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GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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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.

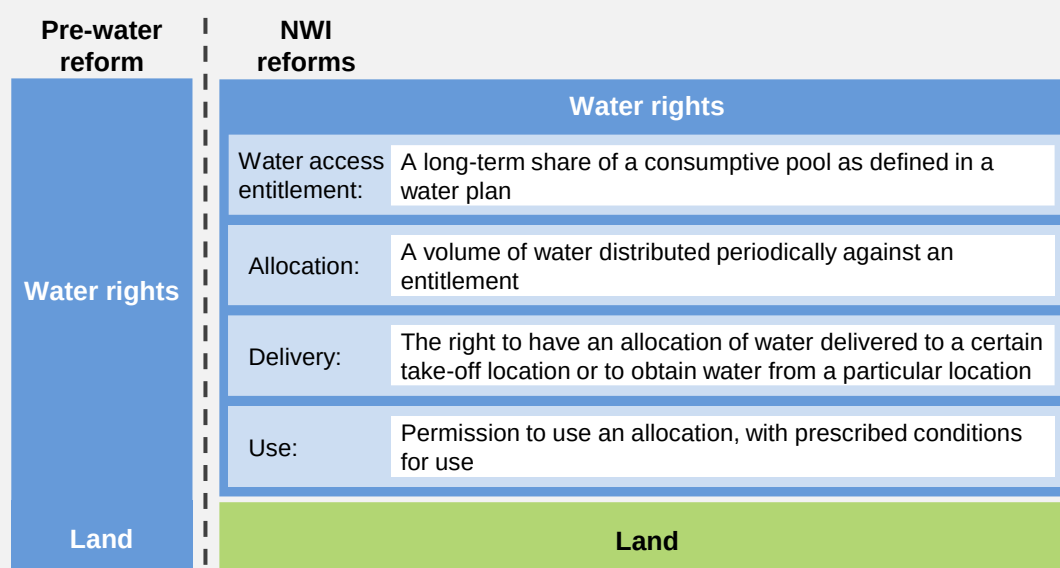
1.1 The NWI built on and extended previous reforms

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 NRM (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 gegalitres (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 be 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.

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- 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 flows⁹ (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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Australian Government
Productivity Commission

Water trading and markets

Supporting Paper B

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Reforms have facilitated the development of water markets, which in turn have allowed a significant growth in trade and development of irrigation industries over the past 30 years.
- A large majority of trade occurs in the southern Murray–Darling Basin (MDB) where hydrological connections and a large number of users create the key pre-conditions. Outside of the MDB, trade has increased gradually in some water systems where characteristics permit.
 - Queensland surface water markets and South Australian groundwater markets have seen particularly strong growth in entitlement trade volumes.
 - Northern Australia has been recognised as an area where secure water rights could enable the future development of trading.
- Although relevant NWI commitments have been achieved or largely achieved, there is scope to build on these foundations.
- Recommitting to the original NWI water markets and trading principles would support the objective that arrangements facilitate the efficient operation of markets, where system and water supply considerations permit. These principles will become increasingly important in enabling irrigators, in particular, to manage through drought and adapt to a changing climate.
- The addition of principles to support best-practice governance, regulatory, operational and informational arrangements would enhance possible gains from trade in the diverse range of Australian water systems as they develop — drawing on the lessons from 30 years of trading and recent reviews in the MDB.
- There is a gap at the system level in the proactive monitoring of water trading (particularly long-term market dynamics), and its interaction with resource availability and system constraints. No entity is currently responsible for overseeing trade operations within the broader, long-term water resource management and system operation context.
 - Where appropriate, jurisdictions could consider establishing such a function, distinct from the existing oversight, regulatory and compliance functions performed by various entities to address this gap.
- A renewed NWI should continue to provide principles on water registers to support jurisdictions' decision making about the provision of basic entitlements and trade data.

The creation of water rights, separate from land, coupled with caps on consumptive use set up the drivers for the trade of water. Trade includes transactions within a season (predominantly called allocation trade), the permanent transfer of water rights (entitlement trade) and a growing range of diversified tradeable products that transfer water access and use rights across space and time. Trading enables scarce water resources to move between uses, promoting efficiency and benefiting the community as a whole.

Under the National Water Initiative (NWI), all jurisdictions agreed to a common set of objectives, outcomes and actions to facilitate the development of efficient water markets in Australia, building on previous reform effort. The NWI broadly focused on the 'progressive removal of barriers to trade in water' and other arrangements to facilitate an open trading market.¹

¹ NWI paragraph 23(v).

The NWI intent and objectives providing for water markets and trading not only remain relevant today, but will become even more important, particularly for irrigators, in enabling them to manage through drought and adapt to a changing climate. However, many of the substantive actions that jurisdictions committed to, were focused on liberalising trade in the Murray–Darling Basin (MDB). And since the NWI took effect in 2004, a range of specific legislative instruments and agreements, such as the *Water Act 2007* (Cth) and the 2012 Murray–Darling Basin Plan (Basin Plan), have been developed to govern the MDB water market — superseding the NWI. Moreover, most of the specific actions in this element have been completed. As the Commission observed in 2017, the relevant 2004 NWI commitments have been achieved or largely achieved — but there is scope for further gains from incremental reform (PC 2017, p. 118).

A renewed NWI should assist entitlement holders and communities to meet the challenges posed by a changing climate and growing population. Water markets will be an increasingly valuable tool in the management of water resources given these and other trends. Fit-for-purpose governance, regulatory, operational and informational arrangements are central to sustaining markets of this type. Inclusion of a more detailed set of principles in a renewed NWI that reflects these arrangements would better underpin the development of markets and trading in non-MDB parts of the country — and build on the lessons from the MDB.

A renewed NWI will not be the policy lead in the MDB. Reform of the MDB water market arrangements will, however, need to be consistent with NWI principles. The Australian Competition and Consumer Commission’s (ACCC) Murray–Darling Basin Water Markets Inquiry (2021) has provided advice to governments on possible reforms to water markets in the MDB, which, at the time of writing, was under consideration. After almost 30 years of operation, this review of the MDB water markets also provides nationally-relevant lessons in the management and future development of water markets.

This paper includes:

- a summary of the development and status of water trading in Australia (section 1)
- a discussion about fit-for-purpose market arrangements that account for hydrological, economic and institutional pre-conditions (section 2)
- principles for efficient water trading and markets for inclusion in a renewed NWI (section 3)
- a summary of the Commission’s advice on water trading and markets as part of NWI renewal (section 4).

1 Development and status of water trading

Australia is widely regarded as a world leader in the establishment and management of water markets (Horne and Grafton 2019, p. 167). Trade in water allocations and entitlements has increased significantly from small beginnings over 30 years ago, primarily in the MDB. In

2018-19, Australia's water markets were estimated to have generated \$5.2 billion in turnover (BOM 2020a, p. 7). Water management reforms, including those under the NWI, have been essential in establishing markets, increasing trade and making water markets more efficient.

For further reference, the Commission's inquiry into National Water Reform (2017) provides a detailed description of the development of water trading in Australia and the progress of reforms to 2017. And the Commission's assessment (*Assessment*: section 2) reviews jurisdictional progress since 2017 against NWI commitments to facilitate water trading and markets, finding that jurisdictions have made progress in reducing unwarranted trade barriers, improving water registers and reducing transaction costs through improved water market information. Since 2017, there has been further progress in reforming water trade and market arrangements, and most jurisdictions have largely achieved their commitments against the NWI in this area.

1.1 Patterns and drivers of water trade

Understanding the context of where water trade currently occurs — in systems where the consumptive share of water resources are close to or fully allocated² — will help in assessing how trade-enabling reforms may impact future trading activity (*Report*: chapter 5).

Trade is concentrated in the southern Murray–Darling Basin ...

By volume, over 80 per cent of water allocation trade activity occurs in the hydrologically connected southern MDB (table 1). Regions outside the MDB with significant quantities of trade (in both entitlements and allocations) include Fitzroy, Barron, Burdekin and Burnett (all in Queensland), South East South Australia, Thomson–Macalister (Victoria), Hunter (New South Wales), Harvey (Western Australia) and irrigation schemes in Tasmania.

... but there are pockets of growth elsewhere

Each water system has distinct underlying characteristics that shape market development.³ The degree to which the consumptive share of a water resource is close to full allocation or fully allocated will significantly influence the possibility of trade — if water needs can be met through issuing new entitlements, then trade will not generally occur. The potential for water trade also relies on a range of hydrological and economic pre-conditions that are necessary for trade (section 2.1). These underlying characteristics largely explain why

² The precise meaning of the term 'fully allocated' varies by jurisdiction. In this context and throughout the paper, it is used to refer to water systems where the sustainable level of extraction has been reached and new consumptive water demands are unable to be met through the issue of new entitlements.

³ A water system is hydrologically connected and described at the level desired for management purposes (for example, sub-catchment, catchment, basin or drainage division, and/or groundwater management unit, sub aquifer, aquifer or groundwater basin) (NWI schedule B(i)).

systems outside the southern MDB have significantly lower volumes of trade and why some systems have very little trade or none at all.

Table 1 Trade summary by region and resource type, 2019-20

Region	Resource type	Allocation trade ^a	Share	Entitlement trade	Share
		GL	%	GL	%
Southern MDB					
	Regulated surface water	5 527		775	
	Unregulated surface water	0		20	
	Totals	5 527	88	795	41
Northern MDB					
	Regulated surface water	130		283	
	Unregulated surface water	60		157	
	Totals	190	3	440	22
MDB Groundwater ^b					
	Groundwater	291		184	
	Totals	291	5	184	9
Rest of Australia					
	Regulated surface water	236		136	
	Unregulated surface water	3		182	
	Groundwater	28		224	
	Totals	267	4	542	28
Australia					
	Regulated surface water	5 893		1 194	
	Unregulated surface water	63		359	
	Groundwater	319		408	
	Totals	6 275	100	1 961	100

^a Allocation trade data include environmental water transfers. These transfers within and between water systems were to achieve environmental watering objectives. In 2018-19, the most recently available year of data, these were 36 per cent of all allocation trades by volume (BOM 2020a). ^b The MDB groundwater systems overlap the northern and southern MDB.

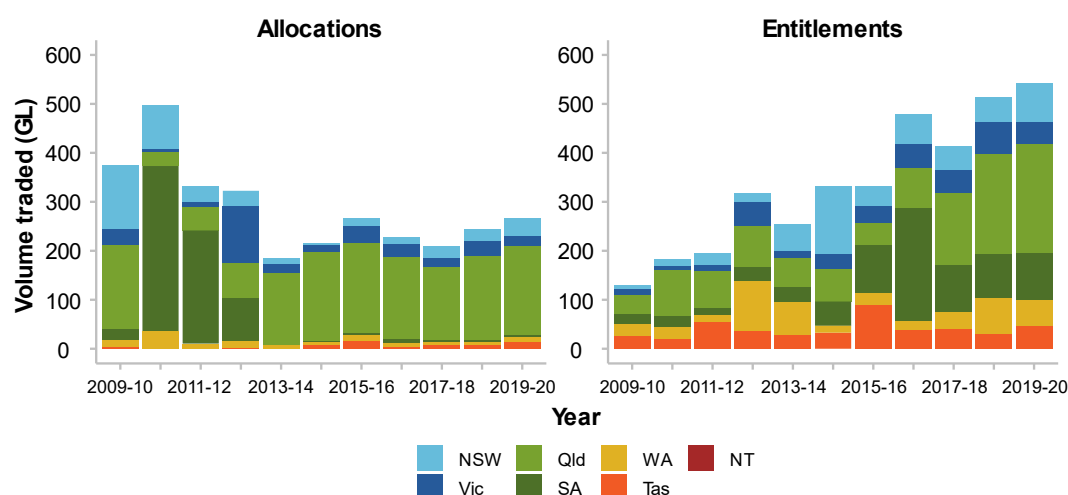
Source: BOM (2020b).

In the northern MDB, trade is limited due to the smaller public storages and greater volumes of unregulated surface water (that is, their flow cannot be controlled or captured in public storages). Trade in MDB groundwater systems has higher transaction costs relative to surface water, which means that this is more often traded when surface water is scarce (de Bonviller, Wheeler and Zuo 2020, p. 7).

Outside of the MDB, trade has increased gradually where the characteristics of water systems permit, and is likely to grow further in the future. Permanent entitlement trade in particular has been increasing over time (figure 1) — up 195 per cent over the past decade (from a low base). Most of the growth has been in surface water entitlements in Queensland and groundwater entitlements in South Australia. Permanent entitlement trade generally supports

structural shifts in water use, including the entry of new water users and new types of uses in fully allocated regions.

Figure 1 Water trade outside of the MDB^a



^a The Northern Territory recorded seven trades in 2019-20, which have not yet been incorporated into BOM's water market data.

Sources: BOM (2020b); DENR (2020).

The development of northern Australia, particularly investment in irrigated agriculture, represents an opportunity for future water trade (IA 2016, p. 114). The Northern Territory has made significant changes to its water entitlements and planning systems, which led to its first water trades in 2019. And Queensland and Western Australia are exploring options for water reforms that would further support trading (*Assessment*: section 2).

1.2 Impacts of water trade

Water trading has led to a range of benefits

Overall, the development and operation of water trading in Australia has provided an efficient mechanism to reallocate water, delivering net benefits to the Australian community (NWC 2012, pp. 99–106). While benefits so far have accrued mainly to consumptive users, the environment has also benefited. Cost-effective recovery of water in over allocated systems has been made possible by water markets (Grafton and Wheeler 2018, p. 504). Governments have been able to recover water for the environment from private water users at market rates (*SP C Environment*).

For many irrigation businesses, water is not only an input to production but also a significant asset — the value of entitlements held by active and retired farmers and environmental water

holders is \$26.3 billion (Aither 2020, p. 5). In 2018-19, the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) found that water entitlements comprised between 35 and 41 per cent of capital assets of irrigated farms in the southern MDB, depending on the industry (ACCC 2020, p. 7). Recent modelling by ABARES estimated that over the past two decades, inter-regional trade and carryover provided an average \$117.1 million per year in benefits to irrigators in the southern MDB, relative to a scenario with no trading and carryover (Hughes et al. 2021, p. 17). These benefits reflect the net proceeds from selling water, lower water prices and increased use of water in relatively more productive activities.

Water trade also aids in the management of water supply risks (Nauges, Wheeler and Zuo 2016, p. 456). The capacity for irrigators, firms, towns or industries to manage weather and other shocks is enhanced by the flexibility that markets offer in providing short-term access to water. Prices transmit information to water users allowing for the dynamic adjustment of business models and practices to changing circumstances. Water markets have helped to support an upward trend in the value of irrigated agricultural production in the southern MDB since 2010-11, despite volatile climatic conditions (ACCC 2021, p. 1).

Looking ahead, climate change is likely to cause a long-term decline in available water in a number of regions, as well as more frequent and intense periods of water scarcity. This will prompt adaptation within and between water user groups. Water trading is an important and cost-effective part of a suite of adaptation strategies (that also includes, for example, changing land use and water supply augmentation) that will be required in a changing climate (Loch et al. 2013, p. 1).

But there have been some downsides, particularly in the MDB

Increased volumes of trade, particularly in peak periods, have led to negative impacts on the environment, including erosion and unseasonal high flows during the delivery of water traded downstream. Unseasonal flooding of the red gum forests around the Barmah Choke has been a prominent example in the past (MDBA 2019).

In addition, there have been complex and cumulative flow-on impacts of water trading and its long-term effect on other irrigators and adjacent industries (Whittle et al. 2020, p. 6). For example, where irrigators in shared water distribution systems sell their entitlements out of their system and reduce their water use, water delivery costs for other irrigators in that system increase. In smaller, irrigation-dependent communities, businesses in other industries can experience flow on demand impacts where declining regional water use results in farmer exits and a decline in agricultural output, regional processing and jobs (SP H *Rural*) (Sefton et al. 2020, p. 59). While this may occur in certain regions, the claim that water trade is a significant driver of farmer exit has been contested (Wheeler, Xu and Zuo 2020, p. 562).

Nationally, water trading activity and market participation have been increasing over time (ACCC 2021, p. 566).⁴ While a number of submissions reaffirmed the support for water markets among irrigators (for example CICL, sub. 7, p. 6; AgForce, sub. 24, p. 5; NIC, sub. DR174, p. 18), there has been evidence of declining confidence in water markets among some groups and communities (Wheeler et al. 2020, p. 150). Perceptions of market fairness have also declined in recent years (Schirmer and Peel 2020, p. 44). Trust and confidence in water trading and markets influence their efficient functioning through participation; markets with greater participation of buyers and sellers typically have lower transaction costs.

The ACCC’s Murray–Darling Basin Water Markets Inquiry highlighted a number of issues and ‘deficiencies in current water trading arrangements’ (ACCC 2021, p. 2), which undermine the efficiency of water markets in this system (box 1).

Box 1 ACCC Murray–Darling Basin Water Markets Inquiry and the NWI

On 26 February 2021, the Australian Competition and Consumer Commission (ACCC) released its *Murray–Darling Basin Water Markets Inquiry: Final Report*. It found that, while water markets provide net benefits to the community, the Murray–Darling Basin (MDB) market arrangements have ‘significant deficiencies’ (p. 2). The ACCC recommended a comprehensive package of reforms (and an implementation plan) which aims ‘to restore confidence in water markets across the Basin, and to improve their operation and efficiency’ (p. 2).

The recommendations centre around four themes:

- governance of the Basin water markets
- market integrity and conduct
- trade processing and water market information
- market architecture.

These recommendations are proposed to be implemented in three stages. In stage 1, the ACCC proposes improving current trade arrangements and existing commitments. Stage 2 involves creating new market-focused governance, oversight and information arrangements through: the introduction of new legislation; creating an independent, MDB-focused Water Markets Agency; adopting Water Market Data Standards; and improving trade rules and rule-making processes. In stage 3, the ACCC proposes a range of measures to strengthen governance and designates responsibility for delivery between the Water Markets Agency and the Australian and Basin State Governments.

(continued next page)

⁴ Increasing participation can be observed through a number of measures: the number of locations where trading occurs in Australia; the number of irrigators; the number of trades; volume of trades; and, in some locations, a greater diversity of market participant types.

Box 1 (continued)

This report is the first of its kind in almost 30 years of MDB market operation. It provides a strong mandate for modernising MDB market arrangements, while recognising the significant cooperation and coordination that will be required between the Australian and Basin State Governments to give effect to the reforms. The proposed reform agenda is consistent with current NWI principles and objectives, but builds on a range of specific legislative instruments and agreements covering MDB water markets that have emerged separately from national water reform processes. In renewing water trading and market principles in the NWI, lessons from the MDB can help to ensure that market arrangements remain in step with the growth in water trading in other systems as they develop.

At the time of writing, governments were considering their response to the inquiry findings and advice.

Source: ACCC (2021).

1.3 Markets can be broader than volumes and access

In addition to the core water products (permanent entitlements and seasonal allocations), the NWI sought to enable development of other trading options.⁵ The value of water as a commodity is derived not only from its quantity, but also its quality, reliability, timing, location and use (Chong and Sunding 2006, pp. 242–243). Opportunities to develop additional trading options lie in: the unbundling of water access rights; development of secondary markets; and the establishment of property rights for water quality and pollution markets.

Unbundling of water access from the right to delivery and storage can create markets that facilitate the efficient allocation of scarce capacity constraints. Coleambally Irrigation Co-operative Limited (sub. 7, p. 5) (and other irrigation infrastructure organisations), for example, have established ‘delivery entitlements’ separate to irrigation right ownership. Lease arrangements have unbundled the duration of access — for durations longer than seasonal allocations, but shorter than permanent entitlements. The recognition and protection of these property rights and the removal of regulations that might limit their trade would enable wider adoption of these types of markets in hydrologically suitable systems.

Secondary water products are contracts based upon underlying water assets (entitlements and allocations). These products allow market participants to take positions on future water prices or quantities through forward contracts, calls and options, acting as a risk management tool (Bayer and Loch 2017, p. 2). Increased participation of financial investors, large agribusinesses and environmental water holders can support market depth for these products and increase the diversity of risk preferences (Seidl, Wheeler and Zuo 2020, p. 13).

There are also a number of opportunities to potentially improve the specification of property rights; and support wider adoption of market instruments in other aspects of water management outside of consumptive water access markets.

⁵ NWI paragraph 58(iii).

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- Market-based instruments can support water quality outcomes and manage pollution (PC 2006, p. 135). The most prominent current examples are in salinity (for example, the MDB salinity credit and debit arrangements and the Hunter River Salinity Trading Scheme) and nutrients (Hawkesbury–Nepean offset scheme) (DEC 2003; Fairbairn 2018). The complexity of water quality management, however, will require carefully considered market design to be successful in other contexts (Fisher-Vanden and Olmstead 2013).
 - As urban centres look to adopt integrated water cycle management, there may be opportunities to adopt trading instruments to manage stormwater. Clear property rights and supporting institutional arrangements will be necessary for this to occur (SP A *Entitlements and planning* and SP F *Urban*).
 - The use of markets to support environmental outcomes has been a prominent approach to water recovery in the MDB (SP C *Environment*). Environmental water holders will require further development of market instruments, particularly in unregulated systems, coupled with the removal of some remaining trade barriers to enable markets to support the achievement of environmental objectives in all systems.

2 Pre-conditions for trade and efficient markets

This section describes the pre-conditions for efficient water trade and markets that are used in developing principles in section 3.

In considering principles for water trading and markets for a renewed NWI, the primary objective should be to facilitate the efficient use of water.⁶ Water trading and markets can only function efficiently if they have effective governance, regulatory, operational and informational arrangements. And the implementation of these arrangements should be fit for purpose — across the diverse range of water systems, reforms should balance the costs and benefits associated with their implementation. The pre-conditions described in this section include hydrological and economic conditions and the concept of fit-for-purpose institutional arrangements.

2.1 Hydrological, institutional and economic pre-conditions for trading

Before water managers develop the necessary arrangements to facilitate trading, a number of pre-conditions have to be considered (NWC 2011, p. 10):

- the consumptive share of a system is close to full allocation or fully allocated (and this cap is able to be enforced)
- hydrology and system type, which covers:

⁶ See *On Efficiency and Effectiveness: Some Definitions* for a full treatment and definition of economic efficiency (PC 2013, p. 13).

-
- the availability of water (for example, rainfall variability, groundwater level)
 - connectivity; that is, the number of users for whom trade is hydrologically feasible and the degree to which a system is primarily surface water, groundwater or an interconnected combination of both (known as conjunctive systems)
 - the presence of structures such as dams, weirs, and off takes that regulate flows and store water
- existing institutional, planning and property right arrangements (including seasonal allocation processes and enforceable access rights).

Economic factors will also influence the possibility for trade (Aither and DG Consulting 2018, pp. 5–6). These include:

- sufficient numbers of users and heterogeneous water use
- changes in other markets that lead to adjustments in the activities of businesses using or trading water (for example, a commodity price increase driving an increase in water demand).

For example, hydrologically connected systems and a heterogeneous range of water uses in the MDB — particularly in the southern MDB — have led to the region hosting the most advanced water market system in the world (Wheeler and Garrick 2020, p. 134). A range of sophisticated intra- and inter-jurisdictional arrangements have developed to support this system including the Murray-Darling Basin Agreement, the National Partnership Agreement on Implementing Water Reform in the Murray–Darling Basin and the Basin Plan, as well as state legislation.

In many systems in Australia, large volumes of trading will unlikely develop in the foreseeable future due to hydrological constraints, the size of the water system, its level of development or homogeneity of water uses that limit possibilities for trade.

Two supporting papers for this inquiry provide greater detail on the institutional pre-conditions, reflecting the structure of the NWI. The establishment of well-defined and enforceable water property rights is discussed in SP A *Entitlements and planning*. Secure water entitlements needed to support trading also require sustainable water management practices, which are discussed in SP C *Environment*.

2.2 Water markets have to be underpinned by fit-for-purpose institutions

Australia’s experience with water markets since 2004 has demonstrated that appropriate management and institutional arrangements are required to ensure that markets function efficiently (box 1). Wheeler et al. noted:

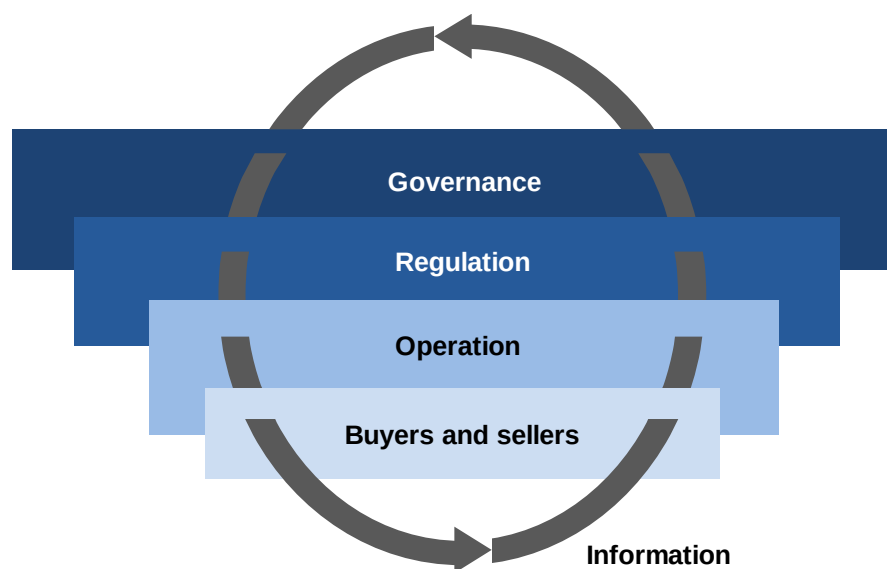
... decisions to allow ‘unfettered’ water trade prior to the reconfiguration of the administrative arrangements to adequately manage water supply and demand can be damaging to, rather than supportive of, water security. (2017, p. 809)

The complexity of water markets gives rise to risks of inefficient outcomes. Market structures can either facilitate or impede efficient trade, depending on their design and implementation (Teytelboym 2019, pp. 139–140). Leading practice governance, regulatory, operational and informational arrangements are key to ensuring water markets operate as efficiently as possible and are consistent with broader water resource management objectives. Wheeler et al. (2017, p. 812) used international comparisons of the Diamond Valley (United States), Guadalquivir Basin (Spain) and Tasmanian Irrigation regions (Australia) to highlight that, in addition to consideration of market pre-conditions, management regimes need to be ‘commensurate with potential market/trading activities’ to ensure efficient trading occurs.

Figure 2 illustrates the overlapping and interconnected layers of governance, regulatory and operational structures needed for water markets. For example, the operations involved in approving a trade between buyers and sellers of water are shaped by the trade rules and arrangements specified through regulation. Information connects these layers with each other and with the buyers and sellers who sit at the heart of a market. Information flows are as important to efficient market functioning as other more tangible structures or arrangements.

A number of layers make up the market structures, as illustrated in figure 2.

Figure 2 Framework of market structures



Source: Adapted from ACCC (2020, p. 395).

- Governance: the decision makers who shape the rules and processes for trade of water products and associated services; and the processes by which decisions are taken and the accountability mechanisms for those decisions (OECD 2015, p. 5).
- Regulation: the rules within which trade can occur and the processes by which these regulations are implemented. These rules: ensure transactions reflect hydrological

constraints; ensure that third-party and environmental impacts are avoided; and grant access to market participants. Such regulations can include inter-valley trade limits, groundwater-specific trade restrictions, irrigation infrastructure operator rules and reporting requirements, among others.

- Operation: describes the arrangements that facilitate the buying and selling of water rights and related products.

Section 3 discusses the principles that should underpin these market structures.

Water market structures in practice

While the principles discussed in the next section are desirable across jurisdictions and diverse water systems, how they are applied needs to be fit for purpose. The underlying characteristics of a system, and therefore potential benefits from trading, should be accounted for when determining the appropriate level of governance, regulation, operational arrangements or information.

The governance, regulation and operation of the MDB is highly sophisticated relative to other water management systems around the world. The costs of a complex regime (from well-resourced regulators, water registry services, trading rule enforcement, compliance activities, water market intermediaries and exchanges) are justified due to the large volumes of trade, the number of entitlement holders, the value of entitlements, the possibility of interstate trade (and associated regulatory differences), the water delivery distances (and managing associated water losses), the level of investment and the significance of environmental assets.

At the other extreme, water trading in its simplest form could involve two neighbouring farms, one with surplus water and another with insufficient water to maximise the value of their production opportunities. While foundational trading structures will be required, such as the definition of clear property rights and the capacity to measure take, the costs of developing more sophisticated market structures through regulations or other supporting measures are unlikely to be outweighed by the benefits of trade.

In certain systems, as noted above, the hydrological characteristics and homogeneity of water uses means that trade is unlikely to develop, regardless of the institutional arrangements.

Two case studies illustrate in more detail how market structures must suit the context of the system. The first example, the Gnamangara groundwater system in Western Australia, is an overallocated groundwater system with a diverse range of uses, but very little trade (box 2). The second, in Tasmania, is a system with relatively large volumes of available regulated and unregulated surface water which has growing volumes of trade (box 3).

Box 2 **Water trade in the Gngangara groundwater system**

The Gngangara groundwater system contains eight aquifers, some with connections to surface water sources. It provides almost half of the total water used in Perth and extends 90 km to the north of the Swan River, along the coast.

The diversity of industrial, agricultural and urban demands on the resource combined with the high rates of allocation would suggest a heterogeneity of use that would be conducive to water trading. Despite this, there have only been 789 trades in the past decade. (By comparison, there were more allocation trades than this per week during busy periods in the southern MDB in 2018-19). The primary reason for low trading rates is that the Gngangara is a groundwater system. Groundwater systems have a number of characteristics that raise transaction costs relative to surface water systems, lower the pool of potential buyers and sellers and ultimately lower the possible gains from trade.

- Trade in such systems can have uncertain third-party impacts on water availability and quality.
- There are hydrological limits to trade between entitlements located within the same aquifers.
- The seasonal and spatial variability of rainfall in surface water systems can result in trade opportunities that are less prominent in groundwater systems, where users draw from a common pool that recharges at a slower rate.

Despite these hydrological challenges, institutional arrangements could be more trade-enabling. Time limited rights, ill-defined trading boundaries that do not reflect hydrological realities and sovereign risk from Ministerial discretion all weaken property rights or impose unnecessary transaction costs. Improving processing times would also lower transaction costs (*Assessment*: section 2.4).

There may be a case for reform to these institutional impediments, provided the likely gains from trade outweigh the costs of changing governance, regulatory or operational settings.

Sources: Skurray et al. (2013, p. 1051; 2012, p. 262); BOM (2020b); DOW (WA) (2016, p. 22); DWER (WA) (2018, 2020); Wheeler et al. (2016, p. 513).

Box 3 **Water trade in Tasmanian surface water**

Tasmania has historically seen relatively low water trade, both in absolute volumes traded and as a share of total entitlements on issue. The primary reason for historically low trade volumes has been sufficient supply in most systems and irrigation schemes to meet demand through the issuing of new entitlements; meaning reallocation through trade has not been required.

While formal water trading outside irrigation schemes has been relatively infrequent, transfer of water through informal temporary water transfer and sharing between neighbouring entitlement holders on a seasonal basis is considered to be more common.

With clear property rights and low transaction costs to informal negotiation, individual trades can occur without significant institutional arrangements.

Today, some irrigation schemes are reaching full allocation, increasing the potential for trade. The Southern Highlands Irrigation Scheme, for example, is fully subscribed^a and has had trading for the past three years.

^a Equivalent to 'fully allocated' elsewhere in the text

Sources: BOM (2020b); DPIPWE (Tas) (pers. comm., 9 September 2020); Tasmanian Irrigation (2019).

3 Principles to guide future development of Australian water trading and markets

The NWI provides solid foundations for trading and markets through provisions covering secure property rights and sustainable extraction limits set through planning. The intent of the objectives relating to markets and trading also remain relevant (box 4).

Box 4 NWI paragraph 58

The States and Territories agree that their water market and trading arrangements will:

1. facilitate the operation of efficient water markets and the opportunities for trading, within and between States and Territories, where water systems are physically shared or hydrologic connections and water supply considerations will permit water trading;
2. minimise transaction costs on water trades through good information flows in the market and compatible entitlement, registry, regulatory and other arrangements across jurisdictions;
3. enable the appropriate mix of water products to develop based on access entitlements, delivery and storage capacity which can be traded either in whole or in part, and either temporarily or permanently, or through lease arrangements or other trading options that may evolve over time;
4. recognise and protect the needs of the environment;
5. provide appropriate protection of third-party interests.

This section identifies leading practice and principles that can guide a renewed NWI. Before heading into the detail, one overarching principle is noted: a renewed NWI should emphasise that the purpose of water trading and markets is to increase efficiency within a water resource management framework. Water trading and markets are not ends in themselves.

3.1 Creating the foundations for leading practice arrangements

Governance — who sets the rules and how

Roles and responsibilities of key parties should be clearly defined and their activities coordinated

Core roles within water market governance include policy design and implementation, regulation and operational management. With the exception of the MDB, States and Territories and their bureaucracies perform the majority of market governance functions. Governance within the MDB is shared between MDB jurisdictions and the Murray–Darling Basin Authority (MDBA). Under the *Water Act 2007* (Cth) and Basin Plan, the MDBA develops and enforces water trading rules as well as operates the River Murray system under the Murray–Darling Basin Agreement (ACCC 2020, p. 491). The Australian Government

also plays a prominent role as a market participant through the Commonwealth Environmental Water Office (CEWO) (SP C *Environment*).

In many systems, including the MDB, overlapping, conflicting or fragmented governance roles have developed (ACCC 2020, p. 490). The multiple and possibly conflicting roles of the MDBA, as an agent of government and a regulator, has been recognised (ACCC 2020, p. 491; PC 2018). The ACCC (2020, p. 491) also recognised that:

Irrigation infrastructure operators operate trading platforms and/or offer brokerage services, while acting as a trade approval authority. This puts them in a position where they could prioritise the approval of trades facilitated by their own brokers or trading platforms over other trade approval requests.

The provision of trade and market information is an area that illustrates the potential benefits of better defined governance roles. Victoria's dedicated Water Registrar has a statutory requirement to provide accurate and reliable records of ownership of water entitlements and allocations, improving market confidence and efficiency (DELWP (Vic) 2019b, p. 12). The ACCC has recognised Victoria's water register and market information arrangements as best practice (2021, p. 315).

Effective water market governance also ensures that relevant parties' activities are coordinated effectively. Coordination may need to span a number of dimensions, including between authorities within the water sector, jurisdictions, scales (for example, water infrastructure, system and catchment), and adjacent sectors (for example, environment, agriculture and health) (OECD 2015, p. 9). Coordination can ensure that water trading and market tools remain effective within a water resource management framework.

Activity in markets should be monitored and evaluated

A responsive governance regime that is conscious of developments and responds proactively can improve the efficiency of a system. Regular monitoring, evaluation and subsequent responses to changes in trading patterns and levels of market development ensure that institutional arrangements remain fit for purpose (*Report*: chapter 5). Changes in water availability and economic factors, as well as new information about system hydrology and environmental conditions, will influence demand for water trading, potentially warranting improvements in governance arrangements.

Tasmania, for example, has a state-wide water trading policy, but, in line with a fit-for-purpose approach, tailors its market arrangements to the level of trading demand in water systems. As irrigated agriculture has developed and trading has gradually increased, the Department of Primary Industries, Parks, Water and Environment has been monitoring water systems to identify opportunities to better support water trading (DPIPWE (Tas) 2020, p. 24).

Queensland also has a process to respond to the needs of market participants and tailor market structures accordingly (*Assessment*) — the then Department of Natural Resources,

Mines and Energy has consulted with industry stakeholders through an Underutilised Water Partnership Project.

Public confidence in market functioning is also an important governance consideration, particularly in sophisticated water markets. As noted in section 1.2, it affects market participation and, in turn, transaction costs. Market confidence can be supported through regular and transparent evaluation and monitoring. Responsiveness to evaluation findings when markets could be improved is also required. Public confidence and integrity relate to a number of water management areas and are discussed further in (SP E *Integrity*).

Water trade monitoring should be integrated into water system management in sophisticated systems

There have been significant changes in water market dynamics in many systems since 2004. While the NWI explicitly recognises and protects the environment and third-party interests, greater trade has seen issues emerge in the MDB (PC 2018, p. 261). Examples of third-party impacts have included increased risks of delivery shortfalls and unintended unseasonal flows and erosion caused by poorly coordinated movements of regulated surface water (Murray Irrigation, sub. 69, p. 8; SRI, sub. 77, p. 9; MVPD, sub. 101, p. 2). Reduced channel capacity in the Barmah Choke, and increased frequency and peaks in demand at more concentrated downstream locations highlight the need for longer-term monitoring of water trade and its interactions with MDB system constraints (ACCC 2021, pp. 415–416).

For most systems and most trades, existing arrangements to monitor water trading and markets (box 5) provide appropriate protections against these impacts. The monitoring of individual water trades, at a short-term operational level, is reasonably well managed. Trade approval authorities ensure that individual trades are consistent with environmental and third-party interests. Planning by system operators, often on a seasonal basis, ensures that water is able to be delivered to all users, taking into account trades that have occurred, any locational changes in access points and operational considerations that are necessary to limit environmental and third party impacts. The MDB shows however, that while existing arrangements provide appropriate protections most of the time, there may also be a need for longer-term monitoring of the cumulative effects of increasing trade volumes within system constraints, particularly in the face of changing land use and greater climatic variability.

Proactive monitoring of water trading (particularly long-term market dynamics) and its interaction with resource availability and system constraints may fill a gap in monitoring in highly developed systems. As the operator of the River Murray system, the MDBA, in cooperation with other system managers (such as Goulburn Water, WaterNSW, and DELWP), has increasingly been performing this role (DELWP (Vic) 2018b). In other systems, however, no entity is responsible for monitoring the interaction of water trade with the broader tasks of long-term water resource management and system operation. While delivery risk is the responsibility of system managers, their objective is to manage short-term competing demands on their constrained infrastructure.

Box 5 **Existing monitoring and oversight roles**

There are several entities that perform water trading and market monitoring and oversight regulatory functions:

- State government water policy departments
- the Murray-Darling Basin Authority, which monitors and oversees the operation of the River Murray system on behalf of New South Wales, Victoria and South Australia
- the Victorian Water Grid Partnership, which brings together 19 water corporations, 10 catchment management authorities and the Victorian Environmental Water Holder to provide a state-wide oversight function of grid operations, including of water trade and markets
- the Australian Competition and Consumer Commission and the Independent Pricing and Regulatory Tribunal (NSW), which monitors market participant behaviour in the Murray–Darling Basin
- the Interim Inspector–General of Water Compliance (AG) and the Natural Resources Access Regulator (NSW), who monitor compliance and enforcement of resource use
- the Productivity Commission, which monitors and assesses water market reform implementation against the National Water Initiative and Basin Plan commitments.

Sources: ACCC (2020, pp. 415, 487); DELWP (Vic) (2018a).

To address this gap, the Commission suggests jurisdictions consider establishing an explicit monitoring function, particularly in systems that are approaching fully- or over-allocated status. Such a function would take a broader and longer-term, system-level view of water trade and operational risk within the context of the water management system. It would consider the interaction between resource availability, system constraints and water trade that may otherwise go unidentified. More specifically, in performing this function, jurisdictions would:

- proactively anticipate, identify and advise on responses to emerging risks in the context of third party and environmental impacts of trading
- provide transparent reporting
- coordinate with relevant governance bodies in supporting trade.

Monitoring and advising on emerging risks, they would then also consider whether further regulatory action, such as recommending the introduction or alteration of trade rules, is required to protect third parties and the environment. Information from this longer-term monitoring would also aim to support the performance and effectiveness of system managers (SP E *Integrity*). The processes and advice provided through this function must be transparent, rigorous and deliberate to ensure that findings do not create unnecessary market uncertainty and impinge on confidence. Given the challenges posed by a changing climate, this function will become increasingly important. The role, in jurisdictions where it would be required, aligns with resource management and could be undertaken by existing agencies.

As part of a comprehensive reform package, the ACCC (2021, p. 40) has recommended that the Australian and Basin State governments create an ‘independent Basin-wide Water

Markets Agency to consolidate and carry out new and existing trade-related roles and functions’. Among the range of functions to be performed by this agency, the market surveillance and evaluation functions are most similar to those described here. The implementation of these functions, however, are described in a way that is MDB-specific and reflects the other recommendations made by the ACCC (2021, pp. 555–562). In principle, however, the recommendation is supportive of the need for water trade monitoring to be better integrated with water resource management.

FINDING 7.1

The Murray-Darling Basin demonstrates that, in highly developed systems, water trade monitoring ought to be integrated into system-level resource management. By taking a broader and longer-term system-level view of water trade and operational risk within the water resource management context, jurisdictions can more proactively anticipate and identify emerging issues and be advised on regulatory responses where warranted.

Regulation — the rules and their administration

Water trade regulation describes the rules within which trade can occur and the processes by which these regulations are implemented. A key objective of the NWI is the ‘progressive removal of barriers to trade in water’, which has been largely achieved (PC 2017, p. 118).⁷ However, rules are warranted where trade results in negative impacts on other water users and the environment. In cases like these, restrictions may be required in order to maximise overall community benefits (Chong and Sunding 2006, p. 251).⁸ Leading practice has a number of characteristics.

Regulation should protect third-party interests, appropriately defined

When two parties choose to trade water, there are mutual benefits accruing to buyer and seller. A market failure occurs where this mutually beneficial choice results in an impact on others that is not compensated by the parties to the trade.

Where possible, regulations should protect against identifiable negative impacts (externalities) of trading (both of individual trades and the cumulative effects of trading). Identifiable impacts of water trades on other water users and the environment can include increases in conveyance losses (for example, evaporation and spillage during delivery), pumping impacts on water quality (in groundwater systems) and unseasonal flooding in constrained river segments.

⁷ NWI paragraph 23(v).

⁸ Noting that this maximisation problem will necessarily consider both benefits and costs that arise from trade restrictions. The use of ‘community’ in this context refers to whole of society outcomes.

In most systems, third-party protections are provided by trade rules and approval processes. As a broad principle, however, pricing and other regulatory measures that seek to internalise the negative impacts of individual trades can provide greater community benefits than untargeted, rules-based trade restrictions. Inquiry participants called for pricing of delivery losses — through the use of loss factors — to improve the efficiency of water delivery (CICL, sub. 7, p. 7; MVPD, sub. 101, p. 6). The St George Water Scheme in Queensland provides an example of this approach. But the complexity of the southern MDB system means that the benefits of a loss factor approach are unlikely to outweigh the costs of implementation (ACCC 2021, p. 541).

Inquiry participants have also commented on socioeconomic third-party effects of increased trade (AgForce, sub. 24, p. 5; SunRice and RGA, sub. 82, p. 3). Socioeconomic impacts of water reform more broadly are considered through the adjustment provisions of the NWI (chapter 13).

The boundaries of trade should facilitate trade within hydrological and environmental constraints

Trade between locations, whether between states and territories, valleys, or management zones, should not be limited by artificial administrative impediments, but should reflect hydrological and environmental constraints. A fit-for-purpose trading system should reflect hydrological characteristics of surface water and groundwater systems (and their interconnectedness) (NRMSC 2002, p. iv). In some cases, the spatial regulation of intrastate trade (particularly in groundwater systems) acts as a barrier to trade. This occurs when geographic trading zones are drawn from historical administrative boundaries, often associated with boundaries of land titles, rather than being based on hydrological considerations (Skurray, Pandit and Pannell 2013, p. 1051).

In other cases, such as in the MDB, increased volumes and changed patterns of trading may require consideration of changes to boundaries to better reflect hydrological constraints. The ACCC (2020, p. 527) has recommended that Basin States ‘together with the MDBA, should assess the appropriateness of the current set of, and spatial definitions of, geographical units used in water management and river operations as the basis of trading zones’.

No interstate trade currently occurs outside of the MDB (BOM 2020b), and there is neither the demand nor hydrological connectivity that would support this taking place in other transboundary systems in the near future. Nevertheless, if interstate trade were to develop in the Great Artesian Basin or the Lake Eyre Basin, any administrative incompatibility and inconsistency between regulatory systems should be removed to facilitate trade. Within the MDB, the continued lack of interstate trade between New South Wales and the ACT is a clear demonstration of where regulatory inconsistency prevents trading (*Assessment*).

Rule changes, allocation decisions and drivers of water availability should be transparent

Where the changing of trading rules is necessary and well-justified, the communication of these changes should be clear, timely and accessible to market participants. There has been evidence that better resourced participants have been able to take advantage of ‘first come, first served’ trade limit rules, to the detriment of less informed participants (ACCC 2020, p. 19). For significant rule changes, such as changes to inter-valley transfer limits, community engagement will be necessary in the development of changes. The regulatory impact assessment and consultation process that has been conducted by Victoria into the Goulburn to Murray trade rule review is an example of best practice (*Assessment*).

In the MDB, an explicit (and published) decision framework for the assessment of trade restrictions is also desirable to provide transparency around the adoption or removal of trade restrictions (PC 2018, p. 48). The MDBA Water Trade Restriction Assessment Framework has been developed and is currently being piloted (*Assessment*). It has identified over 1500 surface water trade restrictions that may need to be reviewed to ensure they meet the Basin Plan requirements (MDBA 2020, p. 3). Transparency around the decision-making process for rule changes provides certainty to market participants and similar decision frameworks may have applicability outside of the MDB.

Beyond trade rules, administrative processes and decisions that affect water availability, and therefore market dynamics, would benefit from increased transparency. Examples of these processes include seasonal announcements around water allocations, information on carryover policies, reporting on conveyance losses and delivery impacts among others. The Basin Plan Water Trading Rules currently include a trigger for Commonwealth and Basin State announcements to be made ‘generally available’ where they would be considered to have a ‘material effect on the price or value of water access rights’.⁹ The ACCC is proposing broadening the scope of this trigger in the MDB to cover announcements more generally, including by non-government entities (ACCC 2020, pp. 31, 355). While other markets may not be sufficiently developed to warrant a similarly sophisticated trigger arrangement, the impact of, and transparency around, non-market administrative processes and decisions should be considered.

Market access should be protected for all participants

Although technically a form of trade restriction, market access warrants separate treatment because it impacts other dimensions of market functioning, like market composition, in addition to permitting or preventing individual trades.

The MDB has experienced a significant increase in the diversity of market participants as more brokers, domestic and foreign investors and other non-user participants have entered the water market. Some inquiry participants (as well as participants to other inquiries) have argued that the access of certain participants, particularly non-users such as participants from

⁹ Basin Plan, 2012 (Cth), s12.49.

the financial services sector, should be restricted because their involvement reduces the volume available for use and drive up the price (ACCC 2021, pp. 276–278; DPIPWE (Tas) 2020, p. 24; RAMJO, sub. 28, attachment, p. 2; PIAC, sub. DR156, p. 7).

The Commission shares the conclusion reached by the ACCC that, while there may be a case for increased regulation of certain market behaviours, particularly by market intermediaries, this should not preclude entire groups from participating in water markets (ACCC 2021, p. 278). These participants offer several benefits, particularly in increasing market depth (the numbers of buyers and sellers), reducing transaction costs and providing a risk management function.

A goal of the NWI was for states and territories to enable a diversity of water market products to develop. Broad market access — particularly for investors and other financial sector participants — provides a more diverse source of demand for a wider range of products. In particular, such financial sector market participants provide capital, expertise and increase the diversity of market demand, that make products like forwards and options more likely to develop. Government regulation has a role to play in ensuring market access to a diversity of water users and non-users as a way to ensure that these products are available.

This pattern of increased market entry of non-users can be expected to occur in other water systems as trading develops further. To pre-empt these developments, a renewed NWI should enshrine principles of market access. While the NWI does not include non-discriminatory market participant clauses, subsequent reform, namely the Basin Plan, has codified the concept.¹⁰

Limits to inter-sectoral trade represent another potential barrier to market access for certain participants. Various state governments continue to provide implicit or explicit direction to water utilities not to purchase or transfer rural water for urban use (effectively placing a policy ban on this supply option) (*Assessment*). There is currently limited trade involving businesses in the mining sector (MCA, sub. 102, p 3). As jurisdictions integrate these other sectors into their entitlements and planning systems, the opportunities for trading may increase (SP A *Entitlements and planning*). Going forward, their participation in water markets should not be impeded due to their industry.

Operation — how trades happen

The operations relating to water trading can be described by a range of trade-related services, which give effect to agreements between buyers and sellers (figure 2). These include:

- trade approval fees and timing
- regulation of trade-related services such as advisory, matching, clearing and settlement.

¹⁰ Basin Plan Chapter 12, Section 7 and 8.

Both can affect the efficiency of markets by imposing unnecessary transaction costs on market participants.

Market operation should seek to optimise transaction costs

Trades require some approval processing to ensure they are consistent with hydrological constraints, the protection of third parties and the environment. A set of minimum operational tasks that are required to give effect to efficient water trades, was provided by the Natural Resource Management Standing Committee (2002, paragraph 29):

- seller checks (including on existing native title and potential impacts) on the title to water, availability, delivery capacity and third party interests;
- buyer checks (including on existing native title and potential impacts) on delivery capacity, site use and compliance with relevant environmental criteria and management plans;
- adequate assurance to potential traders that agreements for payment and timely transfer of the water will be honoured; and
- minimum standard documentation that sets out the obligations of buyers and sellers.

While trade approval processes are conducted by a government approval authority for most trades, irrigation infrastructure operators are responsible for trade approvals within, into or out of their systems.

In all systems, the procedures above should be implemented in a way that is fit for purpose. For example, where trades have a low risk of affecting third-party entitlement holders or the environment, the checks of buyers and sellers can be proportionately simplified. Nevertheless, these processes will always be required to ensure that entitlement holders are operating within their obligations and system rules (SP E *Integrity*).

Approval fees

Approval authorities impose charges on trade applications to recover the cost of processing.¹¹ Approval fees should be set at the cost of efficiently delivering approval services. There are disparities in processing costs across jurisdictions due to the different technologies used. However, even if these technologies were similar, there would still be some variation in costs due to the number of trades processed in each jurisdiction. A higher number of trades generally lowers the average cost per trade.

Although there has been some research on the impact of approval fees on trade within the MDB (ACCC 2021; Loch, Wheeler and Settre 2018), the evidence is limited for the rest of Australia. The ACCC (2020, p. 300) found that high trade approval fees alone do not significantly impact the volumes (in GL) of individual trades. States with higher approval fees had similar rates of low volume trades relative to states with lower approval fees. At the

¹¹ NWI paragraph 64(iv).

margin, however, higher approval fees will increase transaction costs, lowering the gains from trade. Effective pricing oversight is needed to ensure that efficient cost recovery occurs (*Assessment*), and that approval fees are not imposing unnecessary transaction costs.

Processing times

The impact of approval processes in deterring trade can also occur through non-monetary transaction costs, such as processing times. A risk-based approach is often applied to processing, where more complex trades that have a higher likelihood of negative externalities are subject to greater approval scrutiny and therefore lengthier processing times. The technology used in processing is another driver of processing times, with Victoria's digital processing platform bringing most trades down to same day processing.

Some jurisdictions have implemented service standards and targets to minimise processing times. MDB jurisdictions are the only jurisdictions that have committed to statutory service standards for processing times, under a COAG agreement. In 2017, the Commission found that trade approval processing times in the MDB had generally improved over the years (PC 2017, p. 387). However, despite numerous recommendations to do so, service standards have not been reviewed (ACCC 2010; PC 2017, p. 30). The ACCC has recommended mandatory trade approval service standards be instituted in the MDB (ACCC 2020, p. 30). There are also requests from market participants to harmonise and reduce time to process approvals (ACCC 2020, p. 293).

Outside of the MDB, Western Australia and South Australia have nominal processing time targets. Tasmania and the ACT do not set targets, but monitor the performance of their processing times. In jurisdictions with low volumes of trade, the benefits from shorter processing times may not be sufficient to justify complex service standard regimes. A lower level of performance monitoring, as in Tasmania and the ACT, is fit for purpose in their context (*Assessment*).

Trade-related services and regulation

Trade-related services provided by third parties can help to lower transaction costs for buyers and sellers of water. Exchanges, brokers and other water market intermediaries can assist sellers in finding appropriate buyers for their entitlements, lower the costs of compliance and provide tailored information to participants.

Increased regulation of these services, which can raise costs and/or lower their availability, would have the indirect effect of increasing transaction costs for market participants. These costs must be balanced against the possible market failures that can arise from insufficient regulation of behaviour of these service providers, such as conflicts of interest and asymmetric information.

