigger designed such that the benefits of rebalancing could be expected to outweigh the costs. And for connected systems, triggers should be integrated across jurisdictions. The following principles (adapted from MDBA, sub. DR186) should be considered in establishing a trigger:

- The evidence for any trigger needs to be robust to engender stakeholder trust in the management system. A trigger should indicate that there has been sufficient long-term change such that rebalancing is agreed to be necessary.
- For interconnected systems, triggers should take into consideration the impact on other users.
- Water users require certainty and transparency to enable them to make business decisions. Triggers should not require frequent rebalancing and should enable certainty for water users.
- The process for determining the trigger should include consultation with stakeholders prior to the trigger being established.

Overall, Governments will need to consider the options for determining when rebalancing may be required and decide what is suitable for their communities.

Decisions on rebalancing are likely to be highly contested. Decision-making processes need to be timely and outcomes should be definitive to enable decisions to be taken in this context.

Box 14 Triggers for plan rebalancing

Two different options for specifying a trigger for plan rebalancing are presented below.

First, a hydrological trigger. This would require independent expert review and assessment of hydrological conditions (stream flows and groundwater levels) on a regular basis, to identify when predefined triggers for reconsidering the balance have been reached.

Victoria has a process of this type through the 15 year long-term water resource assessments. The *Water Act 1989* (Vic) requires a long-term water resource assessment every 15 years to assess changes in long-term water availability and determine whether waterway health has deteriorated for reasons related to changes in flow. The process considers whether:

- there has been a reduction in long-term availability of surface water or groundwater and whether this decline is disproportionately falling on the environment
- water sharing arrangements need to respond to a decline in waterway health where it is related to the decrease in water availability.

Where this is the case the balance between consumptive and environmental uses needs to be examined in the next Sustainable Water Strategy.

Victoria completed their first long-term water resource assessment in Southern Victoria in February 2020. It has shown both a reduction and a disproportionate reduction on the environmental share. They will examine this in their next Central Sustainable Water Strategy.

There are a number of potential concerns with this approach. Although the hydrologic balance is important, it may not reflect the actual ecological outcomes. Ecological outcomes could be as expected or possibly better (particularly if the approach has truly integrated natural resources management) or they could be worse. It is also not clear how often the review should be conducted. In Victoria, assessments are required every 15 years. However, 15 years may not be a sufficient period to detect permanent hydrological change.

Second, an ecological trigger. This requires ongoing monitoring of long-term environmental outcomes with regular public reporting. Where the long-term ecological outcomes are clearly not being achieved, a review would be triggered to identify why. If the investigation indicated that the outcomes observed were a direct result of insufficient water, the water planning process would need to reconsider the balance between environmental and consumptive uses.

One key benefit of this approach is that it considers outcomes directly.

However, there are a number of requirements to make this approach work.

- A body is required that is responsible for monitoring long-term environmental outcomes, and that has the authority to advise the Minister to trigger the process when required. This should be the same body responsible for waterway management (SP C *Environment*).
- The long-term ecological outcomes would have to be specified well enough to enable monitoring against them (section 3 and SP C *Environment*).
- The timeframes for reporting would have to be suitable to monitor long-term outcomes and take into account climate variability.
- Funds are required over the long term for environmental monitoring.

Instituting this process as a statutory requirement would help ensure it was undertaken.

Once a trigger is reached, the appropriate new balance would be decided through an open consultative water planning process. In this case, the water plan review is about fundamentally resetting objectives and the balance between consumptive and environmental uses to suit a drier climate. The rebalanced plan could also identify some agreed contingency actions to be taken in the event that climate change impacts materialise faster than predicted. This would enable communities to avoid frequent major rebalancing exercises.

The water planning process should include the following actions.

- Review of the plan objectives and outcomes — including environmental, economic and social — and agreement to either retain or change them based on community engagement and a clear cost-benefit analysis. This should be based on the most up-to-date projections for water availability and its potential implications for competing uses. Other things may have also changed in the interval between plan reviews that also need to be taken into account. For example, there might be better scientific information available on the watering needs of ecosystems, or to meet cultural outcomes or the importance that the community places on environmental outcomes might have changed.
- Identification of options to meet the new objectives and outcomes, and selection of the options that achieve this most cost-effectively. This needs to consider all options across all user groups. For example, in addition to changes to environmental and consumptive shares, it could include investments in innovations and efficiencies to reduce water use, increasing use of alternative water supplies and changes in passing flows and environmental works.
- Agreement on a mechanism to transition to the new balance. Where water transfers between consumptive and other uses are required, an evaluation of any potential socioeconomic impacts should be undertaken, and the means, process and timelines adopted should seek to deliver the largest expected benefits relative to costs.

The process for a rebalancing review should adopt the same best practice principles as for any water planning process (section 3). In particular, it requires effective community partnerships and engagement processes (particularly with communities that will be affected) (SP J *Engagement*), must recognise the needs of Aboriginal and Torres Strait Islander people, must be informed by the best available environmental, social and economic data and should be transparent. Importantly, entitlements must be respected in the process. The above actions should also be undertaken concurrently so that the review of plan objectives and outcomes is cognisant of the costs of alternative water sharing options and transition mechanisms.

As the process for rebalancing occurs, it is expected that there will be significant learning through experience. Therefore, it should be re-examined in the 10 year comprehensive review of the renewed NWI (*Report*: chapter 4) to take into account new knowledge and understanding.

Risk provisions under the NWI

Finally, there needs to be clarity about who bears the risks of any future declines in the availability of water for consumptive use due to any change in the balance set in water plans.