In the MDB, water market intermediary services play a prominent role in facilitating water trade. The most recently available data, from 2015, suggest that 82 per cent of irrigators used an intermediary to trade (Wheeler et al. 2020, p. 116). The ACCC (2020, p. 26) has concluded that there is insufficient regulation of water brokers and other water market intermediaries in the Basin. The existing self-regulation arrangements have not been effective. The ACCC has recommended that legislative changes by Basin States and the Australian Government include an enforceable mandatory code for the industry. Further regulations on price reporting and limits on market misconduct among other market participants (including intermediaries) are also recommended to be monitored and enforced by a MDB-wide regulator — the Water Market Agency (box 1).

As trade-related services are increasingly provided in systems outside of the MDB, their regulation should account for whether indirect increases to transaction costs for buyers and sellers are greater than the benefits likely to be gained from the regulation (for example, greater customer protections and lower rates of market misconduct by brokers).

Information provision — roles and responsibilities

The efficient functioning of the three suites of market arrangements — governance, regulation and operation — all depend on adequate information flows (figure 2).

In some markets a lack of information is cited as a significant barrier to more active trading (for example, TasWater, sub. 11, p. 5). Trade information remains inadequately or insufficiently provided by jurisdictions. For example:

- there is a lack of transparent price data
- trade rule changes and other regulatory announcements are made available to users in an inconsistent manner
- the reasons for trades are not typically recorded or reported (such as environmental trades)
- irrigation infrastructure operator internal trades (such as within irrigation districts) are not required to be reported, meaning that the registers show an incomplete picture of trading.

Facilitating ‘good information flows’ to minimise transaction costs remains relevant to a renewed NWI.¹² Water registers, provided by State and Territory Governments, are the foundation of these information flows, as a transparent record of water right ownership and trades. Beyond water registers, the public and private sector each have roles to play in collating and communicating market relevant information to meet different user needs.

¹² NWI paragraph 58(ii).

Water registers are critical in defining water ownership and provide basic trade data

Under the NWI, jurisdictions agreed to implement ‘compatible, publicly-accessible and reliable’ water registers.¹³ The water register guidelines (schedule F) of the NWI remain relevant. This means that registers should capture all water access entitlements and their trades, along with their location, price, and identity of entitlement holders.

Victoria, South Australia and the Northern Territory have made significant progress in improving their water registers since 2017. Queensland has made progress in improving access to its water market information, however, its water registers still do not meet all NWI guidelines (*Assessment*). New South Wales has undertaken stakeholder consultations on its water registers and possible reforms to increase transparency (DPIE (NSW) 2021). Inquiry participants are divided on whether water registers meet user needs. In the view of NSW Irrigators’ Council (sub. 27, p 19), other than regarding compatibility between states, ‘the National Water Initiative requirements are largely satisfied’ given the current information available on NSW water registers. In contrast, the Southern Riverina Irrigators (sub. 77, p. 9) argued that water registers are currently ‘grossly inadequate’.

While the characteristics of ‘publicly-accessible’ and ‘reliable’ should be retained for all water registers under a renewed NWI, the characteristic of ‘compatible’ is only necessary where interstate trading is likely to occur (currently only the MDB).

In line with lowering transaction costs, water market information provided by jurisdictions should also aim to be timely (NIC, sub. 27, p. 19). Improving processing times will have the dual benefit of lowering transaction costs and improving the timeliness of trade information reaching the rest of the market.

Guidance around publication of information should be modernised. In particular, the publication of entitlement holder identities should balance transparency and integrity considerations with privacy concerns (DELWP (Vic) 2019a; NIC, sub. 27, p. 19). The ACCC has formed the view that ownership information is not required for market efficiency and that its publication may lead to perverse outcomes (ACCC 2020, p. 347). To the extent that transparency supports market confidence and efficiency, jurisdictions could consider improving the accessibility of ownership information, while balancing this against privacy concerns. Victoria, for example, has published a Largest Water Owners webpage (*Assessment*).

A renewed NWI should continue to provide principles and guidelines on water registers to support jurisdictions’ decision making about the collection and provision of basic entitlements and trade data. At a minimum, basic trade information, including prices, volumes, dates, locations and product types, should be publicly available. In some systems, government provided water registers may play a role in communicating this information, but need not be the only mode of doing so (*Assessment*). Jurisdictions, in consultation with their market participants, may choose to capture, organise and communicate this information in different ways to suit their contexts. Government provision of basic trade data beyond

¹³ NWI paragraph 59.

registers should be guided by user needs and by a consideration of the benefits and costs related to government provision of that information (relative to private provision).

Water registers also support a range of other water management objectives, which are discussed in SP E *Integrity*.

In addition to these water register arrangements, the Australian Taxation Office currently administers the Register of Foreign Ownership of Water Entitlements. The effectiveness, costs and benefits of this register are currently being examined separately by the Productivity Commission as part of a concurrent inquiry (PC 2021).

Beyond registers, governments' role in ensuring information flows should be clear

Governments have a clear role providing non-trade information that supports trading. As discussed in the regulation section, information around market rules needs to be provided by government. This should include not just their content, but also a transparent rationale for their imposition. Information on water resource quality and accessibility is another area where government has a role in provision (SP E *Integrity*).

Well-informed market participants are necessary for well-functioning markets (Teytelboym 2019, p. 141). Evidence from the MDB suggests that the effectiveness of government-provided information services on water markets and resources could be improved. That aspects of the MDB water markets, such as the relationship between carryover policy settings and water supply, are ‘not well understood by users’ was a common theme in submissions and consultations by the ACCC (2020, p. 24). Improving water literacy — particularly among new water market participants — may require government involvement (Aither and DG Consulting 2018, p. 14; IIGMDB 2020, pp. 41–42; SP E *Integrity*: section 5.2). Educational information that supports transparency and minimum levels of understanding among participants about market risks may have been underprovided in the MDB. As water trade and markets grow in other water systems, the effectiveness of government-provided information should be monitored and improved where necessary.

Private providers are often able to lower transaction costs to market participants by providing tailored information. For this kind of user-specific information, private providers are, in general, more efficient than government. Furthermore, the benefits of tailored information generally accrue privately to market participants, weakening the case for government to expend public resources providing it. Several brokers and exchanges are now providing these services in regions outside the MDB, in Queensland and in groundwater systems in South Australia.

4 NWI renewal advice

National water reform has progressed significantly since the NWI was agreed in 2004. For water trade and markets, the unbundling of property rights, capping of consumptive extractions, and improvements in the efficiency of trade rules have seen trade grow substantially.

Almost all of this growth has occurred in the MDB, a region with pre-conditions that are particularly well suited to market development. Subsequently, the importance of the MDB water markets, and the unique challenges that these systems face, has warranted the development of MDB-specific institutional arrangements, beyond the NWI. The *Water Act 2007* (Cth) and Basin Plan are now the primary inter-governmental legislative arrangements that govern trade in the MDB. A renewed NWI will not be the policy lead in the MDB. After almost 30 years of trade, the ACCC MDB Water Markets Inquiry will provide advice on improvements to MDB arrangements.

There is broad-based support for a renewed NWI that continues to support the development of water trading across Australia. The development of northern Australia, particularly in agriculture, has been recognised as an area where secure water rights could enable the future development of trading (IA 2016, p. 114).

The NWI provides solid foundations for trading and markets through provisions covering secure property rights and sustainable extraction limits set through planning. And the intent of the key outcome relating to trading and markets should be retained — arrangements should facilitate the efficient operation of markets, where system and water supply considerations permit. The current NWI also establishes other outcomes for water trading: to minimise unnecessary transaction costs through good information flows; enable the development of an appropriate mix of products; recognise and protect the needs of the environment; and provide appropriate protection for third-party interests.

But a more detailed set of principles building on this foundation would better underpin the development of trading and markets in other parts of the country — and build on the lessons from the review of 30 years of trading in the MDB. To the extent that the NWI targeted actions towards facilitating trade in the MDB, a broader focus can now be taken which builds on the experience of the MDB and recognises the diversity of water systems in Australia and their relative market readiness. Growing water scarcity and variability due to climate change and population growth mean that water trading has an important role in providing a low cost approach to reallocation.

NWI RENEWAL ADVICE 7.1: THE ROLE AND APPLICATION OF WATER TRADING AND MARKETS

A renewed National Water Initiative should emphasise that the purpose of water trading and markets is as a tool within a water resource management framework to increase efficiency.

There is no guaranteed supply of water by location, time and quality. For given users, and trade-offs in the values people place on availability, markets can play an important role in allocating water efficiently.

The diversity of water system hydrology — regulated and unregulated surface water, groundwater and conjunctive (surface and groundwater) systems — coupled with other economic and institutional pre-conditions mean that the establishment of market arrangements need to suit their context. They need to be fit for purpose.

Leading practice market arrangements are needed to ensure fit-for-purpose implementation.

NWI RENEWAL ADVICE 7.2: LEADING PRACTICE GOVERNANCE, REGULATORY AND OPERATIONAL ARRANGEMENTS

Recommitting to the original National Water Initiative water trading and market principles would support the objective that arrangements facilitate the efficient operation of markets, where system and water supply considerations permit.

Reshaped principles covering governance, regulatory and operational arrangements for water markets and trading would provide stronger foundations for developing markets.

- Roles and responsibilities of key parties involved in governance are clearly defined, and the parties' activities are effectively coordinated.
- Institutional arrangements are monitored and evaluated to ensure they remain in step with the level of a market's development.
- Trade is regulated to maximise overall community benefit (efficiency).
 - Arrangements protect against negative third party impacts of water trades on other water users and the environment.
 - The boundaries of water markets should be shaped by hydrology; trade between locations or sectors should not be limited by artificial administrative impediments.
 - Regulatory consistency and compatibility apply where it is hydrologically feasible for interstate trade to occur.
 - Where the changing of trading rules is necessary and well justified, the communication of these changes should be clear, timely and accessible to the market.
 - Where broader management and administrative decisions (such as processes for determining seasonal allocations) impact on water availability and therefore market dynamics, these processes should be transparent and their impacts well understood.
- Market access is open to all participants.
 - Development of an appropriate mix of tradeable water products is enabled.
- Water market operations optimise transaction costs, including both monetary (for example, trade approval fees) and non-monetary (for example, from trade approval processing times and regulation of trade related services).

Jurisdictions could also consider integrating water trade monitoring with system management in highly developed systems. Such a role could focus on the long-term operation of the market within the water resource management system. In a changing climate, shared resources and connected systems will require consideration of the interaction between resource availability, system constraints and water trade; and the identification of risks as these interactions change.

Supporting market structures, information is a central component to the efficient functioning of water markets in all systems.

NWI RENEWAL ADVICE 7.3: INFORMATION TO SUPPORT EFFICIENT WATER MARKETS

In efficient water markets:

- registers of all water access entitlements and trades are publicly accessible, timely and reliable
- basic trade data — including on prices (clearly specifying reasons for zero price trades), volumes, dates, locations and product types — are publicly available
- publicly-provided non-trade information covers market rules and the quality and accessibility of water resources.

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Australian Government
Productivity Commission

Environmental management

Supporting Paper C

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Environmental water provision and management have delivered benefits to the environment, particularly at the local level, and these have yielded direct and consequential cultural, economic and social benefits.
- But, recent challenges have hindered progress. Drought, incomplete water recoveries and governance and compliance failures in some Murray–Darling Basin jurisdictions have failed to arrest ecological decline in some riverine environments. However, without the commitment to national water reform and provisions of water for the environment it is likely that this decline would have been significantly worse.
- Planning reforms and adaptive management are required, particularly in light of a changing climate and the likelihood of more frequent droughts.
- Whether environmental water is planned or held, the focus for the next phase of reform should be to ensure that environmental water is managed efficiently and effectively to deliver agreed (and where possible, better) environmental outcomes. Principles reflecting current best practice should be embedded in a renewed National Water Initiative.
- In all systems (whether a simple unregulated river or a complex water system) management requirements that are important to achieve agreed outcomes include:
 - a focus on clearly specifying environmental objectives and outcomes
 - the provision of environmental water, established through planning
 - the integration of environmental water, waterway and catchment management
 - effective compliance regimes
 - clearly identifying institutional responsibility for waterway management
 - processes to adapt environmental management objectives, when necessary, in a changing climate.
- In addition, in complex, highly developed regulated systems (with held environmental water), further requirements to achieve the best outcomes from the management of environmental water entitlements include:
 - effective outcomes-based planning and priority-setting processes
 - coordinated water delivery in shared water systems
 - capacity to actively trade environmental water allocations, including between years
 - innovative market approaches
 - capacity to vary the entitlement portfolio to match ecological requirements
 - delivery of shared community benefits wherever they are compatible with achieving environmental outcomes
 - good governance, including the independence of environmental water holders and independent audit.
- Environmental management is a young discipline but is evolving rapidly. Effective risk-based monitoring, evaluation, and reporting arrangements, and a commitment to adaptive management are crucial, especially in the context of a drying and more variable climate.

In its 2017 assessment of national water reform, the Commission reported that, although ecological restoration is a long-term process, the benefits of having more water available for the environment had started to be realised. But, the Commission also emphasised that to achieve the best use of water provided for the environment, a significant enhancement of policy settings was required and, associated with this, considerable effort by all governments to make the necessary changes (PC 2017, pp. 20–21, 141).

In the 17 years since the National Water Initiative (NWI) was agreed, environmental management has evolved rapidly and a disconnect between the agreement and current management practices has emerged. Embedding current best-use principles in a renewed NWI, and ensuring that environmental water managers can continue to evolve their frameworks and practices through experience and adaptation to new knowledge, would provide a stronger platform for achieving agreed outcomes.

Furthermore, in the three years since the Commission’s 2017 assessment, the challenges facing environmental water managers have intensified. Severe drought and bushfires of unprecedented magnitudes have strained Australia’s water management regimes in a number of areas. For example, in the Murray–Darling Basin (MDB):

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)

It is important to now reflect on the lessons learnt during this challenging period and evaluate where environmental management policy principles, frameworks and practices have room for improvement. The recent drought conditions are a timely reminder that managing our water-dependent ecosystems requires continuous learning and adaptation. The intensifying challenge of a variable and changing climate provides further impetus for improvement of this key water management component through a renewed NWI. The provision and future management of environmental water will be critical in managing Australia’s water-dependent ecosystems to enable them to deal with drought and adapt to a changing climate.

This paper builds upon the Commission’s 2017 work on environmental management by providing first-principles guidance on what is required (under a renewed NWI) to achieve agreed (and, where possible, better) environmental outcomes from providing water for the environment, within the context of Australia’s highly variable and changing climate and the necessity for adaptive environmental management.

This paper:

- considers the progress made by jurisdictions in environmental management of water-dependent ecosystems under the NWI (section 1)
- outlines the environmental management requirements to achieve environmental objectives and agreed outcomes (section 2)

-
- considers the role of the system manager in an environmental management context (section 3)
 - discusses the importance of monitoring, evaluation and reporting for adaptive management (section 4).

1 Progress and outcomes of national water reform

1.1 The environment is established as a legitimate water user

As Australian cities, agriculture and industry grew during the late 1800s and 1900s, floodplains and river banks were progressively cleared, rivers were increasingly regulated and water extraction for consumptive use rose. For example, in the MDB:

There were enormous ecological changes in the southern Basin in the latter half of the nineteenth century ... including overgrazing by sheep and cattle and forest clearing for timber and gold mining, with consequent siltation and altered stream flows. (Colloff et al. 2015, p. 965)

From the late 1960s, recognition of the need for improved environmental management of Australia's rivers, wetlands and other aquatic ecosystems began to grow, as community concerns about environmental degradation (such as erosion, sedimentation, and generally poor river and wetland health) increased. In the 1980s, severe river salinity issues resulting from irrigation development became apparent and low flows caused a build-up of sand that closed the mouth of the River Murray for the first time in recorded history (Walker 2002). Environmental concerns again intensified in the 1990s with extensive toxic algal blooms in the Lower Darling (PC 2017, p. 142).

In response to the poor health of Australia's water-dependent ecosystems, and the resulting social and economic impacts, Australian, State and Territory Governments have undertaken a range of initiatives (both individually and collaboratively) to improve environmental conditions and the balance between environmental and consumptive uses of water. In 1994, COAG reforms sought to: establish the environment as a legitimate water user; deliver legally-recognised provisions of water for the environment; and achieve a better balance in 'overallocated systems' (that is, systems where allocation levels are deemed to exceed an environmentally sustainable level of extraction). Its successor, the NWI¹, continued and extended these policy directions, requiring governments to:

- identify the share of water for the environment in water planning
- return overallocated and overused surface water and groundwater systems to environmentally sustainable levels of extraction
- establish effective and efficient management and institutional arrangements to ensure the achievement of environmental and other public benefit outcomes.

¹ NWI paragraph 78.

1.2 Progress under the NWI

All jurisdictions (with the exception of Western Australia) have identified, and legally recognised, a share of water for the environment through legislation that allows for water plans or equivalent instruments. Although Western Australia provides water for the environment through water allocation plans and extraction limits, the lack of statutory backing of these arrangements makes provisions for the environment less secure.

The Commission's assessment of progress against the relevant NWI commitments is discussed in the *Assessment*: section 4. (Environmental water provided through water plans is discussed in SP A *Entitlements and planning*).

1.3 Most environmental water is 'planned'

Across Australia, provision of water for the environment to meet agreed environmental outcomes takes two main forms.

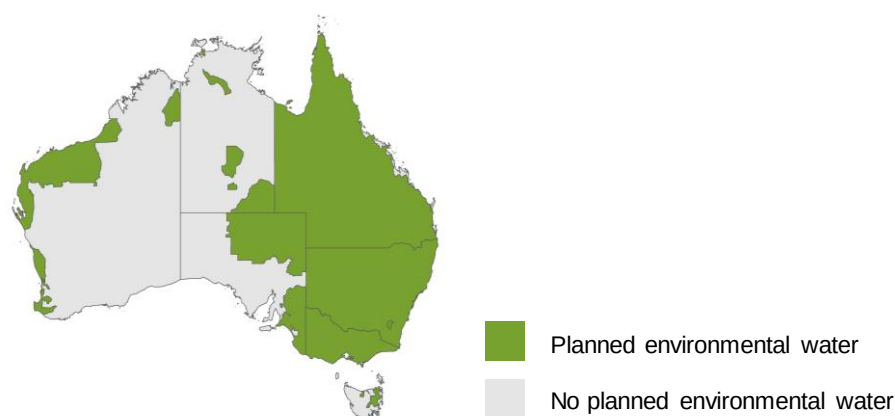
- Planned environmental water is established in water plans by placing constraints or obligations on consumptive users to leave a residual flow in a river or stream, or to limit water extraction from aquifers to protect groundwater-dependent ecosystems.
- Held environmental water is established through the provision of water access entitlements for specific environmental uses. Held environmental water generally has the same rights and conditions as water entitlements owned by irrigators and other consumptive users. Environmental water managers need to actively manage these entitlements. Managers establish priority uses for the entitlements in their portfolio and have considerable discretion in how, where and when they are used (PC 2017, p. 145).

The provision of water for the environment (as planned, or both planned and held) varies across jurisdictions and between systems, reflecting differences in water allocation processes and the level of system development (*Report*: chapter 5, figure 1).

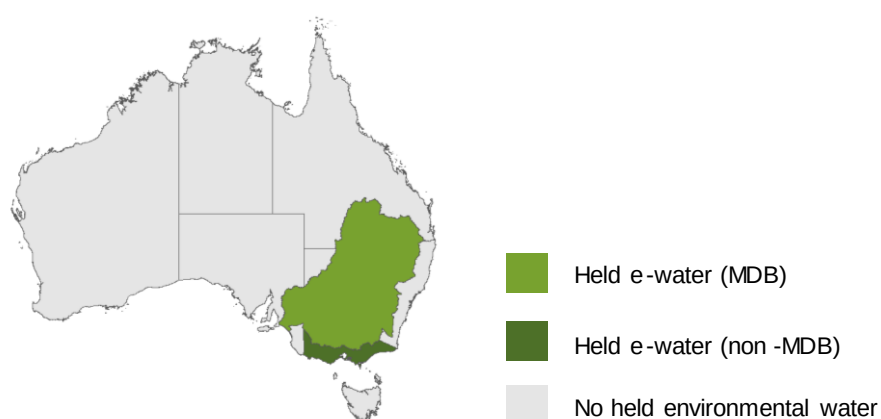
In all jurisdictions, and in most systems, planned environmental water constitutes the majority of water dedicated to achieving environmental outcomes. Water planning covers the vast majority of water use in Australia. But the coverage of water use by water plans varies by jurisdiction — from almost 100 per cent in New South Wales, Victoria, South Australia and the ACT to about 30 per cent in the Northern Territory, Tasmania and Western Australia where there is less development (table 1).

Figure 1 Environmental water areas in Australia

Systems with planned environmental water^a



Systems with held environmental water^{b,c}



^a Each state manages environmental water through different planning mechanisms. For example, Victoria has a state-wide entitlement licencing system, and New South Wales manages planned water through valley-level water sharing plans. This map illustrates the geographical coverage of state-level planning that caps consumption to protect environmental water. In some cases, water plans do not cover all water sources within a geographic area. ^b The shaded areas illustrate the ownership of held environmental water by region but do not provide a precise spatial representation of entitlements. ^c Commonwealth holdings are as at 30 November 2020, Department of Planning, Industry and Environment (NSW) holdings are as at 30 June 2017, Victorian Environmental Water Holder holdings are as at 6 May 2020, Department of Environment and Water (SA) holdings are as at 29 June 2020.

Sources: ABS (*State and Territory Australian Statistical Geography Standard, July 2016*, Cat. no. 1270.0.55.001) (2016); CEWO (2020a); DENR (NT) (2020b); DEW (SA) (2020); DNRME (Qld) (2020); DPIE (NSW) (2019); DPIPWE (Tas) (2020); DWER (WA) (2020); VEWL (2020b).

Table 1 Coverage of water plans^a in Australia, as at December 2020

<i>Jurisdiction</i>	<i>Coverage (%)</i>	<i>Comment</i>
NSW	>99	Percentage of water entitlement volumes covered by water sharing plans. ^b
Vic	100	Water management is conducted through the entitlements and planning system, which covers all water sharing in the state. ^c
Qld	98	Percentage of water entitlement volumes covered by statutory plan areas. ^d Data are not comparable to 2017.
SA	100	Percentage of water extractions entitlement volumes covered by water sharing plans. ^e Data are not comparable to 2017.
WA	35	Percentage of water entitlement volumes covered by non-statutory plan areas. ^f Data are not comparable to 2017.
Tas	34	Percentage of water entitlement volumes covered by statutory plan areas. ^g
NT	28	Percentage of water entitlement volumes covered by statutory plan areas. ^h Data are not comparable to 2017.
ACT	100	Percentage of water volumes identified in legislation.

^a Estimates of water plan coverage are indicative only. Estimates are not directly comparable across all jurisdictions due to different approaches to calculating coverage. ^b The approximately 0.2 per cent of water volume that is not covered by water sharing plans includes four coastal floodplain alluvial water sources and some legacy *Water Act 1912* (NSW) licences that have not been transferred to coverage by the *Water Management Act 2000* (NSW) for various reasons. ^c Victoria allocates 6016 GL of entitlements to consumptive use of an estimated 12 072 GL of available surface water, groundwater and recycled water. Thus, all consumptive water entitlements are covered by planning arrangements. ^d Queensland has 6727 GL allocated in statutory plan areas out of a total 6853 GL allocated statewide. ^e In South Australia, 2870 GL is licensed for extraction in prescribed water resources that are managed through water allocation plans. Water extraction outside of prescribed areas is not licensed. ^f In Western Australia, 1409 GL of licensed water is covered by water allocation plans out of 3997 GL of total licensed water. In 2017, the coverage estimate was based on the count of licences within and without water allocation plans, rather than the share of licensed volumes. In 2020, 80 per cent of total licences were covered by plans, similar to the coverage in 2017. ^g DPIPWE (Tasmania) estimated approximately 455 GL (including 19 GL groundwater) is allocated in statutory plan areas and a total of 1332 GL is allocated statewide. ^h In the Northern Territory, there are 136 GL of entitlements within plans and 489 GL entitlements in the whole of the territory.

Sources: DENR (2020a); responses to the Commission's State and Territory information requests.

In systems covered by water planning processes, sustainable extraction is the key goal when agreeing the balance of water between environmental and consumptive uses. Under the NWI, an environmentally sustainable level of extraction is defined as the level which, if exceeded, would compromise key environmental assets or ecosystem functions and the productive base of the resource.²

² NWI schedule B(i).

Underpinning environmentally sustainable extraction are the concepts of environmental water provisions, trade-offs and ecological risk.

- Environmental water provisions are made as environmental flows (encompassing the quantity, quality and timing of water flows) and/or groundwater levels, provided to maintain or improve the condition of water-dependent ecosystems.
- Trade-offs need to be made in decisions about the sharing of water between environmental water provisions and consumptive uses and between different stakeholders and spatial locations.
- Ecological risks arise due to the potential adverse impacts on water-dependent ecosystems of using water for consumption. Water extraction reduces surface water quantity and quality, alters the natural flows of waterways and can reduce groundwater levels. Ecological risk increases as the volume of water allocated for consumptive use increases. The timing of extractions for consumptive use can also impact the natural flow pattern of waterways and groundwater levels in wetlands.

Agreeing on a sustainable level of extraction recognises these concepts, and generally aims to provide a water regime that can maintain key environmental assets and ecosystem functions while accepting a degree of ecological risk.

While such an approach seeks to maintain these key assets and functions at an agreed level of risk, some diminution of general waterway health is implicit:

All water in our environment supports, directly or indirectly, freshwater ecosystems and biodiversity, and diversions for consumptive use inevitably diminish this. (Wentworth Group of Concerned Scientists, sub. 68, p. 2)

Table 2 summarises the water provision arrangements used to protect the environment. In the MDB and some parts of Victoria, held environmental water entitlements are included as part of the environmental water provisions and are actively managed to deliver environmental and other public benefit outcomes.

Planned environmental water arrangements vary by jurisdiction and system but broadly include cease to pump rules, flow sharing arrangements, passing flow releases from water storages, environmental water allowances and groundwater access rules.

Where water plans are not in place, water access is still regulated through licensing arrangements. Licences are provided after considering other consumptive demands on a particular water resource and the potential environmental impacts of the licence. However, in these areas, extraction levels (relative to the available water resources) are often low, meaning risks to the environment from extraction are also generally low (table 2).

In some jurisdictions, a precautionary approach is used restricting the annual take as a share of the total resource to limit potential adverse impacts on the environment. As licences increase and systems are developed, more sophisticated planning arrangements should be introduced (*Report: chapter 5*).

Table 2 Provision of water for the environment, jurisdictional summary

Jurisdiction	Held environmental water ^a	Number of water plans ^b	Types of rules and constraints	
	Entitlement face value (GL)		Within water plans (planned environmental water)	Without water plans
NSW	2 523	56 water sharing plans; 20 MDB water resource plans (WRPs)	• Daily minimum flow by catchment • 'Above cap' water^c • Redirected high flows	N/A
Vic	2 001	Entitlement system ^d ; 5 WRPs	• Obligations on consumptive entitlements • 'Above cap' water	N/A
Qld	294	23 water plan areas; 3 WRPs	• Storage volume thresholds for release • Optimising water quality when releasing • 'Above cap' water	Water access requires licences which protect environmental water
SA	253	16 water allocation plans; 3 WRPs	• Annual consumptive allocation limits • Buffer and exclusion zones for groundwater well construction	Water access requires licenses which protect environmental water
WA	N/A	26 water allocation plans (non-statutory)	• Monthly cease-to-take limits • Abstraction rates and timing restrictions • Buffer and exclusion zones for groundwater well construction	Water licences constrain annual take
Tas	N/A	12 water management plans	• Monthly cease-to-take limits • Monthly minimum flows • Groundwater well permitting	Water access requires licences which protect environmental water
NT	N/A	6 water allocation plans in effect, 3 under development	• Annual consumptive allocation limits • Residual water protections • Redirected high flows	Water licences constrain annual take
ACT	N/A	1 water resources determination; 2 WRPs	• Annual environmental allocation	N/A

^a Held environmental water by jurisdiction is the combination of entitlements held by State and Commonwealth environmental water holders. ^b 'Water plans' is used as a generic term, noting that water planning arrangements vary by jurisdiction. Jurisdictions within the MDB are obliged under the Basin Plan to develop water resource plans (WRPs) that are separate from, but consistent with, state-level planning arrangements. ^c Includes water that is left over after diversion limits have been reached and unregulated flows that cannot be stored. ^d The provision of planned water for the environment is defined through Victoria's entitlement system. Ten catchment management authorities are then responsible for environmental water reserve management.

Sources: CEWO (2020a); DELWP (Vic) (2020b, pp. 16, 18); DEW (SA) (2020); DPIE (NSW) (2019); Selection of water plans across jurisdictions; VEWI (2020b).

1.4 Significant long-term progress in water recovery

In some highly developed and regulated systems in New South Wales, Victoria, South Australia and Queensland (that are also, in some cases, overallocated) planned environmental water is supplemented with held environmental water.

Addressing overallocated systems requires difficult trade-offs between environmental and consumptive uses of water. During the Millennium Drought, recognising the need for urgent environmental rehabilitation, the Australian Government announced a major initiative to rebalance the share of water between the environment and consumptive use in the MDB. This resulted in the \$13 billion Murray–Darling Basin Plan (Basin Plan) and the targeted surface water recovery of 2750 GL of water entitlements across the MDB by 2024 to meet a range of environmental outcomes with an adjustment mechanism (PC 2018).

In 2018, this target was revised down to 2075 GL³, partly due to the use of ‘supply measures’ (operating under the adjustment mechanism) aimed at delivering the same environmental outcomes with less environmental water (MDBA 2020c).⁴ These highly ambitious supply measures are not on track to be fully implemented by 2024 (MDBA 2020a; PC 2018, p. 2).⁵

Although progress on water recovery in the MDB has slowed in the last three years — with states requiring time to negotiate outcomes and water recovery mechanisms with water users — there has been significant progress over the longer-term (figure 2). The stock of held environmental water has grown significantly over the past decade, currently yielding a long-term average of 3000 GL (MDBA 2020g).⁶ The Commonwealth Environmental Water Holder (CEWH) holds entitlements that yield the majority (62 per cent) of this water (MDBA 2020c). The New South Wales and Victorian Governments also hold significant volumes of environmental water, while the South Australian Government has a relatively small amount (Victoria also holds some entitlements outside the MDB).

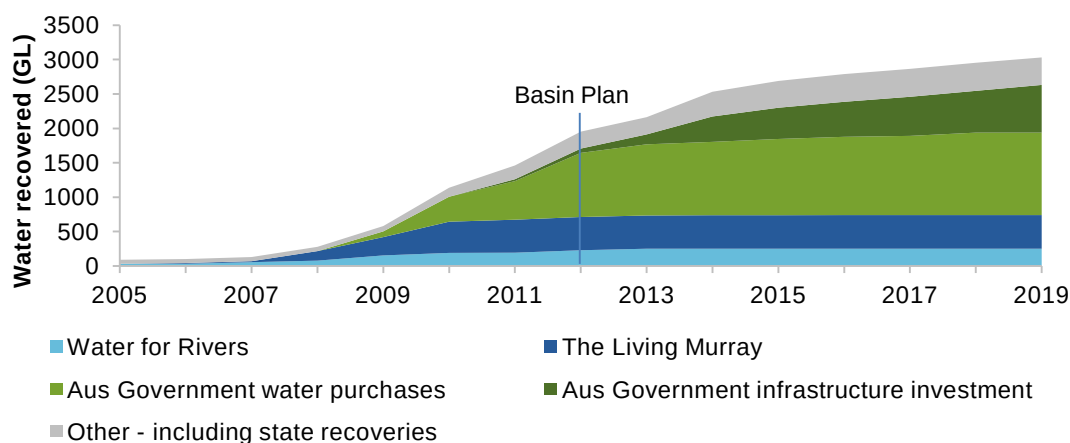
³ This recovery target includes both entitlement purchases and infrastructure measures.

⁴ The decrease in the surface water recovery target is made up of two components: 1) a review of the northern Basin target recommended reducing it from 390 GL to 320 GL (a 70 GL decline) and 2) supply contributions of 605 GL. Examples of supply contributions include pumping stations, regulators and levees to deliver water to lakes and floodplains without creating overbank flooding. Against the revised target, there has been 2098 GL contracted for recovery as of 2018–19, but these contracts are not yet fully implemented.

⁵ In addition to this target, the Commonwealth is separately seeking to deliver 450 GL of surface water entitlements to the pool of held environmental water through on- and off- farm efficiency measures by 2024.

⁶ Includes the Basin Plan, the Living Murray, Water for Rivers, and state-specific schemes.

Figure 2 **Held environmental water recovery in the Murray–Darling Basin^{a,b}**



^a Volumes recovered to 30 June 2019 in terms of long-term average annual yield. ^b State recoveries include programs such as New South Wales Riverbank and other small recoveries.

Source: MDBA (pers. comm., 30 September 2020).

1.5 Outcomes of the provision of water for the environment

Provision of water for the environment is starting to yield benefits, particularly at the local scale

In many parts of Australia, environmental water provisions (both held and planned) have contributed to a range of positive ecological outcomes, particularly at the local scale⁷, such as: improved native vegetation and wetland condition; protection of rare and threatened biodiversity such as in groundwater-dependent ecosystems; and the migration and breeding of native fish, frogs and waterbirds (CEWO 2020b; Hart and Butcher 2018, p. 2; Thurgate et al. 2019). As at March 2021, over 11 400 gigalitres of Commonwealth environmental water has been delivered to rivers, wetlands and floodplains of the MDB (since 2008-09) (DAWE 2021).

However, it is not simply the provision of larger volumes of water that generates improved environmental outcomes; enhanced land and river management actions are also required to deliver outcomes (Chapman, sub. 5, p. 3; ADF, sub. 43, p. 1; Engineers Australia, sub. 63, p. 14). Improved management, coordination and monitoring techniques are increasing the effectiveness of environmental water provision. For example, the Victorian Government (DELWP (Vic) 2021, p. 1) reported that environmental infrastructure management (such as channels, regulators, fish ways and sandbagging) can ‘optimise the benefits of water for the

⁷ Benefits may not always be widespread, for example at the systems level.

environment by targeting water to waterways to provide the right timing, frequency and length of inundation needed by water dependant plants and animals’.

We know this approach works. We know this from small scale examples, such as Lake Cullen which can now receive water via the irrigation supply system which would have been isolated from a river. And we know this from large scale examples. Works at four Victorian Murray floodplain sites (Gunbower Forest, Hattah lakes, Lindsay Island and Mulcra Island) are achieving their environmental objectives with the least amount of water as possible – with benefits to the environment that are shared by Traditional Owners, the community and recreational groups. (DELWP (Vic) 2021, p. 1)

As alluded to in this comment, in addition to environmental benefits, environmental water has provided other direct and consequential complementary benefits to a range of water users. In particular, the delivery of watering events is increasingly integrating Aboriginal and Torres Strait Islander knowledges to improve the delivery of environmental outcomes and to achieve distinct cultural and spiritual outcomes (MDBA 2019b, 2020b, 2020f) (box 1 and section 2.2).

Box 1 Other public benefits of environmental water

Environmental water provision has the potential to deliver other public benefits that contribute to cultural, social and economic outcomes, in addition to those that accrue to the environment.

It can provide cultural outcomes for Aboriginal and Torres Strait Islander people. The Gayini Nimmie–Caira wetlands are an example where a consortium including the Nari Nari Tribal Council and the Nature Conservancy has successfully tendered for the management of the floodplain in southern New South Wales. The cultural significance of these wetlands and their ecological health is demonstrated by the presence of burial mounds, campsites and evidence of interventions that generations of Nari Nari have used to increase fish, bird and vegetation growth. The provision of environmental water by the New South Wales and the Australian Governments has helped to support the return of wildlife to these sites, contributing to cultural outcomes for the Nari Nari people.

Recreational and commercial fishers and the tourism industry can also benefit from improved native fish breeding and the amenity of riverbank vegetation. For Murray–Darling Basin communities, the Basin Plan evaluation found there were several instances where timed releases of environmental water to support wetlands and other environmental assets induced additional tourism demand. The construction of environmental water infrastructure, such as inlet regulators, has created additional flows that support recreational activities such as kayaking and other waterborne activities.

And, although difficult to quantify, healthy rivers, lakes and wetlands provide amenity benefits — that is, pleasure derived by those who use or view them.

Sources: Hayter (2020); MDBA (2017); The Nature Conservancy (2018).

In some waterways, the environment has been hampered by recent drought and other factors ...

There is also evidence that ecological conditions have declined in some waterways since 2017. In particular in the MDB, environmental rehabilitation has been hampered by drought, incomplete water recoveries, and governance and compliance failures in some jurisdictions.

- The most prominent example of environmental distress during the recent drought was fish deaths in the Lower Darling. This is discussed in more detail in section 4.1.
- The long-term decline in populations of Macquarie perch, once the most abundant native fish in the MDB, was showing signs of stabilising in late-2019 in the Snowy Mountains region (Silva et al. 2018). As the rains broke over the bushfires in early 2020, ash and mud was washed into the river system, suffocating much of the remaining population (Doyle et al. 2020).
- In other waterways, there is an increased risk of algal blooms. The drought and bushfires mean rains have generated larger runoffs taking sediments and nutrients like phosphorous into waterways that can trigger algal blooms. Algal blooms can produce toxins and reduce the oxygen content of water, affecting fish and other oxygen-dependent organisms.

Drought and prolonged dry periods place significant strain on Australia's ecosystems. To an extent, these climatic extremes are a natural feature of Australia's landscape, causing water systems to contract to a series of drought refuges and recover in wetter periods. However, the natural stresses of drought are amplified by water extraction for consumptive use and compounded by loss of habitat and poor environmental condition. In the overallocated MDB, the drier conditions of a changing climate coupled with constraints on environmental water management have meant that, even in wetter periods, the flooding of wetlands (particularly at Ramsar sites) has not met objectives (Chen et al. 2020, p. N).

In some systems, planning and management deficiencies remain, contributing to negative outcomes. In New South Wales, rules in water sharing plans have been shown to inadequately protect environmental water (*Assessment*: section 1). The efficacy of environmental watering under the Basin Plan has also been called into question (Chen et al. 2020); and remaining challenges are driven by 'a range of policy, practice and climate change impacts' (Engineers Australia, sub. 63, p. 14). For example, *The 2020 Basin Plan Evaluation* concluded that 'the Basin Plan is unable to effectively support many floodplain and wetland ecosystems until implementation of critical improved water infrastructure and river operating rules are in place' and that 'water management arrangements in the Basin will need to be responsive to climate extremes in the future'. (MDBA 2020d, pp. ix and xiii)

A lack of commitment to compliance and enforcement is likely to also have contributed to negative environmental outcomes in these systems by allowing water take that may be unsustainable and, in some cases, illegal (SP E *Integrity*). (The Commission's next five year assessment of the Murray-Darling Basin Plan is scheduled for 2023.)

... but environmental decline could have been more severe without the provision of water for the environment

Flow patterns in many waterways have been significantly altered over time⁸ and (with expected climate change) are unlikely to return to natural flow regimes, even with provisions of water for the environment. In the over allocated MDB, where environmental degradation is pronounced in many areas, environmental water (to date) has been insufficient to achieve widespread rehabilitation. Although there have been environmental improvements at specific sites, these have not been replicated MDB-wide. The Wentworth Group of Concerned Scientists (sub. DR152, p. 1), said that:

... these effects [from the use of environmental water] are highly localised and short-term in nature, and the amount of environmental water available is far too little to have a sustained and widespread benefit. ... Environmental flows are being actively managed but the evidence at the large scale is that river dependent communities are continuing to decline. (sub. DR152, p. 1)

To arrest decline, continued commitment to completing agreed water recovery programs in the MDB is important, particularly given the uncertainties of a changing climate. But, most significantly, the MDB experience offers a valuable lesson for national water reform. The provision and protection of water for the environment is critical to prevent over allocation and overuse, maintain environmental assets and avoid (in other systems) a repeat of the serious environmental degradation that has occurred in parts of the MDB.

The provision of water for the environment, both planned and held, has been a major national reform effort that has helped to avoid environmental degradation that would have otherwise occurred through unconstrained water access. For example, water delivered for the environment to support the Coorong, Lower Lakes and Murray Mouth during the recent drought prevented environmental degradation of the extent observed during the Millennium Drought (MDBA 2020d, p. xiii).

And, in some waterways, water provided for the environment has slowed the rate of environmental decline. For example, without environmental flows ‘the already devastating environmental impacts, such as the Lower Darling fish deaths, would have been worse’ (MDBA 2020d, p. ix). Similarly, analysis of data (Bino et al. 2018) from the Eastern Australian Aerial Waterbird Survey⁹ has found that:

... continued waterbird declines and low numbers may be indicative of compromised conservation management, reflecting the challenges of restoring sufficient water to wetlands for feeding and breeding waterbird habitat. Environmental flows are likely to have reduced the rate

⁸ Primarily, as development, agriculture, mining and therefore water extracted for consumptive use have increased.

⁹ The Eastern Australian Aerial Waterbird Survey provides a long-term measure of waterbirds in eastern Australia, surveying major wetland sites in the Murray-Darling Basin. It is particularly relevant in understanding the dynamics of environmental water needs for biodiversity purposes as they relate to waterbirds and wetlands (UNSW 2020). The 2020 survey reported that the four major indices for waterbirds (total abundance, breeding index, number of species breeding and wetland area index) continue to show significant declines over time but that Eastern Australia's wetlands and waterbirds have partially recovered from the drought (Dubach 2020; Porter et al. 2020, p. 2).

of decline, through providing increased feeding habitat and breeding habitat but not sufficient to arrest decline. (MDBA 2020e, p. 39)

Some of the benefits of environmental water can be attributed to the provision of planned environmental water maintaining habitats and river connectivity. During the drought of recent years, sites that have received environmental water have had critical ecosystem functions protected. The provision of refuges has been particularly important in maintaining breeding grounds during drought (SCEBWC 2019). Ecosystem resilience was therefore supported until rain started to return to some parts of the country.

Moving forward, it is important to understand the extent to which recent environmental decline (in some areas) was: an inevitable consequence of the severity and longevity of the recent drought (and outside the bounds of planning); a failure of water management; or an indication that current environmental water provisions are inadequate. However, it is also important to recognise that without the commitment to national water reform and provisions of water for the environment, that environmental decline is likely to have been significantly worse.

2 Achieving agreed environmental outcomes

In general, water planning processes consider possible environmental outcomes and then the water required to meet those outcomes together with consumptive requirements. The environmental and consumptive outcomes of the plan are agreed by making trade-off decisions between these competing uses of water.

But, the provision of a water regime alone will not achieve agreed environmental outcomes. It needs to be part of an integrated river or wetland management program that includes complementary habitat and water quality management. The ultimate objective of providing water for the environment is to improve the health of environmental systems — not simply a volume of water. Whether environmental water is planned or held, the focus for the next phase of reform should be to ensure that environmental water is managed efficiently and effectively to deliver agreed (and where possible, better) environmental outcomes.

Extreme events and climate change pose significant threats and future challenges to ecological sustainability. Over the next 20 years, an expected drying climate in large parts of the country, together with more frequent extreme events, is likely to affect the provision and reliability of environmental water. There is no panacea for these threats. To achieve current agreed outcomes from environmental water (both planned and held) there is a need for consistent policy principles and fit-for-purpose management frameworks. These will enable environmental management to best respond to weather extremes and adapt to a changing climatic baseline. Even with this in place, over time (in some cases) the required response is likely to include reassessing and resetting the balance between environmental and consumptive water uses (SP A *Entitlements and planning*) and redefining agreed environmental outcomes.

The NWI has an important role to play in achieving agreed environmental outcomes by establishing the principles that can be used by all jurisdictions to guide their individual environmental management frameworks and practices. In 2017, the Commission recommended that Australian, State and Territory Governments ensure that their policy frameworks provide for the efficient and effective use of environmental water. And these frameworks should also provide for community outcomes (where this does not compromise the achievement of environmental outcomes) relating to cultural values, recreation and economic benefits (PC 2017, p. 149).

Drawing on current and emerging issues, this section outlines management requirements that are critical to achieving agreed environmental outcomes, ensuring accountability and building public confidence in the use of environmental water. First, it discusses those that are important in all systems, whether environmental water is provided through planning or held entitlements. Second, additional guiding requirements for complex, highly developed systems with additional held environmental water are examined.

2.1 Requirements in all systems

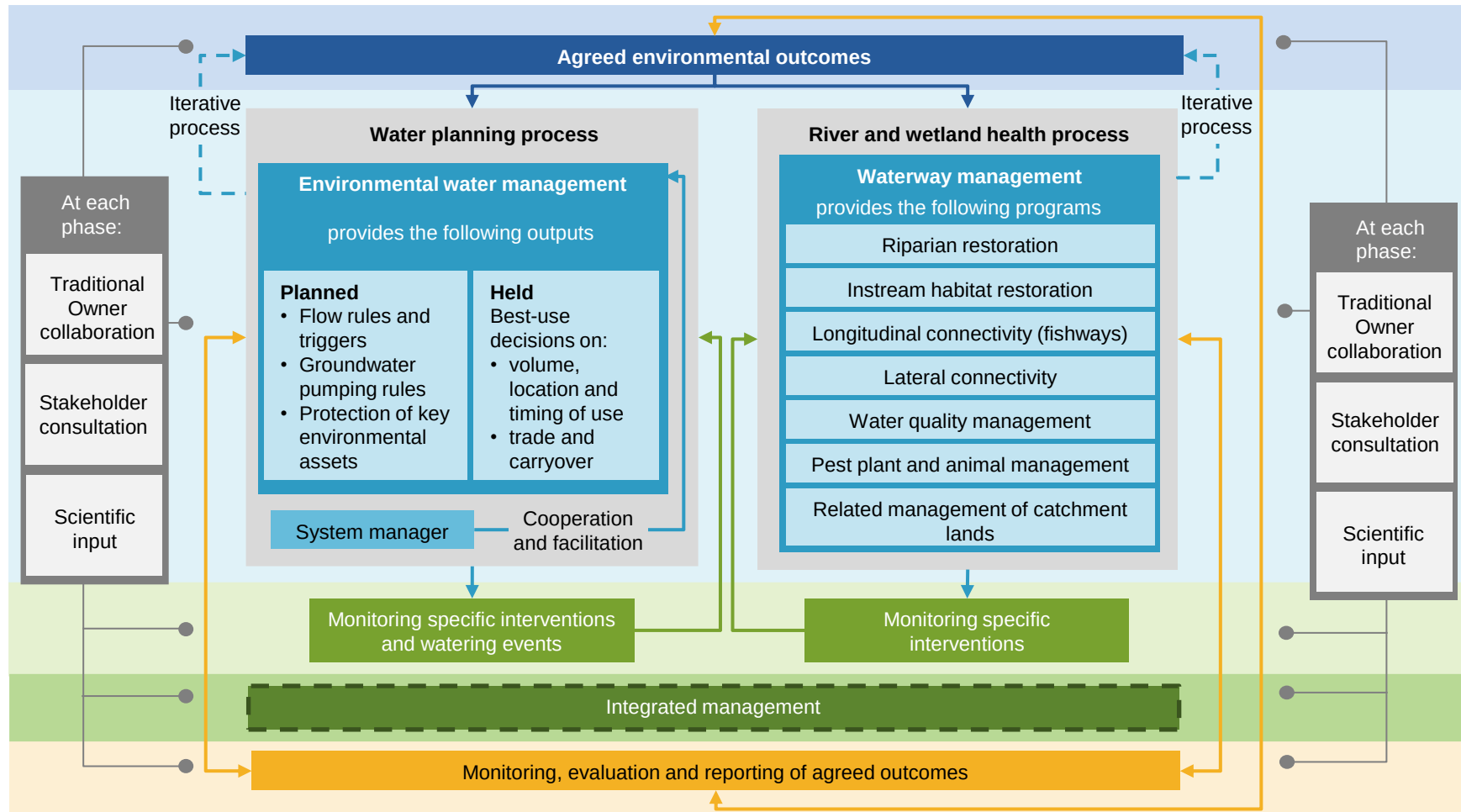
State and Territory Governments have policy frameworks in place for determining environmental objectives and outcomes for their river, wetland and other water-dependent ecosystems. Agreed environmental water outcomes and provisions are established in water planning processes and managed by environmental water managers. River and wetland health management (referred to as ‘complementary waterway management’) is undertaken as a separate process under state and territory natural resource management (NRM) frameworks. To achieve environmental objectives and agreed environmental outcomes, environmental management and waterway management must act in concert. This is illustrated in figure 3 and is a key environmental management reform theme presented in this section.

A number of other key elements of environmental management that are required to achieve agreed environmental outcomes (in all water systems) are also introduced in figure 3 including:

- clearly specifying environmental objectives and outcomes and the provision of water for the environment (discussed below)
- the importance of essential knowledge-based inputs to water planning and wetland health processes including Traditional Owner collaboration, scientific input and stakeholder consultation (discussed below)
- a flexible, cooperative and innovative water system manager who is committed to facilitating the achievement of agreed environmental outcomes, subject to managing third-party impacts and open to experimentation as opportunities arise (discussed in section 3)
- effective, risk based monitoring, evaluation and reporting arrangements (for both specific interventions and agreed outcomes) to assess whether agreed outcomes are being achieved (accountability) and to enable an adaptive management feedback loop into management processes (discussed in section 4).

Figure 3 The integration of environmental and complementary waterway management

At the local level, to achieve agreed outcomes



A focus on clearly specifying environmental objectives and outcomes

Under the NWI, water planning is recognised as ‘an important mechanism to assist governments and the community to determine water management and allocation decisions to meet productive, environmental and social objectives’.¹⁰ 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’.¹¹

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 results being sought by stakeholders once the plan has been agreed.

Under the water planning process, the goal is to protect the key environmental assets and functions agreed by stakeholders. Stakeholders can include individuals and interest groups that are located outside of the designated water resource planning area.

The selection of environmental objectives and agreed outcomes through planning processes is essentially a societal choice involving trade-offs that should be guided by science in terms of what is achievable (Acreman 2016) and consultation and valuation in terms of the relative importance of outcomes to the community. Through this, communities will identify the key assets in the system and ecosystem functions that they would like to protect (this should include consideration of any dependent downstream environmental assets such as estuaries and near shore marine environments (CSIRO sub. DR149 and the Northern Prawn Fisheries Industry sub. DR155)) and the risks that they are willing to tolerate in achieving this. This results in the prioritisation of environmental assets to guide planning and active management. To enable stakeholder confidence and ‘buy-in’ to environmental water programs, it is important that these trade-offs and their associated ecological risks are well understood and accepted.

Agreed outcomes should be transparent, logical, and easily understood by stakeholders. Establishing agreed outcomes in planning processes requires effective engagement with stakeholders to ensure that priorities relevant to water plan areas are adequately considered and where necessary fed up to the state, territory or basin scale. However, in practice, reaching agreement on objectives and outcomes can be very difficult, even if good collaborative processes are in place.

The process of negotiation can be socially inclusive, but is often nonspecific and subjective. People may want the river to be natural, or they may have a golden age in mind (i.e., a view of the landscape in a painting from 1850), or memories of how nice the river was when they were young, which can influence their vision. Desires are often driven by a cultural or spiritual connection with the river. Given the high demand for water in many river basins it is often impossible to meet everyone’s needs, and compromises are required. Reaching agreement can be

¹⁰ NWI paragraph 36.

¹¹ NWI paragraph 37.

very difficult if expectations are unrealistic, for example, if the river has been heavily managed and will continue to be so for local or national economic prosperity. Setting objectives for environmental water through stakeholder engagement is thus a socio-political process rather than a solely scientific procedure. (Acreman et al. 2017, p. 23)

Science, data and qualitative information is an important precursory input to the process of reaching agreement on plan objectives and outcomes. This information plays an important role in identifying ecological risks, and the value of environmental assets to the community when determining alternative uses of environmental water and setting environmental priorities (valuation techniques for water use are discussed in SP A *Entitlements and planning*). This is particularly important in systems where agreement on objectives and outcomes is difficult to achieve (for example, in overallocated and overused systems where the use of environmental water is highly contested), and to avoid the setting of unachievable objectives and outcomes.

To ensure some consistency of approach in the identification of key environmental assets, criteria for the prioritisation of environmental assets, based on conservation planning practice, should be embedded in the NWI (box 2). And these criteria should be used to identify water-dependent ecological features of significance as a precursor to determining objectives and agreed environmental outcomes.

Box 2 Prioritisation criteria for identification of key environmental assets

Waterways or water-dependent ecosystems should be considered high environmental priority if they have one, or more, of the following characteristics:

- formally recognised significance (under Australian or State government legislation)
- the presence of highly threatened or rare species and ecological communities (under Australian or State government legislation)
- high naturalness values (for example, aquatic invertebrate communities or riparian vegetation)
- vital habitat (for example, drought refuges or important bird habitat and key sites for connectivity).

Source: Productivity Commission criteria adapted from the principles of conservation planning and reflect Commonwealth and State government practices.

Applied scientific analyses and good data are also key to the monitoring and evaluation of outcomes. Environmental outcomes should be specific and defined well, to enable clear long-term performance indicators to be set and monitored (monitoring, evaluation and reporting is discussed in section 4).

Ecological risks and environmental conditions vary under different climatic conditions. Recent dry conditions have called into question whether water planning has adequately considered the impacts of extreme water scarcity when establishing agreed environmental outcomes and objectives. The assessment of whether agreed environmental outcomes have been achieved will need to be based on a long-term assessment over a range of climatic conditions.

Water planning should consider objectives and agreed outcomes under different climate conditions (wet, average and dry years). The Western Australian Government reported:

Environmental water provisions are set in most cases at a low-level risk factored with drying climate projections. In drought conditions consumptive use and the environment share the burden of reduced water availability, however critical water refuges are maintained. For example, releases from large dams are tailored to reflect inflows to the dam, while providing minimum critical flows to downstream refuge pools.

At key wetlands on the Gnangara Mound supplementation programs maintain Lakes Nowergup and Jandabup. In self-supply farm dam catchments in the South-West low flows are maintained through low-bypasses and a winter-fill period policy, allowing dams to only capture water between July and October. In drought years the Department of Water and Environmental Regulation implements a dry-season response which may include higher levels of monitoring and compliance of licensees, and biological monitoring of critical summer refuges. (Western Australian Government, pers. comm., 21 September 2020)

Best-practice principles to establish environmental objectives and agreed outcomes, including understanding any environmental trade-offs during dry climate scenarios should be embedded in the NWI.

NWI RENEWAL ADVICE 8.1: BEST-PRACTICE ENVIRONMENTAL OBJECTIVES AND OUTCOMES

Environmental objectives and outcomes agreed in water plans should be guided by criteria on the identification of key environmental assets (including dependent downstream estuaries and near-shore marine environments) and the values communities place on those assets.

- Waterways or water-dependent ecosystems should be considered high environmental priority if they have one, or more, of the following characteristics:
 - formally recognised significance (under Australian or State Government legislation)
 - the presence of highly threatened or rare species and ecological communities (under Australian or State Government legislation)
 - high naturalness values (for example, aquatic invertebrate communities or riparian vegetation)
 - vital habitat (for example, drought refuges or important bird habitats and key sites for connectivity).
- Environmental objectives and agreed environmental outcomes should then:
 - be set through a collaborative, stakeholder and community process that considers the relative community value of outcomes
 - be based on good scientific, objective and on-the-ground knowledge
 - clearly identify any risks and potential environmental trade-offs under different climate scenarios (including average and dry years)
 - be transparent, logical and easily understood by stakeholders
 - be specific and defined well, enabling clear long-term performance indicators to be set and monitored.

The provision of environmental water, established through planning

The water planning trade-off process results in objectives and agreed environmental outcomes with supporting environmental water arrangements and a defined share of water resources to be allocated (either as held environmental entitlements, planned environmental water or both). As discussed in section 1.3, planned environmental water is established in water plans by placing constraints or obligations on consumptive users that limit extractions from waterways, overland flows or groundwater systems to leave a residual water provision for environmental purposes.

Environmental water provisions are central to achieving ecological outcomes. The environmental impact of the recent drought in New South Wales has shown that in some catchments there has been an inadequate understanding of the importance of low-flow provisions to achieve environmental outcomes during periods of water scarcity. This was particularly evident in the Barwon–Darling, where there were substantial fish deaths and algal blooms in 2018 and 2019 due to cease-to-flow events.

Flow targets to protect critical ecosystems and river health need to be managed, not just for long-term averages, but for a range of climatic conditions including the very dry extremes. This includes managing water extraction during critically low flows to protect ecologically important refuges, protecting the resumption of flows, enabling small flushes at appropriate frequencies and managing connectivity across the landscape. The process for achieving this is through water planning. Future water plans and water reviews need to ensure that water sharing arrangements during low flow and prolonged dry periods are explicitly considered and clearly described (SP A *Entitlements and planning*).

The integration of environmental water, waterway and catchment management

The environmental condition of waterways — such as rivers, wetlands, floodplains and estuaries — is dependent on a range of factors including water extraction and land use and management within the catchment and riparian zone. Waterways face threats like nutrient pollution, salinity, increased sedimentation, habitat degradation and invasive species.

Waterway management aims to protect and manage waterways and their adjoining riparian zones, so that their physical condition and ecological health are maintained or improved over time. Managing and protecting waterways is important as a precautionary approach (to prevent irreversible environmental damage) and because it is less costly (in terms of sustained effort, investment and time) than restoring degraded waterways (DWER (WA) nd).

Non-flow waterway management activities (such as water quality improvement, restoration of habitat and connectivity and the management of pest species) will have a critical impact on the achievement of environmental outcomes.

Inquiry participants discussed the benefits of non-flow measures to improve environmental outcomes. For example, Chapman (sub. 5, p. 3) commented:

Increasing the volume of water used for environmental purposes should not be viewed as a substitute for achieving actual environmental outcomes ... The ‘just add water’ approach has been much criticised. Actual river health should be monitored rather than focusing predominantly on volumes of environmental water.

Measures like carp control, feral animal control in wetlands and fish migration facilities may produce significant environmental outcomes with lower economic and social costs compared with taking water out of productive use in rural economies.

The NSW Irrigators’ Council (sub. 27, p. 21) expressed a need for a greater focus on non-flow waterway management activities:

The irrigation industry has long advocated for complementary or non-flow measures to improve the health of river systems. Such measures include: habitat restoration, feral and invasive species management, carp control, cold water pollution management, improvements to fish passage, and native species breeding programs. Programs such as these have received far less attention than required, given the current volumetric focus.

In a similar vein, the Wentworth Group of Concerned Scientists (sub. 68, p. 5) noted the increasing importance of investing in non-flow measures in a changing climate.

Greater investment is needed in non-volumetric freshwater ecosystem conservation measures that will increase resilience of biodiversity under a changing climate. The NWI should include provisions for such measures including: restoration of indigenous vegetation along riparian corridors, removal of redundant infrastructure, removal of structures which reduce connectivity on floodplains where possible, provision of fish passage, and thermal pollution control devices.

To deliver agreed environment outcomes it is essential that environmental water is managed within an integrated waterway management framework (figure 3, above). In the absence of integration, the long-term benefits of environmental water (including environmental rehabilitation and resilience) may be eroded or not realised. Providing environmental water to a particular wetland is likely to be more effective in increasing native fish populations if waterway managers maintain wetland vegetation, reduce weeds and install screens to exclude invasive species such as carp. Similarly, the benefits of providing water to stimulate regeneration of red gum forests may be completely eroded if grazing then eliminates the seedlings. For example, a recent report on the *Victorian Environmental Flows Monitoring and Assessment Program* found that:

- the benefits of environmental water are dependent on complementary works
- non-flow related factors (such as fish stocking, angling and habitat condition) influence trends in fish populations therefore, understanding how these factors interact with flows to influence fish populations is important to achieve environmental outcomes
- the ‘strategic delivery of environmental flows, when considered together with weed and grazing management, can maximise benefits to native riparian plants.’ (DELWP (Vic) 2020a, pp. 7 and 11)

Integrating environmental water with complementary waterway management activities is critical to achieving agreed environmental outcomes but, is not adequately covered in the

NWI. Waterway managers are generally responsible for waterway and catchment management activities under state and territory NRM frameworks but, except for Victoria, may not be involved in environmental water management.

To facilitate the achievement of agreed environmental outcomes, State and Territory Governments should ensure that consistent management objectives govern the use of environmental water and complementary waterway management activities, and that NRM programs give priority to the assets identified in water planning processes, provide funding, and undertake the required works.

Complementary NRM programs are important to deliver long-term outcomes, as well as to manage changing conditions. During periods of water scarcity, NRM should focus on the protection of reserves and refuges and making sure that the regenerative capacity of water-dependent ecosystems is protected. This could include (during periods of low flow) banning of fishing in fish refuge pools, fencing of key refuge areas, captive breeding programs and increased compliance monitoring and enforcement. Environmental water management and NRM approaches to adaptation must operate in concert to achieve agreed outcomes. This is especially important in the context of Australia's drying and highly variable climate.

NWI RENEWAL ADVICE 8.2: INTEGRATED MANAGEMENT

The management of environmental water should be integrated with complementary waterway management at the local level by ensuring that consistent management objectives govern both the use of environmental water and complementary waterway management activities.

RECOMMENDATION 8.1: NATURAL RESOURCE MANAGEMENT

Natural resource management (NRM) programs should give priority to the key environmental assets identified in water planning processes, provide funding and undertake the required works to protect those assets.

During periods of water scarcity, NRM should focus on the protection of reserves and refuges and making sure that their regenerative capacity is protected.

Effective compliance regimes

Compliance and enforcement mechanisms are a key aspect of any regulatory system. To achieve agreed environmental outcomes, it is critical that the environmental water provided under water planning processes is delivered.

The vast majority of environmental water provisions are provided through the imposition of rules and constraints on other active water users. Effective compliance policy and processes

to protect environmental water through these regulations is critical for achieving agreed environmental outcomes. Best practice includes:

- compliance processes (inspections and investigations, enforcement and reporting) that are targeted, accountable and consistent (within systems)
- penalties that are designed to support deterrence and proportionate to the level of harm posed to the environment
- compliance policy and processes that are risk-based. For example, in systems where there is high competition for water (such as systems that are overallocated and highly regulated), regular and systematic collection and collation of evidence on compliance is required
- clear, open and transparent reporting on instances of non-compliance.

SP E *Integrity* explores best practice in compliance and enforcement under a renewed NWI.

Clearly identifying institutional responsibility for waterway management

The environmental condition of a waterway or wetland is the consequence of a range of management factors within both the catchment and the waterway itself. Therefore, effective waterway management requires the coordination of all waterway activities and will involve a range of people and organisations. It requires cooperative relationships between system managers, local communities, Traditional Owners, landowners, land managers, catchment groups, river operators, State and Territory Government agencies, environmental water holders and scientists.

To be effective, shared governance models require significant effort in collaboration, coordination and the sharing of key information and data. When not managed well, shared responsibility governance models can lack structure, transparency and accountability, and ultimately key tasks to achieve good outcomes can be neglected or overlooked.

In the context of waterway management, a shared responsibility model can lack clarity over who is responsible when agreed outcomes cannot be met, such as during a prolonged period of water scarcity. For example, an outpouring of community frustration over poor environmental outcomes during the recent low-flow events in the Barwon–Darling exposed a gap in structure, transparency and accountability for waterway management in New South Wales.

The Review of the Water Sharing Plan for the Barwon–Darling reported:

The overwhelming majority of stakeholders feel that the Plan is not meeting its objectives, and that a lack of water and poor water quality is impacting environmental outcomes and affecting local residents and communities ...

Based on feedback from the [Natural Resources] Commission's consultation, disparate stakeholder groups show widespread distrust and cynicism in government water planning and management over a long time period. Indeed, there were numerous calls from community members, and more widely in media, for a Royal Commission and independent review body;

“There needs to be one body in NSW to run water ... with ICAC [Independent Commission Against Corruption] type powers. It could even be federal. But it needs that level of oversight ... we need real action to be convinced”. (NRC (NSW) 2019, pp. 93 and 98)

This erosion of trust, transparency and accountability must be addressed to build the credibility of environmental management in the Barwon–Darling and more broadly.

Although no single agency can control all the factors affecting the condition of a waterway, to achieve agreed environmental outcomes all jurisdictions should have in place an institutional oversight responsibility for wetland and waterway management that provides an interface between the management of waterways and environmental water. Box 3 describes waterway management in Victoria, where the establishment of institutional responsibility for waterway and wetland management has generated benefits.

The type of agency responsible for waterway management may vary between jurisdictions and waterways, but the broad roles and functions of a waterway manager should include those listed below (in NWI renewal advice 8.3).

NWI RENEWAL ADVICE 8.3: WATERWAY OVERSIGHT

Where not in place, State and Territory Governments should establish a formal institutional oversight responsibility for wetland and waterway management that provides an interface between the management of waterways and environmental water.

The roles and functions of a waterway manager should include:

- undertaking collaborative planning processes that result in clearly articulated environmental objectives, targets and priorities
- ongoing collaboration with Traditional Owners
- ongoing environmental risk assessment
- providing input to water planning processes on environmental priorities and impacts
- oversight of natural resource management actions to achieve agreed objectives
- working with the system manager to achieve agreed environmental outcomes
- facilitating on-ground delivery of environmental water management
- monitoring and reporting on environmental outcomes and risk management
- evaluation where environmental outcomes were not achieved
- providing opportunities for community participation, to facilitate change and awareness of waterway issues
- communicating policy changes to stakeholders.

Box 3 **Case study: waterway managers in Victoria**

In Victoria, there are ten catchment management regions and each has a catchment management authority to co-ordinate integrated management of land, water and biodiversity. Catchment management authorities also have specific responsibilities for waterway management (except in the Port Phillip and Westernport region where Melbourne Water has waterway management responsibilities). The nine catchment management authorities and Melbourne Water are referred to as 'waterway managers'.

A key function of waterway managers under the *Water Act 1989* (Vic) is to develop and deliver Regional Waterway Strategies (RWSs) and associated action plans. RWSs are planning documents for river, estuary and wetland management in each region that drive the implementation of the Victorian Waterway Management Strategy. RWSs are developed by waterway managers in collaboration with other regional agencies, authorities and boards involved in natural resource management, Traditional Owners, regional communities and other key stakeholders.

At the local and regional level, waterway managers are the primary link with local communities and regional stakeholders. Waterway managers work with their local communities to determine the environmental values of most importance to the community and additional benefits that can be met, such as helping to meet recreational needs.

RWSs outline regional goals for waterway management. The regional priority-setting process relies on information about values, threats and risks. High value waterways are identified, and from those, a subset of priority waterways are determined for the eight-year planning period. A strategic regional work program of management activities for priority waterways is included. The regional work program provides clear direction to guide investment in waterway management by the Victorian Government. RWSs also identify regional priorities for environmental water management over the eight-year planning period, together with the complementary management activities required at those sites. This information is used as a key input to environmental water planning arrangements.

Other functions of waterway managers under the *Water Act 1989* (Vic) include:

- developing and implementing work programs
- authorising works on waterways, acting as a referral body for planning applications, licences to take and use water and construct dams, for water use and other waterway health issues
- identifying regional priorities for environmental water management and facilitating the delivery of environmental water
- providing input to water allocation processes
- developing and co-ordinating regional floodplain management plans
- managing regional drainage in specified areas

undertaking community participation and awareness programs.

Sources: DELWP (Vic) (2019b); DEPI (Vic) (2013).

Processes to adapt environmental objectives, when necessary, in a changing climate

Climate change is expected to lead to changes in water availability and reliability, and an increase in the frequency, severity and duration of droughts across much of Australia (*Report*: chapter 2).

This is likely to result in many of our waterways and wetlands changing character over the long-term. Environmental managers are already managing a changing climate through planning restoration programs, for example in Ramsar sites such as Lake Albacutya and the Coorong.

Uncertainties associated with climate change compel the need for flexible, adaptable and risk-based environmental planning and management. In some systems, climate change may make the realisation of agreed environmental outcomes unachievable based on existing water provisions. The process of resetting the balance, outlined in SP A *Entitlements and planning*, reviews what may be possible in some systems.

However, in many water systems (particularly those in unregulated systems, with little water extraction or affected by rising sea levels), the scale of the predicted climate shifts means that some environmental objectives are unlikely to be met over the longer-term, even if environmental water provisions increase relative to consumptive use. In these systems, environmental managers will need to review environmental objectives, ultimately enabling those systems to adapt to a drier future.

To manage risk in a changing climate, environmental managers must establish clear processes for reviewing their progress on outcomes and determining if and when management objectives need to be revisited within planning review processes.

NWI RENEWAL ADVICE 8.4: REVIEW PROCESSES FOR OUTCOMES

Clear processes should be established for reviewing progress on environmental outcomes, understanding their feasibility given climate induced changes in water availability and other factors (such as rising sea levels and increased temperatures), and determining if and when management objectives should be revisited within planning review processes.

2.2 Requirements in systems with additional held environmental water

As noted above, in a number of complex, highly developed and highly regulated systems, planned environmental flows are supplemented by held entitlements. This situation generally arises where environmental water has been recovered from the consumptive pool to improve the balance between water for consumptive and environmental use. In these systems, environmental water managers have been established to make decisions on where, how and when environmental water should be used and whether it should be traded or carried over (that is, stored for use in the following year). And, in the case of shared river systems (within the MDB), decision making also involves how environmental water managers should undertake actions in a coordinated way.

These more complex systems have further requirements, in addition to those outlined in the section 2.1, because of their complexity and their capacity to support the active management of held environmental water entitlements. They require dynamic planning for each parcel of

water, and day-to-day decision making because the timing of environmental water delivery can be as critical as the volume of water itself.

Active environmental management by environmental water holders involves making trade-offs between competing environmental needs at different locations and times. The decision-making task, and outcomes possible, will be strongly influenced by the scale of environmental water entitlements held, water plan outcomes sought, and the level of risk agreed in water plans. Where risk levels are higher, decisions made by environmental water holders will be more critical to achieving environmental outcomes.

And, because environmental water holders are provided with entitlements (worth billions of dollars), and have considerable discretion in how they use them, there is also an accountability obligation on environmental water holders to achieve the best outcomes that they can with the water resources that they steward. Environmental managers should use their best endeavours to achieve agreed (and, where possible, better) environmental outcomes in water plans by seeking out efficiencies from each allocation of environmental water. And, stakeholders have a right to clear information about how best-use decisions are made and the trade-offs involved.

To ensure accountability and build public confidence in the use of Australia's valuable environmental water, best-practice principles that support the effective and efficient use of held environmental water entitlements should be embedded in the NWI. The requirements for held environmental management set out in this section are focussed on achieving the best outcomes from environmental water under a renewed NWI.

Effective outcomes-based planning and priority-setting processes

The successful delivery of environmental water is a complex exercise and relies on robust planning mechanisms to deliver the best outcomes. A number of frameworks, plans and strategies, covering short and long-term time scales and local and regional spatial scales, guide the process.

Varying by jurisdiction, these documents broadly include long-term watering plans, long-term asset plans, annual watering plans, annual watering priorities and environmental watering strategies. They set out the:

- agreed ecological objectives and outcomes
- water regimes needed to achieve them under a range of climatic conditions
- principles for guiding the use of the relevant environmental entitlements to achieve them
- additional cultural and social benefits to be achieved, where compatible.

In systems with held environmental water, environmental water managers make active decisions on where, how and when environmental water should be used and whether it should be traded or carried over, guided by these planning mechanisms. The overarching

objective for environmental water managers is to make these decisions based on the best use for the environment over the long-term.

The actual water needs of environmental assets vary on a yearly basis, depending on antecedent conditions, watering history, environmental requirements and risk considerations. Therefore, the best mix of water use, trade and carryover will be different in each catchment and vary every year. Best use is influenced by a range of local factors and assessment criteria. For example, box 4 summarises decision making for Commonwealth environmental water holdings.

Because environmental water needs are inconsistent across years, and rainfall and water available under entitlements are also highly variable, environmental watering has evolved to make the most strategic use of available allocations. In a dry year, environmental water managers are required to set priorities for the best use of limited environmental water, and so they need the information and management tools to undertake this task efficiently.

At an operational level, in seasonal watering plans environmental water managers make risk-based decisions on watering various, specific environmental assets. During periods of water scarcity (in particular), this is likely to involve difficult environmental trade-offs between different:

- regions (deciding to commit water to a river or wetland in one region over a river or wetland in another region)
- river reaches or wetlands in one river system (deciding to commit water to one river reach or wetland over another in the same system)
- environmental flow elements in a particular river or wetland (for example, the creation of small summer flushes for water quality versus the maintenance of baseflows) (VEWH 2015, p. 3).

These trade-offs establish priorities from a tactical management sense, within agreed long-term water objectives and outcomes. As discussed in section 2.1, under the water planning process communities agree on the key assets and ecosystem functions that they would like to protect (guided by precursory scientific data and qualitative inputs). The water planning process establishes the long-term environmental objectives and outcomes to be sought from environmental water management. However, because environmental water holders make active tactical decisions on the use of the actual available water in a particular season, they use prioritisation criteria that can be applied on a real-time basis in response to actual climatic conditions. In doing this, they have the potential to achieve better outcomes than those agreed through long-term water planning processes. Indeed, to be accountable for the water resources that they steward, it is important that environmental water holders are well informed, nimble, and (where possible) seek out efficiencies and outcomes that are better than those agreed in water planning processes.

Environmental water holders have developed prioritisation criteria to guide the active management of held environmental water. These broad criteria are summarised in table 3

and can be equally applied at individual sites or at the broader landscape scale. Environmental prioritisation criteria for held environmental water should be embedded in the NWI to provide validity to current best practice and transparency to the community and other entitlement holders.

It is also important (given Australia's increasingly variable climate) that these prioritisation criteria are used to set objectives that take into account information about values, threats and risks under different seasonal climate conditions.

Box 4 Environmental watering — best-use decision making

As set out in the Commonwealth Environmental Water Office's (CEWO) *Water Management Plan* (2020c), a range of local factors influence decisions on the use, trade and carryover of water including:

- environmental demands and opportunities at specific sites
- anticipated environmental demand in coming years
- climatic conditions across a range of scenarios and current dam storage levels
- physical and operational constraints to water delivery
- environmental and operational risks
- cost versus benefit assessment of each option, within and across catchments
- water account rules and carryover limits
- long-term yield of entitlements and appropriate levels of carryover, given uncertainty about future environmental needs
- water market conditions.

Watering assessments are undertaken against set criteria (and are also outlined in the CEWO's *Water Management Plan* (2020c)) including the:

- ecological value of the river, floodplain or wetland
- expected outcomes from watering
- potential risks of watering
- long-term sustainability and management of the site
- cost effectiveness and feasibility of watering.

Watering events vary in scale significantly — in terms of the target area, volume of water and whether they are a single or repeated event. Before any water is delivered, potential risks are considered, including the risk of flooding private property or 'double-booking' a channel for water delivery.

Local on-ground knowledge is important for detailing a specific watering action including the flow magnitude, timing, triggers for commencement, rates of rise and fall in the level of the water course and the area to be inundated. When a decision is made to proceed with a watering action, arrangements for implementation are made with delivery partners including river operators, who manage the delivery of the water and operational monitoring. Communication with stakeholders is crucial during water delivery as weather and flow conditions can change rapidly and may result in the need to adjust, suspend or even cancel the watering action.

Source: CEWO (2020c, p. 7).

Table 3 Criteria for prioritising environmental watering^a

<i>Prioritisation criteria</i>	<i>Factors considered</i>
Extent and significance of environmental benefit	Size of the area being watered Expected ecological outcomes Expected scale of response Conservation status of the species or community that will benefit Expected contribution to regional environmental objectives
Likelihood of success	Evidence that the desired outcomes are likely to be achieved External threats that may affect getting the desired results
Longer-term benefits	Value added to previous watering undertaken at the site Longer-term environmental benefits expected Ability to sustain these values into the future
Urgency of watering needs	History of watering at the site Potential for irreversible damage if the watering does not occur Risks associated with not delivering the water
Feasibility of the action	Capacity of infrastructure to meet the delivery requirements System or operational constraints Flexibility in the timing of delivery Likelihood that planned management actions will mitigate external threats
Environmental or third-party risks	Adverse environmental outcomes that may arise from the event Third-party risks associated with the event Effectiveness of mitigation to manage third-party and environmental risks
Cost effectiveness of the watering action	Likely environmental benefit compared against costs to deliver and manage water and costs of interventions to manage external threats and risks
Efficiency of water use	Volume of water needed to achieve the desired outcome Volume and timing of return flows that may be used at downstream sites Alternative supply options such as use of consumptive water en route or augmenting natural flows Risks of spills from storages in the upcoming water year and any carryover water that may be available
Cultural, economic, social and Traditional Owner benefits	Traditional Owner values and aspirations Recreation, community events and activities Economic benefits

^a The table sets out the prioritisation processes of the Victorian Environmental Water Holder. Other jurisdictions with environmental water entitlements follow a similar approach, as described below.

Box 4 outlined the Commonwealth Environmental Water Holder's five criteria for assessing water use options: ecological value of the river, floodplain or wetland; expected outcomes from watering; potential risks of watering; long-term sustainability and management of the site; and cost effectiveness and feasibility of environmental watering.

The Murray–Darling Basin Authority's process to identify Murray–Darling Basin annual priorities follows five broad steps: identify environmental watering need (consideration of outcomes from previous watering and whether additional watering is required to consolidate outcomes, assessment of flow data against environmental watering requirements for significant sites, and consideration of ecological condition); identify the resource availability scenario and management outcomes; consider complementary outcomes and risks (such as the First Nations Environmental Water Guidance Project); consider state annual environmental watering priorities; and consult and collaborate.

The Living Murray (TLM) water is prioritised based on where the water will achieve the biggest environmental outcomes, the availability of water in the river and the Living Murray, seasonal outlook and on site condition. TLM water is generally not distributed evenly across sites each year, but delivered (in a 'rostered' way) to mimic natural flooding cycles. This involves alternating large-scale watering of different sites every three to five years, and smaller watering in between.

Sources: CEWO (2020c, p. 7); MDBA (2011, p. 75, 2019a, pp. 80–82); VEWB (2020a, p. 23).

The Australian Government described how, during the recent drought, objectives were aligned with conditions to achieve the best use from environmental water:

The CEWO's [Commonwealth Environmental Water Office's] planning was very effective in the recent drought, with unprecedented dry conditions experienced throughout the Basin ... Like other water users when it's dry, Commonwealth environmental water holdings receive less allocation. This means that during drought we reduce the footprint of our watering to achieve more modest objectives, focussed on protecting sites of highest priority, creating refuges for plants and animals to survive through the drought, improving water quality, minimising irreversible damage and providing for later recovery.

As an example, throughout the year Commonwealth environmental water maintained longitudinal connectivity between the River Murray and the Coorong, providing constant fish passage and contributing 100 per cent of flows through the barrages in 2019-20. Over 685 GL of Commonwealth environmental water flowed to the Coorong to provide critical estuarine habitat refuges in low flow, drought conditions. (DAWE, pers. comm., 4 September 2020)

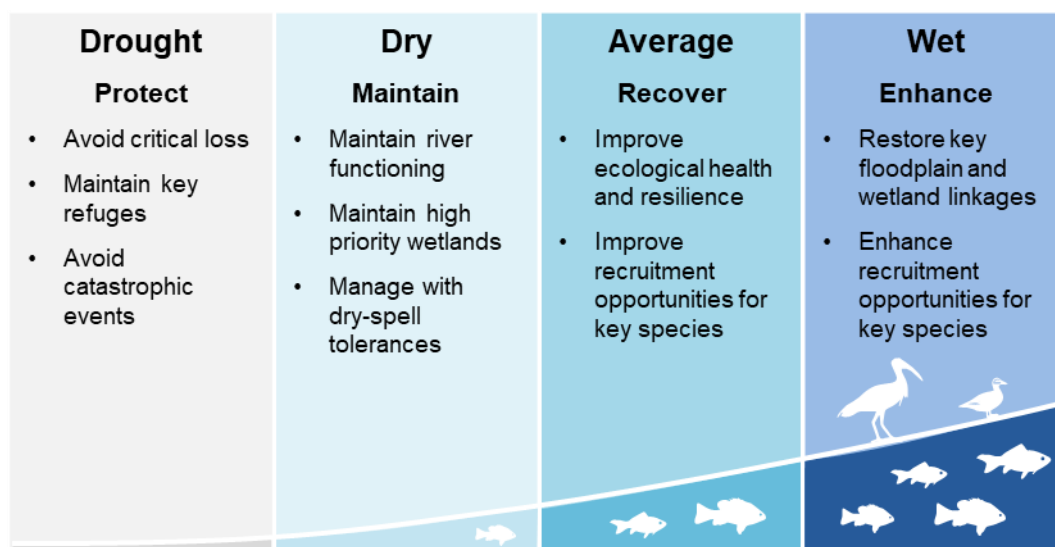
Similarly, the Victorian Government (sub. 108, p. 16) said:

Victoria continues to apply a seasonally adaptive approach to environmental water management that considers recent climate history, climate outlook and available environmental water. This approach was established during development of the Northern Region Sustainable Water Strategy 2009 as a flexible way to manage rivers and wetlands.

This has proved effective during the recent drought when environmental water has been targeted to the sites that need it most. For example, in West Gippsland earlier this year, the WGCMA [West Gippsland Catchment Management Authority] decided not to deliver the usual autumn fresh in three rivers to promote fish spawning, focusing instead on using available environmental water to maintain base flows and water quality.

Figure 4 illustrates environmental planning objectives for seasonal environmental watering under different climate conditions — drought, dry, average and wet climates. For example, in drought conditions, the general environmental watering objective is to protect at-risk environmental values and avoid critical loss. In wet conditions, the objective is to reconnect rivers to floodplains and wetlands and enhance recruitment of key species. Objectives for seasonal environmental watering under different climate scenarios should be embedded in a renewed NWI.

Figure 4 Environmental objectives under different planning scenarios



^a This figure sets out the prioritisation processes of the Victorian Environmental Water Holder (VEWH).

The Murray–Darling Basin Authority (MDBA), under the *Basin-Wide Environmental Watering Strategy*, follows a similar climate scenario approach (described below).

- Very dry — avoid irretrievable loss of, or damage to, environmental assets.
- Dry — ensure environmental assets maintain their basic functions and resilience.
- Moderate — maintain or improve ecological health, condition and resilience of water-dependent ecosystems.
- Wet — improve ecological health, condition and resilience of water-dependent ecosystems.

Commonwealth environmental water planning is primarily driven by supply (how much water is available) and how this can be used to meet identified demands (what are the environment’s needs). The *Commonwealth Environmental Water Portfolio Management Framework* specifies four objectives (similar to the VEW and MDBA approaches) but scenarios are based on different combinations of environmental water demand and supply (described below).

- Avoid damage to the environment — very low supply and very high or high demand; and low supply and very high demand.
- Protect and ensure capacity for recovery — very low supply and moderate or low demand, low supply and high or moderate demand, and moderate supply and very high or high demand.
- Maintain ecological health and resilience — very low supply and very low demand, low supply and low or very low demand; moderate supply and moderate, low or very low demand; high supply and low or very low demand, and very high supply and very low demand.
- Improve ecological health and resilience — high supply and very high, high or moderate demand, and very high supply and very high, high, moderate or low demand.

Sources: CEWO (2020c, p. 6); MDBA (2019a, p. 71); VEW (2015).

NWI RENEWAL ADVICE 8.5: EMBED OBJECTIVES AND PRIORITY SETTING FOR HELD ENVIRONMENTAL WATER

The overarching objective for environmental water managers managing held environmental water is to make decisions on where, how and when environmental water should be used (or whether it should be traded or carried over) based on the best use for the environment over the long-term.

Criteria for prioritising environmental watering should be embedded in a renewed National Water Initiative and include the:

- extent and significance of environmental benefit
- likelihood of success
- longer-term benefits
- urgency of watering needs
- feasibility of the action
- environmental or third-party risks
- cost effectiveness of the watering action
- efficiency of water use
- additional cultural, economic, social and Traditional Owner benefits.

Objectives for seasonal environmental watering under different climate scenarios should be embedded in a new National Water Initiative such as:

- avoid critical loss, maintain key refuges and avoid catastrophic loss during drought scenarios
- maintain river functioning and high-priority wetlands and manage dry-spell tolerances during dry scenarios
- improve ecological health and resilience and recruitment opportunities for key species during average-climate scenarios
- restore key floodplain and wetland linkages and enhance recruitment opportunities for key species during wet scenarios.

Coordinated water delivery in the MDB

In MDB shared systems, providing water for the environment through the use of held entitlements requires collaboration and coordination by environmental water holders and government agencies at all levels, including on-ground waterway managers, delivery partners and community stakeholders more broadly. Since 2017, there has been increased commitment to improving the coordination of water delivery in the MDB to achieve better outcomes.

Improved cooperation between Basin governments in the delivery of water for the environment was demonstrated in mid-2018 when 32 gegalitres of water was delivered an unprecedented distance flowing over 2000 km from the northern tributaries of the Barwon-Darling River to the Menindee Lakes. As it flowed from storages in the north through Bourke and Wilcannia, this

water refreshed waterholes and provided connectivity for native fish. The NSW Government applied temporary water restrictions to protect the water from being pumped as it flowed down the rivers. This event was so successful that the second event of this kind, called the Northern Fish Flow Event, ran from April to June 2019 to support the health of the Dumaresq, Macintyre, Mehi and Barwon river systems. (Joint Basin Governments 2019, p. 15)

The mechanism to enable coordination in shared systems of the MDB is the *Basin-wide Environmental Watering Strategy* (MDBA 2019a). The Commission will examine the Strategy in its 2023 review of Basin Plan implementation.

Capacity to actively trade environmental water allocations, including between years

Environmental water holders have considerable discretion on whether to use, trade or carryover each parcel of water. With this management discretion, there is an accountability obligation for environmental water holders to make decisions based on the best use for the environment.

Carryover allows water entitlement holders to retain the unused portion of their water allocation from one year so that it can be used in subsequent years, and is available to consumptive water users and environmental water holders in most highly regulated systems. It allows all entitlement holders to flexibly manage their water availability between seasons to help meet discrepancies between water supply and demand in wet years versus dry years (VEWH 2018, p. 10). However, the use of carryover can be limited in some catchments by a lack of storage capacity, high rates of storage evaporation and a lack of connectivity, which prevents the use of carryover in other catchments. Trade in held environmental water can overcome some of these barriers.

All governments with held environmental water (Australian, New South Wales, Victorian and South Australian) are legally able to trade water allocations (PC 2017, p. 72).¹² Environmental water holders trade water in two key ways:

- administrative water transfers, which enable environmental water to be moved across river systems and/or between environmental water holders for environmental purposes (with no financial considerations). These are the majority of trades undertaken by environmental water managers and are required to operationalise many environmental water decisions outlined in seasonal watering plans
- trading environmental water allocations with consumptive users (both selling and buying), where it is in line with their statutory objectives such as that it benefits the environment.

¹² In South Australia, water entitlements held by the Minister exclusively for environmental purposes for the SA River Murray (for example, under the Living Murray program or as a result of environmental watering obligations under the original Adelaide Desalination agreement with the Commonwealth) are not traded. The Minister also holds a small volume of additional water entitlement which may be the subject of trading activity (SA Government, pers. comm., 18 September 2020).

Water markets can allow more efficient water use. Trade can provide opportunities for environmental water holders to manage low flows as well as to top-up medium flood events for the benefit of water-dependent ecosystems. Trade can help maximise environmental benefits by putting environmental water to better use in different locations or at a later time, to better match the hydrographs of environmental needs. It allows for increased flexibility and reduced risk by better aligning seasonal water resource variability with needs.

To maximise environmental outcomes, it is important that environmental water holders have the ability to actively trade water allocations and carry forward revenues. However, decisions to sell environmental water allocations can be contentious, particularly during periods of water scarcity and when significant public investment has been used to procure entitlements. For example, in 2018 when the New South Wales Government sold 15 GL of environmental water allocation to irrigators within the Gwydir, Macquarie, Lachlan, Murrumbidgee and Murray–Lower Darling valleys in response to dry conditions, questions were raised as to whether this was the best use of the allocations for the environment (PC 2018, p. 294).

Decisions to sell or buy environmental water allocations require a robust and transparent framework to facilitate optimal outcomes from the trade of environmental water, and ensure that these decisions are well understood by communities and other stakeholders. Under the NWI, parties agreed that water for the environment held as an access entitlement may be traded on the temporary market, ‘when not required to meet the environmental and other public benefit outcomes sought and provided such trading is not in conflict with those outcomes’.¹³

This limit (placed on trade) is intended to ensure that trading arrangements are consistent with the use of the water for environmental purposes, and are not primarily aimed at raising revenue. But, the salient concern is that the environmental water holders may fail to maximise environmental and community benefits by trading too little.

Although the CEWH manages a large quantity of water rights, to date it has only sold water on five occasions when it judged that the environment’s needs in the relevant catchments had been met — a requirement of Part 6 of the *Water Act 2007* (Cth). And the CEWH has (to date) not purchased any water allocations through the temporary market. However, as discussed below (box 5), in 2020 the Commonwealth Environmental Water Office (CEWO) implemented a market-like instrument (a ‘no-pump’ contract) in the Lower Balonne that served a similar role to the purchase of a water allocation. A grant was accepted by a landholder who agreed to forgo pumping of their water allocations during a flow event (*Assessment*: section 4).

It is desirable that over time, the CEWH and other environmental water holders fully exploit trade in allocations to maximise benefits for water-dependent ecosystems. Active decision making by environmental water holders on whether to use, trade or carryover held environmental water should demonstrate the best use of water to contribute to environmental

¹³ NWI paragraph 35.

outcomes as opportunities arise. In particular, best use for the environment, should take into account the potential for net environmental benefits over both the short and long-term.

Revenue from trading should also be put to best use to achieve environmental outcomes. It should be held in a dedicated, ring-fenced account with the ability to carryover between years. The uses for this revenue should be clearly defined and transparent. Examples include:

- trading costs
- acquisition of entitlements
- acquisition of allocations, including buying allocations or entering into lease, option or similar arrangements
- making use of market-like instruments such as ‘no-pump’ arrangements (discussed in the next section)
- works and measures that enable best use of environmental water or extend environmental water outcomes
- research and development relevant to enabling more efficient use of environmental water or extending environmental outcomes and assisting with operations
- providing contingency funds to assist delivery of agreed environmental outcomes during periods of extreme water scarcity
- monitoring outcomes.

To ensure accountability, decision making by environmental water holders on best use should be open, transparent and publicly reported (for example, through annual trading and carryover strategies or statements).

NWI RENEWAL ADVICE 8.6: TRANSPARENT TRADE STRATEGIES

Environmental water holders should have in place transparent and publicly reported trading and carryover strategies and reporting statements for entitlements and allocations that show the best use of water to contribute to environmental outcomes as opportunities arise.

Revenue from trading should be held in a dedicated, ring-fenced account with the ability to be carried over and devoted to activities that enable the best use of environmental water over time. And use of this revenue should be publicly reported.

Innovative market approaches

Environmental water holders will require further development of market instruments, particularly in unregulated systems, coupled with the removal of some remaining trade barriers to be able to best use markets to support the achievement of environmental objectives.

In unregulated water systems, water sharing is particularly time-sensitive. Consumptive and environmental users rely on rainfall events to access allocations. In these systems, innovative market instruments have the potential to move water across time that would otherwise not be possible through standard allocation trade. Innovative approaches to trading in unregulated systems include no-pump contracts, store and release arrangements, option mechanisms and conditional leases (BDAGroup and CSIRO 2017, p. 32).

Box 5 presents a case study on a no-pump contract, a market-like mechanism recently trialled by the CEWH as a pilot project to enhance flows to the Narran Lakes and improve outcomes. The New South Wales Government also reported that in 2015-16 it entered into a no-pump contract with a landholder to prevent water extraction from a key lagoon. This volume was compensated with a transfer of general security allocation (New South Wales Government, pers. comm., 11 November 2020).

Operational rules for these sorts of activities need to be fit for purpose to ensure that trade is efficient. For example, in Queensland under the *Water Supply (Safety and Reliability) Act 2008*, the use of waterways as a conduit is only allowed in exceptional circumstances. This prevents water stored privately being traded to a potential downstream buyer. For environmental water managers who may wish to store their allocations for opportunistic use, this restricts their potential to on-sell the water when not needed. Whether this barrier is still fit-for-purpose warrants review. For innovative market instruments to develop and be efficient, appropriate institutional pre-conditions need to be in place (SP B *Trading*).

Internationally, an innovative approach to leverage farmland as temporary wetlands was adopted during California's extreme drought (2011 to 2017). This involved nature conservation groups in California paying rice farmers to keep their fields flooded during the post-harvest months, to allow migratory birds to take refuge in these 'pop-up wetlands' (Weill 2018).

Inquiry participants expressed support for increased use of innovative mechanisms to manage environmental watering. For example, AgForce (sub. 24, pp. 6–7) said:

AgForce supports alternative approaches to the management and use of already held environmental water, such as the use of temporary water markets and mechanisms like 'no-pump' contracts to maximise the value of this water across a broader range of outcomes or shared benefits while not compromising environmental objectives (NWI paragraph 35(iii)). Any water efficiency expectations on consumptive water users should also be applied to managers of environmental water.

Similarly, Lifeblood Alliance (sub. 70, p. 20) commented:

There remains an opportunity to be innovative by using alternative approaches to managing water for the environment, such as greater and more innovative use of temporary water markets and market like mechanisms. For example, the Murray Darling Wetlands Working Group were able to use temporary trade of water to help fund complementary waterway/wetland management activities, and works and measures to enable the supply of environmental water.

Environmental water holders should work with system managers and consumptive water holders to pursue innovative market approaches, as opportunities arise. Innovative market approaches should be assessed relative to their contribution to achieving environmental outcomes. Establishment and transaction costs should be estimated and the risks of implementing the arrangement for all parties should be evaluated (CEWO 2011, p. 18).

Box 5 Case study: Narran Lakes no-pump contracts

The internationally significant Narran Lakes is an important wetland in the northern Murray-Darling Basin. Endangered native waterbirds rely on the lakes to breed and survive. The Narran Lakes are also of immense cultural significance — a meeting place. When water flows, frogs emerge, birds breed, people arrive and ceremonies begin. The lakes system has been important for Aboriginal groups for thousands of years.

An unusually long period of low flows has resulted in ecological decline. In most circumstances, mid-sized flows in the Lower Balonne do not reach the Narran Lakes due to irrigation extractions. The protection of mid-sized flows by limiting extractions can enable some water to reach the lakes.

The Commonwealth Environmental Water Office (CEWO) implemented a market-like instrument in the Lower Balonne in early 2020. This involved offering grants to landholders who agreed to forgo pumping of their water allocations to leave water in the system for the environment.

The grant process was run through a community grant hub within a Commonwealth agency. The grants resulted in 9 GL being left in the Narran River, at a cost of \$2 million. This water contributed to the 90 GL of flow into the Narran Lakes system (measured at the Wilby Wilby gauge). The Commonwealth Environmental Water Holder has undertaken a review of the Narran Lakes event to inform future event management.

The CEWO chose to use this reimbursement grant process to enhance flows in the Narran Lakes because the allocation trade (termed seasonal water assignment) processes currently in place in Queensland could not provide the Commonwealth with sufficient allocation or be implemented in a timely manner. Future changes being considered by Queensland should enable such an acquisition to be completed by allocation trade in the future rather than by a grant process.

The grant process to reimburse irrigators who were prepared to forego the conditions on their licences provided the CEWO with the ability to secure the environmental outcome for the Narran Lakes without exposing it to costs greater than would be incurred through trading seasonal allocations.

Other market-based mechanisms will be considered by the CEWO in due course.

Sources: DAWE (pers. comm., 4 September 2020); DAWE (nd).

NWI RENEWAL ADVICE 8.7: INNOVATIVE MARKET APPROACHES

Environmental water holders should work with system managers and consumptive entitlement holders to pursue innovative market approaches.

Capacity to vary the entitlement portfolio to match ecological requirements

The mix of different entitlement types held by environmental water holders determines the allocations available for use each year. As discussed above, short-term seasonal variations in the demand for, and supply of, environmental water can be managed through allocation trading. However, over time, structural entitlement portfolio issues (such as a mismatch between entitlement reliability and environmental demand) can emerge that nimble seasonal allocation trading cannot address. This has implications for achieving agreed environmental outcomes.

Environmental water holders may require the flexibility to re-balance the portfolio of entitlements based on new knowledge of environmental watering requirements. This will only become more important as climate change compels environmental water holders to re-evaluate their approach to environmental management. To achieve the best environmental outcomes, environmental water holders may, from time to time, need to rebalance entitlement portfolios, and should be empowered to do so under very strict controls. Environmental water entitlements are a major public asset and should not be sold at the cost of diminished environmental outcomes over time.

Changes in environmental water entitlement holdings should only occur against a long-term plan of portfolio requirements, under clear guidelines, with cost-benefit analysis, consideration of possible consequential adjustments to catchment sustainable diversion limits and environmental provisions in water plans, a formal approvals process such as ministerial approval and reported trade activity. These processes would provide confidence that buying or selling entitlements will provide net benefits. This cautious, risk-based approach would mean that entitlement transactions would be expected to be infrequent.

NWI RENEWAL ADVICE 8.8: CAPACITY TO VARY ENTITLEMENT PORTFOLIO

Environmental water holders should be enabled to vary their entitlement portfolio over time to match ecological requirements in a changing climate.

Environmental water entitlement trading should occur as part of a long-term environmental water portfolio management strategy. Governments should develop clear guidelines on the criteria for trading environmental water entitlements including cost-benefit analysis, consideration of possible consequential adjustments to catchment sustainable diversion limits and environmental provisions in water plans, a formal approvals process and publicly reported trade activity.

Delivery of shared community benefits wherever they are compatible with achieving environmental outcomes

As discussed in section 1.5, environmental watering has benefits beyond individual wetlands and river reaches — it can provide other public benefits that contribute to cultural, social and economic outcomes.

Environmental watering contributes both directly and consequentially to other public benefit outcomes.

- For Aboriginal and Torres Strait Islander people, healthy rivers and wetlands are essential to spiritual, cultural and physical wellbeing. Where environmental and cultural water outcomes intersect there are opportunities for environmental water holders to directly contribute to achieving cultural outcomes.
- Site-specific watering events can make a direct positive contribution to recreational opportunities such as recreational fishing and canoeing and rowing regattas.
- Environmental watering of rivers, lakes and wetlands provides consequential benefits via contributing to the strength of local economies and to the health and wellbeing of community members.

For example, the Murray–Darling Basin Authority (MDBA) reported that watering events are contributing both directly and indirectly to social and economic outcomes:

Residents in Victoria report that specific environmental watering activities have contributed to, “bumper recreational fishing catches, increased numbers of bird watchers, improved canoeing and rowing regatta conditions, influxes of campers and bush-walkers and a general improvement in the ‘greening’ of scenery encouraging picnickers and day-trippers.” There are also anecdotal reports from site managers and operators of tourism businesses that environmental flows have directly supported a recovery in visitor numbers to specific sites. (MDBA 2017, p. 5)

The NWI recognises the positive externalities of environmental watering under the agreement that environmental water managers should seek opportunities to achieve other public benefit outcomes.¹⁴ The Commission’s view is that environmental water holders should contribute to those outcomes where doing so does not compromise environmental objectives. This limit is important because the pursuit of other public benefit outcomes may not always align with decisions on the best use of environmental water (including flow volume, timing of delivery and asset prioritisation) to achieve environmental outcomes. If instances arise where competing public benefit outcomes are thought to be of more value to the community than the environmental watering and associated outcomes that would be forgone, then this needs to be the subject of discussion, agreement and the rebalancing of consumptive allocations in water sharing review processes (SP A *Entitlements and planning*).

To maximise the benefits of environmental water, explicit consideration should be given to other public benefit outcomes, provided agreed environmental outcomes are not compromised.

Environmental water holders are increasingly planning watering events and working with Aboriginal and Torres Strait Islander communities to deliver other public benefit outcomes, when they are compatible with achieving environmental outcomes. For example, in Victoria, in 2019 a requirement to consider recreational and Aboriginal cultural values during water

¹⁴ Schedule B(i) defines ‘other public benefits’ as: ‘mitigating pollution, public health (eg. limiting noxious algal blooms), indigenous and cultural values, recreation, fisheries, tourism, navigation and amenity values’.

planning and operations was introduced under the *Water Act 1989* (Vic) (DELWP (Vic) 2019a). The Victorian Government commented:

When planning for and delivering environmental flows, the VEWL [Victorian Environmental Water Holder] and its program partners look for opportunities to achieve shared community benefits in both the short and longer-terms, without compromising environmental outcomes. CMAs [Catchment Management Authorities] engage with Traditional Owners, key stakeholders and the local community to provide local knowledge, views and solutions to inform annual environmental watering priorities during the preparation of their seasonal watering proposals and throughout the year. These proposals form the basis of the VEWL's Seasonal Watering Plan, which sets the scope of potential environmental watering across Victoria for the water year. (Victorian Government, pers. comm., 6 October 2020)

The MDBA (2019c, 2021) *Rivers, the veins of our Country* publications present case studies from First Nations people and environmental water holders on shared cultural and environmental benefits through the delivery of water for the environment. For example:

- a partnership between the CEWO and the Ngarrindjeri Regional Authority (the peak regional organisation of the Ngarrindjeri) is improving the health of the Ngarrindjeri land and waters. Ngarrindjeri are the traditional owners of the Ruwe (Country), waters and Yarlumar-Ruwe (SeaCountry) of the Lower River Murray, Coorong and Lower Lakes (South Australia). In 2019, the Ngarrindjeri Regional Authority delivered 500 megalitres of Commonwealth environmental water to the culturally significant Teringie wetlands. These wetlands provide swan eggs, fish and other food for the community. Native reeds are used for basket weaving and the wetland is an important meeting place for recreation (MDBA 2019c, pp. 16–17)
- the Lindsay-Mulcra-Wallpolla area holds significant cultural value for Traditional Owners and is an important habitat for native fish, such as golden perch, silver perch, Murray cod and freshwater catfish. In 2018, Wallpolla Horseshoe Lagoon (Wallpolla Island, Victoria) was filled by pumping water for the environment from the Murray River. Traditional Owners in conjunction with the Mallee Catchment Management Authority undertook surveys before releasing 120 000 golden perch and silver perch fry. A key take away from the project for the Mallee Catchment Management Authority was the importance of having Traditional Owner input in the delivery of water for the environment, including flexibility in delivery timeframes (MDBA 2021, pp. 14–15)
- the CEWO is providing funding to scientists to work with Traditional Owners so that Aboriginal knowledge can help inform how water for the environment can benefit rivers and wetlands. In 2019-20 members from the Yarkuwa Indigenous Knowledge Centre (a Traditional Owner organisation in Deniliquin) worked with researchers from Charles Sturt University to examine how environmental flows impact turtle movement and condition. Turtle populations in six wetlands along the Edward/Kooley-Wakool river system were monitored. The local knowledge and experience of the Yarkuwa fieldworkers drove the project's success, and they were provided with an opportunity to learn new skills and share knowledge (MDBA 2021, p. 26).

A number of inquiry participants¹⁵ commented that the CEWO has improved collaboration with First Nations people on environmental water decision making through the First Nations Environmental Water Guidance project. The collaborative project, funded by the MDBA and CEWO, helped to frame the way that First Nations, the MDBA, the CEWO and other environmental water holders do business together in setting annual priorities for the use of environmental water. The project was delivered by Murray Lower Darling Rivers Indigenous Nations (MLDRIN) and the Northern Basin Aboriginal Nations and involved the engagement of 32 Nations across the MDB (MLDRIN, sub. 105, p. 5).

But despite the positive steps in collaborative processes, MLDRIN (sub. 105, pp. 6–7) reported that there remains a need for improved engagement and transparency in environmental water prioritisation processes.

It is still unclear in many cases how First Nations' inputs are factored into complex decision-making and trade-offs regarding environmental water use. In most cases, the MDBA and water holders are required only to 'have regard to' First Nations values and uses. This weak and opaque terminology can result in confusion and cynicism, with First Nations disappointed that plans and strategies do not necessarily need to reflect their substantive inputs ...

There is still a strong need for the CEWO to develop a more transparent and structured engagement approach so that all Nations are informed of options to participate and influence planning. There are some promising examples of direct collaboration between Nations and the CEWO, including an environmental water delivery agreement with the Ngarrindjeri regional authority.

Environmental water holders have a responsibility to effectively collaborate and transparently communicate decision making on the delivery of shared benefits from environmental water. In particular, environmental water holders should improve engagement and transparency with Traditional Owners on cultural water decision making and outcomes in environmental water planning processes (SP D *Cultural access*). This includes clear and public reporting on where specific cultural benefits sought by environmental water holders have been achieved and where they were not. And this, in turn, should be fed back into planning as part of an adaptive management process.