Inquiry participants have raised concerns about the lack of clarity as to how water will be allocated under a changing climate. For example, the Wentworth Group of Concerned Scientists contended:

> In our view existing NWI provisions are ambiguous. For while they state water entitlement holders bear any losses, governments have agreed to compensate users in the event of policy changes. Reductions in water availability in southern Australia will inevitably lead to the need for revised policy settings that reduce water allocations for all purposes, which is predicted to affect water for the environment (PEW) [(planned environmental water)] about four times as much as other entitlement holders. (sub. 68, p. 3)

The NWI includes a risk assignment framework, under which water access entitlement holders are to bear the risks of any reduction or less reliable water allocation arising from reductions to the consumptive pool as a result of long-term changes in climate.[10]

However, additional risk-sharing arrangements are also included in the NWI for any reduction arising as a result of bona fide improvements in the knowledge of water systems' capacity to sustain particular extraction levels and changes in government policy.[11] It is not clear what would trigger these arrangements, nor how they would be implemented.

A renewed NWI should have clear provisions for assigning risk, with water access entitlement holders continuing to bear the risks to the consumptive pool arising from climate change and periodic natural events (as reflected in paragraph 48 of the NWI). Importantly, there is a need to clarify how the risk provisions would interact with the adopted rebalancing approach, and to provide additional guidance on a transition path when rebalancing is required.

4.4 Principles for climate data and modelling

Analysis of climate change data and modelling will underpin the above processes for dealing with climate change through water planning.

States are adopting various approaches to climate modelling. For example, in New South Wales the approach is to use paleoclimatic data:

> NSW has invested in new modelling methods and datasets to develop a better understanding of both historical climate variability and likely future climate scenarios. This involves using new scientific methods that augment the observed historical record with paleoclimatic data and climate change projections and greatly improves the ability to identify plausible climate

10 NWI paragraph 48.

11 NWI paragraphs 49–50.

> conditions and how these may affect river flows, groundwater resources and the supply of water for communities, towns and cities, industry and environment. (NSW Government, sub. DR138, pp. 4–5)

In contrast, Victoria has taken an approach that favours climate projections and uses a post-1975 historic climate reference period and a post-1997 historic climate reference period (DELWP (Vic) 2020).

Different approaches have merit and may be appropriate in different water systems. Nonetheless, there is merit in including a consistent set of principles in a renewed NWI to ensure all jurisdictions are held to the same standard of information. Importantly, modelling should be undertaken at the water system scale; where a system is across multiple jurisdictions, a consistent approach is required. Basin Governments are considering the benefits of adopting a similar approach:

> The benefits of adopting similar methods and datasets across the Murray–Darling Basin are being explored with Basin governments, acknowledging that coordinated planning requires an agreed basis for climate change scenarios and joint and individual governmental responses to this. A further extension of this across Australia could ensure that new knowledge and shared experiences could be achieved more efficiently (NSW Government, sub. DR138, p. 5)

In addition, climate modelling and information is most valued when its quality is assured (SP E *Integrity*). A number of factors can help to build credibility, including that:

- climate models are regularly tested, evaluated and updated to encourage ongoing improvement, ensure that they are fit for purpose and are using the most appropriate and up to date scientific knowledge
- the best available data are used to establish, calibrate and validate models and methods
- model methodologies are documented and made publicly available
- models and methods are subject to independent peer reviews or accreditation (SP E *Integrity*, box 9).

NWI RENEWAL ADVICE 6.2: WATER PLANNING

In renegotiating the National Water Initiative (NWI), State and Territory Governments should ensure that water planning provisions are maintained and enhanced.

Priorities to improve water planning are to:

- better specify measurable and well-informed cultural and environmental outcomes and improve engagement with Traditional Owners
- include principles to frame the process for assessing and reflecting the relative values placed by communities on environmental, social and economic outcomes to inform the trade-offs that have to be made in water planning. This process should be transparent, evidence-based and involve effective engagement with stakeholders
- include principles for independent review of water plans. While the review processes would be determined by jurisdictions, the NWI could set out principles for reviews to promote their need to be robust and fit for purpose, focused on achieving the greatest net benefit and to involve community participation.

Processes to better account for climate change are also required, including that:

- water plans include priorities, actions and rules that cover drought conditions, as well as mechanisms for dealing with more extreme scenarios, including clear triggers, roles and responsibilities for actions and a hierarchy of uses
- water quality issues are better incorporated into water planning, particularly in drought scenarios
- water planning processes in relatively undeveloped and developing water systems take climate change into account in ways that manage the risk of less water
- as water plans reach the end of their planning cycle, review processes promote improved water use and system operation to lessen risks in meeting the agreed environmental and consumptive objectives
- a process for rebalancing between environmental and consumptive uses as a result of climate change is developed. Rebalancing due to climate change should occur when there is sufficient evidence that the expected benefits will outweigh the likely costs. Where this occurs, governments should ensure that a water plan review assesses the feasibility of the objectives of the plan, sets new objectives that are realistic under climate change (including environmental, cultural and consumptive objectives), selects the most cost-effective option for meeting them and agrees a pathway to transition to the new balance. The process requires effective community partnerships and engagement, must be informed by the best available environmental, social and economic data and should be transparent
- there are clear provisions for allocating risk, with water access entitlement holders continuing to bear the risks to the consumptive pool arising from climate change and periodic natural events (as reflected in paragraph 48 of the NWI)
- climate modelling is undertaken at the system scale, based on the best available data and subject to on-going reviews and refinements. The models and information should be made publicly available and be subject to independent peer review or accreditation.

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