A further priority for reform relates to the ability to achieve agreed shared benefits during climatic extremes and an increasingly drying climate. During periods of water scarcity, environmental water allocations are reduced, and other public benefit outcomes from environmental watering may be more difficult to achieve. This was the case in some systems during the Millennium Drought when cultural, social and amenity values derived from water ecosystems declined and recreational and tourism-based industries suffered as visitor numbers dropped (MDBA 2017, p. 3). To plan for an increasingly drying climate environmental water holders should build upon their knowledge of the potential for environmental water to achieve public benefit outcomes under drying climate scenarios.

¹⁵ For example: Northern Basin Aboriginal Nations (sub. 17, p. 2-3); Lifeblood Alliance (sub. 70, p. 23); and Murray Lower Darling Rivers Indigenous Nations (sub. 105, p. 6).

NWI RENEWAL ADVICE 8.9: ACTIVELY PURSUE PUBLIC BENEFIT OUTCOMES

Environmental water holders should:

- give explicit consideration to other public benefit outcomes, including cultural and social outcomes, where they do not compromise environmental outcomes
- improve collaboration and communication with Traditional Owners on cultural water decision making and outcomes in environmental water planning processes
- report on any instances where specific cultural outcomes were unable to be delivered because they were incompatible with agreed environmental outcomes
- build on their knowledge of the potential for environmental water to achieve shared community benefits under drying climate scenarios.

Good governance, including the independence of environmental water holders and independent audit

The stakes in environmental water management are high. Governments hold entitlements worth billions of dollars — the Commonwealth’s holdings alone are valued at over \$3.3 billion (PC 2018, p. 273). Active management by environmental water holders involves making trade-offs between competing environmental needs at different locations and times. And, these decisions affect regional environments and communities, are of significant interest to other water users and involve substantial funds. As a result, best-practice governance is essential to ensure that environmental water is managed appropriately.

Managers require independence

The NWI recognises that environmental water managers must have ‘the necessary authority and resources’ in order to do their jobs well.¹⁶ This authority is likely to be best achieved through governance arrangements that provide independence to the entity responsible for managing the water, so that decision making is free from political interference.

In 2017 the Commission recommended that:

- where governments own significant environmental water that can be actively managed, they should ensure that decisions on the use of this water are made by independent bodies at arm’s length from government
- the Australian and New South Wales Governments should review governance arrangements to ensure that held environmental water and environmental contingency allowances are managed independently of government departments and political direction, and by statutory office holders with an appropriate range of expertise (PC 2017, p. 162).

¹⁶ NWI paragraph 78(ii).

Independence that allows environmental water holders to operate at arm's length from government promotes objectivity in decision making and community 'buy in' to environmental water programs.

During the recent drought, it was suggested that the independence of environmental managers (the CEWH and the New South Wales Office of Environmental Heritage) had been put to the test when significant political pressure was placed on the Australian and New South Wales Governments to provide or sell environmental water allocations to irrigators (O'Donnell and Horne 2018). It has also been argued that CEWH governance arrangements proved effective and robust (Hannam 2018), signalling the CEWH's independence in decision making.¹⁷ In contrast, it is not clear whether the New South Wales Government's decision to sell 15 GL of environmental water allocation to irrigators within the Gwydir, Macquarie, Lachlan, Murrumbidgee and Murray–Lower Darling valleys in 2018 was the best use for the environment (PC 2018, p. 294).

To ensure accountability, any decision to trade environmental water should be based on an objective and transparent approach that takes into account the environmental condition of key assets and the best use of environmental water, free from political interference. The New South Wales Government should review current governance arrangements to ensure that held environmental water is managed independently of government departments and political direction.

In response to the Commission's draft report the NSW Government (sub. DR138, p. 6) submitted that proceeds from the sale of the 15 GL of environmental water in 2018-19:

... were used to support drought related projects that had environmental benefits, such as installing fish screens on irrigation pumps to prevent the loss of small-bodied fish during pumping when water levels are low, weed and feral pest controls, and installation of infrastructure to improve the delivery of environmental water to Tuppall Creek.

Nonetheless, NSW supports the proposal made by the Productivity Commission that it should review current governance arrangements for environmental water management to ensure independence in decision-making, and is already considering potential options.

Independent audit is a requirement under the NWI

Independent auditing is important for accountability and adaptive management. The NWI recognises the need for 'periodic independent audit ... of the achievement of environmental and other public benefit outcomes and the adequacy of the water provision and management arrangements in achieving those outcomes'.¹⁸

¹⁷ The *Water Act 2007* (Cth) (part 6, division 1) prevents the CEWH from disposing of water entitlements unless they are surplus to meeting environmental needs at the time. It also stipulates that the CEWH is not subject to the direction of the Department of Agriculture, Water and the Environment or the Australian Minister for Water when undertaking water trading.

¹⁸ NWI paragraph 79(i)(d).

The National Water Commission (NWC) independently reviewed the arrangements in all jurisdictions for its *Australian Environmental Water Management* reports in 2010, 2012 and 2014. However, these biennial reviews ceased with the abolition of the NWC in 2015.

- In November 2017, an independent panel (Byron 2017) undertook a *Review of the Commonwealth Environmental Water Holder's Operations and Business Processes*.
- In 2018, the Victorian Public Sector Commission was commissioned by the Department of Land, Water and Planning Victoria to review the Victorian Environmental Water Holder's first seven years of operation (VEWH 2019, p. 11).

But, there is currently no consistent or regular basis for this activity.

When water functions were transferred from the NWC to the Productivity Commission, the Productivity Commission became responsible for reviewing the NWI and the Basin Plan. But, the audit of environmental water management was not explicitly transferred. The NWI and Basin Plan inquiries are not a substitute for in-depth consideration of environmental water management. Governments with environmental water entitlements should put independent auditing processes in place.

NWI RENEWAL ADVICE 8.10: INDEPENDENT MANAGERS AND AUDITING

Where governments own significant held environmental water that can be actively managed they should ensure that decisions on the use of this water are made by independent bodies at arm's length from government.

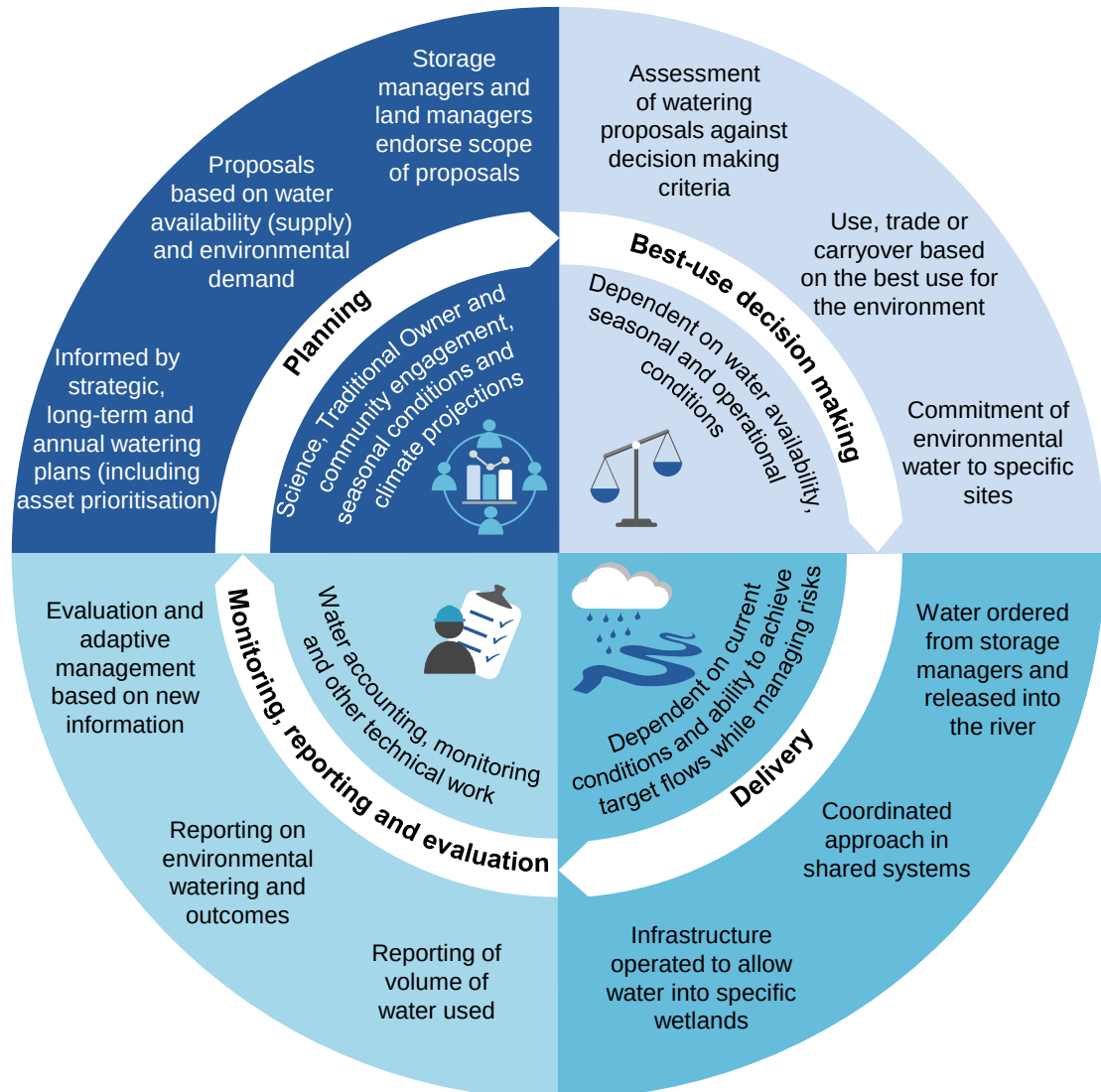
Governments with held environmental water entitlements should provide for independent auditing, on a three-yearly basis, of the adequacy and use of environmental water entitlements to achieve the best outcomes.

Bringing it together — a visual summary of the active management of held environmental water

The active management of held environmental water is a complex, dynamic process, with multiple steps completed by a range of organisations acting in partnership with environmental water managers. The field of environmental water management has evolved rapidly since 2004 when the NWI was agreed and reform efforts were primarily focussed on the recovery of water for the environment. Today, best-use held environmental water management has evolved to follow a continuous, adaptive management cycle of: planning, active decision making; water delivery; and monitoring, evaluation and reporting. This cycle is summarised in figure 5.

Moving forward, it is important that current best-use practices in water planning are embedded in the NWI and that environmental water managers continue to evolve through experience and adapt to new knowledge (section 4).

Figure 5 The held environmental water active management cycle



Sources: adapted from CEWO (2020c); VEWB (2015).

3 Water system managers should use their best endeavours to achieve agreed outcomes

Section 2.1 presented the need for a waterways manager to provide oversight and work collaboratively with all parties to achieve agreed objectives and outcomes. An important aspect of this involves working collaboratively with water system managers. Water system managers are responsible for managing bulk water resources and operating bulk water infrastructure to meet stated objectives (SP E Integrity). Essentially, this involves

maximising the benefits of water use for entitlement holders, the environment and other cultural, economic and social uses (where possible). (The role of the system manager in water resource management is discussed in SP E *Integrity*.)

The decisions and actions of a water system manager can involve making trade-offs that affect water-dependent ecosystems and communities. Achieving agreed (and, where possible, better) environmental and other public benefit outcomes requires a flexible and innovative system manager who is open to experimentation as opportunities arise. This is mostly applicable in systems with actively managed held environmental water, where the timing of environmental watering can be crucial to achieving the best use of environmental water. However, even in systems with just planned environmental water, stakeholders may benefit from a flexible system manager who, for example, is willing to review the timing of planned environmental flows.

In making decisions, a key consideration for the system manager is to ensure that deals are suitable for third parties by avoiding, managing or mitigating impacts to stakeholders, local communities and industries — that is, ensuring that there are no unacceptable third-party impacts.

It is in the interests of all entitlement holders and the community that all opportunities are taken to get the best environmental outcomes possible from the share of water for the environment. The expectation that water system managers should use their best endeavours (while protecting third-party interests) to facilitate the achievement of environmental and other public benefits should be included in the NWI. In practice, this could be achieved through a formal process such as inclusion in a ministerial statement of expectations for water system managers.

For transparency and accountability purposes, governments should report and evaluate system managers' efforts and commitment to facilitate the achievement of agreed environmental and other public benefit outcomes.

Finally, to implement adaptive management through continuous improvement, the system manager should reflect on successes and failures from experimentation among stakeholders and share knowledge to improve practices across systems.

NWI RENEWAL ADVICE 8.11: THE SYSTEM MANAGER'S ROLE IN ENVIRONMENTAL MANAGEMENT

Water system managers should be obligated to use their best endeavours, while protecting third-party interests, to achieve agreed outcomes.

State and Territory Governments should report and evaluate system managers' efforts at facilitating the achievement of agreed environmental and other public benefit outcomes.

4 Effective monitoring, evaluation and reporting

Sections 2 and 3 discussed requirements that are crucial to achieve agreed (and, where possible, better) environmental outcomes, ensure accountability and build public confidence in the use of environmental water. Interconnected with these requirements is the need for adaptive management. Knowledge gained through monitoring and evaluation should be used to continuously improve management decisions.

Environmental water management is not set and forget — continual learning and adapting underpins sustainable management. Monitoring, evaluation and reporting as part of an adaptive management process (one that learns from past experience to improve future decisions) should lead to more efficient and effective water use over time. And these activities will only become more important given the uncertainties of a changing climate.

Monitoring, evaluation and reporting are key inputs to ensuring accountability and building public trust and credibility in the way water is managed. They allow informed judgements on the merits of government decisions to allocate water to the environment, whether through planning frameworks or entitlement acquisitions.

Under the NWI, the focus of environmental monitoring, evaluation and reporting is rightly on outcomes. Progress in environmental management cannot be measured by, or simply attributed to, the volume of environmental water allocated or used. It has to be evaluated on the basis of whether agreed environmental outcomes are being achieved.

Ecological complexity makes monitoring agreed environmental outcomes inherently difficult and costly. Therefore, monitoring, evaluation and reporting should be fit for purpose — that is, commensurate with the risk to, and value of, these outcomes to the community.

For example, Tasmania (which has not identified any overallocation) generally faces a low level of risk in meeting agreed environmental outcomes. It therefore has less need to monitor the outcomes of environmental water provision than jurisdictions facing water resource stress. In contrast, in higher risk areas (such as the WA Gnamptarra Mound) monitoring is critical to ensure these resources are being managed sustainably and adaptively.

However, even in systems without overallocation or resource scarcity, some monitoring of outcomes is necessary to ensure planning arrangements remain adaptive and sufficient to maintain the desired benefits over time.

In complex systems with held environmental water, adaptive management requires greater attention. Managers must make decisions about water use despite significant uncertainty concerning future water availability, ecological responses to water provision and changing on-ground conditions. This inevitably involves trial and error, so it is essential that past learnings are used effectively to inform future decisions. This will only become more important in the future as climate change compels governments to re-evaluate their approach to managing water resources.

In systems with held environmental water, monitoring undertaken over different geographic scales and timeframes is required to ensure that the water is used as effectively as possible and to assess whether the costs are justified. Environmental water holders have a responsibility to monitor and evaluate effectively, and to transparently communicate their objectives, work undertaken, outcomes, and consistency with the watering priorities established in planning processes.

Of particular importance is evaluation and reporting on agreed outcomes that have not been achieved. Key areas of monitoring, evaluation and reporting in systems with held environmental water include: environmental water use; the outcomes of watering events; the achievement of ecological outcomes; and monitoring of environmental objectives (to determine if and when management objectives should be revised).

Monitoring of the size of environmental water holdings and use is undertaken through accounting registers — discussed in SP E *Integrity*. Monitoring, evaluation and reporting on the effectiveness of water use is essential for adaptive management and this is discussed in section 4.1.

4.1 Commitment to adaptive management

Adaptive management is widely recognised as a key overarching principle for effective water management, yet it is not reflected in the NWI and therefore warrants a greater focus in future reforms. The Commission is recommending that adaptive management be included as an overarching principle, under the NWI, across all key areas of water resource management and water service provision (*Report*: chapter 3).

Environmental management requires feedback loops to ensure that the knowledge gained through experience, monitoring, evaluation and research continuously improves management decisions. This particularly applies to held environmental water, which requires decision making in the face of uncertainty. Recent shocks are a reminder that experience, evaluation and the sharing of new knowledge is critical to adaptive management and achieving agreed outcomes.

Environmental holders have committed to and are increasingly recognising the value of adaptive management. For example, box 6 describes the adaptive management response to the 2018-19 fish deaths in the Darling River.

Box 6 Adaptive management case study, 2019 fish deaths

Three significant fish death events occurred in the Darling River near Menindee between December 2018 and January 2019. The events posed a serious ecological shock to the Lower Darling and reversed the positive ecological outcomes that had accrued from past environmental watering programs. The main native fish species impacted included Murray cod, silver perch, golden perch and bony herring, with mortality estimates ranging from hundreds of thousands to over one million fish (Vertessy et al. 2019, p. 8).

An independent panel (Vertessy et al. 2019) was appointed to assess the causes and influencing factors of these deaths and provide recommendations for future management. Consequent priorities for reform are listed in the table below (MDBA sub. 23, p. 10). Foremost amongst these is the recognition of the importance and protection of low flows.

<i>Priorities for policy makers</i>	<i>Priorities for MDB water managers</i>
The protection of low flows	Emergency native fish response and early warning systems
Basin connectivity	Ongoing monitoring
Improving Menindee operations	Collaboration with key stakeholders
Provide joint plans for Northern Basin Toolkit Measures	Management of water for the environment
Increase investment in research and development	Climate change research

In response to the fish deaths, the Australian Government and Basin States have developed the *Native Fish Recovery Strategy* to guide future investment and achieve four key outcomes:

- recovery and persistence of native fish
- threats to native fish are identified and mitigated
- communities are actively involved in native fish recovery
- recovery actions are informed by best available knowledge (MDBA 2020f).

The Australian Government has also injected \$20 million into the *Murray–Darling Water and Environment Research Program* to strengthen scientific knowledge of the Murray–Darling Basin (MDBA 2020h).

And the MDBA (sub. 23, p. 10) has adapted and improved its management activities.

Significantly improved planning and management arrangements for the MDBA were put in place across the 2019-20 summer period to act as our early warning and emergency response system. Across this high-risk period, the MDBA implemented a planned process of sharing information with states to understand risk trajectories and pre-emptive management responses; reporting regularly to MDBA Executive; and triggering urgent advice to the Minister for Water as required. These processes were invaluable both in the context of the higher risk to native fish during summer under drought conditions and also as the bushfire season placed additional pressure on the quality of the Basin's water resources. The MDBA notes the considerable efforts by the Basin states in managing native fish throughout this period, and the spirit of collaboration and information sharing committed to by all stakeholders.

In 2017, the Commission identified that further work on monitoring of environmental outcomes, reporting and auditing was required. In particular, the Commission reported that although there have been some positive developments, some jurisdictions should increase their focus on outcomes, and report more openly about instances where objectives are not achieved (PC 2017, pp. 166–167).

Since 2017, there has been an increased focus on the monitoring and reporting of environmental outcomes. For example, in Queensland, new water plans now include a measure to develop a Monitoring, Evaluation and Reporting Strategy which sets out evaluation questions, monitoring objectives and information to be collected over the life of the water plan. This informs and assists in the evaluation of the plan and whether its outcomes have been achieved (*Assessment*: section 4).

A number of inquiry participants noted improved efforts in monitoring, evaluation and reporting. The Australian Floodplain Association (AFA) (sub. 45, p. 8) commented:

The AFA was impressed with the monitoring and reporting to the community throughout the 2019 Northern Fish Flow event. We commend the Commonwealth Environmental Water Holder for ensuring timely and transparent reporting to interested stakeholders and communities. The AFA recommends that this ‘high-bar’ set a standard for future reporting.

But others stipulated that gaps in monitoring, evaluation and reporting remained in some systems. Lachlan Valley Water (LVW) (sub. 40, p. 4) stated:

LVW believes that the monitoring could be improved. We recommend that an important requirement of monitoring and evaluation programs should be that they must clearly identify the change in conditions as a result of climatic variation, and as far as possible they should distinguish between the additional environmental outcomes achieved as a result of the use of water entitlements held by Commonwealth and state governments, and the outcomes that have occurred as a result of planned environmental water that was already available due to state based water sharing plans.

And the Wentworth Group of Concerned Scientists (sub. 68, p. 2) reported:

The NWI should focus on transparency to improve decision-making, including systematic monitoring of ecosystem information and management ...

The body of knowledge about environmental watering has grown significantly in recent years, but increased effort on monitoring, evaluation and reporting would build on this and enable environmental water managers to improve management and ensure that water for the environment is used effectively and accountably (*Assessment*: section 4).

An ongoing commitment to adaptive management through monitoring, evaluation and reporting is key to achieving agreed outcomes. Governments should establish mechanisms to ensure adaptive management is implemented consistently and explicitly in practice. Jurisdictions should focus on outcomes, and publicly report on agreed outcomes that are not achieved, in addition to those that are, and the reasons why. In the context of a changing climate, progress on agreed outcomes and monitoring of objectives will become an increasingly important input into water planning processes.

Finally, managers of held environmental water should use the results of monitoring, evaluation and research to improve water use as part of an adaptive management cycle. To achieve this, adaptive management should be adequately resourced.

NWI RENEWAL ADVICE 8.12: COMMITMENT TO ADAPTIVE MANAGEMENT

In planned environmental water systems, State and Territory Governments should:

- establish mechanisms to ensure that adaptive management is implemented consistently and explicitly in practice
- ensure adequate monitoring, evaluation and reporting efforts on agreed environmental outcomes, and report openly about instances where these outcomes are not achieved.

Environmental water holders should:

- use the results of monitoring, evaluation and research to improve water use as part of an adaptive management cycle and ensure that this is adequately resourced
- publicly report on environmental water use, the outcomes of watering events, the achievement of ecological outcomes, and monitoring of objectives.

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Australian Government
Productivity Commission

Securing Aboriginal and Torres Strait Islander people's interests in water

Supporting Paper D

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- The National Water Initiative (NWI) is a product of its time, with a focus on achieving cultural outcomes through engagement with Aboriginal and Torres Strait Islander people. Since 2004, Aboriginal and Torres Strait Islander people have articulated their aspirations for access to water for unconstrained use (that is, for both cultural and economic purposes).
- In 2020, all Australian governments signed the National Agreement on Closing the Gap. One desired outcome is that Aboriginal and Torres Strait Islander people maintain their distinctive relationship with water. A target for inland waters is also to be developed.
- Consistent with the co-design approach committed to in the National Agreement on Closing the Gap, a Committee on Aboriginal Water Interests with Aboriginal and Torres Strait Islander membership has been established to develop a new NWI element covering Aboriginal and Torres Strait Islander people's interests in water. This approach could be strengthened by:
 - allowing it to report directly to water ministers
 - coordination with Coalition of Peaks members involved in implementing the National Agreement on Closing the Gap. This would aim to ensure the water outcome and inland waters target under the agreement are reflected in a renewed NWI.
- The delivery of cultural outcomes could be improved through existing frameworks while the new NWI element is being developed, as well as being incorporated into the renewed NWI.
 - Clear, measurable and well-informed cultural outcomes should be agreed in water plans. Monitoring and reporting arrangements that promote accountability and foster learning about what works should also be in place.
 - Cultural outcomes should be pursued through environmental watering where they are consistent with achieving agreed ecological objectives.
 - Local catchment or land management authorities should establish long-term relationships with Traditional Owners and engage with them on the management of cultural assets.
- Governments need to work with Traditional Owners to determine their best and preferred pathway for ongoing economic development. Where agreement is reached that access to consumptive water entitlements is the best way to support economic development, that access should be facilitated within existing entitlement frameworks.
 - Where the consumptive pool is fully allocated, water should be bought from the market.
 - Where the consumptive pool has not been fully allocated, reserves can be created, as has happened recently in the Northern Territory, Queensland and Western Australia.
 - Where governments invest in new water infrastructure, consideration should be given to reserving a share of any new water rights for Traditional Owners where this would be consistent with, and support, targets under the National Agreement on Closing the Gap.

Water is an essential part of connection to Country for Aboriginal and Torres Strait Islander people. Many water sources are featured in the Dreaming (oral histories of creation) and have significant spiritual value. They also support economic activity, including food production, and provide potable water — with cultural significance accompanying each water use. Special places near water have been sites for large gatherings for ceremonial, social or economic purposes. Rivers, creeks and lakes often mark boundaries between groups and nations. And waterways have been transportation routes, with travel and trading

partnerships defined by cultural relationships (National Cultural Flows Research Project 2014, p. v). In other words, the water needs of Traditional Owners span a wide range of cultural and economic purposes.

A number of inquiry participants highlighted the importance of water to Traditional Owners.

Maintaining spiritual and cultural relationships with land, water and Country are crucial for Aboriginal people. The right to economically develop natural resources, consistent with cultural obligations, is also of significant importance. (NSWALC, sub. 96, p. 2)

Land, water and people are inextricably connected, which means unity of land, water and Indigenous people. (IRG, sub. 103, p. 7)

... our involvement in the management of water is essential for our physical, spiritual, cultural, environmental, social and economic health ... (NBAN, sub. 17, p. 2)

Reflecting Traditional Owners' connection with water and Country, governments committed through the National Water Initiative (NWI) to recognise Aboriginal and Torres Strait Islander people's needs in relation to water access and management,¹ and agreed to a number of actions to support achievement of this outcome.² These were:

- the provision of access to water resources, in accordance with relevant legislation, through planning processes that ensure:
 - inclusion of Indigenous representation in water planning, wherever possible
 - incorporation of Indigenous social, spiritual and customary objectives — and strategies for achieving them — in water plans, wherever they can be developed
- that water planning processes take account of the possible existence of native title rights to water in a catchment or aquifer area
- that water allocated to native title holders for traditional cultural purposes be accounted for.

While the NWI is the primary national articulation of policy concerning the water interests of Traditional Owners, a number of other national Acts and agreements are also relevant, including the:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) (ATSIHP Act)
- *Native Title Act 1993* (Cth) and associated agreements
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- National Agreement on Closing the Gap.

A range of State and Territory policies and legislation also influence Traditional Owners' access to water resources.

¹ NWI paragraph 25(ix).

² NWI paragraphs 52–54.

This supporting paper focuses on access to water for cultural and economic purposes. The provision of safe water for remote communities and broader public health implications is examined in *SP G Regional*.

This paper includes:

- background on the NWI and progress to date against agreed outcomes (section 1)
- advice to governments on:
 - a co-design process to develop a new NWI element addressing Aboriginal and Torres Strait Islander people’s interests in water (section 2)
 - approaches to delivering cultural outcomes through water management frameworks (section 3)
 - a contemporary focus on access to water for economic use (section 4).

1 The NWI does not reflect Traditional Owners’ aspirations

1.1 Written in 2004, the NWI is a product of its time

The 1990s were a significant era for the recognition of Aboriginal and Torres Strait Islander people’s right to access their traditional lands, with the landmark decision in *Mabo v Queensland [No 2]* 1992³, and the associated Native Title Act, recognising limited rights to use water on native title land.

By the end of the 1990s, Australian governments had developed a greater understanding of Aboriginal and Torres Strait Islander people’s connection to Country and that water was also a central part of that connection. The NWI placed Aboriginal and Torres Strait Islander people’s access to water on the national water policy agenda, and was the first step towards improving access. However, this was mainly through seeking to improve consultation with Traditional Owners during water planning processes and ensuring that water plans considered cultural values.

1.2 Traditional Owners have further articulated aspirations to include economic use

While the NWI includes provisions that recognise and provide for cultural values in water plans, at the time, these were considered to include social, spiritual and customary uses of water — that is, values that are frequently aligned to or dependent on the condition of environmental assets.

³ HCA 23.

However, in the years since the NWI was agreed, Aboriginal and Torres Strait Islander people have further defined and articulated their thinking on water. In 2007, 31 First Nations in the Murray–Darling Basin (MDB) endorsed a statement on their rights and aspirations relating to water management — the Echuca Declaration. The declaration defined cultural flows as:

... water entitlements that are legally and beneficially owned by the Indigenous Nations of a sufficient and adequate quantity and quality to improve the spiritual, cultural, environmental, social and economic conditions of those Indigenous Nations. This is our inherent right. (MLDRIN 2007, p. 2)

It also: described a range of environmental, social and economic conditions that would be improved for First Nations if cultural flows outcomes were achieved; set out mechanisms for delivering cultural flow outcomes; and commented on the quantity of cultural flows needed.

The key difference between the NWI and the Echuca Declaration was that the latter explicitly broadened cultural outcomes (which were to be achieved by the provision of cultural flows) to include economic development.

The subsequent National Cultural Flows Research Project (2011–2018), funded by several Commonwealth agencies⁴, articulated how cultural flows might be implemented (National Cultural Flows Research Project 2018). The project, a collaboration between peak Aboriginal organisations, Australian Government agencies and private organisations, developed a framework to conceptualise how the aspirations of Aboriginal and Torres Strait Islander people could be met through legal and policy reforms (figure 1).

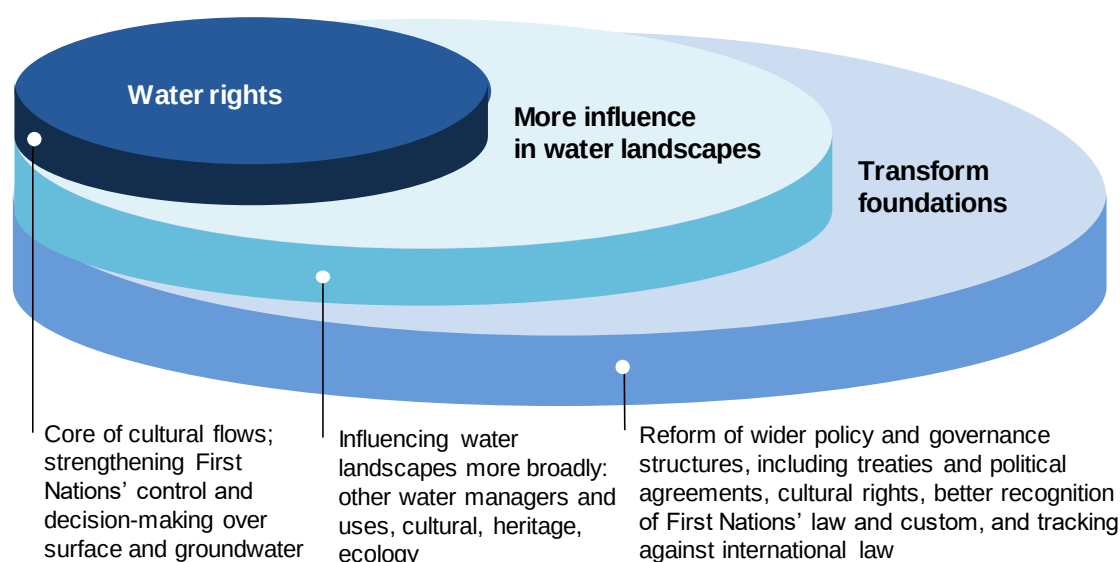
The framework identifies mechanisms for:

1. improving water rights (such as through the creation of Aboriginal Strategic Reserves in undeveloped regions and the purchase of entitlements in fully developed regions)
2. increasing influence in water landscapes (such as through strengthened recognition of First Nations' objectives in water management plans)
3. transforming the broad foundational context in which water management is undertaken.

The National Cultural Flows Research Project was developed for the benefit of First Nations across Australia, with a focus on the MDB. Throughout Australia, Aboriginal and Torres Strait Islander people have been working towards increasing their influence in water management using 'governance models that fit the context and direction of Traditional Owners' (Martuwarra Fitzroy River Council and Water Justice Hub, sub. 80, p. 1).

⁴ The Murray–Darling Basin Authority, the Commonwealth Environmental Water Office, the National Water Commission, and the Department of Families, Housing, Community Services and Indigenous Affairs.

Figure 1 The National Cultural Flows Research Project framework introduced three legal and policy approaches to cultural flows



Source: National Cultural Flows Research Project (2018).

The Martuwarra Fitzroy River Council has developed a complementary proposal to the National Cultural Flows framework: a Conservation and Management Plan for the heritage listed Fitzroy River Catchment (RiverOfLife Martuwarra et al. 2020). Traditional Owners have proposed the plan to the Western Australian Government to jointly manage the Fitzroy River. The proposed plan places the Martuwarra, the River of Life (the Fitzroy River), at the centre of decision making, incorporates first law (the system of Aboriginal governance), and is built on the traditional knowledge of six independent Nations.

Two other key developments of relevance to the issue of access to water for Aboriginal and Torres Strait Islander people have occurred since the NWI was agreed.

First, as noted by a number of inquiry participants⁵, in 2009, Australia adopted the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Articles 25, 26 and 32(2) of the declaration are particularly relevant to water access (box 1). The IRG (sub. 103, p. 17), for example, recommended that:

Governments adopt the United Nations Declaration on the Rights of Indigenous People as a guide to engaging with Indigenous people in the design and implementation of a new National Water Initiative.

⁵ Martuwarra Fitzroy River Council and Water Justice Hub, sub. 80, p. 1; NSWALC, sub. 96, p. 1; IRG, sub. 103, p. 17.

Box 1**UNDRIP provides an underpinning for Traditional Owner involvement in water management****Article 25**

Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources to uphold their responsibilities to future generations in this regard.

Article 26

1. Indigenous peoples have the right to their lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired.
2. Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use, as well as those which they have otherwise acquired.
3. States shall give legal recognition and protection to these lands, territories and resources. Such recognition shall be conducted with due respect to the customs, traditions and land tenure systems of the indigenous peoples concerned.

Article 32(2)

States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources.

Source: UN (2007).

Second, in 2020, a new National Agreement on Closing the Gap was signed by all governments. The agreement establishes four priority reforms to transform the way governments work with Aboriginal and Torres Strait Islander people, and establishes targets for improvements in socioeconomic conditions (box 2).

The National Agreement on Closing the Gap has implications for a new NWI in two key ways. First, the four priority reform areas transform the wider policy and governance context in which any new policy affecting Aboriginal and Torres Strait Islander people would be negotiated. These broad reform areas effectively reflect progress in the third component of the National Cultural Flows Research Project framework (transform foundations) and set the context within which a new NWI would be developed. Second, it includes several water-related commitments. One outcome sought is that ‘Aboriginal and Torres Strait Islander people maintain a distinctive cultural, spiritual, physical and economic relationship with their land and waters’ (Australian Governments and the Coalition of Peaks 2020, p. 34). And a new inland waters target is to be designed to:

... measure progress towards securing Aboriginal and Torres Strait Islander interests in water bodies inland from the coastal zone under state and territory water rights regimes. This will include data development to identify a nationally consistent measure for inland waters encompassing, for example, water licences, water rights and water allocation plans. (p. 36)

Box 2**The National Agreement on Closing the Gap seeks to improve outcomes for Aboriginal and Torres Strait Islander people**

In 2008, the Council of Australian Governments established a Closing the Gap strategy with the aim of improving outcomes of Aboriginal and Torres Strait Islander people in the areas of health, education and employment. The strategy had mixed results, with improved outcomes in some areas and unchanged or worse outcomes in others (SCRGSP 2016).

In July 2020, all governments signed a new National Agreement on Closing the Gap. The agreement takes a new approach — shared decision making and co-design of policies between government and Aboriginal and Torres Strait Islander organisations. This represents a shift towards a genuine partnership with Aboriginal and Torres Strait Islander people, based on ‘the belief that when Aboriginal and Torres Strait Islander people have a genuine say in the design and delivery of services that affect them, better life outcomes are achieved’ (Australian Governments and the Coalition of Peaks 2020, p. 2). Four priority reforms aim to transform the way governments work with Aboriginal and Torres Strait Islander people. These are:

- strengthening and establishing formal partnerships and shared decision making
- building the Aboriginal and Torres Strait Islander community-controlled sector
- transforming government organisations so they work better for Aboriginal and Torres Strait Islander people
- improving and sharing access to data and information to enable Aboriginal and Torres Strait Islander communities to make informed decisions.

In addition to the reforms, the new agreement includes 16 socioeconomic targets across a range of areas, and an additional four targets to be developed. Two of these targets to be developed are relevant to the refreshed National Water Initiative.

- The community infrastructure target ‘will measure progress towards parity in infrastructure, essential services, and environmental health and conditions. This will include data development to measure essential service provision to Aboriginal and Torres Strait Islander communities, including water and sewerage, waste management, road reserves and electricity supply, as well composite measures to capture all aspects of the target’ (Australian Governments and the Coalition of Peaks 2020, p. 36). This is discussed further in SP G *Regional*.
- The inland waters target ‘will measure progress towards securing Aboriginal and Torres Strait Islander interests in water bodies inland from the coastal zone under state and territory water rights regimes. This will include data development to identify a nationally consistent measure for inland waters encompassing, for example, water licenses, water rights and water allocation plans’ (Australian Governments and the Coalition of Peaks 2020, p. 36).

A target will also be developed for service provision for communities (*Report*: chapter 12). A renewed NWI will have to meet these government commitments — both in the way it is developed and its policy content.

1.3 Despite limited NWI objectives, progress was slow

Progress on addressing Aboriginal and Torres Strait Islander people's interests in water was slow in the years after the NWI took effect. In 2011, the National Water Commission commented that:

most jurisdictions ... improved consultations with Indigenous communities in water planning and management, but [had] generally failed to incorporate effective strategies for achieving Indigenous social, spiritual and customary objectives in water plans, as envisaged under the NWI. (NWC 2011, p. 46)

Similarly, in 2017, the Productivity Commission concluded that most jurisdictions had 'routinely failed to identify and provide for Indigenous cultural values and objectives in water plans' (PC 2017, p. 99).

1.4 Support for a renewed NWI to help realise Traditional Owner aspirations is widespread

Many inquiry participants expressed support for a renewed NWI to better reflect the aspirations of Aboriginal and Torres Strait Islander people, and argued that more needs to be done to achieve Traditional Owners' aspirations to access water (for example, box 3).⁶ For example, the NSW Government said that it:

... strongly supports the focus the Productivity Commission has given to discussing Aboriginal and Torres Strait Islander people's interest in water in the Draft Report and agrees that this requires a focus in the revised NWI. (sub. DR138, p. 6)

Reflecting the water-related outcome and targets under the National Agreement on Closing the Gap, the disparity between the NWI and Aboriginal and Torres Strait Islander people's aspirations, and the slow progress on improving recognition of Traditional Owners' interests in water for much of the life of the NWI, a new objective and element dedicated to Aboriginal and Torres Strait Islander people's interests in water should be included in the renewed NWI. The overarching goal of the agreement should also recognise Aboriginal and Torres Strait Islander people's interests (*Report*: chapter 3).

The Commission's advice on a renewed NWI reflects the three components of the National Cultural Flows Research Project's framework: transforming the foundations of national water reform through partnership (section 2); strengthening Aboriginal and Torres Strait Islander people's influence in water management systems to achieve cultural outcomes (section 3); and addressing water rights to reflect commitments under the National Agreement on Closing the Gap (section 4).

⁶ IWF, sub. DR120, p. 2; LBA, sub. DR133, p. 1; NLC, sub. DR134, p. 25; NSW Government, sub. DR138, pp. 6-7; WWF Australia, sub. DR139, p. 1; PIAC, sub. DR156, p. 10; MLDRIN, sub. DR185, p. 4.

Box 3 Inquiry participants expressed support for First Nations aspirations in water

Inquiry participants in the broader community raised the importance of water access for First Nations.

The needs of Indigenous communities to access and manage water have been a marginal consideration for policy makers, relative to the attention and effort given to (a) environmental restoration in regions such as the [Murray–Darling Basin], (b) structural adjustments and the vitality of irrigation communities, and (c) developing northern Australian water resources ... there is a risk that inaction will undermine the achievements of the land rights era of reforms ... In drafting the NWI, COAG did not properly consider the implications for Indigenous peoples of separating land and water titles and these urgently need serious and close attention to avoid or ameliorate adverse impacts. (Jackson, sub. 61, p. 1)

In recognition of the role water plays for the economic and overall well being of [I]ndigenous populations, WaterRA is a strong supporter of research and collaboration with [I]ndigenous groups with the aim to resolve water access or technological (e.g., water treatment) issues. We encourage the NWI to embrace the positive challenge to co-create a suitable framework with the [I]ndigenous leadership. (WaterRA, sub. 98, p. 4)

Implementation of the NWI has failed to adequately recognise, support and improve the water requirements of Indigenous Australians across the various jurisdictions. Further, the NWI itself is not ‘fit-for-purpose’ in meeting the future water requirements of Indigenous Australians and their communities. (IWF, sub. 30, p. 7)

It is well-established that the identity, culture and wellbeing of First Nations are intrinsically linked to land and water, yet there are limited opportunities for First Nations to participate in water planning and management, or access water for their cultural and economic needs. This is in part due to an ongoing lack of understanding of and support for cultural water. The NWI objectives should be strengthened to reflect the need to increase First Nations’ access to water to complement direct involvement in planning and management of water resources. (MDBA, sub. 23, p. 6)

1.5 The Commission’s advice does not include fundamental changes to water allocation and property rights regimes

Some participants to this inquiry called on the Commission to advise governments to directly address the loss of Aboriginal and Torres Strait Islander people’s traditional rights in a renewed NWI. British settlement in Australia meant that Aboriginal and Torres Strait Islander people were dispossessed of their traditional rights and denied sovereignty or property rights over land and water. The relocation of many Aboriginal and Torres Strait Islander people to reserves, and policies aimed at assimilation, added to the damaging effects of this dispossession.

Settlement, containment, regulation and assimilation processes greatly diminished the capacity of Aboriginal peoples to manage and utilize their land and waterscapes, with profound effects on peoples’ abilities to maintain language, knowledge of environments and cultural landscapes, and to adhere to customary tenure institutions. (Hartwig, Jackson and Osborne 2020, p. 5)

As discussed below, the 2004 NWI sought to recognise Aboriginal and Torres Strait Islander people’s needs through consultation with Aboriginal and Torres Strait Islander people in water planning and inclusion of cultural values in water plans. The Commission’s advice goes further by recommending, as per the preceding discussion, that Aboriginal and Torres Strait Islander

people's interests are elevated in the renewed NWI through greater recognition in the goal and objectives of the new Agreement and through inclusion of a new element.

LBA (sub. DR133, p. 2), WWF Australia (sub. DR139, p. 1) and MLDRIN (sub. DR185, p. 3) suggested that the following wording be included within the renewed NWI's overarching goal.

In committing to this agreement, the Parties recognise First Nations peoples' reverence and responsibility for rivers and groundwater systems, and their enduring rights to manage and access water resources.

However, the Commission has not included reference to First Nations people's enduring rights to manage and access water in its advice. Addressing the dispossession of Aboriginal and Torres Strait Islander people's traditional rights would be a vast exercise potentially involving fundamental change to current property rights regimes, which would have far-reaching consequences. Renewal of the NWI is not the appropriate vehicle for the Australian community to consider such change. Similarly, the Commission is not in a position to direct governments to increase water allocations to Aboriginal and Torres Strait Islander people, as requested by MLDRIN (sub. DR185, p. 2), nor 'to action reforms that will commit state governments to progress water hand backs to First Nation's people' (p. 6). Decisions that involve the reallocation of resources from one group in the community to another have to rest with governments, who are elected to make the judgements inherent in those decisions.

As such, the Commission has framed its advice on how Aboriginal and Torres Strait Islander people's aspirations might be met within existing frameworks. This means that the advice below on access to water for economic and cultural purposes has been separated, although we acknowledge that some participants do not support this separation. For example, MLDRIN observed that:

... it is inconsistent with First Nations' cultural protocols to treat water for "cultural outcomes" and "economic development" separately. (MLDRIN, sub. DR185, p. 4)

Discussion on access to water for cultural and economic purposes is contained in sections 3 and 4 of this supporting paper respectively.

FINDING 9.1

Much more needs to be done to include Aboriginal and Torres Strait Islander people's interests in water in jurisdictional planning and the management of water. Slow progress against commitments made in the 2004 National Water Initiative, coupled with the contemporary context including the National Agreement on Closing the Gap and wide support for action, warrants recognition of Aboriginal and Torres Strait Islander people's interests in water in the overarching goal of a renewed National Water Initiative, and inclusion of both a dedicated objective and new element.

2 A renewed NWI

As noted above, the Commission considers that the renewed NWI should include greater recognition of Aboriginal and Torres Strait Islander people's interests in its goal and objectives, as well as a new element relating to Aboriginal and Torres Strait Islander people's interests.

The National Agreement on Closing the Gap provides the broader context for how this new policy should be developed and some of the targets it needs to address. Given the commitment to partnership, the new element should be developed through a co-design process with Aboriginal and Torres Strait Islander people.

This would be consistent with aspects of the third component of the National Cultural Flows framework. While the full description of the component is potentially far-reaching and includes references to treaty-making, key aspects are focused on partnership and co-governance to provide First Nations with a voice in the management of water resources and landscapes. Elements of the component also note the need to better recognise and implement existing agreements such as UNDRIP (and the National Agreement on Closing the Gap could have been referenced in this component had it been in place at the time the framework was developed).

Consistent with the idea of co-design and increasing the voice of First Nations people, the National Water Reform Committee has recently established the Committee on Aboriginal Water Interests (CAWI) (box 4). CAWI, which has Aboriginal membership, is tasked with developing a new element for the NWI addressing Aboriginal and Torres Strait Islander people's interests in water. The Commission supports this approach, but notes that to give issues associated with Aboriginal and Torres Strait Islander people's interests in water the status in policy making implied by the National Agreement on Closing the Gap, CAWI should report directly to water ministers overseeing the development of the renewed NWI (*Report*: chapter 4).

A diverse group is essential to ensure that the content of a renewed NWI reflects the diversity of Aboriginal and Torres Strait Islander knowledges and perspectives on water. CAWI has Aboriginal members who bring a deep understanding of water resource management, and a variety of perspectives. It also includes representatives from multiple States and Territories to cover variation in governance models due to differences in geography and culture, and has a gender balance to cover both Men's and Women's Business.

Content of the new element will need to align with governments' commitments under the National Agreement on Closing the Gap — actions consistent with the water outcome and targets could be included. There would therefore be significant benefits from coordination between CAWI and the Coalition of Peaks members involved in developing the implementation arrangements for the National Agreement on Closing the Gap, particularly development of the inland waters target. The Commission also recognises the committee's experience and knowledge in water resource management. To ensure this knowledge is

available to the Coalition of Peaks if required, the CAWI's terms of reference should allow for it to advise on, and contribute to, development of the inland waters target if requested.

Box 4 The Committee on Aboriginal Water Interests

The National Water Reform Committee (NWRC) has recently established the Committee on Aboriginal Water Interests to develop a new element for the National Water Initiative relating to Aboriginal and Torres Strait Islander people's interests in water. The committee comprises twelve Aboriginal members from different States and Territories who have deep understanding of water resource management, and who bring a variety of perspectives and work within diverse governance models.

According to the committee's terms of reference, its role is to identify and inform the NWRC on:

- national Aboriginal water policy principles that will support the national Aboriginal water policy framework
- priority national water reform directions (priority directions) that:
 - set out better practice for culturally appropriate policy and legislative frameworks for Aboriginal water interests and influence government activities (including meeting Sustainable Development Goal 6 outcomes), action, investment, and policy
 - recognise Aboriginal water rights, increased access and/or ownership of water entitlements, and decision-making practices in determining outcomes that support cultural, spiritual, economic, social and environmental outcomes
- preferred funding model/s for the implementation of priority directions
- actions to enhance the co-design and nationhood capacity of Aboriginal Peoples in relation to water, which incorporate a quinary bottom line approach (cultural, spiritual, economic, social and environmental) and build the capacity of Aboriginal women, men, children and youth.

Decisions on advice to the NWRC will be made by consensus. Committee members have been appointed for a term of 24 months, and will meet at least four times a year.

2.1 Existing frameworks can be used to deliver outcomes while the NWI is being renewed

While this policy work is being undertaken by CAWI, the Commission considers that existing frameworks can still be used to deliver improved water outcomes for Aboriginal and Torres Strait Islander people (as stated above). However, in working within the existing water management frameworks, it is necessary to differentiate the aspirations of Aboriginal and Torres Strait Islander communities for water for economic development from the cultural outcomes envisaged under the original NWI. The former requires the provision of consumptive water entitlements, able to be used for a range of purposes, while the latter can be achieved by enhancing the influence of Traditional Owners in relevant water planning and management processes.

These two approaches align with the first and second components of the Cultural Flows framework (figure 1), and are discussed in the sections below. As noted above, we

acknowledge that that some participants do not agree with this approach and would like to see more fundamental change in land and water management. The Commission's advice in both these sections is directed at governments, and for consideration by the Committee on Aboriginal Water Interests as they develop the new Indigenous element of the NWI.

3 Achieving cultural outcomes through enhancing the influence of Traditional Owners in water planning and management

Cultural values relating to water are complex and diverse, and may vary significantly between Aboriginal and Torres Strait Islander peoples. Recent work provides one insight into their breadth (box 5). The key is that cultural values are inextricably linked to the environmental condition of Country. Given this, the most effective way of achieving cultural outcomes is through enhancing the influence of Traditional Owners in the water management processes that most affect their Country. These include water planning, where the trade-offs between social, economic, environmental and cultural outcomes are agreed, and environmental water management and natural resource management (NRM), in which on-ground action is taken to achieve agreed environmental outcomes.

The following discussion reflects recommendations made by the Commission in 2017 (PC 2017). Since then, there has been little progress in some areas (*Assessment*: section 1.6) and the Commission's 2017 recommendations remain relevant. In other areas, progress has been better, meriting advice to support governments in going further.

Box 5 Aboriginal and Torres Strait Islander people's water values are wide ranging

For Aboriginal and Torres Strait Islander people, rivers, wetlands, aquifers and other water bodies have interdependent cultural, social, spiritual, customary and economic significance.

The Aboriginal Water Initiative collated a list of water dependent cultural values in New South Wales through direct engagement with local Traditional Owners. These cultural values include (but are not limited to):

- creation sites along a Songline or Dreaming track
- teaching sites where knowledge and language are passed on to the younger generation
- gender specific sites for Men's and Women's Business
- ceremonial sites or meeting sites
- resource sites for cultural practices
- burial places or sites
- massacre sites
- sites that contain evidence of occupation
- culturally specific environmental conditions to sustain totemic species or cultural keystone species.

Source: Moggridge, Betteridge and Thompson (2019, p. 276).

3.1 Water planning is a key vehicle for achieving cultural outcomes

While States and Territories have engagement mechanisms in place, progress on embedding cultural values in water plans and achieving cultural outcomes remains insufficient.

In 2017, the Commission found that most jurisdictions had taken steps towards engaging Traditional Owners in water planning, and as a result have started to recognise cultural water needs in these processes. But more could be done. The Commission recommended that cultural objectives and outcomes should be explicitly agreed, specified and provided for in water plans and that progress in achieving those objectives should be regularly monitored and reported publicly (PC 2017, p. 109).

Since 2017, many States and Territories have made some progress (box 6).

However, there should be further development. Reiterating the Commission's conclusion from its 2017 assessment, States and Territories should ensure both the specification of clear, measurable and well-informed cultural outcomes in water plans, and monitoring and reporting arrangements that promote accountability and foster learning about what works (PC 2017, p. 18).

Renewal of the NWI should embed principles consistent with these outcomes (*Report*: chapter 9), and ensure performance against these commitments is tracked.

3.2 Cultural outcomes can also be pursued through environmental water management

Because cultural outcomes are frequently dependent on or aligned with environmental values and condition, environmental water management can often achieve both environmental and cultural outcomes. This is particularly the case in the MDB and southern Victoria where there is held environmental water and environmental water managers make active decisions on the key locations and timing for its use. For example, environmental flows could be planned to support bird breeding, fish movement or recruitment, or vegetation regeneration, which may be aligned with cultural objectives.

However, it is important that water managers do not assume that environmental and cultural outcomes always align. For example, the NWC noted that:

Species of importance scientifically or to peak groups such as recreational fishers or tourism, may not align with those required by traditional owners for food or ceremonial purposes. (NWC 2014, p. 422)

Box 6 **Attainment of cultural outcomes is a work in progress**

Action to embed, achieve and report on cultural outcomes in water plans has varied around the country.

As MLDRIN (sub. 105, p. 8) noted:

Some plans also include principles, objectives and strategies to recognise and protect First Nations water-dependent values and outcomes ... For example, amended [Water Sharing Plans]^a in NSW include Objectives, Strategies and Performance Indicators relating to First Nations water interests. [But t]he practical value of these provisions is unclear. [Water Allocation Plans] in [South Australia] also include extensive description and recognition of First Nations water interests.

Similarly, all new water plans from 2018 in Queensland explicitly recognise the importance of water resources to Aboriginal and Torres Strait Islander people. Water plans must include strategies for the achievement, monitoring and reporting of cultural outcomes (Business Queensland 2020).

Victoria's annual report on Traditional Owner outcomes have been incorporated into water resource plans, as per Murray–Darling Basin Plan requirements (DELWP (Vic) 2019).

Other States and Territories are working to better incorporate cultural outcomes into water planning.

- The Western Australian Government has started to incorporate cultural outcomes in water plans through work in the north of the state (DWER (WA), pers. comm., 21 September 2020).
- The Tasmanian Government (pers. comm., 9 September 2020) has been focusing on better engaging the Tasmanian Aboriginal community in water planning in recent years, however, it is yet to result in specific cultural outcomes in water plans.
- In the Northern Territory recent water allocation plans have highlighted the need for ongoing work to identify Aboriginal cultural values and their water requirements (Northern Territory Government, pers. comm., 4 September 2020).
- In the Australian Capital Territory, development of its water resource plans was a strong catalyst to implement a framework to provide for cultural water for the Ngunnawal community. The water resource plans state the ACT Government will work with the Ngunnawal people to identify cultural water flow opportunities and support the community in obtaining water access entitlements (EPSDD (ACT), pers. comm., 21 September 2020).

^a The submission refers to Sustainable Water Strategies (SWSs), which was an error (MLDRIN, pers. comm., 25 November 2020).

In 2017, the Commission recommended that environmental water planning processes should provide explicitly for other public benefit outcomes (including cultural) where these are compatible with environmental outcomes (PC 2017, p. 156). (These benefits are discussed in SP C *Environment*.) It also found that there should be 'public reporting of how Indigenous cultural objectives have been considered in the management of environmental water — both held and planned' (PC 2017, p. 109). Since then, engagement of Aboriginal and Torres Strait Islander people in environmental watering activities, and reporting on those activities, has broadly improved (box 7).

Box 7**First Nations' participation in environmental water management has improved**

Within the Murray–Darling Basin:

... basin water holders, and state governments, are now required to self report on how they have engaged with and supported First Nations outcomes through environmental watering, under the 2018 Water (Indigenous Values and Uses) Direction. The first 'First Nations People participation in environmental watering' report was released in 2019. (MLDRIN, sub. 105, p. 2)

The 2020-21 environmental watering priorities are the first to have included the perspectives of First Nations people. We worked with the Murray Lower Darling Rivers Indigenous Nations (MLDRIN), the MDBA and the Commonwealth Environmental Water Office in a project called 'the First Nations Environmental Water Guidance Project' to articulate guidance for the environmental watering priorities. (NBAN, sub. 17, p. 2)

In 2018-19, the Victorian Environmental Water Holder documented cultural values and objectives, and identified priority cultural sites for rehabilitation through Aboriginal Waterways Assessments and partnered with Traditional Owners through:

- working with Aboriginal Water Officers from the local Catchment Management Authority
- planning environmental flows with Traditional Owners to deliver cultural outcomes
- monitoring plants and animals in collaboration with Traditional Owners
- the appointment of an Aboriginal Commissioner in 2019 (VEWH 2019).

A renewed NWI should build on progress and current practice by requiring environmental water holders to engage and promote cultural outcomes through environmental watering provided they are consistent with agreed ecological obligations. Environmental water managers will need to ensure that Traditional Owners are engaged in long-term and meaningful ways to identify cultural values and outcomes specific to Country. These processes will need to be supported by sufficient time and resources for environmental water managers and Traditional Owners to ensure Traditional Owners' full participation. Further discussion is presented in SP C *Environment*.

3.3 Traditional Owners need to be involved in broader natural resource management programs

As described in SP C *Environment*, the provision of water for the environment is a critical element in achieving agreed environmental (and aligned cultural) outcomes, but it is not sufficient. The management of environmental water needs to take place within a broader NRM program (SP C *Environment*: section 2.1). NRM programs aim to manage land and water in an integrated way to reduce environmental degradation and to achieve agreed community objectives.

Engaging Traditional Owners in NRM is a key avenue to recognise, maintain and strengthen their connection to Country. Involvement in NRM also provides an opportunity for Traditional Owners and catchment or land management authorities to partner in the management of cultural assets.

Over the years, there have been many initiatives to more actively involve Aboriginal and Torres Strait Islander people in the management of natural resources (box 8). However, some issues remain, for example in relation to Aboriginal people's ability to physically access river banks. And even where communities are able to access rivers for NRM purposes, further support, such as funding for works, may be required to maximise the value of NRM activities (NSW DPIE, pers. comm., 7 April 2021).

Box 8 Many natural resource management initiatives have featured partnerships with Traditional Owners

Since 1997, the Australian Government's Indigenous Protected Areas program has been assisting Aboriginal and Torres Strait Islander communities to conserve their land or sea Country while allowing for sustainable development.

The Australian Government's National Landcare Program, including its previous incarnations (Caring for Country, National Heritage Trust), has been operating since 1996. More recent programs have provided opportunities for stronger participation of Aboriginal and Torres Strait Islander people in the planning and delivery of National Landcare Program investment and outcomes.

In 2013, the New South Wales and Australian Governments purchased 86 000 hectares of the Murrumbidgee floodplain in southern New South Wales for the Nimmie Caira Project. In 2017, a consortium led by the Nature Conservancy and including the Nari Nari Tribal Council was successful in tendering to manage the site.

Under the Water for Victoria program, the Victorian water sector is diversifying its workforce. In 2018, Victorian water corporations and catchment management authorities were developing traineeship and employment programs for Traditional Owners and Aboriginal people in Victoria.

Since 2017, under the *Yarra River Protection (Wilip-gin Birrarung murron) Act 2017* (Vic), 15 Victorian state and local agencies and the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation have collaborated to develop a draft Yarra Strategic Plan for the integrated management of the river and its parklands.

In 2020, the Australian Government announced the Murray–Darling Communities Investment Package, which includes a commitment to investing in four new Indigenous Ranger programs to care for Country across the Basin.

Sources: DAWE (2020), DOI (2018), National Landcare Program (2020), NIAA (2020), Pitt and Wyatt (2020), Victorian Government (2020).

While there has been progress in including Traditional Owners in NRM, a coordinated approach is merited given the numerous initiatives across different legislation and policies. NRM programs should ensure stronger engagement with Traditional Owners. As NRM typically occurs at the local level, engaging directly with local Traditional Owners regarding Country is more appropriate than engaging with peak bodies in this circumstance.

A renewed NWI should require natural resource managers to develop long-term relationships with Traditional Owners around the management of Country. This would allow natural resource managers to engage Traditional Owners to incorporate cultural outcomes into wetland and river plans. It would also facilitate natural resource managers working

collaboratively with Traditional Owners in on-ground management programs to promote cultural outcomes. These processes will also need to be supported by sufficient time and resources to ensure Traditional Owners' full participation.

Long-term relationships with Traditional Owners could also assist in improving the quality of engagement on a range of issues related to the management of Country (such as water planning and environmental water management), and increase Traditional Owners' influence on landscapes.

3.4 High-quality engagement with Traditional Owners should be one focus in a renewed agreement

Achievement of cultural objectives and outcomes through water planning, management of environmental water and NRM will rest on deep engagement with Traditional Owners, fostered through the development of long-term relationships around the management of Country. Funding to support Traditional Owners to engage is also likely to be needed to maximise the effectiveness of engagement processes.

While all jurisdictions have mechanisms to engage Traditional Owners, inquiry participants have pointed to shortcomings in the quality of that engagement (*Assessment*: section 1.6). For example, the IRG (sub. 103, p. 15) said that:

Indigenous involvement in existing water planning can encompass a spectrum of involvement that encompasses limited engagement, active participation, through to formal and extended collaboration. There are currently significant variations across time and jurisdictions in the structure, process and consistency of implementation of existing regimes.

The NLC (sub. DR134, p. 13) also expressed concern that there had been 'a substantial decline [in engagement] over recent years' in the Northern Territory.

The renewed NWI should embed the principles for engagement, formal partnership and shared decision making that governments have committed to in the National Agreement on Closing the Gap. This is particularly as they relate to water planning, environmental water management and broader natural resource management to ensure that cultural objectives are agreed and can be achieved through these mechanisms.

4 Enabling access to water for economic use

Aboriginal and Torres Strait Islander people consider that, in addition to the protection of cultural values, there is a need for water entitlements for community and economic development. This aligns with increasing water rights, the first component of the National Cultural Flows framework (figure 1).

Although the NWI clearly referred to cultural values, there has been some debate on whether the issue of water for economic use could be considered under the wording of the NWI.

On one hand, the Indigenous Access section of the NWI, which covers actions, does not include access to water for economic use.⁷ As the IRG observed:

The NWI provided constrained recognition of Indigenous interests in water ... recognition was limited to social, spiritual and customary interests, not, as many [I]ndigenous leaders have argued economic interests. (sub. 103, p. 7)

On the other hand, some participants have noted that paragraph 25 (ix) of the NWI⁸, which focused on desired outcomes, could be interpreted to include provisions for water for economic use (Jackson, sub. 61, p. 3; IRG, sub. 103, p. 7).

Additionally, in later work in 2010, governments acknowledged in the *NWI Policy Guidelines for Water Planning and Management*, that Indigenous values could include economic use.

Although the range of Indigenous values in water may be difficult to quantify, they are likely to cover both cultural and economic uses of water, and these uses may overlap. (COAG 2010, p. 32)

Regardless of the debate, the NWI did not adequately provide guidance on Aboriginal and Torres Strait Islander people's access to water for economic use. This needs to be addressed in a renewed NWI.

4.1 There are many barriers to accessing water for economic use

As the Commission observed in 2017, the boundaries between water for economic use, and for cultural uses can sometimes be blurred (PC 2017, p. 106). For example, they overlap in activities such as native food businesses, where cultural practices are also used to generate income.

But it is nonetheless important to consider water for economic purposes as a distinct issue because of the way the water entitlements framework and markets operate in enabling access to water. Practically, under existing state and national policy and legislation, any person wanting to extract water from a river, wetland or groundwater source for a consumptive purpose requires an entitlement. This includes Aboriginal and Torres Strait Islander communities desiring to use water for community economic development. In highly developed water systems where markets are operating, entitlements need to be acquired through the market.

These statutory arrangements can create barriers for Aboriginal and Torres Strait Islander people. Participation in water markets and managing water entitlements have a number of requirements including purchasing water entitlements, paying water fees and charges by a prescribed date, decisions on use or trade of seasonal allocations and adapting to changes in water market operations. Without adequate supporting arrangements, gaining access to water

⁷ NWI paragraphs 52–54.

⁸ 25. The Parties agree that, once initiated, their water access entitlements and planning frameworks will:
(ix) recognise indigenous needs in relation to water access and management.

through markets and maximising the value of the resource can be difficult for Aboriginal and Torres Strait Islander people (PC 2017, p. 106).

Inquiry participants and others have raised these and a number of other issues relating to access to water for economic use including: native title and water legislation, water entitlement processes, and competition from other water users (NBAN, sub. 17, p. 2; Jackson, sub. 61, pp. 3–4; IRG, sub. 103, pp. 12, 16; MLDRIN, sub. 105, p. 8).

Regarding native title legislation, the courts have only recognised native title rights to water for domestic purposes (Macpherson 2017). This means, for example, that when Traditional Owners engage in customary fishing, they may be unable to barter or exchange fish with the community without a native title determination, as this would be classified as a commercial activity and be subject to more stringent regulation (PC 2016, p. 155). Similarly, harvesting reeds for weaving or trading is prohibited under some legislation as it is defined as aquaculture, which is commercial in nature.⁹

4.2 Current access is limited

Recent research by Hartwig, Jackson and Osborne (2020) showed that Aboriginal water holdings represent a very small proportion of total water holdings in the New South Wales portion of the MDB (box 9).

Box 9 **Aboriginal people in the New South Wales portion of the Murray–Darling Basin hold very few entitlements**

Hartwig, Jackson and Osborne (2020) found that water holdings by Aboriginal organisations and entities in the New South Wales portion of the Murray–Darling Basin represent 0.2 per cent of all available surface water (as of October 2018), based on water register searches and datasets. Data on water holdings of individuals identifying as Aboriginal were not available. Aboriginal water holdings originated from Aboriginal land handovers under the *Aboriginal Land Rights Act 1983* (NSW) and through Aboriginal land acquisition schemes by the NSW and Australian Governments.

They also found that water rights held by Aboriginal organisations declined by at least 17 per cent between 2008 and 2018. This was a result of permanent water (and land) sales after the liquidation of Aboriginal enterprises.

Section 44 of the *Aboriginal Land Rights Act 1983* (NSW) prohibits the sale of land belonging to Aboriginal Land Councils or the winding up of these organisations in event of overdue or unpaid rates, which provides some protection against losses of land. However, no such provisions are in place with respect to water entitlements.

Source: Hartwig, Jackson and Osborne (2020).

⁹ *Fisheries Act 2000* (ACT).

Similarly, the ACCC (2021, pp. 122, 160) found that:

First Nation and Traditional Owner groups own a very small proportion (less than 0.1 per cent) of entitlements across the Southern Basin ... analysis of allocation trade data in the Southern Connected Basin over 2012-13 and 2018-19 period indicate that Traditional Owner groups very rarely purchase allocations, but do consistently make a very small number of allocation sales each year ...

And the NSWALC (sub. 96, p. 1) noted that:

Land and water rights remain central to Aboriginal peoples. Reacquiring our lands and waters is at the heart of our future. Through the NSW *Aboriginal Land Rights Act (ALRA) 1983*, Aboriginal people have successfully seen thousands of hectares of land returned across NSW with much land still under claim. However, our ownership of water is miniscule by comparison.

This situation has emerged despite many advocacy statements to improve access for economic use (table 1).

Table 1 A timeline of advocacy statements to improve Aboriginal and Torres Strait Islander people's access to water for economic use

<i>Authors</i>	<i>Policy or statement</i>	<i>Year</i>
North Australian Indigenous Land and Sea Management Alliance (NAILSMA)	Garma International Indigenous Water Declaration	2008
Murray Lower Darling Rivers Indigenous Nations (MLDRIN)	Echuca Declaration	2008
NAILSMA	Mary River Statement	2009
NAILSMA	North Australian Indigenous Water Statement	2009
First People's Water Engagement Council	Advice to the National Water Commission	2012
MLDRIN, Northern Basin Aboriginal Nations and relevant government departments	National Cultural Flows Research Project	2011 to 2018

Sources: Cultural Flows Research Project (2018), FPWEC (2012), MLDRIN (2007), NAILSMA (2008, 2009b, 2009a).

4.3 There has been some progress in increasing access

Meeting aspirations for access to water for economic use have clearly been difficult to achieve in practice. But action to address this issue is starting to be taken in a number of jurisdictions, including by the Australian Government. Among these are a \$40 million Australian Government program in the MDB, programs in Victoria and the provision of water reserves in the Northern Territory and northern Queensland (discussed further in the next section).

In addition, the Australian, Queensland, Western Australian and Northern Territory Governments have recognised the connection between economic development and Aboriginal and Torres Strait Islander community wellbeing in the Northern Australia Indigenous Development Accord.

Economic development is a productive path to long-term community wellbeing, and contributes to nation building. Parties support the [Indigenous Reference Group's] aspiration for Indigenous self-determination and economic independence through engagement in markets and the use of private capital. (COAG 2019, p. 3)

Once developed, the inland waters target under the National Agreement on Closing the Gap (box 2) will likely also contribute to furthering access to water for economic use, through actions in the jurisdictional implementation plans under the agreement.

4.4 A way forward to improve access

Where, as part of co-design processes to determine Traditional Owners' preferred pathway for ongoing economic development, governments and communities agree that access to water is the best way to support Aboriginal and Torres Strait Islander communities' economic development objectives, governments should facilitate access to that water as efficiently and transparently as possible within existing entitlement frameworks.

In undeveloped regions, reserves can be a way forward

In water systems where the consumptive pool is not fully allocated, governments may choose to allocate or reserve a volume of unallocated water for exclusive use by Aboriginal and Torres Strait Islander people, but should do so transparently.

The *NWI Policy Guidelines for Water Planning and Management* note a typical rationale for water reserve policies is that Aboriginal and Torres Strait Islander people may be working towards acquiring the infrastructure and water literacy to use water for economic purposes, but by the time they do, it will be more expensive for them (or governments) to acquire water entitlements (DAWR 2017, p. 24).

A number of States and Territories have established, or are considering, specific provisions to enable access to water for economic use in undeveloped regions.

The Northern Territory Government's *Strategic Aboriginal Water Reserves Policy* sets aside a percentage of water from the consumptive pool of a water allocation plan (Northern Territory Government 2017). Aboriginal land rights holders can use this reserve for economic development. The percentage of the water reserved is based on the percentage of Aboriginal land containing water resources in the water allocation plan area. For land to be eligible for a Strategic Aboriginal Water Reserve, it needs to be classified as one of the following.

- Aboriginal land under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth).

-
- Aboriginal land under Northern Territory Enhanced Freehold.
 - Land within an Exclusive Possession Native Title Determination Area.

Since 2019, the Queensland Government's Cape York Water Plan has provided over 485 gigalitres of water per year for local management by Traditional Owners (DNRME (Qld) 2019, p. 3). The access to water resources, granted to native title holders and Aboriginal and Torres Strait Islander corporations, aims to help these groups achieve their economic, social and cultural needs and aspirations (Queensland Parliament 2019, pp. 2, 8).

The Western Australian Government is considering multiple Strategic Aboriginal Water Reserves. It negotiated to include a Strategic Aboriginal Water Reserve in the Indigenous land use agreement with the Yamatji Nation during a native title settlement in February 2020. This reserve provides access to up to 25 gigalitres per year of groundwater for licensed use by the Yamatji Nation. The Western Australian Government has also provided \$20 million for groundwater investigations to support future licence applications by the Yamatji Nation (DWER (WA), pers. comm., 21 September 2020). Consultation is currently being undertaken on the draft Derby Groundwater Allocation Plan, which incorporates a Strategic Aboriginal Water Reserve.

Transparency in any process to create allocations will be important to sustaining confidence in water rights and the development of efficient water markets.

In fully developed regions, governments can purchase entitlements on the market

In regions where water rights are fully allocated, jurisdictions can provide water entitlements to Aboriginal and Torres Strait Islander communities by purchasing entitlements on the market. There have been some steps in this direction (box 10).

When governments are considering community development opportunities for Aboriginal and Torres Strait Islander people, and have found water to be the most effective way of delivering these, they should consider buying water from entitlement holders on the water market to ensure that the integrity of the entitlement system is maintained.

Construction of new infrastructure in undeveloped areas presents an opportunity

The Australian Government has allocated significant funding to constructing water infrastructure, with \$3.5 billion available under the National Water Grid Fund over ten years (SP I *Infrastructure*). \$388 million of this has already been allocated to construct four water infrastructure projects across Northern Australia (NWGA 2020, p. 11).

Box 10**Governments have purchased entitlements on the market for Traditional Owners**

Government have established a number of initiatives to provide access to water for economic use in developed catchments.

- The Australian Government has provided \$40 million for a water entitlement scheme in the Murray–Darling Basin, which will assist Aboriginal communities to invest in water for cultural and economic activities. \$20 million is available each for the Northern and Southern Basin Aboriginal Communities (DAWE 2019). However, recent reports suggest that some of this could be used to purchase non-water assets (Foley 2021).
- The Victorian Government has allocated two gigalitres of unallocated water in the Mitchell River to the Gunaikurnai Land and Waters Aboriginal Corporation, for use as the Gunaikurnai people see fit (Gunaikurnai Land and Waters Aboriginal Corporation 2020). The Victorian Government has also invested \$5 million to fund projects for access to water for economic development in partnership with Aboriginal people. The Aboriginal Water Program, which commenced in 2016, supports local Traditional Owners by researching economic development opportunities for the use and ownership of water (DELWP (Vic) 2020).
- The New South Wales Government established Aboriginal Community Development Licences to be used for economic purposes such as irrigated cropping, aquaculture or manufacturing (PC 2017, p. 106). These were part of the Aboriginal Water Initiative which has now been defunded.

In assessing water infrastructure proposals, governments should ensure that Traditional Owners are fully consulted on the proposal and that any negative implications of development on environmental, social, cultural heritage and other values are clearly identified and fully considered, in accordance with requirements under the ATSIHP Act and the EPBC Act.

The NWI calls for demonstration of environmental sustainability and economic viability of a major development before it is approved. This should be extended to require infrastructure decision-making processes to be culturally responsive. The Commission sees two criteria that could underpin a requirement for culturally responsive water infrastructure development. At a minimum, culturally responsive infrastructure development would:

1. incorporate deep engagement with the Traditional Owners of potentially affected areas (both at the infrastructure site and downstream) as part of business case development
2. comprehensively identify and manage impacts on cultural heritage in affected areas.

Determination of the specific criteria that should be met by major infrastructure developments and included in a renewed NWI should occur as part of the co-design process led by CAWI. This process could consider existing frameworks for engagement with Indigenous Peoples, the principle of free, prior and informed consent (as set out under UNDRIP), and look to align with (rather than duplicate) State and Territory cultural heritage protection legislation.

In undeveloped areas in particular, there is an opportunity to consider the provision of Indigenous access entitlements. These may be in lieu of identified impacts or to contribute

to the future development of that community and to assist in meeting commitments under the National Agreement on Closing the Gap.

Engagement is a crucial element of developing new infrastructure. Infrastructure Australia has developed principles in this regard.

Governments and proponents should undertake meaningful stakeholder engagement at each stage, from problem identification and option development to project delivery. (IA 2018, p. 3)

The Commission considers this a key area of concern, as Traditional Owner engagement on infrastructure has been poor in the past. Some Traditional Owners have raised concerns about consultation processes for new developments. For example:

In NSW a series of new dam projects have highlighted deficiencies in First Nations consultation. Despite an announcement that pre-construction works on the Wyangala Dam wall-raising project will commence in October 2020, the NSW Government has not undertaken any meaningful consultation with Wiradjuri and other First Nations. Traditional Owners have also highlighted concerns regarding poor consultation for the ‘Macquarie River Re-regulating storage’¹⁰. In fact, a Facebook event for consultation on the Macquarie River Re-regulating storage failed to identify First Nations in a list of organisations with a ‘primary connection to the Macquarie River’. (MLDRIN, sub. 105, p. 12)

Aboriginal people’s rights and interests must be recognised more comprehensively in water planning. This should extend to major infrastructure such as dams and weirs. Engagement with Aboriginal people upstream and downstream of these proposals is needed, consistent with Akwé: Kon guidelines. (NSWALC, sub. 96, pp. 2–3)

In summary, where governments have decided to invest in new water infrastructure, the Commission considers that jurisdictions should ensure development processes are culturally responsive and incorporate high-quality engagement with Aboriginal and Torres Strait Islander people, and that they consider the provision of Indigenous access entitlements.

Whatever the approach, supporting arrangements should be in place

In 2017, as noted above, the Commission observed that Aboriginal and Torres Strait Islander communities may face barriers to sourcing water through standard access pathways (due to the costs of purchasing and maintaining entitlements, and the complexity of water market operations) and need assistance to both gain access and exploit potential opportunities (PC 2017, p. 106).

Access to water is not the only barrier that Aboriginal and Torres Strait Islander people may face in taking advantage of economic development opportunities. Other factors, such as access to specialist skills and knowledge, experience with water-related businesses, and the infrastructure and financial capital needed to make best use of water are just as important. Water access arrangements for Aboriginal and Torres Strait Islander people are likely to produce the greatest value for their communities when they are part of a broader strategy for community development, which may include investment in education, training and business development.

¹⁰ The Macquarie River Re-regulating storage project constructed a new re-regulating gated weir and fishway structure on the Macquarie River.

The chances of success will be maximised if programs providing water for economic purposes are co-designed with Traditional Owners using good policy design principles, namely: engaging effectively with Traditional Owners in program design to set a clear and measurable policy objective; identifying the range of ways the objective could be met (including via the provision of resources other than water); transparently weighing up — quantitatively or qualitatively — the benefits and costs of each option; and reviewing and evaluating the policy. Program design and implementation should also carefully specify and implement governance arrangements, accountabilities and conditions for use.

Under the National Agreement on Closing the Gap, the Australian, State and Territory Governments have committed to developing a national target for inland waters, including data development work to identify a nationally consistent measure encompassing for example, water licences, water rights and water allocation plans (Australian Governments and the Coalition of Peaks 2020, p. 36). Data to inform the reporting on progress against the Closing the Gap targets will be publicly available via the Productivity Commission’s Closing the Gap Information Repository and the Productivity Commission will conduct three-yearly reviews of progress under the National Agreement on Closing the Gap (Australian Governments and the Coalition of Peaks 2020, p. 41).

5 NWI renewal advice

The renewed NWI should have a new element for Aboriginal and Torres Strait Islander people’s access to water, developed by the Committee on Aboriginal Water Interests.

NWI RENEWAL ADVICE 9.1: A NEW CO-DESIGNED ELEMENT

The renewed National Water Initiative (NWI) should include both an objective and new element dedicated to Aboriginal and Torres Strait Islander people’s access to water and the involvement and participation of Aboriginal and Torres Strait Islander people in water management. The Commission supports the establishment of the Committee on Aboriginal Water Interests to develop the new NWI element.

In developing the new element, the committee should:

- ensure alignment between commitments under the National Agreement on Closing the Gap and new NWI content
- have a terms of reference that allows for an advisory role to the Coalition of Peaks
- report directly to water ministers.

The new element of the NWI should consider processes that ensure high-quality engagement, and the delivery of cultural outcomes through water planning, environmental water management and NRM to increase First Nations influence in water management more broadly.

In addition to cultural outcomes, the renewed NWI should consider provisions to enable access to water for economic use and regularly monitor and publicly report on progress.

NWI RENEWAL ADVICE 9.2: IMPROVING CULTURAL OUTCOMES USING EXISTING FRAMEWORKS

In developing a new National Water Initiative element, the Committee on Aboriginal Water Interests should consider content that ensures that:

- cultural objectives are explicitly identified and provided for in water plans and progress in achieving those objectives is regularly monitored and reported publicly
- environmental water holders seek to deliver cultural outcomes whenever consistent with their ecological obligations
- natural resource managers incorporate cultural objectives into river and wetland plans and work with Traditional Owners in on-ground management programs to achieve them
- Traditional Owner engagement in water planning, environmental water management and natural resource management is of high quality and fostered through the development of long-term relationships (NWI renewal advice 6.2, 8.3 and 8.9).

NWI RENEWAL ADVICE 9.3: IMPROVING ACCESS FOR ECONOMIC DEVELOPMENT

In developing a new National Water Initiative element, the Committee on Aboriginal Water Interests could consider content that ensures that, where agreement is reached between State and Territory Governments and Traditional Owners that consumptive access to water is an effective way to support the economic development of Aboriginal and Torres Strait Islander communities, access is provided by:

- sourcing water within existing water entitlement frameworks, such as by purchasing water on the market or as part of transparent processes for assigning unallocated water
- ensuring adequate supporting arrangements (such as training and business development) are in place to enable Aboriginal and Torres Strait Islander communities to maximise the value of the resource for their needs and uses
- actively involving Aboriginal and Torres Strait Islander communities in program design.

The provision of water by governments to Aboriginal and Torres Strait Islander communities would be supported by:

- specifying and implementing governance arrangements for such water
- regularly monitoring and publicly reporting on the inland waters target under the National Agreement on Closing the Gap.

Where governments invest in new water infrastructure, particularly in undeveloped areas, governments should consider whether reserving a share of any new water rights for Traditional Owners would be consistent with plans for future community development and assist in meeting targets set under the National Agreement on Closing the Gap.

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Australian Government
Productivity Commission

Ensuring the integrity of water resource management

Supporting Paper E

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Given the demands on water in Australia, water users and the broader community need to be able to trust that it is being managed to best effect.
- Recent reviews into compliance and enforcement in the Murray–Darling Basin found numerous shortcomings around governance, practice and resourcing. Growing mistrust and a lack of confidence in water system management during the drought were a consequence.
- While such problems have not been seen elsewhere, the Murray–Darling Basin experience contains important lessons for national policy, and recent government responses offer insights on best practice.
- Credible information about how water is used (and by who, when and why), combined with robust institutional processes, underpins the integrity of water management systems.
- A renewed National Water Initiative (NWI) would be strengthened by broadening the water accounting element to ensure the provision of credible and reliable information and institutional processes that provide assurance that:
 - entitlement holders are operating in line with their rights and water use is consistent with established rights and plans
 - water resource systems are being managed to best effect for all users.
- Provision of trusted information on the broader water context is also needed to improve understanding of key water resource challenges and potential risks, enabling entitlement holders, industry and communities to better plan for the future.
- To ensure the integrity of water use, a renewed NWI should require fit-for-purpose:
 - metering and measurement of surface water and groundwater take and reporting on use
 - registers that reflect the benefits of this information for water resource management and support compliance and enforcement systems
 - compliance and enforcement systems, including a focus on proactive regulation to increase entitlement holders' awareness of their obligations.
- To promote trust and confidence, a renewed NWI should require water system managers to:
 - take a risk-based approach to developing and maintaining information and data collections
 - ensure that information and data sources are publicly available and effectively communicated
 - implement transparent quality assurance processes to ensure that information is credible
 - ensure that information about their operations is transparent.
- Information regarding the broader water context (which enables entitlement holders, industry and communities to better plan for the future) must align with users' needs.

Given the demands on water in Australia, water users and the broader community must be able to trust in water resource management. They need to have confidence that water users are complying with their obligations and that water managers are managing this valuable resource to best effect. In other words, system management should have integrity.

The integrity of Australia’s water resources management rests on the provision of credible and relevant information combined with effective compliance and regulation. Information plays a critical role in all decision making in water resource management. Robust processes and trusted institutions can provide confidence that water users are complying with their obligations and that water system managers are undertaking their roles to best effect for the benefit of all entitlement holders and the environment.

Integrity can be gauged by the degree of trust in water management institutions and systems held by water users, communities and the market. Where there is integrity in water system management, public confidence follows.

This paper considers key issues in the provision of information and the regulation of access entitlements. These issues were highlighted in fully allocated systems in the Murray–Darling Basin (MDB) by the recent drought. There are lessons for the rest of Australia from this MDB experience that should be considered in a renewed National Water Initiative (NWI). Moreover, recent government responses offer insights on potential best practice to strengthen the integrity of water resource management given a changing climate.

1 Confidence in water management has been tested

1.1 Water accounting, metering and compliance under the NWI

Water accounting is ‘a systematic process of identifying, recognising, quantifying, reporting and assuring information about water, the rights or other claims to that water and the obligations against that water’ (BOM 2016). Metering is a key contributor to water accounts, providing data on when and how much water is being used. And monitoring of user compliance with metering requirements, with enforcement action where necessary, is needed to give confidence that information from metering is credible.

Water accounting and registers were to support confidence in water use

Under the NWI, parties agreed that:

... the outcome of water resource accounting is to ensure that adequate measurement, monitoring and reporting systems are in place in all jurisdictions, to support public and investor confidence in the amount of water being traded, extracted for consumptive use, and recovered and managed for environmental and other public benefit outcomes.¹

¹ NWI paragraph 80.

To enable this outcome, parties agreed to:²

- benchmark jurisdictional water accounting systems to encourage continuous improvement and adoption of best practice
- the development and implementation of:
 - accounting system standards, standardised reporting formats and water resource accounts that can be reconciled annually
 - integrated accounting of groundwater and surface water use (where there is close interaction)
 - principles for environmental water accounting
 - a register of, and annual reporting for, environmental water.

The aim of these water accounting actions was to provide credible information to assess whether water use (both for consumption and by the environment) is consistent with established rights and water plans. That is, to ensure that water accounting is robust and protects the integrity of the access entitlement system and the markets that depend on it.

Parties also agreed to open reporting of: metered water use, compliance and enforcement actions; trade outcomes; environmental water releases and management actions; and availability of water access entitlements against rules for availability. Compatible, publicly accessible and reliable registers of all water access entitlements and trades were also to be established: these were to enable resource managers, among other things, to monitor trade and water use volumes accrued in a separate water accounting system.³ Transparent reporting against water use supports public and investor confidence — water users doing the right thing can be seen to be doing the right thing, and where they are not it can hopefully be picked up.⁴

Metering and measurement were to underpin the credibility of water accounts

The metering and measurement of water used underpins the credibility of water accounts. Meters determine the volume of water taken directly from surface water or groundwater using a pump or offtake; measurement estimates the water taken when metering is not practical, such as when water is intercepted through farm dams, forestry or floodplain harvesting.

Under the NWI, parties agreed that information from metering needed to be ‘practical, credible and reliable’ and actions were articulated to ensure it was undertaken consistently across the country. Commitments included development of: a national meter specification, national meter standards for installation, and national standards for the ancillary data

² NWI paragraphs 81–85.

³ NWI paragraph 59 and schedule F(6).

⁴ NWI paragraph 89.

collection systems associated with meters.⁵ Further, in 2009 COAG agreed to a *National Framework for Non–Urban Water Metering* (the Non–Urban Metering Framework) to help meet those commitments (DAWR 2009). The Framework was to be implemented over a ten-year period to 2020, with jurisdictions publicly reporting on progress every two years via the Bureau of Meteorology website.

Compliance and enforcement were given little focus in the NWI

Systems to monitor and enforce compliance with metering requirements depend on accurate and reliable metering and on a sound governance framework to be effective (MDBA 2017).

Compliance and enforcement were given little focus in the NWI — in fact, they were only mentioned in the context of four water access entitlements and water resource accounting actions. Parties agreed that:⁶

- water entitlements would be enforceable and enforced
- a robust compliance monitoring regime would be implemented for interception in catchments that were approaching, at or beyond full allocation
- standardised reporting formats would be developed and implemented to enable compliance against entitlements
- national guidelines would be developed and applied, covering reporting for metered water use and compliance and enforcement actions.

However, in 2009 COAG agreed to the development of the *National Framework for Compliance and Enforcement Systems for Water Resource Management* (the National Compliance Framework) to improve compliance and enforcement efforts and to set a nationally agreed standard for pursuing consistency in compliance with jurisdiction based water laws and regulations (COAG 2012).

The Australian Government provided \$53.4 million over four years (ending 30 June 2016) through National Partnership Agreements to States and Territories to implement the National Compliance Framework (PC 2017, p. 456). In particular, the funding was to ‘assist the transition to adopting the new framework and increasing the compliance and enforcement effort’ (COAG 2012, p. 1).

The Department of Environment (Cth) (2016) stated that the National Compliance Framework is important because it:

- protects the rights of water entitlement holders by having extra compliance officers on the ground and by using smart technology to detect non compliance

⁵ NWI paragraphs 87–88.

⁶ NWI paragraph 31(vi), paragraph 57(i)(c), paragraph 82(ii) and paragraph 89(i).

-
- protects water dependent natural ecosystems by focusing compliance efforts on river systems at the highest risk
 - contributes to the sustainability of water use and thereby protects the interests of communities
 - deters the unlawful taking and use of water by improving and harmonising water laws around Australia
 - treats the unlawful taking and use of water as a national problem, with all Australian states and territories implementing strengthened compliance programs.

1.2 Compliance has been under scrutiny in recent years

Despite metering and compliance frameworks being in place, events in the MDB, including during the recent drought, have shown that they have not been enough to ensure the integrity of water system management in times of stress. A lack of commitment to compliance and enforcement, insufficient metering by entitlement holders and a growing mistrust and lack of confidence in water system managers was uncovered in the MDB over 2018-19. This has highlighted the critical importance of establishing credible and trusted water management in all water systems before they become as highly contested as the MDB.

The Commission's 2017 assessment of jurisdictions' progress against their NWI commitments found that a lack of progress towards meeting the commitments under the Non-Urban Metering Framework had undermined compliance. Difficulties with certifying meters to the required standard and a lack of water user buy-in presented challenges with implementing the framework within the timelines it set out (PC 2017; Sinclair and Holley 2015).

The Commission also found that, while progress had been made in implementing the National Compliance Framework, the framework 'does not seek to cover all factors that may contribute to effective compliance, such as broader institutional and governance arrangements' (PC 2017, p. 459).

The broadcast of the ABC Four Corners program 'Pumped' in 2017, on water management in the Barwon–Darling river system, raised questions about the effectiveness of compliance and enforcement regimes in the MDB (particularly in New South Wales and Queensland⁷) and was a wake-up call to many stakeholders and communities around the country. Governments announced a number of reviews in response (box 1).

⁷ The 2017 review into compliance found that Victoria and South Australia had strong compliance systems and cultures in place with the main issues being an inadequate suite of penalties and sanctions and an aging meter fleet respectively (MDBA 2017, pp. 12–13).

Box 1 **Reviews in response to issues raised by Four Corners**

A number of reviews with a compliance and enforcement focus were announced following the ABC Four Corners program, 'Pumped', which aired in July 2017.

- The interim report for the *Independent Investigation into NSW Water Management and Compliance* (Matthews Report) concluded that 'water related compliance and enforcement arrangements in NSW have been ineffectual and require significant and urgent improvement' (Matthews 2017b, p. 4).
- The *Murray–Darling Basin Water Compliance Review* (2017) raised concerns about: a lack of comprehensive reporting on compliance; deficiencies in the compliance efforts of some water regulators, including the commitment to accurate metering and measurement of water take; and relatively low levels of compliance resourcing in some Basin jurisdictions.
- The NSW Ombudsman's (2018, p. j) water investigation found evidence that the Department of Primary Industries (NSW) Water and WaterNSW had failed to:
 - adequately resource, or secure funding to adequately resource, their compliance functions
 - take appropriate and timely action on instances of clear breaches of the law
 - meet acceptable standards of public administration in the conduct of their compliance functions, and that
 - [Department of Primary Industries] DPI Water failed to ensure water meters met the requirements of the Interim Metering Standards for non-urban water meters — undermining compliance efforts.
- Findings from the *Independent Audit of Queensland Non-Urban Water Measurement and Compliance* (2018, p. v) included:
 - a series of deficiencies in current arrangements for measuring the take of water from supplemented and unsupplemented waters, and from overland flows
 - an absence of appropriate water accounting and management control systems
 - a deteriorating situation in relation to water metering and measurement including understaffing in technical and operational areas
 - a weak enforcement and compliance culture leading to ineffective water management.
- With respect to compliance, the South Australian Murray–Darling Basin Royal Commission (2019, p. 650) found that:

vast differences in penalty regimes and a scarcity of previous successful prosecutions across Basin States ... make it difficult ... to assess any interstate differences in how courts have responded to conduct such as water theft

State laws generally appear to be sufficiently robust ... Concern [has focused on] the operational capacity of States to monitor, and cultural willingness to pursue, enforcement outcomes ... even though a range of national agreements has attempted to promote consistent national standards.
- The Independent Commission Against Corruption's investigation into the management of water in New South Wales (2020, p. 11) found that there was 'a certain lack of support for strong compliance and enforcement measures, a preference for customer service over regulation and a lack of commitment to properly resourcing compliance functions'.

Key findings from these reviews included:

- shortcomings in the transparency, independence and effectiveness of the agencies responsible for regulating access entitlements for water resources
- a lack of commitment to accurate metering and measurement of water take

-
- low levels of compliance resourcing, and a weak compliance and enforcement culture
 - an inappropriate range of penalties and sanctions available for enforcement
 - a preference for customer service over regulation.

While these findings were not universal for regulatory agencies and governments in MDB jurisdictions, they highlighted the inadequacies of the prevailing frameworks.

The New South Wales and Queensland governments responded to the findings with major reform programs — *Securing our Water: NSW Water Reform Action Plan* (December 2017) and the *Queensland Rural Water Management Program* (July 2018), respectively.

As well as the reforms initiated by New South Wales and Queensland, all MDB jurisdictions signed the Murray–Darling Basin Compliance Compact (MDBCC) in June 2018. Subsequently endorsed by COAG in December 2018, the MDBCC aimed to:

... restore confidence in water resource management in the Basin by providing transparency and accountability of surface and groundwater management and regulation, and a consistent approach to compliance and enforcement practices by governments across the Basin. (MDB Ministerial Council 2018, p. 1)

Jurisdictions' progress in implementing commitments under the MDBCC is to be verified and reported on annually. The second annual assurance report found MDB jurisdictions and the Australian Government continuing to make progress and acknowledged the impact of drought conditions on implementing actions (MDBA 2019d). Notable delays were observed in the rollout of: AS4747 compliant meters in New South Wales; Victoria's compliance strategies; and Queensland's and South Australia's improvement programs. A lack of progress on the ACT's metering policy and implementation plan was also noted. The 2020 annual assurance report is expected to be published in May 2021.

More recently the Australian Competition and Consumer Commission (ACCC) Murray–Darling Basin Water Markets Inquiry (ACCC 2021, p. 21) identified metering and measuring use requirements as a key element that provides 'a framework for managing trade, ensuring compliance with individual entitlement limits and system limits, and limiting the opportunities for water theft'. Under the current market settings, the (ACCC 2021, p. 22) found 'current metering data is not sufficiently timely nor spatially granular to inform river operators' decisions' and recommended continued improvement to 'metering and monitoring of water take, including to support capturing improved time of use data and better modelling' (2021, p. 5).

Further changes will occur in the compliance space for the MDB with the Australian Government announcing in September 2020 that the Interim Inspector-General of Water Compliance will take over the statutory compliance and enforcement functions of the Murray–Darling Basin Authority (MDBA) (Pitt 2020). The Inspector-General will be supported by the Office of Water Compliance to be established in the Department of

Agriculture, Water and Environment once amendments are made to the *Water Act 2007* (Cth) (IGWC 2020).

While jurisdictions outside of the MDB have escaped the spotlight on their compliance regimes, the Environmental Defenders Office noted that:

... compliance and enforcement in Western Australia appears to be prima facie problematic. For example, we have been unable to find any publicly reported prosecutions brought by the state for alleged breaches of the *Rights in Water and Irrigation Act 1914* (WA). (sub. 54, p. 8)

Although jurisdictions outside of the MDB have not initiated any major reforms in the last three years with respect to metering or compliance, implementation of and reviews into existing policy have continued. Western Australia has finalised the implementation of its *Measuring the Taking of Water Policy* (31 December 2020) so that all water licences greater than 10 megalitres are now subject to metering requirements. Tasmania has made some changes to how compliance activities are delivered in the last three years and plans to review water accounting and reporting frameworks (action 1.7 *Rural Water Use Strategy* (2021)) and the Northern Territory is implementing its *Non-Urban Water Metering Code of Practice for Water Extraction Licences* (introduced in mid-2017). However, neither Tasmania nor the Northern Territory currently report on compliance activities (*Assessment*: section 5.4).

1.3 Mistrust and a lack of confidence in water system management has been growing

In addition to raising issues about compliance and enforcement in the MDB, recent reviews have identified a growing mistrust and a lack of confidence in water system management in the MDB (box 2). This is a worrying development as water resources in the MDB are highly developed and fully or overallocated — and there is a huge water market which facilitates about \$2 billion worth of water trading annually (MDBA 2020c).

There is a heightened risk of mistrust in times of water scarcity. The value of water increases (along with public expectations for system managers to manage the resource well) in times of water shortage, such as during the recent drought in parts of Australia.

But mistrust has also been fuelled by a lack of information, poor communication of the information that is available, and difficulties for stakeholders in accessing, navigating and reconciling available data collections. A lack of transparency around water system managers' decision making, operations and performance has contributed to concerns that they are not being held accountable. Inadequate transparency has also contributed to misperceptions or misinformation about water availability, worsening the relationship between communities and water system managers (and the governments that fund them) (IIGMDB 2020, p. 40).

Box 2 **Mistrust in MDB water system managers has been growing**

Several reviews found growing mistrust in water system managers in the Murray–Darling Basin:

- The Interim Inspector-General of Murray–Darling Basin Water Resources (2020, pp. 29–30) found that the river operations process is not well understood by the community, and that there was a lack of trust and confidence among irrigators that river operators were delivering water efficiently. It recommended that the Murray–Darling Basin Authority provide clear and accessible information about Special Accounting measures to increase trust in and transparency about water sharing, and for the Basin Operations Committee to implement a single authoritative information platform to provide higher levels of transparency and trust (IIGMDB 2020, p. 15,41).
- Sefton et al. (2020, p. 24) noted that there were concerns from the community about degradation of waterways, which were believed to have been caused by system management issues. The report recommended that transparency of river operations and governance arrangements needed to be improved.
- Craik and Claydon (2020, pp. 5–7) found that there was a high level of mistrust and a perceived absence of transparency in New South Wales’ water management. This was exacerbated by the recent 2020 Northern Basin First Flush event, which involved a series of temporary restrictions on water extractions in New South Wales to manage inflows and prioritise water for critical human and environmental needs (discussed in section 6.4). A key finding of the review was that delays in publishing information, both throughout and following the event, led to views of mistrust, secrecy and mismanagement by the system manager.
- Vertessy et al. (2019, p. 30) found that communities had conveyed scepticism and a lack of trust in the information being used by system managers to make decisions about river operations and management. For example, there was dispute about the evaporation rates used to inform operational decisions.

In the ACCC MDB Water Markets Inquiry, a number of recommendations were made to increase the transparency of decisions made by the system manager including to (ACCC 2021)⁸:

- increase the transparency of allocations decisions and the drivers of water availability
- formalise and communicate plans for managing delivery shortfalls
- refine river-operations guidance to more effectively and transparently balance trade-offs
- improve transparency of conveyance losses and other delivery impacts.

There have been some national initiatives to improve water information collected and made available to the public. For example, the *National Industry Guidelines for Hydrometric Monitoring* provide guidance and technical information on hydrometric practices (Bewsher Consulting Pty Ltd 2018, p. 10). And in 2007, the Bureau of Meteorology received about \$80 million over five years to fund the *Modernisation and Extension of Hydrological Monitoring Systems Program*. This funding was used to improve and expand jurisdictional water monitoring systems and data collection (NWC 2014, p. 56).

⁸ Recommendations 15, 19-21.

However, such initiatives do not address the issues observed in the MDB. Renewal of the NWI presents an opportunity to put in place initiatives to address the types of issues that have arisen in the MDB before they arise in other systems. As Australia's climate changes, the effects on water resources and availability will make water system management more challenging; they are likely to generate greater public scrutiny as inflows reduce and the value of water rises. The current NWI does not explicitly include provisions to address the integrity of water system management. This is a gap that could be remedied to prevent the issues currently evident in the MDB.

2 A framework for trusted and credible water resource management

Trusted water resource management is underpinned by credible and reliable information and by robust institutional processes that provide assurance that:

- entitlement holders are operating in line with their rights, and that water use (both for consumption and by the environment) is consistent with established rights and water plans
- water systems are being managed to best effect for all users.

Trust in water governance frameworks is also influenced by the availability, and understanding, of information regarding the broader water context. Such information is often referred to in commentary about building community water literacy (BOM 2017, p. 9; IWG 2016, p. 2). It can help individuals, communities and businesses to understand key water resource challenges and understand their own potential risks, and can more effectively allow them to plan for the future.

Figure 1 conceptualises the requirements needed to ensure the integrity of the entitlements system and water resource management more generally.

2.1 Demonstrating water users comply with their licence obligations

Water users and communities need to be confident that all entitlement holders are complying with their water entitlement obligations in both their use and trade of water. It is well understood that non-compliance will impact on other entitlement holders in the system and/or the environment.

The ability to provide assurance that entitlement holders are complying with their obligations relies on a range of key institutional processes being in place and operating effectively, and on information being transparently available to the community. Key processes include metering and measurement, the use of water registers, and compliance and enforcement efforts.

Metering and measurement for both surface water and groundwater take provide the basic evidence that entitlement holders are only taking as much water as they are allowed, when and where they are allowed. How and how often entitlement holders report their water use depends on individual jurisdictions' non-urban water metering policy.

Water access regulators use metering and measurement information to assure entitlement holders and water users that their property rights are protected, underpinning the integrity of the access entitlement system. This information is also used at an aggregate level to reconcile opening and closing water balances with total water inflows and outflows reported at the system level and is 'essential for comprehensive water accounting' (MDB Ministerial Council 2018, p. 5).

Water registers provide basic information on water access entitlements and trades — including location, prices of trades and ownership and terms of entitlements.⁹ Jurisdictions have agreed to implement 'compatible, publicly-accessible and reliable water registers of all water access entitlements and trades (both permanent and temporary) on a whole of basin or catchment basis'.¹⁰ By providing this basic information publicly, water registers enable the efficient (by minimising transaction costs through information provision), and equitable (by recognising and protecting environmental needs and third party users), operation of water markets and inform water system managers of the authorised movement of water between users.¹¹ Water registers also enable system managers to 'monitor and accumulate trade and water use volumes accrued under water entitlements in a separate water accounting system'¹² (section 3.2). Registers are discussed in more detail with respect to trade in the SP B *Trading*: section 3.1.

State and Territory Governments are responsible for ensuring compliance with water laws within their jurisdictions and managing water systems. Trusted and effective institutions regulating and reporting on water use are critical to the integrity of water resource management across Australia:

An effective and fair compliance system is critical ... It underpins the integrity of water resource plans, environmental watering, water property rights and the water market. (MDBA 2017, p. 11)

As noted above, the recent focus on compliance and enforcement in the MDB has shone a light on weaknesses in the national frameworks agreed to in 2009 that have implications for all jurisdictions in a changing climate. Particular gaps relate to governance in compliance and enforcement regimes (including independence, transparency, adequate resourcing and capability), as well as the engagement needed with entitlement holders to improve understanding of their water licence conditions. Best practice principles for the regulation of non-urban water resources and for engagement with entitlement holders are discussed in section 3.3.

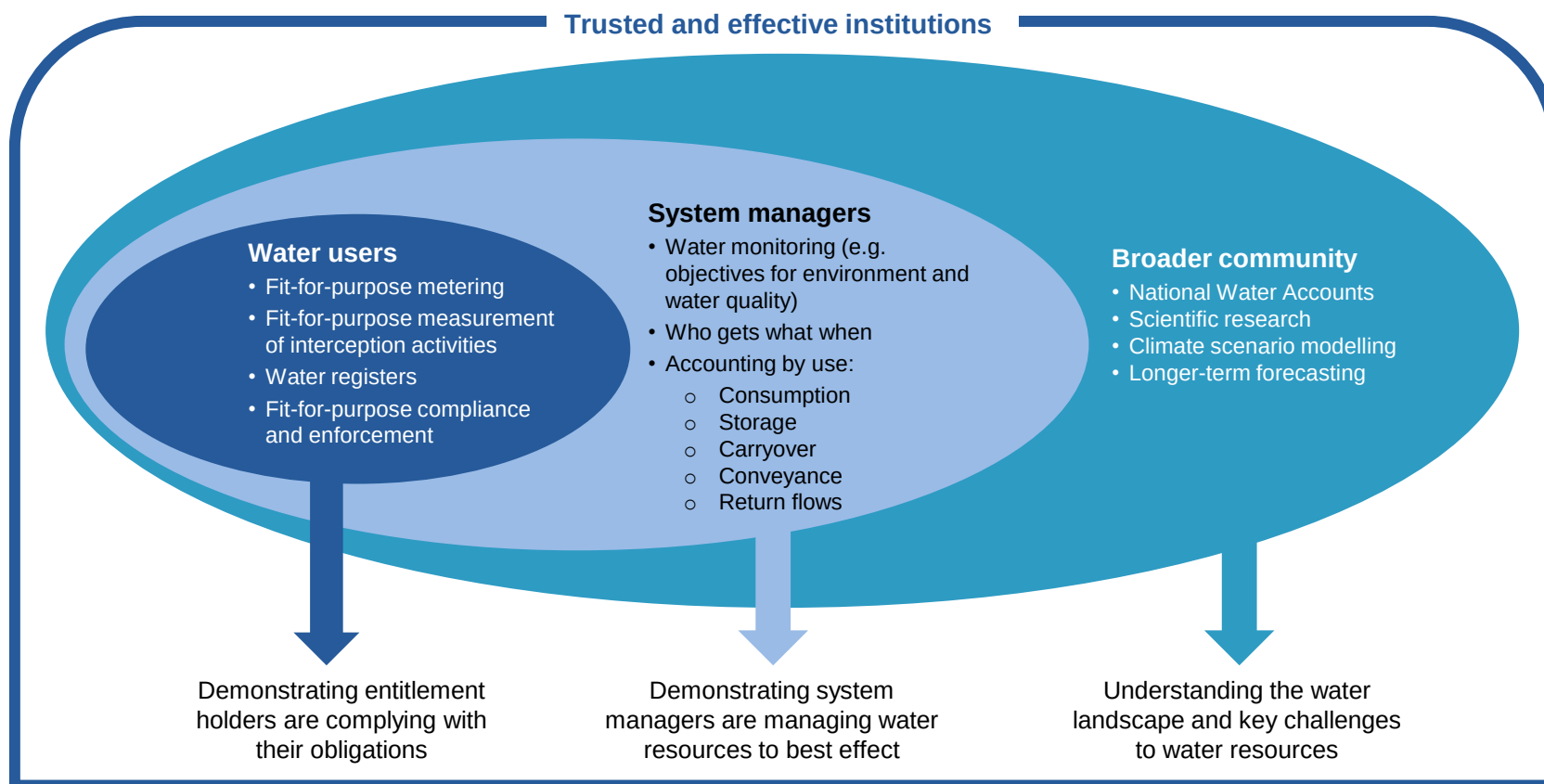
⁹ NWI schedule F.

¹⁰ NWI paragraph 59.

¹¹ NWI paragraph 58.

¹² NWI schedule F(6).

Figure 1 Framework for ensuring integrity in water resource management^a



^a Water use includes access through entitlements, stock and domestic use, interception activities, environmental use (planned), cultural use and community use through drinking water, recreation and liveability.

2.2 Demonstrating that water systems are being managed to best effect

System managers use information from a broader range of sources (including water users) in order to understand and manage their water resources to best effect (to maximise benefits for entitlement holders and the environment).

Broadly, water system managers need to understand their system hydrology and infrastructure, user demands (including likely volumes and locations), environmental requirements (including likely multi-year demands and locations) and system losses under a range of climatic scenarios. This informs development of operating practices to allocate water inflows to entitlement holders, manage their storages and transfer bulk water to different parts of the system to maximise water availability to entitlement holders and deliver water to users when and where they want it. Achieving these outcomes involves a complex optimising function built on information collection and system knowledge, informed by modelling and refined through operational practice. It becomes particularly complicated in large, highly regulated and connected systems like the southern MDB, the Melbourne system and the Hawkesbury–Nepean systems.

Entitlement holders need to have confidence that the system manager is undertaking this function to best effect given that it can affect the volume of water available to them within a season and the deliverability of that water. System managers need to be able to adequately demonstrate this outcome to water users. To that end, the information needed to support their operations should be available to stakeholders and the public — to promote transparency and accountability and to increase confidence that water systems are being managed efficiently and effectively.

Section 4 discusses in more detail: the role of water system managers; how to address current issues (including growing mistrust in water system management, which has been fuelled by a lack of publicly available information) and some examples of leading practice.

2.3 Building understanding of the broader water context

The broader community needs information to understand the water landscape, the impact of key challenges on water resources and the potential risks that these pose to communities and businesses. Better informed community members are more likely to understand how water systems are managed and what that means for them, including future risks. Information puts them in a position to proactively plan and make decisions about their future. The MDBA noted that information must be accessible, timely and user-focused to help communities build knowledge and capacity to navigate and adapt to the water management system (sub. 23, p. 11).

This type of information is also of value to policy makers, urban water utilities and academics, and includes:

- system water accounting (including at the national scale)
- water market and trading trends
- scientific research, including on future risks to water resources
- climate scenario modelling and impacts on water resources
- longer-term forecasting.

It provides the longer term context for water resource management and can support improved planning for water management, communities, businesses and utilities when it is independent or independently reviewed, transparent and publicly accessible.

Best practice principles for information collection on the broader water context are discussed in section 5. A more detailed discussion of role of research and modelling is provided in SP K *Knowledge* and the need for governments to improve water information accessibility and comprehensibility is discussed in SP J *Engagement*.

As noted in section 1, experience has shown that efforts to ensure integrity need to go well beyond water accounting. A renewed NWI would be strengthened by including a new ‘system integrity’ element with content that ensures the integrity of water use and water system management, and includes best-practice principles for information collection on the broader water context. A number of inquiry participants have expressed support for a system integrity element (Vardon, sub. DR121, p. 3; Engineers Australia, sub. DR141, p. 1; LGNSW, sub. DR147, p. 8; Mackay Conservation Group, sub. DR150, p. 5; Wentworth Group of Concerned Scientists, sub. DR152, p. 3; PIAC, sub. DR156, p. 11; CNSWJO, sub. DR164, p. 14; NFF, sub. DR178, p. 36; SunRice and RGA, sub. DR181, p. 11).

NWI RENEWAL ADVICE 10.1: BUILDING SYSTEM INTEGRITY THROUGH A RENEWED ELEMENT

A renewed National Water Initiative would be strengthened by acknowledging that ensuring the integrity of water resource management requires more than robust water accounting. To build integrity into system management, consideration should be given to broadening the water resource accounting element. The provision of credible and reliable information, and robust institutional processes, would provide assurance that:

- entitlement holders are operating in line with their rights and that water use is consistent with established rights and water plans
- water systems are being managed to best effect for all users.

The provision of information regarding the broader water context is also needed to improve understanding of key water resource challenges and potential risks, enabling entitlement holders, industry and communities to better plan for the future.

3 Ensuring water users comply with their licence obligations

The need to account for differences in water systems across all elements of water resource management to ensure effective and efficient outcomes is established in *Report*: chapter 5. For issues like metering by entitlement holders, the requirements and standards applied should increase with the level of system development and risks to the environment and other users. Likewise, compliance and enforcement systems should differ according to the level of development and environmental risk in a system.

The following sub-sections apply the fit-for-purpose framework set out in *Report*: chapter 5 for water resource management to metering and measurement of entitlement holders' water use and compliance and enforcement systems. The role of water registers and leading practice principles for compliance and enforcement are also discussed, as is the importance of engaging with entitlement holders so that they understand the conditions of their water access entitlements.

3.1 Fit-for-purpose metering and measurement is required

Metering and measurement of non-urban water is critical ...

As noted in section 1.1, metering is a key contributor to water accounts, providing information on how much water entitlement holders are using, carrying over, where and when.¹³ Water accounts aim to provide credible information to assess whether water use is consistent with entitlement conditions and water plans.

The importance of metering and measurement of water use to effective water resource management has been highlighted recently. As the MDBA noted:

A compliance system depends on accurate, reliable, tamper proof meters, good data on river flows and groundwater, and modelling appropriate for annual auditing of water take. Accurate metering and measurement are fundamental for water management, compliance and community confidence. (2017, p. 17)

Inquiry participants also noted the interdependency of water measurement and accounting with effective compliance and enforcement of water rights:

... compliance and enforcement — together with accurate water measurement, water accounting and auditing — form the basis of good water governance. (EDO, sub. 54, p. 7)

... robust compliance is dependent on accurate measurement and auditing to ensure compliance with actual permitted usage. (IRN, sub. 86, p. 11)

¹³ The timeliness of reporting water use for water accounting purposes is dependent on a jurisdiction's non-urban metering policy and can range from annually, quarterly or in real-time.

Without strong water accounting capabilities and practices, effective compliance is highly unlikely and trust in the water management system is unachievable. (MDBA, sub. 23, p. 4)

Effective metering and measurement of water take is a prerequisite to ensuring compliance with entitlements and protections of rights to water. (LBA, sub. 70. p. 19)

... but the Non-Urban Metering Framework is yet to be fully implemented

In our assessment of the implementation of the Non-Urban Metering Framework, the Commission found that — despite progress in recent years (particularly in New South Wales) — no jurisdiction had fully implemented the requirements in the timeframes set out (*Assessment*: section 5.3). Irrigation Australia, in their submission to the inquiry stated that:

... states and territories have fallen short of the expectations and objectives on the National Water Initiative with respect to the area of metering and measurement ... had the NWI and the National Framework been implemented in accordance with the undertakings provided, then a national metering standard would have been achieved. (sub. 3, pp. i–ii).

They also observed that compliance with the NWI and the Non-Urban Metering Framework has been ‘generally poor’ in a number of areas (Irrigation Australia, sub. 3, pp. 3–6):

- The National Framework has not been implemented on a national and consistent basis.
- Despite the principle agreed in the framework that states & territories will use certified installers, maintainers, and validators, not all states have complied with this.
- Several states have not complied with the AS4747 standard as required by 1 July 2020; some states have simply exempted themselves.
- Meters installed after 30 June 2010 in every state & territory did not comply with the national metering standard by 2020, however NSW introduced this requirement on 1 April 2019, South Australia on 1 November 2019 and Victoria in March 2020 (with exemptions). Other States are showing little intention to comply with this requirement some eleven years after the adoption of the framework.
- No states have adopted the requirement to replace a meter installed before 2010 with a compliant pattern approved meter by 1 July 2020 however Victoria are requesting water corporations to prioritise the replacement of non-compliant meters by June 2025.

The lack of consistency between states on water measurement, metering, assurance standards and compliance was also raised by other inquiry participants (CICL, sub. 7, NIC, sub. 13), with the Environmental Defenders Office noting that the NWI ‘leaves room for significant discretion regarding its application (and implies that legislative exemptions are acceptable)’ with respect to metering (sub. 54, p. 4).

Of particular concern to a number of inquiry participants was the difference between metering and measurement in regulated and unregulated systems within the MDB:

The above clause [NWI 87] was to be implemented by the end of 2007, fast forward to today, and there is still no accurate metering of flood plain harvesting take in the Northern Basin ... There has been no metering of water in the north on any consistent basis. (SRI, sub. 77, p. 12)

In terms of unauthorised use or monitoring of diversions, the southern connected basin in NSW, Victoria and SA [South Australia] have had a long held culture and practice of high quality monitoring and metering of actual water use. Recent and well publicised failings in the largely unregulated river systems in the northern Murray Darling Basin must be corrected to underpin public confidence in the wider irrigation industry. (SunRice and RGA, sub. 82, p. 9)

There has been inequitable application of Nationally Agreed metering standards. (MVPD, sub. 101, p. 4)

In our view, FPH [floodplain harvesting] is the elephant in the room. The total volume taken is not known and estimates are thought to be conservative. This is a concern as models are only as good as their inputs and the assumptions applied to those inputs. In our view, the lack of a consistent MDB wide accounting framework and accurate metering of all forms of take, especially FPH, provide further evidence that basin states are failing to meet NWI objectives and outcomes. (AFA, sub. 45, p. 3)

While MDB jurisdictions have all revised their non-urban metering policies to meet requirements under the MDBCC consistent with the Non-Urban Metering Framework and the NWI, these concerns are likely to remain until revised non-urban metering and floodplain or overland flow harvesting policies are fully implemented.

Real-time data provides timely information but at a cost

Timely information on who is using water, how, where and when becomes incredibly useful for regulators and system managers as water systems move to becoming fully allocated and the costs of and risks from mismanagement increase (*Report*: chapter 5). A number of inquiry participants commented that making this type of information available in real-time would help to demonstrate that licence conditions are being met — particularly with respect to entitlements where the timing of take is critical, such as floodplain or overflow harvesting in the northern MDB and the MDB more generally (EDO, sub. 54, p. 5; Engineers Australia, sub. 63, p. 12; SRI, sub. 77, p. 16; AWA, sub. 89, p. 10). Engineers Australia outline some of the factors that would need to be considered in assessing the level of reporting:

Consideration should be given to reporting diversions against water entitlements publicly, in real time, and metered diversions against permitted take. Such an option is not without issues: cost, data accuracy, privacy and commercial interests would all need to be considered. However, this would increase transparency, simplify compliance and reporting requirements, and provide a detailed database for later assessments. (sub. 63, p. 12)

The Victorian Government already ‘aims to keep real time balances of water allocation in individual allocation accounts’ and uses this information as part of their compliance system to determine if there is sufficient allocation to account for the use (sub. 108, p. 10). The Victorian Farmers Federation submitted that in other MDB jurisdictions, where real time accounting is not in place, there are ‘direct river diverters taking water they do not have available in their accounts’ (sub. 99, p. 9) and that ‘meter reads once a year is clearly unacceptable’ (sub. DR192, p. 7). Victoria requires telemetry at sites where water take on average is more than 5000 megalitres per year; however, water corporations may define a

lower threshold for take in higher risk systems or for higher risk water users (DELWP (Vic) 2020, p. 13).¹⁴

New South Wales now requires all non-urban metered take from pumps greater than 200 mm diameter to have telemetry and automatically transmit water take data in real time (DPIE (NSW) 2020a, p. 10). This initiative will be progressively rolled out between now and 2023. Queensland, Western Australia, South Australia, and Tasmania require that meters are capable of telemetry, but currently do not require the automatic transmission of data (DEW (SA) 2019; DNRME (Qld) 2019; DOW (WA) 2009; DPIPWE (Tas) 2014).¹⁵ The ACT requires that all new meters from 2015 on that have water take greater than 5000 megalitres per year comply with the AS4747 (ACT Government 2015, p. 3).

In its MDB Water Markets Inquiry, the ACCC has recommended strengthening metering and monitoring, including through the implementation of telemetry across the Southern Connected Basin, where technologically possible and cost-effective (ACCC 2021, p. 516). They found that timeliness can also impact the accuracy of water accounts and that ‘in the absence of more frequent recordings of meter readings, the information from meters will only be useful for measuring aggregate usage or take and will not be suitable to measuring patterns or trends of usage over time’ (ACCC 2021, p. 678). Even then, aggregated water market accounts ‘exhibit significant delays’ (ACCC 2021, p. 695).

A number of inquiry participants expressed concerns about rolling out more accurate meters and telemetry without proper consideration of the benefits against the costs (NIC, sub. 13, p. 13, AgForce, sub. 24, p. 5, NFF, sub. 42, p. 24).

In 2017, the Commission considered that policies guiding the implementation of non-urban metering and measurement should follow the principle of being risk-based with reforms to metering arrangements subject to scrutiny through standard regulatory and economic review processes. In particular, the Commission noted that cost–benefit analyses of proposals for more comprehensive metering, such as setting targets to meter 95 per cent of water take, should be made available to the public (PC 2017, p. 292). The National Irrigators Council emphasised that ‘achieving the highest possible standards in metering requires genuine consultation and engagement with users and manufacturers to ensure standards and targets are practical and effective’ (sub. 13, p. 14; sub. DR174, p. 27).

A risk-based approach is needed

The MDBA has recently developed guidelines explicitly setting out that a risk-based approach should be taken in setting metering thresholds (box 3). While the guidelines were an action under the MDBCC, they were developed collaboratively by the MDBA and all

¹⁴ Victoria recommends telemetering of information when the net cost of automation is lower than the cost of manual meter reading or to improve safety – over half of Victoria’s meters have telemetry installed (DELWP (Vic) 2020, p. 11).

¹⁵ South Australia has committed to exploring opportunities to mandate telemetry for high risk sites (DEW (SA) 2019, p. 4).

jurisdictions; they include guidelines for zones outside of the MDB for both MDB jurisdictions and for non-MDB jurisdictions.

Box 3 Best practice guidelines for minimum metering thresholds

Best practice guidelines for minimum metering standards were developed collaboratively by the Murray–Darling Basin Authority and all Australian states and territories. The first two principles relate to meeting commitments made under the National Water Initiative, and (for Murray–Darling Basin jurisdictions) the Basin Compliance Compact. The third principle acknowledges that State and Territory Governments are responsible for determining their non-urban water metering policy and regulations, including metering thresholds. The remaining principles (clauses three to six) are the same for all jurisdictions:

- In setting metering thresholds, governments should take a risk-based approach that maximises the measurement of water taken, particularly for high-risk users, and avoids imposing undue costs, particularly for low risk users.
- Risks that are relevant to setting the metering thresholds include risks to meeting the environmental, social, economic or cultural requirements for the water.
- The basis upon which the metering thresholds have been set, including any exemptions to thresholds, should be justified and published on the relevant state agency website.

Following the principles, two guidelines (clause seven and eight) set out when licensed take is to be metered and the exceptions allowed:

1. Licensed water take or utilised water take capacity will be metered by a date determined by the jurisdiction, including for:
 - (a) Licensed surface water and groundwater take
 - (b) Large or high risk licensed water take for stock and domestic uses, mining and industrial uses; and
 - (c) Water captured through floodplain harvesting and by collecting overland flows, but only when it is possible to meter or measure the water through best practice means.
2. A government can determine that exemptions apply to their metering threshold requirements. Exemption criteria can apply for individuals or groups of entitlement (allocation) holders, and may include exemptions:
 - (a) For small entitlements (determined by volume or infrastructure size)
 - (b) Where the water taken is not capable of being measured by a meter
 - (c) Where the costs of metering would otherwise significantly outweigh the benefits
 - (d) Where the entitlement holder can demonstrate that water cannot be taken (for example inactive infrastructure)
 - (e) Where any environmental, social, economic or cultural requirements for the water are not at risk through the use of the exemption.

Source: MDBA (2019a, pp. 3–5).

In the main, the guidelines are similar for MDB and non-MDB jurisdictions. The key difference is that all meterable take must be metered, and non-urban water meters must meet the Australian Standard AS4747, by 2025 in MDB jurisdictions. Non-MDB jurisdictions’

non-urban water meters must meet the Metrological Assurance Framework requirements (set out in the Non-Urban Water Metering Framework) at a date they determine (MDBA 2019a). The Metrological Assurance Framework specifies key requirements for non-urban water meters — including for installation, maintenance, validation and reporting — with the primary objective that ‘national metering standards should seek to provide an acceptable level of confidence that measurement performance under in situ conditions is within maximum permissible limits of error of $\pm 5\%$ ’ (DAWR 2009, p. 1)

The MDBA is coordinating a revision of the Metrological Assurance Framework with the states and territories (MDBA 2019b; NMI and DIIS 2019). The revised Framework will look to include a greater use of risk management to prioritise metering implementation and management requirements (MDBA, pers. comm., 23 November 2020).¹⁶

How the level of metering effort and the standards applied should increase with the level of development and risks to the environment is illustrated conceptually in *Report* (figure 5.1). For example, the MDB would be considered an example of a fully developed system, with some systems within it being overallocated. The New South Wales non-urban water metering policy (DPIE (NSW) 2020a) is prioritising the roll out of meters that meet AS4747 in both pumps over 500 mm across the state and meters in the northern inland region (including requiring telemetry for pumps over 200 mm). This policy is consistent with a risk-based framework and considered by some inquiry participants as comprehensive and leading practice (Irrigation Australia, sub. 3, p. 1; NSWIC sub. 27, p. 22; LVW, sub. 40, p. 3). Canegrowers (sub. 72) provided the Wet Tropics region in far north Queensland as an example of a water resource management area where there is low competition for water and supplementary bores are rarely used. There, they noted, ‘the installation of meters and especially any requirement for meters to have telemetry would be redundant with the resulting benefit ... likely to be significantly less than the additional costs’ (sub. 72, p. 2).

Given that the Metrological Assurance Framework is currently being reviewed to incorporate a greater use of risk management, a renewed NWI should reflect any changes that result from the review so that metering and measurement requirements are fit-for-purpose in supporting reporting on use for water accounts and compliance and enforcement effort. The Commission considers that some form of engagement with industry and stakeholders on changes to the Metrological Assurance Framework to confirm the practicality of implementation would be of value, given the difficulties in implementing its first iteration in a timely manner.

¹⁶ Unlike the National Compliance Framework, the Non-Urban Metering Framework did not reference risk-based implementation when it was agreed to in 2009. Instead, a distinction was made between priority meters (those with a capacity of 5000 ML/year or greater or otherwise identified as a priority meter for management purposes) and other meters (DAWR 2009). The main impact of this classification for entitlement holders lay in requirements that priority meters were to be self-audited twice a year (compared with once a year for other meters) and that priority meters were to be replaced with compliant meters by 30 June 2014 (30 June 2016 for other meters).

3.2 Registers can deliver broader benefits for water management

As noted in section 2.1, water registers contain a secure and accurate record of water access entitlement ownership (similar to a land title register) and trades of those entitlements (and associated water products), including location.¹⁷ The form of water registers differs from jurisdiction to jurisdiction, but they generally contain information on:

- water licences, their conditions and water resource they are associated with
- ownership details
- records of temporary or permanent ownership changes (water trading information)
- water determinations/allocations.

States and Territories each determine the information collected and contained in the registers to be made public (and the format for doing so). Information provided in water registers can often be explored using a search function or via a map, and in most cases basic information is freely available online (*Assessment*: section 2.2).

While water registers fulfil a key function by providing information that supports the smooth functioning of water markets (SP B *Trading*: section 3.1), they are also a critical source of information for water system managers, environmental water managers, regulators, policy analysts, irrigation infrastructure operators and the wider community. Water registers enable all these groups to understand who has an entitlement, the conditions associated with it and how much of their entitlement and/or allocation they are trading over time in a clear and transparent way — underpinning the integrity of the water entitlement system.

Technology innovations are improving options for accessing and using water register data in cost effective ways. These technology benefits offer opportunities for more responsive and adaptive management and are highlighted in the Victorian Water Register 10 Year Strategy 2019–2028:

Improving access to data and information will help water managers and users to make better informed decisions about if, when and how to engage in water markets; support water resource practitioners to make better decisions; and, support improved community understanding of the Water Register, the water entitlement framework and water markets. Improving access to data and information will also provide opportunities for third parties to develop value added products and services. (DELWP (Vic) 2019b, p. 6)

As with metering and measurement above, reporting in real-time against water entitlement conditions should be fit-for-purpose, with the timeliness of reporting and the information reported increasing with the level of development and risks to the environment.

As with many other aspects of water resource management, decisions about the nature of reporting on entitlements should not be ‘set and forget’ but regularly reassessed, particularly as technological developments will continue to improve accuracy and reduce costs. After

¹⁷ NWI schedule F(1).

almost 30 years of trading in the MDB, the ACCC MDB Water Markets Inquiry provides national-relevant lessons for the future development of water market information systems broadly, and water registers specifically (ACCC 2021). The reform package proposed by the ACCC represents an opportunity for MDB jurisdictions and the Australian Government to leverage existing initiatives and reassess registry, trade approval and information management processes more broadly to better align with user needs.

While water registers have been progressively improved over the years in response to the evolution of water markets and needs of water users in those markets (*Assessment*: section 2.2), only one guideline out of six on water registers¹⁸ explicitly acknowledges the critical function they serve for water resource managers in monitoring trade and the movement of water as an input to water accounting systems. In addition to supporting trade decisions, a renewed NWI should consider reflecting the benefits that water registers can deliver more broadly for water management — specifically the role that they can play in ensuring the integrity of water use by entitlement holders, water management at the system scale and the broader water context.

3.3 Commitment to leading-practice compliance and enforcement is needed

Trusted and effective institutional processes regulating and reporting on water use are critical to the integrity of water resource management across Australia.

As highlighted in section 1.2, compliance with water obligations in the MDB has been under scrutiny in recent years, and as a consequence there has been a large amount of reform activity in the MDB jurisdictions over the last three years, particularly in New South Wales.

As with metering and measurement, reporting of water use and registers of entitlement ownership and trade, compliance and enforcement activities should be fit-for-purpose and risk-based. It is also important, given improvements in technology, that compliance and enforcement systems are open to innovation. The level of compliance monitoring and the types of enforcement activities should increase with the level of development and risks to the environment. A fit-for-purpose, risk-based approach is also more likely to be supported by stakeholders:

It is important that in seeking to deliver effective transparency and accountability that the requirements placed on water users are fair, cost effective and in proportion to the risk of non-compliance in a catchment. (AgForce, sub. 24, p. 5)

In its evaluation of the National Compliance Framework, KPMG (2016) found that jurisdictions had mostly progressed and aligned with the risk-based compliance and enforcement, best practice tools, public and stakeholder education and monitoring elements — with further work required on legislative framework and annual public reporting.

¹⁸ NWI schedule F.

However, while the Framework laid out good foundations for compliance and enforcement systems, such as monitoring and reporting, they alone are not enough — with a number of jurisdictions still failing to meet those requirements (*Assessment*: section 5.4). Findings from the reviews into compliance in the MDB highlighted gaps in the Framework that need to be addressed in all jurisdictions going forward for leading practice compliance including a strong independent compliance culture and sufficient resourcing and capability — critical components of leading practice compliance and enforcement systems.

The MDBCC (action 2.1) required MDB jurisdictions to publish a revised compliance framework addressing a recommendation made in the Murray–Darling Basin Compliance Review (2017) to improve compliance and enforcement outcomes (box 4). Many of the required elements MDB jurisdictions are to include in their revised compliance frameworks are consistent with good governance such as transparency, enabling of technologies, secure funding and capability.

Further, the MDBCC also provides a good blueprint for accountability principles, building public confidence in compliance arrangements as they ‘will be measured, publicly reported on in a timely manner and independently verified’ (MDB Ministerial Council 2018, p. 3). Measures to support transparency and accountability of governance arrangements to ensure a strong culture of compliance may include publication of (MDBCC action 1.1):

- a statement of obligations for non-urban water management
- Ministerial letters of expectations (including an expectation of regulatory best practice)
- compliance metrics as a performance indicator for executive staff.

Under the MDBCC transparency and accountability section (action 1.2), each MDB jurisdiction had to publish:

- a reporting framework for identified significant water management decisions involving discretion
- a work program to improve the transparency of information about water take under entitlements, that addresses:
 - real time information on flows, extractions and related rules in unregulated river systems
 - location of take and levels of take in all surface and groundwater systems
 - changes to water registers to ensure that information about water entitlements and trades can be easily accessed by the public.

Water registers in particular, as outlined above, serve a critical compliance function — providing information on the conditions of the water access entitlement and trades which regulators and others can measure adherence against.

Box 4 Compliance framework requirements for Murray–Darling Basin jurisdictions

Two key commitments made by each Murray–Darling Basin jurisdiction and the Murray–Darling Basin Authority through the Basin Compliance Compact were to:

1. publish a revised compliance framework addressing the following requirements from recommendation six of the Murray–Darling Basin Compliance Review:
 - (a) a risk-based strategy for guiding compliance monitoring effort
 - (b) annual audit priorities
 - (c) an escalation pathway to apply once non-compliance is detected
 - (d) a mandatory protocol for entitlement holders to follow in the event of meter failure
 - (e) a statement of the penalties and sanctions regime, and any improvements required
 - (f) annual reporting of data on compliance activities by location including the timeliness with which allegations are addressed
 - (g) provisions to ensure compliance staff are adequately trained
 - (h) a program of community awareness and education including a program to ensure that water plans, licences and management rules are expressed as simply as possible and guides for these instruments are published
 - (i) a program to ensure information about entitlements, allocations, licence conditions, meter readings, account balances and so on are easily accessible to the public in real time
 - (j) a program to ensure meters are identified by a unique reference number, and entitlement and pump details are publicly accessible
 - (k) a commitment to effectiveness and efficiency, including the adoption of new technologies
 - (l) adequate resourcing based on a cost recovery pathway, with compliance budgets protected from the normal exigencies of government budgets.
2. establish a network of water compliance practitioners, co-ordinated by the Murray–Darling Basin Authority, to promote best practice and innovation in water compliance.

Sources: MDBA (2017, pp. 21–22); MDB Ministerial Council (2018, p. 4).

A number of inquiry participants identified the need for a renewed NWI to explicitly include an element addressing effective compliance and enforcement:

The NWI says relatively little about compliance and enforcement at the individual and catchment scales, which is arguably out of step with community expectations ... The next iteration of the NWI should emphasise the need for: Strong compliance and enforcement culture including appropriately resourced, independent water regulators (modelled on the NRAR) underpinned by appropriate governance arrangements. (EDO, sub. 54, pp. 7,9)

Any update to the NWI should include consideration of the critical importance of effective and transparent compliance regimes in water management arrangements. (MDBA, sub. 23, p. 6)

Clearly water use compliance should be part of the NWI and there is a need for consistency between the states on how this is achieved. (Engineers Australia, sub. 63, p. 11)

Renewal of the NWI provides an opportunity to embed leading-practice principles for compliance and enforcement effort, including good governance and clear regulatory objectives. Adoption of leading practice would facilitate confidence and trust in the institutions responsible for supporting water entitlement property rights. The principles and actions set out under sections one and two of the MDBCC provide a sensible starting point for these discussions. Supporting frameworks (such as a revised National Compliance Framework) could provide guidance on fit-for-purpose risk-based implementation.

3.4 Water users need to understand their entitlement obligations

Unintentional non-compliance due to complex water legislation and management

The complexity of water legislation and water management in most Australian jurisdictions means that many water users may be unintentionally non-compliant with their licence conditions (and complicates the compliance task).

In Ken Matthews' final report into New South Wales' water management and compliance, he made it clear that it was not his view that 'non-compliance by irrigators is rife'; instead he wrote, the 'overwhelming honest majority of NSW irrigators take compliance seriously' (2017a, p. i). However, unintentional non-compliance may have a larger cumulative impact on water resources than the deliberate actions of a few. Sinclair and Holley (2015, p. 32) in a survey of New South Wales water users found that 47 per cent of respondents agreed that water laws and regulations were too complex and 27 per cent agreed that they found it difficult to understand their licence or approval conditions. More recently the NRAR commissioned a community benchmarking survey in which around a third of regulated water users felt they did not know everything about their obligations (NRAR 2020a). If these users are unintentionally overdrawing against their entitlements or taking water at a time inconsistent with their entitlement, this can undermine the integrity of water entitlements and water plans. As part of their Compliance Monitoring and Audit program, NRAR engage with communities to ensure water users understand their rights and responsibilities as approval and licence holders. In 2019-20, NRAR found that 18 out of 21 properties audited in the Barwon–Darling region had numerous non-compliance issues associated with works approval conditions and just 10 out of 61 properties audited in the Hunter River reach were found to be fully compliant (DPIE (NSW) 2020b, p. 23).

The complexity of water legislation and licensing has been noted in a number of recent reports. In their investigation into corruption in the management of water in New South Wales, the Independent Commission Against Corruption found that:

The water regulatory system in NSW, and indeed the Commonwealth, is exceptionally complex. Not only are the relevant state and Commonwealth water Acts and Regulations long, detailed and interdependent, there are many different [Water Sharing Plans], each with unique and contingent rule settings and historical precedents. Monitoring and enforcing compliance with market rules is therefore a significant challenge. (2020, p. 157)

The Northern Basin Commissioner had similar findings, referring a water licence ‘to several experts in water management agencies in order to interpret the licence conditions’ (Keelty 2019, p. 12). Finding 2a of the Northern Basin Commissioner’s first year report was that:

Simplification of rules over water access, and the communication of those rules would make it easier for water users to be compliant, and conversely, it should be easier to detect and ultimately prosecute those who are non-compliant. (Keelty 2019, p. 13)

While the issue of complex water legislation hampering effective regulation is illustrated here in the context of New South Wales, it is likely that all jurisdictions face similar challenges. As part of the NWI renewal process, jurisdictions should consider:

- investigating the extent of unintentional non-compliance due to the complexity of their water laws
- whether their existing strategies to educate and engage with entitlement holders on their obligations are effective
- whether a broader review of the legislation might be warranted.

Adequate resourcing for proactive regulation to encourage compliance

Resourcing is likely key to the level of proactive regulation being undertaken by jurisdictions. The MDBA’s (2017, p. 14) compliance review found that New South Wales and Queensland both had low levels of compliance resourcing, and that in New South Wales this contributed to its ineffective and inconsistent compliance regime at the time. The KPMG (2016, p. 55) evaluation of the National Compliance Framework found that the cessation of funding associated with its implementation would result in a narrower range of stakeholder information products being maintained going forward.

The National Compliance Framework uses the responsive compliance pyramid developed by Ayres and Braithwaite (1992) which focuses the largest share of compliance resources on less coercive, less interventionist and cheaper regulatory strategies to encourage and assist with compliance. Activities in this tier include incident investigations, prevention programs, information, guidance, education and advice (COAG 2012, p. 1).¹⁹ Examples of preventative and informative programs are provided in box 5.

¹⁹ Where jurisdictions report compliance actions undertaken with respect to water entitlement holders (that is, in New South Wales, Victoria, Western Australia and South Australia), final prosecutions make up approximately less than three per cent of total warning/advisory letters sent out.

Box 5 **Proactive compliance programs**

New South Wales Natural Resources Access Regulator (NRAR)

As well as having a monitoring and auditing function to ensure water users comply with New South Wales' water laws, NRAR also uses discrete proactive campaigning with the aim to achieve on-the-ground presence and improve public confidence.

NRAR undertook a campaign looking at water take in horticulture in the Hawkesbury–Nepean basin in 2020 (NRAR 2020b). Key outcomes of this campaign included that:

- 43 properties were inspected
- of these, 38 had state-owned meters installed, 26 of which were not working properly
- 8 formal warnings were issued for administrative offences and 26 cautions were given to those with faulty meters.

The NRAR also commissioned a community benchmarking survey in 2020 in order to understand the needs of its regulated community better, with approximately 1000 members of the public, 1000 regulated entities and 40 stakeholder groups taking part (NRAR 2020a). The survey has informed a number of initiatives to further engage with stakeholders, including the 'Know the Rules' campaign which uses short videos, fact sheets and other information to help water users understand how they can access and utilise water under the rules set out in the *Water Management Act 2000* (NSW) and other relevant legislation.

South Australia Department of Environment and Water

South Australia's annual Water Compliance Reporting and Planning reports include both 'business as usual' compliance activities and targeted compliance activities undertaken by the Department of Environment and Water in a water year. The Compliance Strategy Plan 2015–18 requires the annual development of risk-based priorities and delivery of targeted operations to address identified high risk issues of non-compliance and the Targeted Water Compliance Monitoring Framework sets out the principles and steps involved.

In 2019-20 the statewide targeted compliance activity assessment of all 4082 River Murray Prescribed Watercourse water accounts to measure compliance with the quarterly accounting requirements and penalties introduced for that system area on 1 July 2019 (DEW (SA) 2020, p. 2). Previous targeted compliance activities have focused on regions outside of the Murray–Darling Basin — including the Northern Adelaide Plains, McLaren Vale, Western Mount Lofty Ranges, Lower Limestone Coast and Tatiara.

Murray–Darling Basin Authority 2019 Metering Reviews

In 2019, the Murray–Darling Basin Authority conducted four reviews to assess the adequacy and effectiveness of metering and monitoring processes for water licence holders across Murray–Darling Basin jurisdictions. The key findings from the four reviews were that:

- Victorian Lower Murray — effective mechanisms are in place to ensure that metered surface water usage is accurately captured and reported on and can be relied on to support the determination of actual annual take in the region

(continued next page)

Box 6 (continued)

- Lower Murrumbidgee — effective measures are in place to ensure that metered surface water usage is accurately determined and reported, however, some areas of improvement were identified such as the reasoning behind telemetry requirements
- Condamine Alluvium — despite a number of measures being implemented to strengthen the integrity of the self-meter read process, the control environment is insufficient to provide adequate assurance that measurement and reporting of water take is reliable and requires improvement
- South Australia — adequate systems are in place to record and report metered surface water extraction; however, there are also a number of processes that could be improved to strengthen the integrity of the self-meter read system.

Sources: DEW (2018, 2020); MDBA (2019f, 2019g, 2020b, 2020a); NRAR (2020b, 2020a, 2021).

While funding for regulating non-urban water use has been forthcoming in the MDB jurisdictions in the past two years, the Environmental Defenders Office (discussing New South Wales) made the point that ‘the NRAR’s continued success will depend on ongoing funding, which has proven to be problematic in the past’ (sub. 54, p. 8). A similar point was made by the Independent Commission Against Corruption which ‘has residual concerns that NRAR will not remain properly funded in the longer term’ and recommended that the New South Wales Government guarantee funding at least equivalent to that recommended by the Independent Pricing and Regulatory Tribunal over the longer term (2020, p. 158). As long as funding is subject to annual budget processes, there is a risk that regulatory agencies will need to prioritise reactive regulatory activities over proactive regulatory activities.

NWI RENEWAL ADVICE 10.2: ENSURING THE INTEGRITY OF WATER USE

To ensure the integrity of water use, a renewed National Water Initiative would be strengthened by requiring fit-for-purpose:

- metering and measurement of surface water and groundwater take and reporting on use
- registers that realise their potential benefits for water resource management and support compliance and enforcement systems as well as critical functions in supporting trade
- compliance and enforcement systems, including a focus on proactive regulation to increase entitlement holders’ awareness of their obligations.

Inclusion of leading-practice compliance principles would also strengthen the agreement. Compliance framework requirements from the Murray–Darling Basin Compliance Review provide good foundation principles, but consideration should be given to augmenting them with requirements consistent with leading-practice governance.

4 Ensuring the integrity of water system management

In addition to ensuring the integrity of water use, the integrity of water system management must be safeguarded in order to build trust and confidence, and to demonstrate that systems are being managed to best effect.

Water system managers are responsible for managing water resources and regulating infrastructure to ensure that they are meeting stated objectives. While there is some variation in these objectives between managers (box 6), in general, they are trying to optimise between maximising resource capture for allocation (benefiting entitlement holders), meeting environmental and other obligations and ensuring that water can be delivered to users when and where they want it. At the same time, system managers may need to balance other objectives including flood management, while having regard for the economic, social, environmental and cultural activities, and values of communities using the water system (MDBA 2018a, pp. 10–11). It is a complex task, and entitlement holders and communities need to have confidence that the system is being managed to best effect given the range of competing objectives.

Water system management is the responsibility of State and Territory Governments — with the exception of the River Murray system, which is operated by the MDBA on behalf of the New South Wales, Victorian and South Australian governments (MDBA 2020d). Jurisdictions employ different models of water system management. For example, some have established state-owned corporations; in others, responsibility for water system management sits within government departments (box 6).

The growing mistrust and a lack of confidence in water system management in the MDB (section 1.3) highlights the important role that water system managers play and provides lessons for water system managers nationally. This section provides advice on what is required to regain and maintain trust and confidence in system managers to assure the public that systems are being managed to best effect. This includes ensuring that:

- water system managers have the information they need to manage systems
- relevant information is effectively communicated and shared
- information is quality assured and credible
- water system managers are both responsive and accountable.

Box 6 **Examples of water system managers and their roles**

- In operating the River Murray system, the **Murray–Darling Basin Authority** has general objectives that include:
 - operating the system efficiently and effectively to maximise the water available to Murray–Darling Basin jurisdictions
 - ensuring that River Murray Operations’ assets allow for the management and delivery of water that is fit for purpose
 - contributing to the safety of communities and having regard to economic, social, environmental and cultural activities
 - contributing to the protection and restoration of environmental assets and ecosystems
 - ensuring that the best available data, tools and systems are used, that stakeholders are well informed, and that decision making and actions are transparent (MDBA 2018a, pp. 10–12).
- **WaterNSW** is a State Owned Corporation established under the *Water Act 2014* (NSW) and operates under an Operating Licence issued and monitored by the Independent Pricing and Regulatory Tribunal. It has several objectives and its functions include a ‘system operator’ role (WaterNSW 2019, p. 8). This includes managing the New South Wales’ surface and groundwater resources to maximise reliability for users through operation of the state’s river systems and bulk water supply systems. WaterNSW works in collaboration with the Murray–Darling Basin Authority.
- **Northern Victoria’s Resource Manager** makes seasonal determinations for all northern Victorian regulated river systems. These determinations specify the water that is available to entitlement holders. It determines this by estimating water storage in dams, expected inflows, and losses from storages, rivers and channels (NVRM 2020a, 2020c).
- The **Western Australian Department of Water and Environmental Regulation** is responsible for managing the state’s water resources including groundwater, surface water and waterways (such as rivers and estuaries). This role includes: investigating and modelling water resources to inform water allocation plans, collecting and analysing data about rivers and their catchments to provide information on environmental flows and river health, and modelling projections of future water demand (DWER (WA) 2019, pp. 76–82).

4.1 **Water system managers require a range of information**

As noted in section 2.2, system managers require a significant amount of information. They need to have a deep understanding of their water resource system, its infrastructure, how the water system behaves under different climate conditions and the key risks to the water resource. Monitoring networks across states and territories are critical for collecting the information on surface and groundwater systems (such as level, flow, recharge and quality data) that system managers need to manage the resource to best effect (Engineers Australia, sub. DR141). Water accounts also provide valuable information to system managers on how much and when water is being used in a system.

They also need forecasting and modelling systems to keep track of where and when water is being used, and to manage the system dynamically to ensure that it meets the needs of users

throughout the year. This can be a complex job requiring a range of clear and transparent operating rules combined with some judgement. In the southern MDB, it is further complicated by cross-jurisdictional water sharing arrangements.

Water system managers use a variety of approaches to generate relevant information. Broadly, water information can be categorised based on its source:

- Direct measurement, using measurement instruments in monitoring or hydrometric networks.²⁰ This includes direct measurement of surface water, groundwater, meteorology and water quality (MDBA 2018b, p. 2).
- Inference from remote sensing, through passive or active remote sensing instruments such as satellites, aircraft or drones. This is useful for estimating: water held in floodplains; on farm water storages; interception; irrigated areas; environmental take; and monitoring environmental or flood flows (BOM 2017, p. 12; MDBA 2018b, p. 2).
- Estimation from models, which can be used to fill information gaps from direct measurement and remote sensing instruments. Models can fill gaps in water monitoring networks and time series data, predict future conditions and synthesise large amounts of data obtained from catchments (BOM 2017, p. 12).
- Administrative data collections, including information related to water entitlements, water pricing and management regimes (BOM 2017, p. 13).

Often, some or all of these approaches are employed. For example, the Northern Victoria Resource Manager uses direct measurement, model estimations and administrative data to determine how much water is allocated to entitlement holders during a season — also known as seasonal determinations (figure 2).

... however, there are gaps in data collections

In the MDB, there are concerns that water system managers are not operating water systems to best effect, in part because of inadequate data.

First, some commentators have pointed to gaps in the data collections of water system managers which adversely affect management activities. For example, a review of water system management by WaterNSW found gaps relating to Queensland flows, floodplain harvesting flows, extraction and in-river flows, extraction from unregulated systems and flow behaviour during extreme events (Craik and Claydon 2020, pp. 49–50). The Local Government Association of Queensland (sub. 32, p. 3) noted that data sets and catchment modelling may be inadequate for the task of understanding the impacts of water allocation decisions on the sustainability of systems and the regional communities relying on them.

²⁰ The term ‘hydrometric network’ refers to a group of data collection activities for different components of the hydrological system. Data can be collected from a range of measures, including surface water gauges, groundwater bores and climate (rainfall and evaporation) stations (DELWP (Vic) 2019a, p. 1).

Figure 2 How seasonal determinations are made in northern Victoria^a
For high-reliability entitlements and for regulated river systems

	Add: Volume in storage and useful forecast inflows to storage over the following 6 weeks. (In some river systems, inflows to storage over 3 months are included)
	Add: Any resources available from other water systems (i.e. inter-valley trade commitments, supplements)
	Subtract: Volume below minimum operating level, storage and river losses
	Subtract: Trade commitments (i.e. inter-valley) to other systems
	Subtract: Carryover commitment from previous season
	Subtract: Remaining volume required to be delivered at current seasonal determination (i.e. volume allocated minus volume supplied to date)
	Equals: Volume available to increase allocation to high-reliability entitlements in the current season

^a Assessments of resource availability during the irrigation season, and seasonal determinations are made and announced fortnightly, on the Northern Victorian Resource Manager's website.

Source: Adapted from Northern Victorian Resource Manager (2020b).

Engineers Australia (sub. DR141, p. 1) state that to promote trust and confidence in water system managers a 'formal review of the spatial coverage and quality of Australia's water resource monitoring systems (monitoring of rainfall, evaporation, streamflow, groundwater level, models, etc) relative to the information requirement of the NWI within each jurisdiction must be undertaken'.

Second, reviews found that models used for water system management had poor track records, particularly in estimating low and zero flows (NRC (NSW) 2019, pp. 100–101; Vertessy et al. 2019, p. 59). The Wentworth Group (2020, pp. i–iii) compared observed river flows with expected flows modelled by the Murray–Darling Basin Authority and found substantial differences. Between 2012–13 and 2018–19, 13 out of 27 sites had observed flows that were about 75 per cent of what was expected.

Gaps are particularly significant in some areas of water information; one key example is interception (farm dams and bores, floodplain harvesting and large scale plantation forestry). These activities can have significant impacts by stopping, reducing or redirecting flows and preventing them from reaching surface water and groundwater resources (SP A *Entitlements and planning*: section 2.3). Inquiry participants and past reviews have stated that there is insufficient information collected on interception activities and their impacts on water

resources (box 7). Several inquiry participants also highlighted that accurate information on interception activities is not being collected by water system managers — and that if it is collected, it is not being shared with the public (MDBA, sub. 23, p. 5; IWF, sub. 30, p. 9; LBA, sub. 70, p. 4).

Box 7 Inadequate accounting of interception activities

Inquiry participants and past reviews have raised concerns that accounting of interception activities is inadequate. For example, the Environmental Defenders Office stated that:

Over two thirds of diversions in the Queensland portion of the MDB are unmetered or otherwise unmeasured. This leaves considerable scope for unauthorised diversions, particularly given the large volumes of unmeasured water that are taken from floodplains, low levels of telemetry and the widespread practise of self-reading meters ... [although the Queensland] Government has announced plans to improve measurement of water diversions, it remains to be seen what percentage of extractions will be accurately measured and subject to telemetry, particularly given the large volumes of diversions attributable to floodplain harvesting ... Further, the ability of floodplain earthworks to divert water is poorly identified and not measured. (sub. 54, pp. 5–6)

The Institute for Water Futures – Australian National University noted that:

Large unmitigated risks will remain for all water users without transparent and audited water accounts that include measures or reliable estimates of recoverable return flows, floodplain water harvesting and climate change ... These risks jeopardise the successful implementation of the NWI principles, including future levels of SDLs, and also the reliability of water entitlements and water trading within Catchments and Basins. (sub. 30, p. 11)

And Turner et al (2019, p. 22) noted that:

Accounting treatment of floodplain harvesting, run off dams and return flows has been identified as an issue in the SDL [Sustainable Diversion Limit water accounting] framework.

It is recognised that poor accounting is, in part, due to difficulties measuring interception activities:

Not all forms of water take can be metered. Floodplain harvesting, or overland flows, in the northern Basin are the most prominent example, with recent estimates at 210 GL annual take (noting the high uncertainty of this estimate) ... Farm dams and forestry plantations are also instances of non-metered take. For these forms of take, the hydrometric network and hydrological modelling are the way in which estimates are derived. (MDBA 2017, p. 19)

... data relating to floodplain harvesting diversions is only in the form of estimates provided from river system models. The effect of floodplain harvesting activities on streamflows within and between systems can only be known with certainty through collection of accurate information on floodplain harvesting volumes. (Vertessy et al. 2019, p. 80)

As the National Water Commission noted in a report that it commissioned, NWI interception commitments can only be addressed by accurately accounting for water use as a result of interception (SKM 2010, p. ix). Improved measurement and accounting of interception activities is needed to support better incorporation of interception activities into entitlements frameworks (SP A *Entitlements and planning*: section 2.3). Jurisdictions have invested in measures to address this information gap, but progress has been slow.

Another example where significant information gaps remain is groundwater systems. Queensland Farmers' Federation (sub. DR161, p. 4) highlighted that 'there is a need for telemetry in static groundwater systems to help identify areas that are stressed from overuse,

or when aquifers are not replenished in times of drought’. While Addison (sub. DR132) discusses paucity of data on domestic bores in Western Australia.

A risk-based approach to address information needs

While information is essential for effective system management, there can be considerable costs and time involved with collecting, processing and analysing data (Bewsher Consulting Pty Ltd 2018, p. 4). For example, it has taken many years and more than \$37 million to develop the databases and models needed to regulate floodplain harvesting in New South Wales (DPIE (NSW) 2019, p. 1).

It is therefore important to consider both the costs and the benefits associated with meeting information needs. However, in many cases, there are risks involved in realising benefits, and so a risk-based approach is required.

A risk-based approach weighs up the costs and benefits of meeting information needs, in light of risks within a water system (*Report*: chapter 5). For example, in water systems that are fully developed, the costs of inadequate information (and the risk of mismanagement) are likely to be higher than in a water system that is less developed. In fully developed systems, the benefits of collecting adequate information are likely to outweigh the associated costs. For example, in the MDB Water Markets Inquiry, the ACCC stated it believes ‘the benefits of more widespread telemetry outweigh the costs, particularly in the Southern Connected Basin’ (ACCC 2021, p. 503). Information necessary for effective water system management should include data about how much water is in a system, where it is, how much is extracted (including for interception activities), the location and volume of system losses, how much is carryover and who gets what when. Mackay Conservation Group also made the point that in developing systems, data and knowledge gaps should be filled to ensure these systems do not become overallocated (sub. DR150, p. 3).

Technological advances, if implemented, could potentially reduce costs. For example, remote sensing and emerging technologies could replace traditional types of hydrometric data collections systems, which are more expensive (Bewsher Consulting Pty Ltd 2018, p. 17). The Australian Water Association (sub. 89, p. 10) noted that various technologies now available (such as remote sensing) can inform monitoring for active management of river systems, and can help identify and monitor water quality.

Several factors should be taken into account in determining relevant risks associated with managing a water system (and, therefore, the types of information that need to be collected). These include the level of development (and the likely change over time), whether it is fully allocated or overallocated, and whether it is regulated or unregulated.

4.2 Effective communication and sharing of information builds trust and confidence

While water system managers need to collect the right data to inform their operations, simply collecting data is not enough to assure the broader community that managers are doing a good job. Effective communication and sharing of information is needed.

As noted above, under the NWI, parties agreed that the intended outcome of water resource accounting is to support public and investor confidence in how water resources are being managed.²¹ If information is not shared with the public, understanding of and trust in the operations of water system managers can be seriously undermined. The Environmental Defenders Office (sub. 54, p. 9) stated that ‘a great deal of mistrust in governments and between stakeholders could be avoided if more information was made publicly available (and in an accessible format)’.

Water system managers already provide a large amount of information through reports and websites; however, there are concerns that important and relevant information is not always made publicly available (IWF, sub. 30, p. 9; EDO, sub. 54, pp. 9–11). The management of the 2020 Northern Basin First Flush event provides examples of information being poorly communicated and shared, highlighting the importance of adequate provision and communication of information with stakeholders and the public (box 8).

Where information is provided, it can be difficult to access, navigate and understand, particularly because managing water systems can be a complex process. For example, a review found that the MDBA’s management of the River Murray system was not well understood by the community and that the processes and outcomes were not clearly set out in an easily accessible and readily available format (IIGMDB 2020, pp. 25, 29). The review found that ‘[m]any of the concerns that the inquiry heard might have been redundant if individuals were able to readily see and understand the way available water has been shared over time’ (IIGMDB 2020, p. 14).

Another issue is that information may be inconsistent across different sources. This is largely an issue in the MDB where a number of agencies are responsible for management and river operations (IIGMDB 2020, p. 40). In particular, there are problems concerning:

- inconsistencies in language used between websites and reports (of relevant agencies)
- inconsistencies in information that is distributed across multiple websites (for example, data on storage volumes for the same dam may differ between websites of the MDBA, Goulburn–Murray Water and WaterNSW) (IIGMDB 2020, p. 40).

²¹ NWI paragraph 80.

Box 8**2020 Northern Basin First Flush event — poor communication and sharing of information**

At the start of 2020, north-western New South Wales and southern Queensland experienced significant rainfall, leading to substantial inflows to the Border Rivers, Peel, Namoi, Gwydir and Macquarie valleys and along the Barwon–Darling River for the first time in several years.

In response, a series of temporary restrictions on water extractions were introduced in New South Wales under the provisions of the *Water Management Act 2000* (NSW) to manage the first flows and prioritise water for critical human and environmental needs. This became known as the 2020 Northern Basin First Flush event.

An Independent Panel Assessment of the management of the event found that it achieved improved outcomes for the environment and surrounding communities in need.

However, many water users and affected communities believed that the water system manager (and other agencies involved) did not adequately manage the event. In particular, there was a lack of transparency and poor communication.

- Information was not released prior to the event.
- Systems to communicate information during the event were inadequate.
- There were delays in information being published after the event.
- Where information was available, the manner of publication was not conducive to improving the community's understanding of how water was being managed.

This contributed to confusion among communities and speculation about extraction, impacts and outcomes of the event. It also exacerbated mistrust in New South Wales' water management.

There was a strong unmet demand for information about the event as it unfolded and after it was over. Adequate resources were not put aside to meet this demand. Delays in publishing information allowed speculation about extraction, impacts and outcomes of the event to become de facto truths, and promoted views of mistrust, secrecy and mismanagement. It inhibited a productive, fact based discussion on the benefits and costs of first flush events and constrained the Panel's assessment, particularly for its draft report. (Craik and Claydon 2020, p. 6)

The independent assessment made several recommendations to improve management of such events in the future. These included: developing a communications plan for stakeholders (including water users and affected communities) and improving, and resourcing, communication coordination and capability.

Source: Craik and Claydon (2020).

Information related to a specific water system must be available and easily accessible in one location. And water system managers should be responsible for this. In the case of the MDB (where multiple agencies are responsible for its management), system managers must collaborate more to ensure that data and the language used to describe aspects of a system are consistent, and that information is accessible from a single website. Work on this is underway, with the Australian, New South Wales and Queensland Governments developing a new website (to be led by the MDBA and the Bureau of Meteorology). This work aims to improve the transparency, consistency and accessibility of MDB related information, and to ensure that information is easy to access in one place (Pitt, Pavey and Butcher 2020).

Making information public and ensuring that it is effectively communicated is not without costs. It can involve time spent preparing reports or other materials, as well as developing and maintaining data portals and dashboards.

A key step is to determine the objective of sharing information (in this case, to build trust and confidence in water system management), and then decide what is required to achieve this outcome. In doing so, it must be acknowledged that there are different types of data users, with different levels of skills in accessing and interpreting data, as well as different purposes for using the data. For example, quarterly data may be sufficient for invoicing and compliance evaluation, but not for modelling and planning (Engineers Australia, sub. 63, p. 7). Engagement with stakeholders is necessary to achieve this.

There are examples of initiatives by water system managers to improve communications with stakeholders and the public. For example, the MDBA recently responded to concerns about how operations of the River Murray system were affecting entitlement holders' allocations by publishing a report explaining the main components of, and factors that influence, river losses (MDBA 2019c, p. iii). The main factors influencing losses had been hot and dry conditions, combined with low inflows, high demands and the need for overbank transfers, resulting in conveyance losses of about 620 gigalitres during the year. An accompanying report summary highlighted key findings in simple language and included infographics to make the analysis more accessible (MDBA 2019e, p. 1).

Water system managers and government agencies have also established interactive data portals and dashboards. For example, WaterNSW has developed a WaterInsights Portal, which provides information on: annual allocations of water to entitlement holders and water usage (by licence category); daily storage volumes, inflow and releases for dams; and the daily recorded levels and flow rates for all river gauges and aquifer bores (WaterNSW 2020). And the Queensland Department of Natural Resources, Mines and Energy (2020) developed an interactive dashboard which provides a range of information on water systems, including on the volume of water that is traded and unallocated, storage capacity and the average annual environmental flow.

Notwithstanding the benefits of communicating and sharing information, there are limits to what can be shared given privacy concerns. AgForce (sub. 24, p. 5) noted that transparency towards the public should not come at the cost of personal privacy and that data should be aggregated and de-identified. Further, Engineers Australia (sub. 63, p. 7) stated that while transparency is essential, there are valid commercial and privacy issues associated with reporting information related to water diversion and trading.

4.3 Quality assurance can enhance the credibility of information

Water information is most trusted and valued when its quality is assured. Public confidence can be improved by applying sound management procedures and systems to all stages of the water data management process, from planning data acquisition and collecting and

processing data through to publishing water information and responding to critical feedback (Bewsher Consulting Pty Ltd 2018, p. 3).

However, the public does not always believe that information made available by water system managers is credible. As the MDBA observed, ‘[e]ven when information is provided, there is a lack of trust in the agency providing the information’ (sub. 23, p. 14).

This particularly applies to water information generated through modelling. Model calculations or estimates may be made publicly available, but often the model itself is not (Horne 2015, p. 2167). Although model estimates are always approximate, steps need to be taken to promote trust and confidence in the underlying work, particularly because a significant amount of water cannot be directly measured — for example, only 25 to 51 per cent of surface water is metered in the northern MDB (Bewsher Consulting Pty Ltd 2018, p. 13). Lifeblood Alliance stated that ‘models must be ground-truthed to make sure they are an accurate representation of reality’ (sub. DR133, pp. 14–15). To build credibility, water system managers need to ensure that their models are regularly tested, evaluated and updated (to support ongoing improvement), peer reviewed, and (in shared systems) accredited. A best practice process for model and method quality assurance was developed for Basin water authorities and is provided in box 9.

At present, there are no national guidelines that classify water data quality or support improvements in water data and information quality. For example, Engineers Australia (sub. 63, p. 7) noted that quality codes (which help data users understand the uncertainty associated with a measurement) are inconsistent. This increases the difficulty and costs of using data and can lead to inappropriate design recommendations. Development of a standardised approach to support data quality was considered during the review of the National Industry Guidelines for Hydrometric Monitoring in 2018, but the task was considered too large to undertake at the time (Bewsher Consulting Pty Ltd 2018, p. 4).

There are, however, some sub-national examples of frameworks and approaches. For example, the MDBA has developed a Water Information Quality Assurance Framework (MDBA 2018b, p. 2). The framework sets out a process to guide fit-for-purpose water data collection, which includes analysing water information needs, strategically reviewing water information sources to identify areas for quality improvements, implementing identified improvements, and undertaking reviews (MDBA 2018b, pp. 5–6). Further, there are other approaches that could improve transparency around data quality. One is to publish standardised accuracy classes (that specify how accurate data are) alongside water information, particularly for information where concerns have been raised by stakeholders (table 1). Another is to ensure that water information is independently audited.

Box 9 A process for model and method quality assurance

A number of steps help to build quality information through models and methods.

- The best available data are used to establish, calibrate and validate models and methods. Where data deficiencies exist, improvements to the coverage of the existing hydrometric networks should be considered so that the data deficiencies can be rectified.
- Model methodologies are documented and made publicly available. This documentation should identify assumptions and limitations, and detail the purposes to which the models or methods could appropriately be applied. Consideration could be given to utilising a standardised system for classification of result accuracies.
- Models and methods are subject to independent peer reviews.
- Models are subject to ongoing reviews and refinements to ensure that they are fit for purpose and are using the most appropriate procedures for simulating take — including take from interception activities such as floodplain harvesting.
- A timetable for reviews of the models or methods, including foreseeable improvements, is prepared and published.

In cases where data or science available are insufficient to facilitate robust modelling, deficiencies should be documented, as should the justification for the adopted estimation procedure (Bewsher Consulting Pty Ltd 2018, p. 17).

The Basin Salinity Management 2030 strategy provides an example of where robust quality assurance processes are required. The strategy aims to hold the Murray–Darling Basin Authority and Murray–Darling Basin (MDB) jurisdictions responsible for managing salinity in the MDB. The strategy requires independent auditing of performance against commitments, for both the Murray–Darling Basin Authority and MDB jurisdictions. The audit process includes reviews of models, salinity registers and identification of knowledge gaps, to inform recommendations for improvement. Audits are undertaken biennially (Wickes, Smith and Walker 2020, p. 1,6)

Sources: Bewsher Consulting Pty Ltd (2018); Wickes, Smith and Walker (2020).

Table 1 Example of standardised accuracy classes for water information^a

Accuracy class	Description	Numerical accuracy range
A	High Accuracy	± 5 %
B	Medium Accuracy	Between ± 5% and ± 20%
C	Low Accuracy	Greater than ± 20%

^a Some water information is estimated — for example, streamflows for ungauged sites. Various techniques (such as calculating the deviation from the rating curve) can show how close an estimate might be to the actual value. The numerical accuracy range indicates the percentage deviation from the actual value or range of values.

Source: Bewsher Consulting Pty Ltd (2018, p. 4).

As with information needs in section 4.1, a risk-based approach should be adopted to weigh up the costs and benefits of verifying water information in light of the risks (*Report: chapter 5*). In their submission on the draft report, the Institute for Water Futures

(sub. DR120, p. 5) called for ‘transparent and audited water accounts that include measurements or reliable estimates of recoverable return flows, floodplain harvesting and the effects of climate change on flows’. Using the risk-based framework (*Report*: chapter 5), water system managers should implement quality assurance processes to enhance the credibility of information, including independent audits, for water information, including data sources and water accounts, compiled for systems that are fully developed and face higher risks. In water systems that are less developed or face lower risks a review of water information may be sufficient.

In renegotiating the NWI, jurisdictions should agree to have formal quality assurance processes in place for information collected and used by water system managers at the system level. There could be merit in a standardised national approach for determining and reporting data quality for key types of water information. Jurisdictions should consider this in renegotiating the NWI.

4.4 Transparency is required to hold water system managers to account

Water system managers’ decisions and actions can affect a range of stakeholders, including entitlement holders and communities. For example, Steinfeld et al. (2020, p. 1,10) compared the outcomes of two river systems that were governed by the same water system manager and the same legislative and policy framework, but had different management rules in place. They found that the rules significantly influenced water allocations and water availability.

Therefore, there must be processes in place to hold water system managers accountable. First, appropriate governance arrangements need to be in place. For example, in the MDB, governance arrangements, agreements and processes have been established for operating the River Murray system. This includes a framework for how operational decision making is undertaken (IIGMDB 2020, pp. 27–28). A comprehensive review of governance arrangements for all system managers is beyond the scope of this inquiry. Nonetheless, the Commission acknowledges that governance arrangements (which outline processes for decision making and implementation) are in place and has not heard evidence suggesting concerns about these arrangements.

Second, there must be transparency on how water is managed. Water system managers need to publish sufficient information about how they make operating decisions. However, there are concerns that this is not presently the case. For example, Steinfeld et al. (2020, p. 11) found that some management rules were omitted from agency reports — and that public records regarding resource assessment processes, how allocation decisions were made, and justification of management rules were not available. Further, there may be a lack of transparency around the performance of water system managers. For example, the Interim Inspector-General of MDB Water Resources (2020, pp. 28–29) stated that while the Independent River Operators Review Group annually assessed the MDBA’s performance in managing the River Murray system, the assessments were not made publicly available, although the most recent assessment has been

published on the MDBA’s website (IRORG 2020, p. vi). Independent audits of water system managers are important for promoting accountability; making them publicly available would reinforce this and improve transparency.

Finally, water system managers need to be responsive to public concerns and engage with stakeholders to improve information provision. The MDBA has been criticised for being slow to respond, or not responding at all to concerns raised by communities about its management of the River Murray system (MDBA 2017, p. 14; SA Government 2019, p. 442). This may diminish transparency, and lead to increased uncertainty, misperceptions or the misappropriation of available information — which is what has been observed in the MDB (IIGMDB 2020, p. 38). In addition, engagement with stakeholders would help system managers determine whether available information adequately demonstrates to the public that water systems are being managed to best effect.

NWI RENEWAL ADVICE 10.3: ENSURING THE INTEGRITY OF WATER SYSTEM MANAGEMENT

To ensure the integrity of water resource management, a renewed National Water Initiative would need to require water system managers to:

- adopt a risk-based approach to developing and maintaining information and data collections necessary for effective water system management. These collections should include information about how much water is in a system, where it is, how much is extracted (including by interception activities), how much is carryover, and who gets what and when
- ensure that information and data sources are publicly available and information is accessible and effectively communicated. Where multiple agencies are responsible for a system’s management, collaboration is needed to ensure that data and the language used for reporting are consistent and that information is accessible from a single online source
- implement quality assurance processes for information and data sources to enhance the credibility of information, including independent audits for fully developed and regulated systems
- ensure information about their decisions, operations and performance is transparent and that public concerns and information requests are responded to expediently.

Stakeholder engagement would improve information provision and help system managers determine if available information adequately demonstrates to the public that water systems are being managed to best effect.

5 Building understanding of the broader water context

Information about the broader water context is important to a range of stakeholders because it helps them understand the key challenges faced by water resources and potential risks (section 2). For example, entitlement holders, water dependent communities, urban water

utilities and businesses may require this information to manage their operations and plan for the future. It includes information from water accounts, trading registers, broader research, and climate projections and scenario modelling. Information principles for water trading and markets are discussed in SP B *Trading* and, as noted above, broader research is discussed in SP K *Knowledge*.

5.1 Information that meets the needs of water users and communities

There are concerns that information on the broader water context does not meet the needs of water users and communities. For example, the MDBA noted that:

... there is a need for governments to reconsider the way information is shared. The focus must shift from providing more information about ‘what Governments are doing’ to providing better information addressing ‘what water users need’ to navigate the system, run their businesses and have confidence in management arrangements. This should consider ways to create an effective operating environment in which water users and communities have information that is accessible, understandable, timely, relevant and credible. This approach could be highlighted in any update to the NWI to ensure governments provide the information stakeholders require to have confidence in water management. (sub. 23, p. 12)

While climate data, projections and scenarios are generally available and providing necessary information, concerns have been raised regarding system water accounts (access, relevance and usefulness) and national water accounts (information gaps).

System water accounts

System water accounts provide information related to a specific water system. The accounts include information collected by water system managers, as discussed above (section 4). Stakeholders may access this information to understand operational decisions made by system managers, but may also access it for other reasons. For example, the Local Government Association of Queensland (sub. 32, p. 4) noted that access to information regarding the processes and triggers for the release of unallocated water would help communities and businesses with their strategic planning.

However, inquiry participants raised shortcomings and gaps in information provision. For example, the Environmental Defenders Office (sub. 54, p. 9) noted that public access to water related information (including for licensing and allocation details, applications and approvals for trades and statutory permits) is lacking or non-existent in some jurisdictions. This makes it difficult to scrutinise approvals and assess their lawfulness. In the MDB, stakeholder engagements continue to find that the needs of water users, communities and the broader public are not being met (MDBA, sub. 23, p. 12). The National Farmers’ Federation (sub. 42, p. 18) noted that water users must be informed to adequately assess their own risks and benefits, and to make meaningful contributions to broader decision making processes, but current information provision does not enable this.

It is important that water system managers engage and consult with stakeholders (including water users and communities) to ensure that information provided in system accounts is relevant and useful (SP J *Engagement*). This would increase the potential benefits from these accounts.

National water accounts

As noted above, under the NWI, jurisdictions agreed to benchmark accounting systems and consolidate water accounts.²² There has been significant progress in the development of national water accounts. Since 2007, the Bureau of Meteorology (BOM) has assumed a central role in the collection and publication of water data and information, including on water stores and flows, water rights and water use (PC 2017, p. 448). National information is also provided through the ABS Water Account, including on the supply and use of water (ABS 2020). Both national water accounts can be used to inform national policy and priorities, water resource planning, water market activity, investment and environmental management decisions. They also inform research and contribute to the development of water information and knowledge (BOM 2015, p. 1) and potentially to the broader Australian system of Environmental–Economic Accounts (including ecosystem services) currently being developed by the Australian Government (ABS 2019; IEEASC 2018).

Recently, there have been efforts to improve national water accounts and to streamline reporting for entities submitting data. For example, BOM and the ABS have integrated a set of water accounts for the ACT as a pilot to: aid environmental management; support a more collaborative approach to environmental economic accounting; and improve data sharing. BOM has also made developments to reduce reporting burdens, for example, by establishing a single portal for urban utilities (BOM 2020; *Assessment*: section 5.1).

National water accounting is generally providing practical, credible and reliable information, largely without duplication of efforts by jurisdictions (*Assessment*: section 5.1); however, there is scope to improve the accounts. For example, connectivity between surface water and groundwater systems is only accounted for in some areas and accounting for inter-connectivity is not typical (Turner, Vanderbyl and Kumar 2019, pp. 22–23). An inquiry participant noted that BOM’s integrated groundwater data collection has lost value due to a declining monitoring network that provides the data (Campbell, sub. 60, p. 1).

Inquiry participants stated that there are information gaps in national water accounts and these accounts are not independently audited (IWF, sub. 30, p. 8; EDO, sub. 54, p. 6; LBA, sub. 70, attach. 1, p. 2). In sections 4.1 and 4.3 we advocate a risk-based approach to developing and maintaining water information and for quality assurance processes on water information respectively. As national water accounts are derived from this information, they should reflect any developments at the system level in response to any identified information gaps or issues with credibility. Determining whether the national water accounts produced by the BOM and the ABS, as an aggregated dataset, could be improved, would require a broader review with stakeholder engagement.

²² NWI paragraphs 80–82.

Climate data, projections and scenarios

Climate data, projections and scenarios are used to estimate water availability and inform water planning and management decisions. For example, in New South Wales, the long-term average annual extraction limits for regulated rivers are determined using models that simulate river basin behaviour based on climate data, irrigation development and water plan rules (Weber and Claydon 2019, p. 26). Australia's climatic variability suggests that there will be a continuous need for water information to help governments and communities manage climate risks (ANAO 2014, pp. 13–14).

Inquiry participants noted the importance of climate data and provided examples of how it is used. For example, the NSW Water Directorate (sub. 37, p. 4), the peak industry body for local government owned water utilities, noted that up-to-date drought data and climate modelling are needed for water security modelling. In terms of farm management, historical climate data are used to estimate farm income and inform resource management (Langford, sub. 91, attach 1, p. 17).

Climate data, projections and scenarios are generally available and are providing necessary information; however, there are concerns that up-to-date data are not being used to inform water plans and management (AFA, sub. 45, p. 6; IRN, sub. 86, p. 4). This issue is discussed further in SP A *Entitlements and planning* and further advice is provided, including the need for better coordination to account for climate change. Climate information is made available through multiple government agency websites, including BOM and the CSIRO, and through international organisations, such as the Intergovernmental Panel on Climate Change.

Overall, a renewed NWI should advocate for information on the broader water context to be shared in an accessible, timely and user focused way to ensure it meets the needs of water users and communities. Governments must also recognise that information needs of water users and communities may change over time (MDBA, sub. 23, p. 12). This means that the scope of national water accounts will need to be reviewed and updated accordingly.

5.2 Improving water literacy

'Water literacy' broadly refers to a combination of water related knowledge, attitudes and behaviours. It is viewed as an umbrella term for several areas of knowledge, ranging from the understanding of scientific properties and the role of water in systems to the sustainable use, and conservation of, water (McCarroll and Hamann 2020, pp. 7–8). Water literacy is not confined to water planners, managers and researchers — it is relevant to all individuals.

High levels of water literacy can have several positive impacts. Research shows that it is important for: sustainable water management; building trust between system managers and water users; and gaining public support for water reform and management decisions (McCarroll and Hamann 2020, pp. 1–2). Inquiry participants also highlighted these benefits, and the importance of improving water literacy (LGNSW, sub. 75, p. 5; Urban Utilities, sub. 85, p. 6; AWA, sub. 89, p. 11). For example, VicWater noted that:

Improved water literacy is critical in enabling the community to define its needs and expectations ... The better informed the community is on matters of water management, values, and trade-offs, the more empowered it will be to participate in decision making – which will also contribute to systemic and societal resilience. Victorian research into water literacy found that once community members have a greater understanding of the water system, they have an increased desire [to] participate in decision making. The new NWI has an opportunity to combine efforts to improve water literacy with genuine opportunities for communities to play a co design role in the determination of fundamental matters such as levels of service, risk appetite and liveability outcomes. (sub. 66, pp. 8–9)

A national survey on water literacy found that Australians had relatively high levels of knowledge about some aspects of water, but poor knowledge about others (Fielding et al. 2015, p. 31). Areas where respondents were not as knowledgeable included: how water is treated; the costs, and sources of drinking water; and how complex processes for water treatment can be. More specifically, the Interim Inspector-General of MDB Water Resources (2020, pp. 41–42) found that water literacy across the MDB varies substantially and that it has changed over time — for example, irrigators now need to understand how water markets operate.

Improved water literacy could further support trusted and credible water resource management. This includes by improving communication between water users and communities with water system managers (section 4.2); assisting individuals to understand information on the broader water context (section 5.1); and driving greater stakeholder engagement in water policy reform and management. SP J *Engagement* identifies the need to improve community water literacy to achieve effective community engagement.

NWI RENEWAL ADVICE 10.4: ENSURING INFORMATION ON THE BROADER WATER CONTEXT ALIGNS WITH USERS' NEEDS

In renegotiating a renewed National Water Initiative, jurisdictions should commit to providing information on the broader water context that meets the needs of system participants (including water planners, managers, users and communities).

The scope of national water accounts should be reviewed. In undertaking these reviews, stakeholders must be engaged to ensure useful and meaningful information is reflected in accounts in the future.

A renewed National Water Initiative should acknowledge the utility of national water accounts and require their regular publication and avoidance of unnecessary duplication of effort in their preparation.

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Australian Government
Productivity Commission

Urban water services

Supporting Paper F

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Under the 2004 National Water Initiative (NWI), all jurisdictions committed to: implement best-practice pricing and institutional arrangements for urban water services; pursue urban water reform; and undertake specific actions as part of these endeavours. COAG subsequently endorsed the *National Urban Water Planning Principles* (2008) and the *NWI Pricing Principles* (2010).
- The urban water reform effort has brought benefits, and good progress has been made towards improving urban water service outcomes, as well as efficient and financially sustainable service provision. But there are shortcomings in pricing and the application of economic regulation, and the case for NWI renewal is strong.
 - Climate change, population growth and changing community expectations will place pressure on urban water service providers, necessitating changes to business-as-usual water services provision. A failure to be proactive risks poor responses to extreme events and uneconomic supply augmentations. National principles may help the sector adjust and avoid imposing unnecessary costs on customers.
- A renewed NWI should include a significantly enhanced urban water reform element covering water supply, wastewater and stormwater management and including best-practice system planning, pricing and institutional arrangements, governance and regulation, guided by:
 - agreed levels of service that set long-term supply objectives for the urban water system, aligned with customer preferences through a transparent and consultative process
 - clear objectives for public health, the environment and urban amenity, set in line with community preferences and enforced through outcomes-focused regulation.
- Best-practice system planning should incorporate:
 - integrated water cycle management — the integration of water supply, wastewater management and stormwater management — through an integrated approach to planning
 - an ‘all options on the table’ approach, with rigorous and transparent assessment of the full range of supply augmentation and demand management options
 - clear roles and responsibilities for governments, utilities, regulators, developers and land-use planners.
- A renewed NWI should recommit to cost-reflecting pricing and look to further improve pricing and institutional arrangements across all water service provision by:
 - including national principles to improve the quality of independent economic regulation
 - establishing an assessment framework to guide how decisions are made to apply different models of economic oversight, based on context
 - recommitting to (and improving) public monitoring and reporting on pricing and service quality.

Providing safe, reliable and affordable urban water services, which include water supply, wastewater disposal and stormwater management, is a key objective of the water sector. This goal is often achieved, but emerging pressures — including climate change, population growth and changing community expectations — are reducing the availability and reliability of some water sources, while increasing demand for water. Failure to adequately prepare to address these pressures risks poorer service outcomes and unnecessary costs for water users.

The National Water Initiative (NWI) has contributed to reform in the urban water sector, but provided relatively little guidance for the sector. Renewal of the NWI presents an opportunity to develop high-level guidance that supports jurisdictions in positioning the urban water sector to meet the challenges of the future.

This paper presents:

- background on developments in urban water reform under the NWI (section 1)
- the case for further reform (section 2)
- an integrated framework for best-practice system planning (section 3)
- suggestions for improvements to pricing and service outcomes (section 4)
- a summary of advice on the content of the urban water sector element in a renewed NWI (section 5).

The terms of reference for this inquiry asked the Commission to consider ‘the provision of reliable water services to regional, rural and remote communities’. While the high-level guidance for the urban water sector presented in this paper applies in these communities, more specific reform priorities of relevance to them are considered in *SP G Regional*.

1 Urban water reform progress under the NWI

National urban water reform commenced during the 1990s, with the 1994 Water Reform Framework agreed to by COAG.¹ The Framework, combined with the subsequent National Competition Policy reforms, was focused on water supply and wastewater management and drove initiatives in these areas to achieve: cost-reflective and consumption-based water charges; institutional separation of service delivery and policy-making; and corporatisation of government-owned service providers (to encourage commercial behaviour).

1.1 How was urban water covered in the NWI and subsequent reforms?

The 2004 NWI built on the COAG 1994 reforms with a continued focus on urban water supply and wastewater management. The agreement recognised the need to service rural and urban communities as part of its goal,² outlined a role for independent economic regulation,³ and included a high-level objective to facilitate water use efficiency and innovation in urban and rural areas.⁴

¹ Chapter 6 of the Commission’s 2017 inquiry into *National Water Reform* provides more detail on the history and benefits of urban water reform in Australia (PC 2017a).

² NWI paragraph 5.

³ NWI paragraph 77.

⁴ NWI paragraph 23(viii).

NWI signatories committed to urban water reform under two elements of the agreement.

- *Best practice pricing and institutional arrangements*, through which jurisdictions agreed to promote the economically efficient and sustainable use of water resources, infrastructure and government resources devoted to water management.⁵
 - Jurisdictions agreed to specific actions on pricing (to facilitate efficient water use), investment in new infrastructure, institutional separation, performance benchmarking and independent economic regulation.
- *Urban water reform*, through which jurisdictions agreed to provide healthy, safe and reliable water supplies, encourage water use efficiency and innovation, achieve improved pricing, and facilitate water trading between the urban and rural sectors.⁶
 - Jurisdictions agreed to specific actions on demand management, innovation and capacity building.

Jurisdictions undertook more work to guide reform

Subsequent work, undertaken by COAG, expanded the NWI urban water reform commitments (box 1). Key pieces of work were the:

- 2008 *National Urban Water Planning Principles* (DAWE (Cth) 2019)
- 2010 *NWI Pricing Principles* (NRMMC 2010).

The *National Urban Water Planning Principles* were designed to help governments and water utilities plan the development of urban water and wastewater services in a sustainable and economically efficient manner (DAWE (Cth) 2019). However, there is no formal requirement for jurisdictions to comply with them (PC 2017a, p. 187), and a departmental review found that some principles were more widely adopted than others (DOE (Cth) 2015, pp. 16–17).

The *NWI Pricing Principles* provided technical guidance to improve how jurisdictions set water charges; particularly regarding recovery of capital costs to comply with the NWI. All State and Territory Governments agreed to use them as the basis for setting water charges (NRMMC 2010, p. 5). The principles have been generally adopted by jurisdictions, but there are still issues with pricing and economic regulation in some jurisdictions (*Assessment*).

1.2 Much of the NWI has been implemented for urban water services

In its 2017 inquiry into *National Water Reform*, the Commission found that jurisdictions had made good progress against their NWI commitments for urban water, but also identified unfinished business (box 2) — mainly relating to pricing practices. Issues were related to the application of economic regulation and capital subsidies for small providers, as well as a risk

⁵ NWI paragraph 64.

⁶ NWI paragraph 90.

of some governments backsliding on their commitments (PC 2017a, p. 180). The Commission’s latest assessment has found that much of this unfinished business remains (*Assessment*). Pricing processes and outcomes, as well as the application of economic regulation, are inadequate in some jurisdictions, with poor application of economic regulation contributing to poor pricing processes and outcomes. Further, subsidies for some regional providers in New South Wales and Queensland are still structured as capital grants instead of community service obligations.

Box 1 COAG expanded on the 2004 National Water Initiative

In 2008, COAG developed a water work program, with actions to progress urban water reform. As part of this work program, COAG adopted the *National Urban Water Planning Principles* as an approach to best-practice urban water planning. The principles are listed below.

1. Deliver urban water supplies in accordance with agreed levels of service.
2. Base urban water planning on the best information available at the time and invest in acquiring information on an ongoing basis to continually improve the knowledge base.
3. Adopt a partnership approach so that stakeholders are able to make an informed contribution to urban water planning, including consideration of the appropriate supply/demand balance.
4. Manage water in the urban context on a whole-of-water-cycle basis.
5. Consider the full portfolio of water supply and demand options.
6. Develop and manage urban water supplies within sustainable limits.
7. Use pricing and markets, where efficient and feasible, to help achieve planned urban water supply/demand balance.
8. Periodically review urban water plans.

Subsequently, COAG developed the *National Water Initiative Pricing Principles* to assist jurisdictions in implementing the National Water Initiative pricing commitments in a consistent way. The principles provide guidance on:

- cost recovery, including capital recovery and legacy asset valuation
- urban water tariff structures.

The principles also provided high-level guidance on pricing for recycled water and stormwater reuse (covering stormwater only as an alternative water source, but not all elements of stormwater management).

Sources: COAG (2008); DAWR (2019); NRMMC (2010).

Outcomes of NWI urban water services reform

Although there are still some shortcomings, urban water reforms (undertaken as part of COAG 1994, the NWI and subsequent reforms) have overall provided significant benefits to water users and taxpayers. Institutional separation — the separation of policy-making, service delivery and regulation — has improved accountability and transparency in the sector. Corporatisation and the introduction of independent economic regulation have

supported institutional separation while encouraging commercial behaviour; promoting efficient investment and lower prices for the benefit of water users (PC 2017a, p. 10). And the widespread adoption of consumption-based pricing has provided better signals, changing water user behaviour, resulting in more efficient water use, better signalling of investment needs and facilitating a more financially sustainable sector.

Box 2 The Commission's 2017 NWI assessment found substantial progress on urban water reform, but some shortcomings

In 2017, the Commission highlighted the progress that had been made towards best-practice pricing and institutional arrangements for urban water, but also observed material shortcomings in several areas, noting that:

- there was scope to extend the use of independent bodies to set or review prices, or price-setting processes, as supported by the National Water Initiative (NWI)
- improvements to pricing practices were required in some jurisdictions to achieve the pricing requirements of the NWI
- governments were still providing grants rather than Community Service Obligation payments for economically unviable services to regional and remote communities.

The assessment also highlighted evidence of backsliding against earlier reforms by some jurisdictions, particularly regarding institutional separation of policy-making and service delivery.

The Commission also found shortcomings in the application of economic regulation. While jurisdictions met the specific action required by the NWI, those actions did not achieve the outcomes required by the NWI. The Commission recommended that jurisdictions agree to national principles to raise the standard of economic regulation, in order to better align with the outcomes required by the NWI.

Source: PC (2017a).

2 Why is further reform needed in the urban water sector?

2.1 There are challenges affecting water supply and demand

Urban water supplies are under pressure from a changing climate

A changing climate threatens the long-term urban water security of Australian cities and towns. As Infrastructure Australia (2019, p. 601) has noted, ‘of all the forms of infrastructure, the potential risks and costs of climate change are greatest in the water sector’.

Rainfall and streamflow are already falling across much of southern Australia, while temperature and the incidence of extreme heat events are increasing across most of Australia (BOM and CSIRO 2018, pp. 4–7, 9). The security of climate-dependent water sources (such as dams and aquifers fed by rainfall and streamflow) is becoming less certain (WSAA 2020,

p. 10), but they still accounted for 80 per cent of Australia's water usage in major urban regions in 2018-19 (BOM 2020a, p. 21).

Projections of rising temperatures and more variable rainfall highlight the need to ensure that urban water systems can contend with more frequent extreme events, such as droughts and floods. For example, Greater Sydney's average dam levels fell from 96 per cent in April 2017 to just above 50 per cent in May 2019 due to drought. Rainfall during 2020 returned average dam levels to close to 100 per cent (Sydney Water, sub. 94, pp. 11–12), and extreme flooding events in March 2021 caused Warragamba Dam to overflow (WaterNSW 2021).

Demand for water services is increasing because of population growth ...

Australia's population has been growing rapidly, particularly in the major cities. As noted in chapter 2 of the report, capital cities accounted for 79 per cent of Australia's total population growth in 2018-19, with net overseas migration a key driver (ABS 2019). And prior to the COVID-19 pandemic, in a medium-growth scenario, the ABS estimated that about 10 million additional residents would need to be accommodated in Australia's capital cities by 2050⁷ (compared with 12 million and 7 million additional residents under a high- and low-growth scenario, respectively) (ABS 2018).

Projections from the Centre for Population (2020) suggest that COVID-19 will affect population growth in the short to medium term (over the next 10 years) — particularly in capital cities such as Sydney and Melbourne, where population growth is expected to be disproportionately affected by international border closures. In the long term, Australia's population is still expected to grow significantly, particularly in capital cities (figure 1). COVID-19 could subdue long-term population growth, but uncertainty in other factors affecting long-term growth means that the rate of population growth could also bounce back to the level projected before COVID-19 or beyond.

Urban population growth increases demand for household water and places pressure on water supplies. Prior to COVID-19, population growth in Melbourne was projected to increase demand for bulk water by 50 per cent from 400 GL to 600 GL between 2017 and 2065 (Melbourne Water et al. 2017, pp. 10–11). And in south-east Queensland, demand for bulk water was projected to increase proportionally more, by about two-thirds, from 300 GL to 500 GL between 2017 and 2040 (Seqwater 2017, p. 44).

Population growth places similar pressures on wastewater services and other parts of the water cycle. As noted by the Water Services Association of Australia (sub. 88, p. 13):

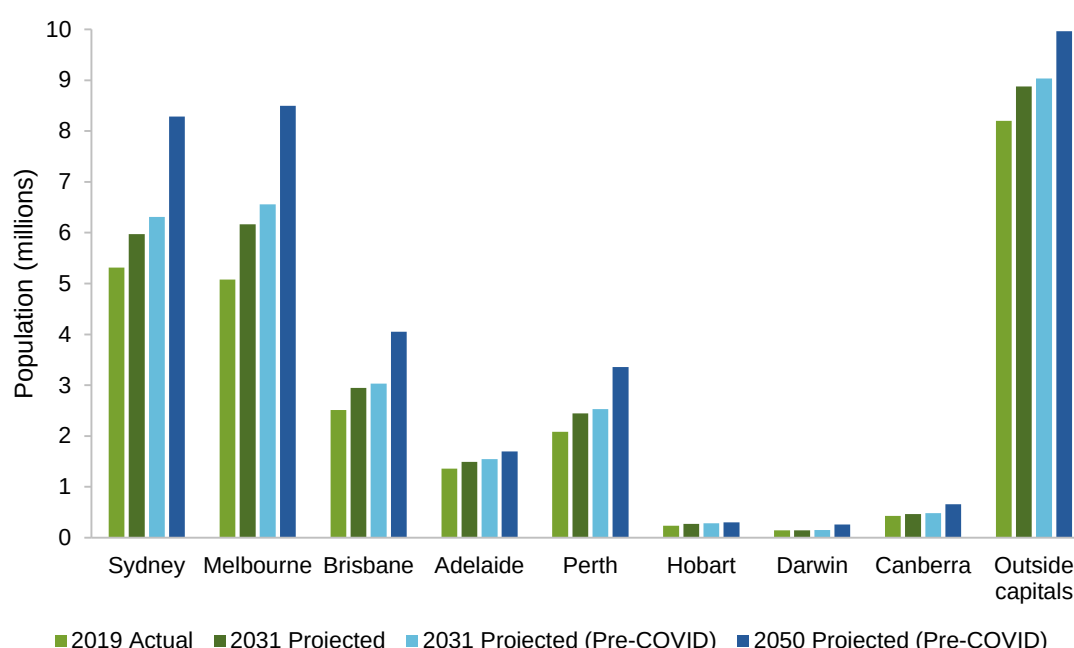
Growth impacts for the water sector include obvious needs like greater water supply, but it also means more hard surfaces, increased wastewater discharges to manage within environmental protection constraints, large and costly new treatment infrastructure, and considerations of stormwater and flood management as the urban footprint expands.

⁷ Population growth has been rebased from 30 June 2017 (used in the original 2017 to 2066 ABS population projections) to 30 June 2020.

Some regional centres are subject to similar growth trends. For example, the local government areas of Greater Geelong and Ipswich grew by 2.7 per cent and 4.1 per cent year-on-year, respectively, during 2018-19 (ABS 2019). But other regional and remote communities are experiencing population decline, affecting the viability of some regional water services (SP G *Regional*).

Figure 1 Australia's population is expected to grow, particularly in the largest capital cities^a

Australia's actual population in 2020 and population projections to 2031 (forecasted pre-COVID and post-COVID) and 2050^b (forecasted pre-COVID)



^a Greater Capital City Statistical Areas. ^b The ABS 2050 population projections reflect the estimated medium-growth scenario (Series B), but there are also high- and low-growth scenarios (Series A and C)

Sources: ABS (*Population Projections, Australia, November 2018*, Cat. no. 3222.0; *Regional Population Growth, Australia, March 2020*, Cat. no. 3218.0); Centre for Population (2020).

Higher demand can necessitate substantial increases in capital investment. For example, Seqwater (the bulk provider for south-east Queensland) determined that peak demand for wastewater services was set to exceed the capacity of the system by approximately 2023 (Seqwater 2017, p. 60). In response, Seqwater proposed a \$218 million increase to its capital expenditure for the 2018–21 period — 70 per cent higher than the 2015–18 period (QCA 2018, pp. 35, 52).

... as well as greater community expectations for water services

Urban communities are increasingly recognising the importance of liveability and urban amenity in contributing to community health and wellbeing — particularly during stressful or isolating

periods such as COVID-19 lockdowns. Previous research has found that increased urban liveability encourages a more active lifestyle, reduces illnesses related to heat, and improves air quality and mental wellbeing for residents (City of Melbourne 2012, p. 13).

Some aspects of steps to improve urban amenity place demands on urban water providers. WSAA (2019, p. 2) highlighted some of the sector's contributions to liveability and urban amenity. These include:

- the provision of fit-for-purpose water to ensure green open spaces, such as parks, to support active and healthy lifestyles
- integrating natural waterways with the urban landscape to create community and ecosystem benefits, including wetlands, urban habitat and connected green corridors
- enhancing waterways through reducing pollution and harmful flows
- supporting cool, healthy environments by using water and greening to reduce heat in the urban landscape.

Many inquiry participants commented on the importance of water services in supporting liveability and urban amenity.⁸ For example, WSAA (sub. 88, p. 3) noted the importance of investment in green open spaces to support physical and mental health. And the Cooperative Research Centre for Water Sensitive Cities (sub. 83, p. 4) noted the sector's shift toward liveability outcomes.

The 'browning' of our cities and towns during the Millennium Drought coincided with a sustained period of rapid population growth in Sydney, Melbourne and south east Queensland. This heightened the awareness of the importance of water for the liveability of these cities, particularly in maintaining green open spaces for recreation and protection from extreme climate events. New policy directions emerged that shifted the focus towards liveability.

Sydney Water (sub. 94, p. 10) recognised the value of liveability to the community, particularly throughout the COVID-19 pandemic.

The community will maintain its desire for high quality open space, interaction with healthy waterways, and preservation of bushland and the natural environment as they seek opportunities for local recreation, and seek refuge from increasing threats, such as urban heat. We note recent survey figures by the NSW Department of Planning, Industry and Environment showing that 46% of people are spending more time in public spaces now than before coronavirus restrictions.

However, demand for liveability and urban amenity increases demand for urban water and imposes costs on users. For example, Infrastructure NSW estimated that, on average, an additional 47 GL of water per year will be required to achieve the 'Parkland City' vision for Western Sydney, which is 35 per cent more water than if business-as-usual urban development was pursued (PC 2020, p. 18).

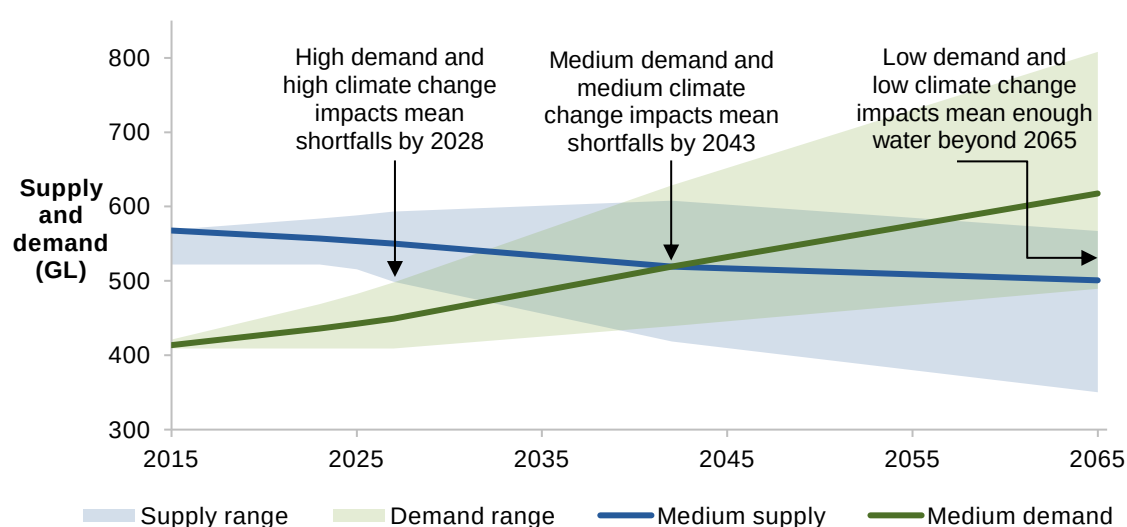
⁸ Cooks River Alliance, sub. 10, p. 1; VPA, sub. 20, p. 2; qldwater, sub. 47, p. 23; Engineers Australia, sub. 63, p. 18; CRCWSW, sub. 83, p. 4; WSAA, sub. 88, p. 24; Sydney Water, sub. 94, p. 10; Local Government NSW, sub. DR147, p. 8; WSAA, sub. DR187, p. 10; Melbourne Water sub. DR190, p. 2.

2.2 Water service providers are responding to the challenges

Urban utilities recognise the importance of water supply and demand planning

Governments and urban water utilities are aware of the challenges placing pressure on water supply and demand, and many are undertaking long-run forecasting to understand those trends. However, there is marked uncertainty over the magnitude and timing of potential shifts in demand and supply. Melbourne Water, for example, has forecast yield estimates under four climate change scenarios and combined them with long-term demand forecasts provided by water retailers (figure 2). Under a high demand, high climate change scenario, Melbourne could face water supply shortfalls as soon as 2028; under a lower demand and scenario, current supplies may be adequate until beyond 2065.

Figure 2 **Demand for water may outstrip supply without action**
Melbourne Water supply and demand forecasts 2015–2065

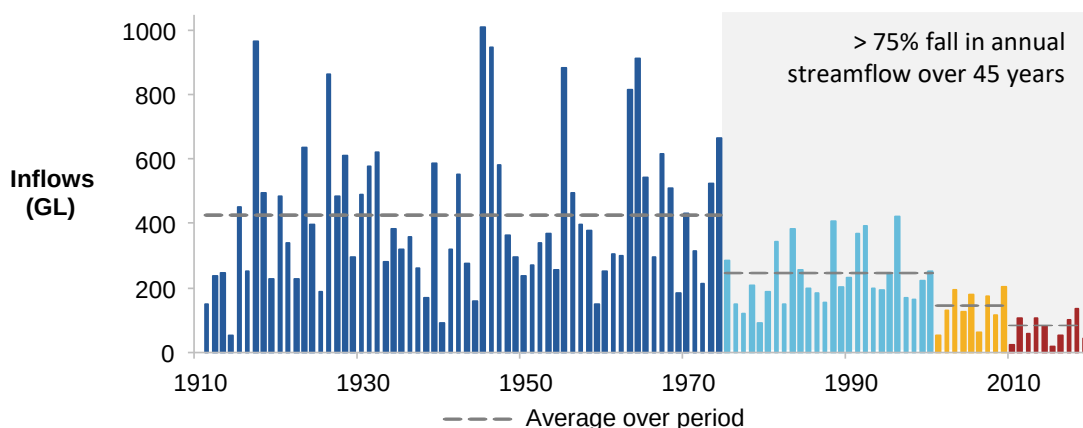


Source: Melbourne Water et al. (2017, p. 15).

Developing scenarios, and assessing the probabilities of these scenarios eventuating as more information becomes available, helps utilities plan for the most appropriate suite of supply augmentation decisions and demand management strategies to ensure urban water security.

In some parts of Australia, significant supply augmentation decisions have already been undertaken to adjust to major changes in water supply. In Perth, surface water has become less reliable since the 1970s (figure 3). In response, Water Corporation, Perth's major urban utility, assessed a range of water supply options, eventually incorporating groundwater, desalination and groundwater replenishment into Perth's water supply network. In 2019-20, Water Corporation sourced 47 per cent of its water from desalination, 45 per cent from groundwater and only 6.9 per cent from surface water (Water Corporation 2020a, p. 30).

Figure 3 Perth stream inflows have declined significantly
Perth annual mean stream inflows 1910–2018



Source: Water Corporation (2020b).

In other cases, events have overtaken planning processes. The Millennium Drought across eastern Australia (1997 to 2009) posed water security risks to most of the major cities, but a lack of effective planning and poor execution resulted in rushed investments into desalination and water recycling (BOM 2015; IA 2019, p. 623).

Decisions were made to fund desalination and water recycling schemes in Sydney, Melbourne, south-east Queensland and Adelaide at a combined cost of \$10 billion (IA 2019, p. 623). Many of these water supply schemes sat idle in the years directly following the Millennium Drought, ‘fuelling backlash against what was widely perceived as unnecessarily expensive water infrastructure’ (CRCWSC, sub. 83, p. 4).

However, the recent drought has put some of these schemes into action. Melbourne’s desalination plant provided 205 GL of potable water between 2016 and 2020, and the Victorian Government has ordered a further 125 GL for use in 2020-21 (DELWP (Vic) 2021). Sydney’s desalination plant commenced restarting procedures in January 2019 when total dam storages in the region fell below 60 per cent, and recommenced water delivery in March 2019 (SDP 2021).

That these investments are being utilised could be seen to justify them — but this does not mean that planning could not have been better, nor that they were necessarily the best options.. While the schemes improved water security, lower cost alternatives could have been pursued, and investments better timed, to achieve the same outcomes.

Significant investment has been planned

Utilities and State and Territory Governments have developed and published medium- and long-term supply augmentation plans which aim to ensure water security (table 1). The depth

of analysis and detail presented varies between plans. For example, Seqwater's *Water for Life* plan contains in-depth supply and demand modelling for south-east Queensland, detailing the methodology, analysing multiple population and climate scenarios, and analysing the impact of incorporating various supply augmentation and demand management options (Seqwater 2017, pp. 39–72). In contrast, while the New South Wales *Metropolitan Water Plan* for Greater Sydney also contains supply and demand modelling, there are fewer population and climate scenarios, the methodology is not outlined and the effect of incorporating various options is not presented (NSW Government 2017a, pp. 26–29).

While the nature, timing and extent of proposed augmentation varies between cities, significant financial investment is required in almost all cases (box 3). This spending is additional to the ordinary investments undertaken by utilities to maintain, repair and replace infrastructure. Some participants have suggested that ageing infrastructure will also drive greater capital investment in the future in order to maintain water service quality. Tasmania's urban water service provider, TasWater (sub. 11, p. 7), noted that:

... like many other urban water authorities, TasWater operates an ageing asset base which is expected to require significant investment over the coming decades to meet community expectations with respect to service reliability and availability.

Pricing determinations for regulated water service providers reveal that large investments are already planned, covering both planned augmentations as well as ordinary asset renewal and refurbishment. For example, economic regulators have approved water supply and wastewater disposal capital expenditure for:

- Sydney Water, worth \$1146 million a year over the 2020–24 period (IPART 2020b, p. 25)
 - The Independent Pricing and Regulatory Tribunal (IPART) also noted that Sydney Water's proposed expenditure on infrastructure maintenance implies that the highest level of activity over the past 10 years would be sustained over the entire 2020–24 determination period (IPART 2020b, p. 43)
- Melbourne Water, worth \$318 million a year over the 2016–21 period (ESC 2016, p. 40)
- SA Water, worth \$411 million a year over the 2020–24 period (ESCOSA 2020, p. 112).

Table 1 Key urban supply augmentation documents

<i>Region</i>	<i>Document(s)</i>	<i>Date</i>	<i>Author</i>
Sydney	Metropolitan Water Plan	2017	NSW Government
Hunter	Lower Hunter Water Plan	2014	NSW Government
Melbourne	Melbourne Water System Strategy	2017	Melbourne Water
Victoria	Urban Water Strategies for each Victorian Utility (3 Melbourne metro and 13 regional) in accordance with the Department of Environment, Land, Water and Planning Urban Water Strategy Development Guidelines	2017	Various
Victoria	Central Region Sustainable Water Strategy ^a	2006	Victorian Government
South-east Queensland	Water for Life: South East Queensland's Water Security Program	2015	Seqwater
Adelaide	Water for Good	2010	SA Government
	Water Forever: Towards Climate Resilience	2009	Water Corporation
Perth	Water Forever: Drought-Proofing Perth	2011	Water Corporation
Hobart	Greater Hobart Strategy	np ^b	Tasmanian Government
Darwin	Darwin Regional Water Supply Strategy	2013	Power and Water Corporation
Canberra	Source Water Strategy 2018–2030	2018	Icon Water

^a Reviewed in 2016 and a final report for the review was released in 2018. ^b Not published.

Sources: Barwon Water (2017); City West Water (2017); DSE (Vic) (2006); Icon Water (2018); Melbourne Water (2017); NSW Government (2014, 2017a); Power and Water Corporation (2013); SA Government (2010); South East Water (2017); South Gippsland Water (2017); Water Corporation (2009, 2011); Western Water (2017); Westernport Water (2017); Yarra Valley Water (2017); Responses to State and Territory information requests.

While medium- to long-term investments are less certain, Sydney Water (sub. 94, p. 5) forecasts capital expenditures of \$25 billion over the next 25 years (excluding bulk water investments).

Although anticipated capital expenditure for water supply and wastewater is well-understood, rising to over \$6 billion a year by 2022-23 (WSAA, pers. comm., 10 December 2020), the same cannot be said for stormwater services, which often fall under the purview of local government. However, the capital requirements are likely to be significant; in its most recent pricing submission, Melbourne Water (which provides waterway and drainage services), estimated that \$244 million would be required for waterway and drainage services each year from 2021-22 to 2026-27 — 57 per cent of that expenditure is to accommodate population growth (Melbourne Water 2020b, p. 197).

Box 3 **Anticipated urban water supply augmentation**

The nature, timing and extent of anticipated investment in urban water infrastructure varies between cities depending on both current and unfolding circumstances.

- In Sydney, the 2017 *Metropolitan Water Plan* assessed that the maximum supply of the city's current water supply portfolio was sufficient to meet business-as-usual demand until 2036, although augmentation would be required by approximately 2024 under higher demand scenarios (NSW Government 2017a, p. 29). After that plan was published, the New South Wales Government triggered planning for the construction of Stage 2 of Sydney's desalination plant during the recent drought (NSW Government 2019), although it has since delayed construction indefinitely due to improved rainfall.
- In Melbourne, as noted in the text, supply augmentation will be required by 2028 under a worst-case scenario (high per capita demand, high climate change impacts) (Melbourne Water 2018, p. 4; Melbourne Water et al. 2017, p. 15).
- In south-east Queensland, population growth and higher water consumption will necessitate further investment — depending on the approach chosen, Seqwater estimates that this will cost between \$2 and \$4.5 billion over the next 20 years (Seqwater 2017, p. 112).
- In Adelaide, an additional 68 GL of annual supply would be required by 2050 under a significant dry scenario, equivalent to one-third of Greater Adelaide's annual water consumption. Under the worst-case supply and demand scenarios and without further investment, Greater Adelaide may experience water shortages in dry years from 2029 onwards, even taking into account output from Adelaide's desalination plant (SA Government 2010, pp. 50–51, 2013, p. 24). SA Water is mitigating the shortfall, with approved capital expenditure of \$1.2 billion in the 2016–2020 determination period (ESCOSA 2016, p. 114), and over \$1.6 billion in the 2020–24 determination period (ESCOSA 2020, p. 112).
- In Perth, projections undertaken in 2009 estimated that the gap between the demand for water services and existing supplies would be 120 GL by 2030 and grow to 365 GL by 2060. Water Corporation anticipated that it will need to invest in 235 GL of new water sources, and employ demand management strategies, such as water efficiency savings and water restrictions, to reduce demand by 135 GL (Water Corporation 2009, p. 22). While current water supply yields are unclear, Water Corporation invested over \$6.5 billion between 2008-09 and 2015-16 to mitigate the supply risks (ERA (WA) 2013, p. 43), and is expected to invest an average of \$536 million every year between 2016-17 and 2022-23 (ERA (WA) 2017, pp. 26–27).

Even when large utilities manage stormwater, there can be unclear objectives for this activity. For example, Sydney Water provides stormwater services to over 500 000 customers, but in their submission to this inquiry, noted that there are no clear waterway health or flow goals for the stormwater assets and waterways they manage (sub. 94, p. 26). In the absence of clear objectives, it is difficult for utilities to estimate how much investment might be needed to maintain, renew and construct additional stormwater assets to the desired standard. Once clear objectives are established, the revealed investment requirements may be higher than had been anticipated.

2.3 More needs to be done

The overall objective of the urban water sector is not just to provide water services to meet the needs of customers, but to do so efficiently, minimising costs for customers. Operational and investment decisions, therefore, must be made well. The billion-dollar capital investment pipeline in major cities presents opportunities and risks — opportunities to improve water service outcomes, as well as broader community outcomes like liveability and urban amenity; but with the risks of inefficient investments imposing legacy costs on water customers, or failing to secure an adequate level of service.

Planning processes that ensure that utilities' decisions about levels of service reflect community preferences would contribute to maximising the benefits of these investments, as would governance and institutional arrangements that promote efficient pricing and utility operations.

The current NWI does not provide much guidance to the sector

As mentioned in section 1, the NWI does not provide much guidance to address the key challenges facing the urban water sector — an inadequacy noted by several submissions to this inquiry.

For many in the sector, and governments more broadly, the National Water Initiative (NWI) has become an irrelevant factor in planning and investment decisions. Lessons from the Millennium Drought, which exposed poor planning and an absence of accountability, remain largely unaddressed, and progress in water pricing reform is inadequate. (Infrastructure Partnerships Australia, sub. 71, p. 2)

Governments no longer refer to or feel bound by the NWI and there is decreasing awareness of the NWI's existence as a policy instrument and [it] is viewed as disproportionately weighted towards rural water issues. (WSAA, sub. 88, p. 14)

The urban water reform element of the NWI (section 1) included very few specific actions for jurisdictions — and these are now largely completed or outdated. Furthermore, although the 2008 *National Urban Water Planning Principles* established guidance for system planning, these principles have been unevenly embedded by utilities (DOE (Cth) 2015). And the pricing and institutional arrangements element:

- provided little specificity on how to achieve cost recovery
- required only a minimal commitment to independent economic oversight
- only applied to water supply and wastewater management (largely ignoring stormwater).

The subsequent *NWI Pricing Principles* improved the guidance on cost recovery, urban water tariffs, and stormwater pricing. But there are still issues with pricing and economic regulation under the NWI and the *NWI Pricing Principles* in some jurisdictions (section 1). And there are other gaps within the NWI pricing and institutional arrangements element that

were not addressed by the *NWI Pricing Principles* (and need to be). These are discussed in further detail below.

Priorities for NWI renewal

Renewal of the NWI presents an opportunity for jurisdictions to refresh their objectives for the urban water sector and include national principles for leading practice in the planning and pricing of urban water services. Committing to national reform could bring a long-term focus to the challenges facing the sector, improve transparency and help depoliticise decision making (WSAA, sub. 88, p. 15).

The Commission has proposed that one element of the overarching objective for a renewed NWI should be for the water services sector to ‘ensure effective, efficient and equitable water services that meet the needs of customers and communities in a changing climate’ (*Report*: chapter 3), by achieving a number of supporting objectives.

- Access to safe and reliable drinking water, including in remote communities.
- Clear objectives for the level and quality of water services which reflect customer preferences.
- In cities and towns:
 - integrated planning and management of water supply, wastewater and stormwater services
 - efficient water services that deliver desired community outcomes, including urban amenity and liveability, in line with customer preferences and willingness to pay.
- Cost-reflective pricing of water services wherever possible, with transparent subsidies to high-cost regional and remote community services.
- Institutional arrangements that:
 - ensure separation of policy setting, service delivery and regulation with clear roles for each
 - incentivise water services providers to be efficient and innovative, and to deliver services in ways that are cost-effective and in the interests of their customers.
- Processes that ensure that water resource infrastructure developments are ecologically sustainable, economically viable and culturally responsive.

This overarching objective should apply across all water services — urban, rural and bulk water. For rural and bulk water providers, maintaining and refining the existing pricing and institutional arrangements under the NWI is expected to facilitate improved outcomes. However, some of the Commission’s advice for a renewed NWI that has been motivated by issues in the urban water sector — including principles for best-practice economic regulation and modernised monitoring and reporting — should also apply to large bulk water providers. The Commission’s view on reform of water services as a whole is contained in *Report*: chapter 11.

The remainder of this paper develops principles for two key aspects of national urban water reform to underpin pursuit of all of these objectives as they relate to urban water services.

- Best-practice system planning, to maintain long-term urban water service quality by integrating water supply, wastewater and stormwater planning and management.
- Improved pricing and service outcomes, building on the pricing and institutional reforms sought through the existing NWI.

This advice applies to all urban water services: those supplying major cities, as well as those servicing regional, remote and rural communities. However, additional issues arise for regional, rural and remote communities, and more tailored reforms could support progress towards best-practice water service delivery in these areas. As noted above, discussion of these reforms is presented in SP G *Regional*.

3 Best-practice system planning

Water planning processes, undertaken by State and Territory Governments, allocate surface and/or groundwater to urban water service providers (among other consumptive users). The availability of these water sources then informs system planning, which determines how service providers deliver water to their customers.

Ideally, system planning optimises decisions to expand water supply, wastewater and stormwater infrastructure, within the constraints of water resource planning. It aims to achieve the full suite of water security, public health, environmental and amenity outcomes sought by the community, without imposing unnecessary costs on consumers. Although system planning is complex — requiring coordination between several planning entities — a high-quality plan will help a utility efficiently pursue the full suite of outcomes sought by the community it serves.

The *National Urban Water Planning Principles* were established in 2008 to bring utilities closer to best-practice system planning (section 1). An Australian Government review in 2015 found that current plans and planning process are consistent with the issues and the concepts covered by the principles, and that the principles are generally seen as a useful set of guidelines, pitched broadly enough to be appropriate in different contexts. But the principles had not been instrumental in advancing new approaches to planning (DOE (Cth) 2015, p. 21).

Building on the *National Urban Water Planning Principles*, the Commission has focused on three areas where nationally-agreed principles would support ongoing progress in system planning. This focus largely reflects the barriers to implementing integrated water management outlined in the Commission's 2020 report on integrated water cycle management (IWCM) (PC 2020). This includes:

1. an integrated approach that: aligns with community preferences; connects across scales and with land planning; and incorporates stormwater management

-
2. all water supply options being considered, with the options chosen supported by a consistent assessment
 3. clear roles and responsibilities in planning for utilities, State, Territory and local governments, regulators, urban planners and developers.

3.1 An integrated approach to planning can bring many benefits

In major cities, large utilities usually only manage water supply services (providing potable water to households and businesses), and wastewater services (removing and treating wastewater from households and businesses). Stormwater is often managed by a separate entity, with the primary focus on ensuring drainage of urban areas. And in some cities, bulk, distribution and retail services are delivered by different providers.

The Commission looked at the integration of these services in its recent work on IWCM, defining this concept as:

... the integrated management of water resources in the urban environment in a way that achieves the full suite of water security, public health, environmental and amenity outcomes that the community seeks. It encompasses all urban water, regardless of its source, and the provision of the full range of water services and water infrastructure, regardless of scale or ownership. (PC 2020, p. 28)

Potential benefits of IWCM include:

- meeting the demand for water by providing water of a quality that is fit for purpose — not just providing potable water for all uses
- managing wastewater to meet environmental objectives in ways that provide an alternative, climate-independent source of fit-for-purpose water that can meet a range of consumption, amenity and environmental demands
- managing stormwater for community safety objectives in ways that keep water in the landscape and contribute to urban amenity, create urban habitat, improve the health of rivers and wetlands, reduce localised flooding and provide alternative sources of water supply
- delivering lower cost solutions to multiple water management objectives
- enhancing the resilience of water systems by increasing the diversity of water supplies and potentially delaying the need to augment the water supply and transfer system (PC 2020, p. 23).

While there are potential benefits to IWCM, simply moving to the approach also has costs. IWCM is complex and may take substantial amounts of investment in planning and workforce capability over several years to implement. For smaller utilities, the costs may outweigh the benefits in the short term, particularly if there are challenges with existing service delivery. The system planning priorities for these utilities are discussed in *SP G Regional*.

The Commission found that most entities in the urban water sector supported shifting towards IWCM, and away from the traditional approach. However, implementing integrated water services planning is one impediment to making this shift.

Effective integrated system planning has a number of prerequisites including:

- clear and agreed objectives
- connecting water system planning across different scales and with land-use planning
- incorporating stormwater management.

These prerequisites are discussed in turn below.

Effective integrated planning has clear and agreed objectives ...

Effective integrated planning incorporates water supply, wastewater disposal and stormwater management services. Utilities, responsible for water supply and wastewater services, seek to provide customers with services that are safe and reliable, at fit-for-purpose quality and at the lowest cost. Stormwater managers (which may be local governments or utilities) seek to manage flooding and surface runoff within urban areas, while minimising impacts on the environmental health of receiving waterways and potentially providing an alternative source of water for water supply. Moreover, all providers are increasingly working to accommodate broader community desires, including urban amenity, liveability and a clean environment. This diverse set of outcomes establishes the objectives that utilities and governments look to achieve through integrated system planning.

In the first instance, integrated system planning establishes health, safety and environmental objectives in line with respective standards, which are generally imposed by other regulators. These standards apply individually across water supply, wastewater disposal and stormwater management. Where these regulations have a narrow focus (for example, by imposing strict standards on pollutant discharge) rather than a more holistic focus on the environmental outcomes sought, they can impose unnecessary costs on providers, and therefore customers, as well as impair the scope for integrated water management. Governments and regulators should ensure that those regulations are fit for purpose and focused on efficiently achieving desired outcomes.

Integrated system planning objectives should then be guided by levels of service for water supply, set by governments, but reflecting customer preferences for water security and other elements of service quality. Levels of service reflect a trade-off between service cost and reliability, and should be established through a transparent and consultative process — accepting that meeting all individual preferences is impossible.

Broader community objectives for integrated system planning, such as for urban amenity, need to be established by government as they guide not only urban water system planning, but also land-use and other development planning. However, these objectives should also have regard to community preferences and their willingness to pay, which can be

substantial — for example, WSAA (2019, p. 8) estimated that the liveability-related benefits attributable to IWCM average in the order of \$94 per person per year.

... connects water system planning across different scales and with land-use planning ...

City-scale water system planning, local-scale water system planning and land-use planning are typically undertaken separately (box 4). At the city-scale, water system planning has traditionally focused on providing centralised infrastructure for water and wastewater services. At the local scale, water system planning has generally involved connecting the centralised infrastructure to end users; local wastewater management has provided fit-for-purpose recycled water for local uses; and stormwater management services are delivered by local governments (PC 2017a, p. 184). But this fragmented approach to planning — where city-scale and local-scale considerations are managed differently — means that supply augmentation options that require an understanding of the costs and benefits across both scales may be overlooked. Water system planning needs to incorporate both centralised and local systems to best effect.

Box 4 Water system and land-use planning are undertaken separately

City-scale (or ‘centralised system’) water system planning aims to optimise the use of, and investment in, centralised infrastructure such as dams, desalination plants and pipes to ensure reliable water supplies while managing affordability. This level of planning requires demand forecasts and recognition of the supply contribution of decentralised options emerging from local system planning. City-scale planning takes these factors into account to determine whether supplies will meet desired reliability levels and, if not, the timing and nature of supply augmentations.

Local water system planning focuses on the infrastructure needed to serve a local area, typically a greenfield or major infill development. This will usually involve extensions of the centralised system to supply water and remove wastewater, but increasingly also involves examining options for localised reuse of wastewater and stormwater, as well as localised stormwater use management. Decentralised options will tend to reduce demands on the centralised system, and so affect city-scale water system planning.

Land-use planning involves zoning and permitting land use in a localised area to determine the shape of development. This process will consider a range of infrastructure needs, including water infrastructure. Efficient supply of water services to a local area will require land-use planning to incorporate and facilitate detailed local water system planning that considers a full range of integrated water cycle management options.

Source: PC (2017a, p. 185).

Under an integrated approach that aims to achieve the outcomes sought by the community (at least cost), water system planning and land-use planning would be contemporaneous and linked at all spatial scales — city-scale, catchment, district/precinct, local and sub-division level. The approach is particularly valuable in growth corridors and major new developments, where the land and water system planning processes entirely define the

outcomes delivered to the community. (Outcomes in other areas are constrained by past decisions.) And land-use and water system planning processes should be updated in parallel with one another, such that all water system planning is up-to-date with land-use planning and vice versa. As detailed in the Commission's research report on IWCM, Western Australia has a formal framework for integrating water planning with the land-use planning process (PC 2020, p. 48). But unfortunately there is a dearth of formal processes linking statutory land planning and water system planning at the relevant time and spatial scales across the rest of the urban water sector (PC 2020, p. 47).

... and incorporates stormwater management

A fully integrated approach to system planning requires stormwater management to be integrated with water supply and wastewater management. This is a significant shift from current arrangements in most cities, where stormwater management is often the purview of local governments, leading to siloed arrangements. And stormwater has, to date, received relatively little attention in national water reform (including the NWI).

Clear objectives for urban amenity and formal processes to link water system and land-use planning may help integrate stormwater into the planning process. But inconsistent local government arrangements for stormwater management and funding mean that management can remain siloed (PC 2020, p. 50), while the absence of arrangements for pricing (section 4) and entitlements (SP A *Entitlements and planning*) present further barriers. Clear institutional responsibilities for stormwater management, such as are seen in Melbourne Water's role as a waterway manager in the Port Phillip and Westernport catchments, can provide an incentive for coordination to help overcome fragmentation (box 5).

In its recent report on IWCM, the Commission recommended that a review be undertaken to determine how stormwater should be managed (PC 2020, pp. 50–51), examining the following.

- The need to set clear environmental and performance objectives for stormwater management and ensure there is a framework for demonstrating they are being met.
- The processes for asset planning and management. Currently, these lack visibility, transparency and quality reporting. Publicly available information on the capacity, condition and age of stormwater assets is limited, and often is not presented to support aggregation or comparison between service providers. This makes it difficult to assess the extent to which significant investment in stormwater infrastructure will be required.
- The need to set clear service standards for stormwater management and have transparent processes for determining any trade-offs (such as between flood mitigation and protecting the environment).
- The development of a clear framework for charging for stormwater management.
- The role of regulation in stormwater management.

-
- 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.

Consistent with this recommendation, a holistic review of stormwater planning and management should be undertaken as part of NWI renewal (SP A *Entitlements and planning*).

Box 5 Melbourne Water's role in coordinating stormwater management

Melbourne Water and a number of local governments provide drainage services in the Port Phillip and Westernport catchments. Local governments provide direct drainage services within Melbourne (for catchments less than 60 hectares); Melbourne Water connects those council drains to regional drains which ultimately discharge into waterways.

Melbourne Water is also responsible for waterway management in the Port Phillip and Westernport catchments, which includes supporting the health of rivers, creeks, wetlands and estuaries.

Although Melbourne Water is not directly responsible for local stormwater management, all of the stormwater in the Port Phillip and Westernport catchments is discharged into waterways that fall under Melbourne Water's responsibility. Poorly managed stormwater adversely affects Melbourne Water, providing the utility with an incentive to engage with local governments on stormwater management.

To improve stormwater management, Melbourne Water provides local governments with:

- recommendations for water sensitive urban design, construction and maintenance
- guidance on stormwater treatment and harvesting
- regulatory considerations for stormwater management
- online tools and resources to plan and implement stormwater management.

Improving local government stormwater management should reduce pressure on Melbourne Water's drainage and waterway services, improve the condition of Melbourne waterways and potentially reduce the associated cost imposed on its customers by its drainage and waterway management function.

Sources: Melbourne Water (2013, 2020c, 2020a, 2021).

3.2 Least-cost water supply requires all water supply options to be considered

As part of the planning process, many water service providers will have to consider how to balance long-term supply and demand, usually through a portfolio of options to manage risk. Often, accommodating demand will require supply augmentation, and there may be several options for utilities to choose between including surface water, groundwater, stormwater harvesting, purified recycled water for drinking, non-potable recycled water, desalination or

transferring water between sectors or regions. Alongside supply augmentation, options to manage demand or to increase water supply distribution efficiency are also considered.

Selecting the best option (or options) to add to a portfolio is key to best-practice system planning. As Infrastructure Australia (2019, p. 623) has observed, ‘[e]nsuring all options are on the table, and can be deployed when required, is likely to be essential for governments and operators to effectively and efficiently ensure secure supply over the long term’.

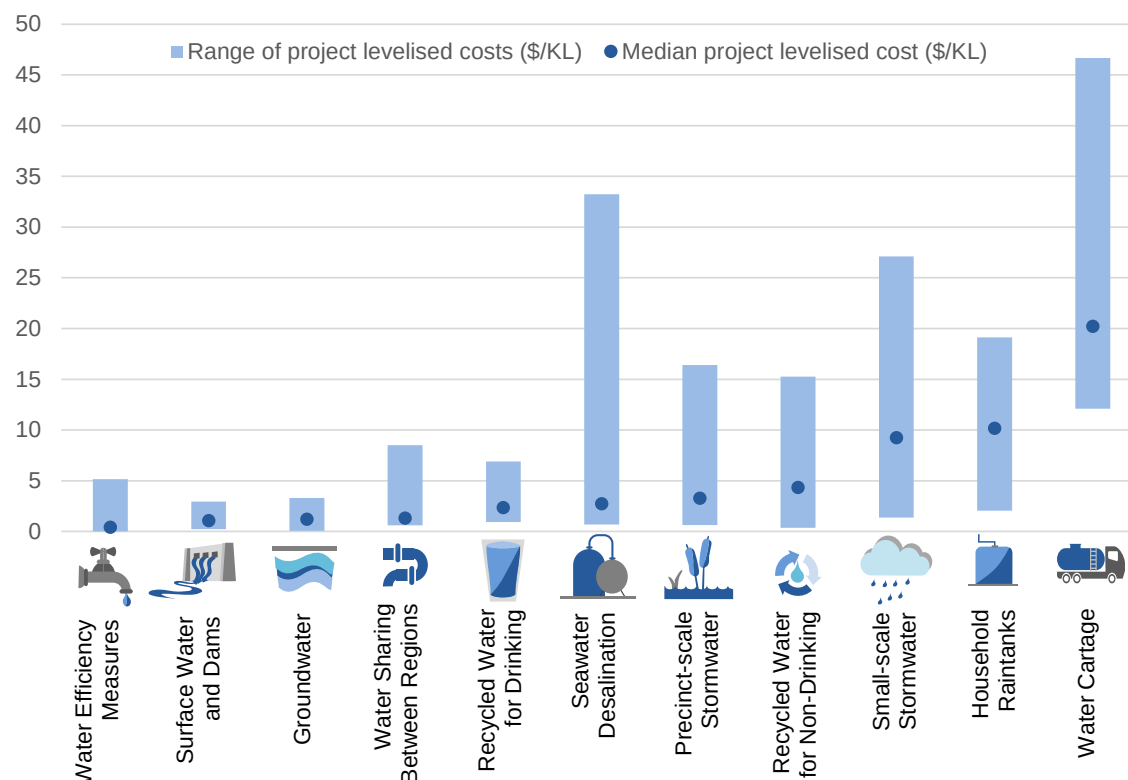
To support selection, the costs associated with each option need to be evaluated. A recent report outlined the costs of options available to providers using a survey of 330 water supply projects across Australia (figure 4; WSAA 2020, p. 11). The analysis revealed substantial variation across projects — costs and benefits can be specific to cities and towns. What may be available and lowest cost for one area may not be for another, and the benefits will depend on the outcomes sought by the specific community and a project’s interaction with the surrounding environment (WSAA 2020, p. 12). Further, costs, communities and the environment change over time with climate, technology and other factors, and this needs to be considered. An effective planning approach looks for the options that best suit the local situation at a point in time.

Demand management is another option that needs to be considered as part of a portfolio. This may be implemented in a number of ways, including dynamic pricing, water restrictions, mandates for water-efficient technologies, or information and education campaigns to encourage reduced water consumption. Like water supply options, demand management options impose costs on users, and their cost-effectiveness should be considered alongside supply augmentation options.

An integrated approach can be constrained by policy bans that rule out the use of some water sources despite them being fit for purpose. Bans may mean that the full suite of outcomes sought by a community cannot be achieved or that more expensive supply options need to be adopted. For example, as recognised in the Commission’s previous research (PC 2020, p. 53), supplying recycled water, if only permitted for non-potable use, requires an entirely separate distribution network (‘purple pipes’) from the potable water network — costing end users far more than with an integrated distribution network.

And although there are national guidelines that allow for recycled water to be used for drinking — the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks*, part of the *National Water Quality Management Strategy* (EPA (Vic) 2021, p. 21; NRMMC, EPHC & AHMC 2006) — only Queensland and Western Australia use recycled wastewater to augment drinking water supplies (by allowing it to be returned to waterways that are drawn from as part of the drinking water distribution system) and Victoria retains an explicit ban on using recycled wastewater for drinking.

Figure 4 **There is a range of water supply option costs**
 Levelised^a cost of water supply options (\$/KL 2019-20)



^a Levelised costs take account of the varying scales and timeframes of projects such that they are compared on an equivalent basis.

Source: WSAA (2020, p. 13).

Guidelines for water recycling should be kept up-to-date and regularly reviewed to keep pace with any new or emerging health risks, as guidelines that reflect the best available information will be necessary for jurisdictions to adequately consider the relative merits of recycled water sources on a case-by-case basis. This will become increasingly important, because as climate change increases the cost of traditional water supply sources, the cost of a continued reluctance to consider all options, including recycled water, increases too.

Credible supply augmentation decisions are supported by rigorous assessment

The choice of supply option (or options) is ideally made on the basis of a rigorous comparison of the relative costs and benefits of the alternatives — with the preferred option (or options) being the one with the greatest net benefit. There are several detailed guidelines on cost-benefit analysis at both the Commonwealth and jurisdictional level (DOFA (Cth) 2006; MJA 2013; NSW Government 2017b). No solution will align with everybody's preferences. But if agreed levels of service, clear objectives for amenity and fit-for-purpose regulation have been established, and the cost-benefit analysis is rigorous and transparent,

the community can have confidence that the chosen solution is the outcome of a strong decision-making process.

An assessment should examine all options, subject to risk and uncertainty

When utilities perform an assessment of all water supply options to select the one with the greatest net benefit, they should consider the risks and uncertainties associated with options. For example, the benefits of a climate-dependent water source (such as a dam) will be riskier than the benefits of a climate-independent water source (such as desalination). Probability weighted climate forecasts can be used to assess the expected benefits of each option.

To quantify these risks, and thereby make a rigorous assessment that will lead to the best option being chosen, acquiring current information will be important. (It will be also be important for best-practice planning more broadly — this is reflected in principle 2 of the *National Urban Water Planning Principles*.) The more relevant, accurate and timely the information, the better the forecasts of potential climate outcomes will be. And better forecasts will lead to better estimates of expected benefits, increasing confidence in the results of the assessment and maximising the likelihood that the most efficient water supply option is adopted.

The assessment should also adopt a portfolio approach to help manage risks. A portfolio approach involves analysing the costs and benefits of various suites of potential water supply options to supplement existing supply, and then selecting the suite with the highest net benefit. Costs and benefits may be miscalculated if a portfolio approach is not taken, as the expected benefit of adding a single water supply augmentation option will depend upon the mix of other options being adopted at that time. For example, the most cost-effective new supply measure to increase yield may not be sufficient to protect water supply during prolonged dry sequences. The addition of measures (such as water recycling) to address supply at these times will also contribute to increasing yield, such that the initial supply measure being considered may not be needed.

A complete portfolio approach to the assessment will ensure that the suite of options that maximise the net benefits of the entire system will be chosen, recognising that the optimal solution may be multiple options with uncorrelated risks, rather than any single water supply option.

As well as dealing with risk, investment analyses must also deal with uncertainty. In the case of climate change, probability weighted climate forecasts will typically rely on a number of uncertain assumptions. One approach to deal with assessment uncertainties is through methodologies such as real options analysis, described by the Victorian Department of Treasury and Finance (2018, p. 4) as:

... an investment evaluation and decision making framework that builds on the traditional cost benefit framework. It encourages and guides practitioners to embed flexibility into an investment strategy to better structure and manage projects impacted by uncertainty. It incorporates a broad

range of methodologies and tools that vary in purpose and complexity, and can be deployed to best suit the requirements of a particular investment.

Evidence of best-practice decision making is often hard to find

It is unclear whether the current supply augmentation projects outlined in each of the metropolitan area supply augmentation plans (table 1) have undergone a rigorous cost–benefit analysis. For example, Sydney Water is reported to have conducted a detailed analysis across a broad range of options (NSW Government 2017a, p. 61), but the Sydney Metropolitan Water Plan does not contain any of the material, and there is no supplementary analysis on the NSW Department of Planning, Industry and Environment website.

To assure the community that decisions have been well made, the assessment of options and their associated costs and benefits should be transparent and publicly available. The Commission has previously recommended that a comprehensive cost–benefit analysis be undertaken and published for all public infrastructure proposals above \$50 million (PC 2014, p. 40). In this inquiry, the Commission has similarly recommended that the NWI should include a principle that the economic assessment of all major water infrastructure investments should be subject to independent and public scrutiny prior to commitment of public funds (SP I *Infrastructure*). Of course, the principles and application of cost–benefit analysis should be brought to infrastructure assessment of smaller projects as well, with the analysis available at least to allow subsequent independent assessment and accountability.

3.3 Clearly defined roles and responsibilities support optimal outcomes

An integrated approach to planning also requires clear assignment of roles and responsibilities for achieving the full suite of outcomes sought by the community, including urban amenity. Integrated system planning (as described above) involves a number of entities (including utilities, state and local governments, regulators, urban planners and developers), raising the risk that a task will ‘fall between the cracks’. Entities may neglect elements of the planning framework if responsibilities are not well defined or are poorly understood, potentially causing delays and ad-hoc solutions that are not in the long-term interest of consumers or the wider community. Clearly defined roles and responsibilities ensure that each entity understands their role and remains accountable to water users, taxpayers and the wider community.

Inquiry participants expressed concern about complicated roles and responsibilities inhibiting an integrated approach to planning.⁹ WSAA (sub. 88, p. 28) argued that:

Current institutional arrangements have resulted in complicated governance arrangements where no one party has full responsibility for managing all aspects of the urban water cycle.

⁹ VPA, sub. 20, p. 2; CRCWSC, sub. 83, p. 9; Urban Utilities, sub. 85, p. 8; WSAA, sub. 88, p. 28.

The problem of unclear roles and responsibilities was identified in the Commission’s 2017 inquiry, and largely attributed to poor accountability between utilities and State and Territory governments. Governments are ultimately accountable for delivering the full suite of outcomes sought by the community, but utilities usually possess essential technical expertise — as well as being the entity that implements the plan. To overcome the issue, the Commission recommended that roles and responsibilities for system and major supply augmentation be clearly allocated between governments and utilities, recognising that ultimate accountability rests with the State or Territory Government (PC 2017a, p. 191).

The arrangements for agreed levels of service in Queensland exemplify clear roles and responsibilities. In south-east Queensland, the levels of service objectives (in terms of supply security) are legislated by the Queensland Government in the *Water Regulation 2016* (Qld) (Queensland Government 2020). Utilities in south-east Queensland are then required to undertake the necessary planning and investment to achieve those levels of service.

As mentioned above, an integrated approach to planning also requires clear assignment of roles and responsibilities for achieving urban amenity. The Commission’s recent research on IWCM recognised that overall responsibility for urban amenity resides with statutory land planners and local governments (PC 2020, p. 47). One participant in this inquiry, Urban Utilities (sub. 85, p. 8) — a utility in south-east Queensland — noted the importance of a formal relationship between water services and statutory land-use planning for effective community and economic outcomes.

There may be a larger role for utilities to play to contribute to urban amenity. As the entity responsible for developing water supply and managing demand, utilities may be well-placed to plan for and develop urban amenity in the communities they serve. This is opposed to their current enabling role; providing water to support or enhance amenity and providing information and expertise on possible options to support land-use planners.

But if utilities were to take a more clearly-defined role in achieving urban amenity, a number of enabling changes would likely be required. For example, utility legislation, operating licences and statements of obligations may need to be altered — items that may require significant resources, both to change now and to unwind in the future (PC 2020, p. 47). Expanding the role of utilities would also involve affordability trade-offs.

Some economic regulators provide workarounds for utilities to contribute to urban amenity in the absence of formally assigned responsibilities, allowing discretionary expenditure when there is evidence of customer willingness to pay. IPART has changed their pricing framework to allow for increased discretionary expenditure on this basis. This led to the approval of \$6 million in expenditure to irrigate public open spaces with recycled water and \$11.3 million to improve the amenity of stormwater channels (IPART 2020a, p. 129). But the evidence of customer willingness to pay must be sound — the Essential Services Commission recently found that the methodology used in Melbourne Water’s 2021 price submission was inadequate, and placed a low weighting on the methodology in its draft price determination (ESC 2021, pp. 5–9).

While this workaround provides utilities with some responsibility for pursuing urban amenity, governments should consider whether there are more effective solutions when defining roles and responsibilities. For example, changes to a utility's statement of expectations would provide an explicit signal to economic regulators concerning what additional expenditure may be allowable and passed through to customers. And solutions may go beyond the water sector: if a local government's role is defined effectively, and there are no barriers to collaboration with utilities, state governments and land-use planners, urban amenity may be funded through council rates.

Better coordination between planning entities would support an integrated approach

An integrated approach not only requires clear roles and responsibilities for each relevant planning entity, but also needs to enable effective coordination between entities. Utilities, governments, regulators, urban planners and developers cannot achieve the full suite of outcomes without relying on each other. Knowing where other entities have expertise and when to rely on that expertise leads to effective coordination and effective planning by extension.

But participants to this inquiry suggested that current planning processes do not always support effective coordination.

Key entities operate according to the obligations set for them by their enabling legislation and decision-makers. This necessarily diverse operating environment limits the ability to deliver integrated outcomes. (VPA, sub. 20, p. 2)

Integrating stormwater into the urban water cycle is fundamental to good outcomes, yet success on this front is characterised by ad hoc collaboration rather than a systematic approach. (WSAA, sub. 88, p. 24)

Redefining institutional arrangements could facilitate better coordination, and there are several different institutional models to consider. While informal collaboration can deliver improved outcomes in the absence of institutional reform, it is not a direct substitute for formalised coordination. Some models could be adopted within existing institutional settings, such as appointing a waterway coordinator to formalise collaboration between planning entities. Other models require more significant changes, such as establishing a waterway manager with ownership of drainage and waterway assets and bear ultimate responsibility for stormwater management (WSAA, sub. DR187, pp. 7–8).

Governments should consider the benefits, costs and risks associated with different institutional models in particular contexts. Although establishing a waterway manager could yield benefits, including better integration of stormwater management into water planning and improved urban amenity outcomes — less drastic reform to institutional responsibilities may be more appropriate where alternative water sources are less feasible, or where urban amenity outcomes apply to a small population or are less contingent on water. As highlighted in the Commission's 2017 inquiry, institutional reform to fully integrate all elements of urban planning (including water) within a single entity is likely to be costly, risky and may not deliver the outcomes sought (PC 2017a, pp. 193–194).

3.4 Summing up

Urban water system planning has developed significantly since the Millennium Drought, but challenges remain in a number of areas and impede progress towards integrated system planning. Under a renewed NWI, jurisdictions could commit to national urban water system planning principles to provide a best-practice standard for those areas.

The key principles that guide best-practice system planning are as follows.

- Integrated management of water supply, wastewater and stormwater is embedded in urban water planning and management systems.
- Planning decisions align with system objectives for levels of water security, service quality, the environment and urban amenity.
- System objectives are discovered through a transparent and consultative approach and are set in line with customer and community preferences.
- Urban water planning connects water planning across different scales and with land-use planning.
- All supply options are considered and their relative merits subject to a rigorous, transparent and consistent assessment of costs and benefits.
- Roles and responsibilities for major supply augmentations are clearly assigned between relevant governments, utilities and other planning entities.
- Utilities, governments, regulators, developers and land-use planners collaborate effectively in planning.

4 Improving pricing and service outcomes

The NWI includes a range of actions to support efficient pricing practices and ensure service delivery outcomes. Many of these have been broadly achieved, but some actions (such as those relating to institutional separation and independent economic regulation) were high-level and allowed for very different application across jurisdictions. The Commission's assessment of progress (*Assessment*) highlights a number of concerns with the inconsistent application of independent economic regulation in the urban water sector — reinforcing findings made in its 2017 assessment (PC 2017a). It also highlights some areas where the NWI pricing requirements are not being met (although large providers are generally meeting the requirements). In part, this outcome reflects the lack of specificity in the NWI's actions for independent economic regulation of the urban water sector.

Further, there are a number of areas where the NWI pricing requirements could be modernised to help enable integrated planning and management across the water cycle, as well as improve the efficiency of urban water service provision more generally. This section discusses ways in which the pricing and institutional arrangements aspects of the NWI could be enhanced.

4.1 There is scope for improvement in some pricing practices

Under the NWI, jurisdictions agreed to pricing policies that would ensure the prices charged to water consumers reflected the long-run cost of service delivery. This pricing commitment is designed to ensure that providers earn sufficient revenue to maintain service quality, fund routine maintenance and finance necessary capital investment to expand or replace infrastructure, as well as ensure that prices are cost reflective in order to encourage efficient water use. To support competitive neutrality, prices should also reflect a market rate of return to ensure efficient investment of capital (known as upper bound pricing).¹⁰

The overall principles of NWI pricing remain important, as these promote efficient water use and support the financial sustainability of providers. However, the NWI's treatment of water pricing could be extended to support integrated system planning and improve efficiency in urban water supply by:

- incorporating stormwater into pricing frameworks
- ensuring developer charges are cost reflective
- considering nodal pricing and other flexible pricing approaches.

Incorporating stormwater into pricing frameworks as part of broader reform

Under the NWI, jurisdictions agreed to develop pricing policies for recycled water and stormwater that are congruent with pricing policies for potable water, with the aim of promoting efficient water use no matter the source.¹¹ The *NWI Pricing Principles* provided guidance on recycled water and stormwater pricing, to enable their use as an alternative water supply source (in line with the NWI requirements), but there has been little progress in implementation. Further, the current pricing regime only covers stormwater as a water supply option as opposed to the entire stormwater management function.

A pricing regime for stormwater management (coupled with entitlement reforms; SP A *Entitlements and planning*) would help ensure that stormwater management services are efficient and effective and would also enable stormwater to be considered as a water supply option on a basis consistent with other water sources. This would allow for the lowest-cost source of fit-for-purpose water to be used, rather than treating stormwater 'as a burden to be quickly directed into drains' (Cooks River Alliance, sub. 10, p. 3). A price signal would also support efficient investment in stormwater infrastructure, particularly where institutional arrangements are fragmented. As submitted by Business NSW (sub. 36, p. 4):

Each of the participants in [stormwater management] faces only a partial set of incentives and accountabilities. Councils may underinvest if they face direct costs to improve infrastructure where benefits are likely to accrue to other councils further downstream. Sydney Water has

¹⁰ The NWI pricing commitments are outlined in more detail in *Assessment*.

¹¹ NWI paragraph 66 (ii).

limited authority to direct individual councils to make decisions that support the operation of its system as a whole.

As discussed above, the Commission's view is that a broad review of stormwater management is needed to improve institutional arrangements and enable integrated water management (SP A *Entitlements and planning*). This review should incorporate stormwater pricing, with a view to providing a clear framework for establishing the economic value of stormwater and overcoming the barriers to effective funding arrangements. New funding models and financial incentives may be necessary for improving stormwater management (Stormwater Australia, sub. 38, pp. 3–4), but any changes should only be implemented following that review.

Ensuring developer charges are cost reflective

Developer charges are designed to reflect the additional investment in both new and existing assets required to service a new development. They are generally levied on land developers to allow utilities to recover some of the additional costs of building infrastructure from those who benefit (the residents of the development) rather than the broader user base.

The calculation of developer charges, particularly in new growth areas, is important for two reasons.

- Developer charges affect the relative merits of different water supply options (PC 2017a, p. 197). Cost-reflective developer charges provide incentives to adopt (or develop) more cost-effective water supply approaches (Langford, sub. 91, p. 5), whereas charges that are not cost reflective may affect incentives to select localised supply options relative to connecting to the existing network.
 - For example, a precinct developer is less likely to select a local option like a small-scale water recycling scheme if the cost of connecting to the existing potable network is artificially suppressed — as is the case for water, sewerage and stormwater developer charges for Sydney Water and Hunter Water (where charges have been set at zero) (IPART 2018, p. 3). Non-zero charges are now being progressively phased in by the New South Wales Government (IPART, sub. DR168, p. 3).
 - Alternatively, if costs can be spread across the network rather than directly incurred by the developer, then higher-cost localised schemes may be developed even if they are not the most cost-effective option.
- Developer charges also, in part, determine who pays the costs of population growth. If developer charges are levied, the residents of the development pay for the costs (via higher property prices). In contrast, if developer charges are not levied, all infrastructure users pay.

In principle, the beneficiaries of the development should pay for the additional infrastructure attributable to it, consistent with the user–pays principle (SP I *Infrastructure*). But although the benefits of additional infrastructure are usually limited to the residents of the

development, there can be positive externalities that provide benefits to the wider community, such as maintaining downstream waterway health and improved urban amenity (VPA, sub. 20, p. 3). And in general, residents should not be double-charged for the infrastructure through both the cost of the property and utility rates (PC 2017b, p. 18).

The 2010 *NWI Pricing Principles* outline an agreed approach to setting, capping and using revenue from developer charges (NRMMC 2010, p. 11). This, however, has not prevented some jurisdictions from imposing mandates that represent a movement away from cost-reflective developer charges. For example, in 2008 the New South Wales Government set water, sewerage and stormwater developer charges for Sydney Water and Hunter Water at zero (IPART 2018, p. 3).

Capping developer charges at zero may reduce costs for homebuyers, as the development costs are not passed onto the final buyer. But housing prices are a function of many other factors, which are best addressed through other policy mechanisms. The policy may, therefore, not meaningfully improve housing affordability as intended, while passing on the cost of connecting the new development to the entire water user base.

Principles for setting developer charges for water services (across water supply, wastewater and stormwater) should be agreed to under a renewed NWI, to balance the incentives for fit-for-purpose infrastructure against imposing excessive costs on property purchasers.

Considering nodal pricing and flexible pricing approaches

Many urban water service providers adopt uniform pricing policies (also known as ‘postage stamp’ pricing), often in pursuit of an equity objective. Yet when applied across centralised networks, these policies can lead to inefficiencies and further inequities, because the price each customer pays does not reflect the cost of service delivery to their property. This creates opaque cross-subsidies between users which mean, like developer charges, that water supply costs are not cost reflective, potentially limiting the uptake of smaller-scale supply options.

Nodal pricing is an approach that is not new in the urban water sector, but it has not been widely adopted despite its merits. The approach overcomes the issues associated with uniform pricing policies by identifying the cost to service individual customers, or a group of customers within a given geographical area or supply node, and pricing accordingly. The Commission has previously discussed this issue, noting that there is scope for efficiency gains in moving to location-specific pricing, particularly when the cost differences between locations are large and easy to quantify (PC 2011, p. 166). And the current *NWI Pricing Principles* allow for nodal-based pricing. But use of the approach may create equity issues. High-cost locations may have many low-income residents, and creating geographical boundaries where prices reflect the average cost of service within a defined area may lead to some households paying higher prices than nearby households in another area, despite identical costs of service to those individual households. To enable providers to implement efficient pricing policies, there may be value in undertaking further research into the net benefits of nodal pricing compared with uniform pricing policies.

Providers should also consider flexible pricing mechanisms that enable greater efficiency in balancing supply and demand for water over the short and long term. The current *NWI Pricing Principles* state that water usage charges should ‘have regard to the long-run marginal cost of the supply of additional water’ (NRMMC 2010, p. 10). But long-run marginal cost pricing in itself does not send signals to consumers about the relative availability of water at specific times (PC 2011, p. 166).

As some utilities are already doing, multi-tiered water pricing such as increasing block tariffs can be used to promote resource conservation (PC 2011, p. 31). But multi-tiered pricing simply promotes lower consumption, and does not typically differentiate between instances of low or high water availability.

In contrast, dynamic pricing is a more direct way to reflect the opportunity cost of available water supply in the short term. Sydney Water is pursuing dynamic pricing that reflects the higher opportunity cost of using limited water supply during drought. In its 2020 price determination for Sydney Water, IPART approved a pricing proposal that allows the utility to vary its water usage charges to recover the costs of water service provision at different times — higher during and following dry periods due to the increased cost of developing water supply infrastructure for meeting demand, increasing the long-run marginal cost of supply (IPART 2020b, p. 5).

While the flexible water usage charge was approved to recover costs, the higher usage charge during dry periods should help to incentivise users to save water, requiring less infrastructure development to meet demand during dry periods and lowering the long-run marginal cost of water supply. And if customers do not adjust their water usage in response to increased water charges during drought, higher water prices help balance the increased costs of providing water during drought (Sydney Water, sub. 94, p. 9).

That said, dynamic pricing compounds the regressive nature of water prices. Increased water charges during dry periods will apply uniformly across all water users, costing lower-income households a higher proportion of their income. This represents a significant cost impost on some households for the provision of an essential service, and should be considered by utilities, governments and regulators when making pricing decisions.

There may be value in further investigating the application of flexible water usage charges and refining the *NWI Pricing Principles* on efficiency grounds.

4.2 The quality and application of economic regulation could be lifted

Best-practice independent economic regulation delivers transparent scrutiny of urban water providers. It supports customer preferences and protects their interests, while avoiding excessive costs on regulated entities, customers and taxpayers. It prevents urban water service providers from exercising market power by charging excessive prices and/or providing poorer quality services, while ensuring those providers can be financially sustainable. It also reduces the risk that government-owned corporations may be directed to

keep water prices low (meaning less resourcing for maintenance and renewals, and deferral of investment in ways that undermine long-term planning). And it drives governments to provide clear policy direction by outlining their expectations for service providers, while improving the transparency of planning, investment and management decisions.

Under the NWI, governments agreed to use independent bodies to set or review prices on a case-by-case basis.¹² This has allowed for significant diversity in both the quality and coverage of independent economic regulation across the urban water sector (*Assessment*: table 3.2).

High-quality independent economic regulation delivers transparent scrutiny of water service providers, forming a key part of sector governance. However, some participants to this inquiry have suggested shortcomings in the quality and independence of current economic regulation in the urban water sector.

- The Victorian Planning Authority (sub. 20, pp. 2–3) noted that the independent economic regulation model ‘constrained the overall funding available for innovative outcomes and the flexibility needed to pursue integrated solutions’, compounding other financial issues including ‘siloe funding responsibilities and varying budget capacities and processes’ that make coordinated contributions to a shared outcome difficult.
- The Local Government Association of Queensland (sub. 32, p. 5) supported ‘price monitoring independent of government and service providers’ in principle, but considered that practical experience had shown that it can be ‘an expensive exercise which [adds] to retailer costs’, and which is not universally accepted as effective.
- The Queensland Water Directorate (sub. 47, p. 14) noted that ‘some form of regulatory alignment or harmonisation would assist in managing the reactive nature of State regulators’, as there is currently ‘a generic lack of mechanisms for clear communication among State agencies in Queensland’.
- WSAA (sub. 88, p. 35) noted that independent economic regulators need to make appropriate trade-offs between affordability and financial resilience and observed that some utilities subject to regulation had less financial resilience than other major utilities that were not, making them more vulnerable to shocks. It also noted that further improvements are needed to meet best practice (p. 38).

These concerns highlight the current problems with economic regulation in the urban water sector, reinforcing the importance of moving away from current practice to best-practice independent economic regulation.

Further, the importance of moving to best-practice economic regulation will only increase as urban water investment increases. Across the Australian urban water sector, data to 2022-23 show capital expenditure rising to over \$6 billion a year and a significant increase in renewals and maintenance capital expenditure, with much of this already approved by regulators as prudent and efficient (WSAA, pers. comm., 10 December 2020). If robust

¹² NWI paragraph 77.

economic regulation is not in place, utilities may make inefficient investments which, at this scale, can lead to sharp price increases and inadequate service delivery outcomes for water users. And trade-offs between affordability and the financial resilience of utilities will need to be made; high-quality and transparent scrutiny from an economic regulator will be critical to ensuring balanced outcomes.

The Commission included independent economic regulation as a prerequisite for assessing compliance with the NWI pricing requirements (*Assessment*: section 3.1). When independent economic regulation is in place, regulators undertake valuations of utility assets, making it possible to assess whether full cost recovery is being achieved. Without those valuations, it is impossible to be definitive on the degree of cost recovery.

There are two key ways in which the NWI could contribute to improving the quality and application of independent economic regulation:

- establishing the characteristics of best-practice independent economic regulation through a set of agreed national principles for the urban water sector
- establishing a framework for when and how to apply economic oversight in a fit-for-purpose manner, depending on the context of the water service provider.

What is best-practice independent economic regulation?

In 2017, the Commission proposed a set of national principles to guide best-practice economic regulation of the water sector (box 6). These principles still reflect best practice in supporting efficient service delivery to underpin the overall objective of promoting the long-term interests of consumers, and should form the basis of nationally consistent principles in a renewed NWI.

Adoption of the Commission's principles would set the standard for independent economic regulation of the water sector — but regulators must also be supported by appropriate governance and institutional arrangements. Ensuring that economic regulation is transparent and independent provides accountability, better aligning regulatory decisions with long-term consumer interests. And institutional separation, with a clear relationship between utilities, their government shareholders and regulators, remains important and should be retained as a principle under the NWI. Institutional separation requires governments to clearly (and publicly) specify the standards that utilities are subject to, as well as ensuring any non-commercial obligations placed on those providers are transparent.

Furthermore, as discussed in section 3, best-practice economic regulation should facilitate integrated system planning by allowing utilities to pass through costs incurred in undertaking transparent policy directions from government (such as clear objectives for amenity). Where such policy direction has not yet been provided, regulators can allow utilities to undertake a certain amount of discretionary expenditure for projects with wider benefits (and recover that expenditure through user charges) if they can demonstrate customer willingness to pay.

Box 6 Principles for economic regulation in urban water

In its 2017 inquiry, the Commission proposed national principles to improve the quality and consistency of economic regulation in the urban water sector. These are expanded on below.

- *Decisions should be guided by the objective of promoting the long-term interests of consumers.* This will help utilities and regulators make trade-offs between potentially conflicting objectives by maintaining a focus on ensuring consumers receive services of the desired quality at the lowest sustainable cost, while encouraging innovation by utilities if consumers ultimately benefit.
- *Regulatory decision-making takes customer and community preferences into account, as determined through transparent engagement with those parties.* This will allow utilities to tailor their services to what customers value. For example, this will help utilities assess whether customers are willing to pay more for improved services.
- *Prices should reflect the full efficient cost of service provision.* While prices can be temporarily kept below the full cost of service provision, this will tend to impose higher costs on society in the future through inflating demand for water, imposing fiscal costs on governments or constraining the ability of utilities to invest sustainably to maintain and replace their assets.
- *Utilities should have incentives to innovate and improve their efficiency.* Regulation should not provide perverse incentives for increasing costs and should reward utilities for reducing their costs.
- *Regulatory decisions should consider the long-term financial viability of utilities.* While regulatory decisions typically constrain prices, they should not do so in a way that compromises the financial viability of utilities, as this could distort investment and operational decisions and increase long-run costs. Regulators should identify where the borrowing or dividend decisions of utility shareholders place a utility in a financially unsustainable position and refer those decisions to the utility and shareholders to address (IPART, sub. DR168, p. 3).
- *Regulatory frameworks should be adaptable and flexible.* In particular, the economic regulator should incorporate feedback into its approach.
- *Regulatory processes should be transparent to allow scrutiny.* In particular, the economic regulator should detail the rationale underlying any regulatory decisions.
- *Regulatory processes should facilitate effective competition in potentially contestable parts of the industry.* They should not affect whether services are delivered by incumbent monopoly utilities or alternative providers. They can do this by making the efficient costs of segments of the water supply chain transparent, allowing providers to compete on a level playing field to supply different components. This should include consideration of an access regime for private participants to access monopoly infrastructure.

Source: Based on PC (2017a, pp. 215–216).

How should economic regulation be applied in different contexts?

Some forms of economic regulation, such as setting maximum prices or revenues, are complex and costly processes that require a high degree of sophistication from both regulators and regulated entities. There are benefits and costs to each of these — but the scale of metropolitan and state-wide urban water service providers usually justifies

best-practice processes because scrutiny of expenditure, operational and investment decisions can have large benefits (or avoided costs).

Independent price setting is not a panacea, nor is it the only way to encourage service providers to operate efficiently and in the long-term interests of consumers. Regular price monitoring, public reporting and benchmarking can provide a degree of transparency that may lead to public or political scrutiny which (alongside the threat of more stringent regulation) can encourage providers to improve. Several different models of economic oversight exist, ranging from price or revenue setting, to price monitoring, to less onerous licensing, reporting and/or audit requirements.¹³ The relationship between owners (be it State, Territory or local government) and service providers can also influence outcomes.

In some cases, the benefits of price setting will not outweigh the costs imposed on service providers (and users), such as for a small regional utility servicing relatively few customers. As put by the Queensland Water Directorate (sub. 47, p. 14):

... the approach taken should be representative of the level of market power that can be exercised by the water business, countervailing market power of customers and competition.

Because of this, the NWI allowed jurisdictions to apply independent oversight ‘on a case-by-case basis’. In practice, this case-by-case application of oversight varies significantly across the country. This is not to say that independent economic regulation *should* be imposed symmetrically on all providers, but that the justifications for particular models of regulation are not consistent, and the basis of the inconsistent application of economic regulation is unclear.

- Unlike most major water utilities, jurisdiction-wide providers in Western Australia and the Northern Territory, as well as retailers in south-east Queensland, are not subject to independent price determinations.
 - The Commission’s assessment has highlighted poor outcomes in some of these cases: for example, based on an Economic Regulation Authority pricing review, the Western Australian Water Corporation charges above full cost recovery for wastewater services, but below cost recovery for water services (*Assessment*: section 3.1).
- Regional utilities in New South Wales and Queensland are not subject to any independent economic oversight, whereas economic regulators license smaller utilities in South Australia and Western Australia (*SP G Regional*).

Instead of the current patchy application of independent economic regulation, the NWI should incorporate a fit-for-purpose framework that guides where different models of economic oversight can be applied, based on context. It should recognise the diversity of water service delivery models, and ensure a transparent assessment guides the application of different forms of economic oversight.

¹³ Models of economic oversight for small or regional utilities are considered in *SP G Regional*.

In the Commission’s view, all large providers should be subject to best-practice independent economic regulation (including price or revenue setting), unless a transparent analysis of regulatory costs and benefits shows that economic regulation imposes net costs.

Where costs of price regulation are likely to outweigh benefits, jurisdictions should agree to a consistent assessment framework to inform decisions concerning the type of economic regulation to apply, based on the risk (and potential impact) of a provider exploiting market power, and the cost of regulation. Jurisdictions should also commit to ‘light touch’ independent oversight of small providers (SP G *Regional*).

Any assessment of whether to apply full price regulation, or a lighter-touch model of economic regulation, should consider:

- the risk of a utility exploiting its market power, based on the scope and costs of that abuse
- the costs of different economic oversight models (to regulated entities and taxpayers)
- ownership and governance of the utility (for example, State or Local government ownership)
- other forms of oversight imposed on the provider.

Irrespective of the model selected, the best-practice principles (discussed above) should guide regulatory processes wherever possible.

4.3 Monitoring and reporting on pricing and service outcomes

The NWI includes actions on benchmarking efficient performance¹⁴, which, for urban water services, are currently implemented through the National Performance Report (NPR) under the stewardship of the Bureau of Meteorology (BOM). Monitoring and reporting of pricing and service outcomes provides transparency in the absence of formal price-setting or price-monitoring processes. It can inform customers about how their provider compares with others, leading to scrutiny over apparent underperformance that can improve pricing and service outcomes. It can also inform a degree of ‘competition by comparison’, whereby the performance of water service providers can be compared against similar entities across the country. And it provides information to support State and Territory Government policy decisions and performance oversight, and the Commission’s triennial assessment of progress against NWI commitments.

The NPR, however, has shortcomings. It does not report on service providers with fewer than 10 000 connections, which means that the performance of smaller providers — which are not subject to formal economic regulation — is not transparent, limiting the benefits of competition by comparison for the key groups that would need it. The Commission previously recommended that performance monitoring data be publicly reported for urban water service providers of all sizes, with the data subject to independent scrutiny (recommendation 6.5; PC 2017a, p. 37). This

¹⁴ NWI paragraphs 75-6.

recommendation remains relevant, although the Commission understands it is currently being considered as part of the NPR Indicator Review (box 7).

Box 7 Recent and ongoing reviews of the National Performance Report (NPR)

The NPR Framework Review, published in 2019, aimed to ‘ensure that the set of data collected through the NPR framework meets the current and future needs of the urban water sector for regulation, benchmarking, planning, and policy development’ (BOM 2018). The review concluded that the NPR framework fulfilled a genuine need, and should be retained, but ‘its core rationale and value are sometimes obscure’ (Aither 2019, p. 6). The review recommended several changes to ensure the framework ‘remains relevant and beneficial to users and to the sector more broadly’ (p. 7).

Following a recommendation of the NPR Framework Review, the Australian Government initiated a further review into the NPR indicators, which commenced in October 2020. The NPR Indicator Review (BOM 2020b) aims to:

- ... identify an agreed set of lasting national outcome areas, associated indicators and definitions, and performance metrics that:
- Reflect the NPR Vision, Objectives and Outcomes
- Clarify and address definitional and interpretation problems and remove redundant indicators
- Introduce new indicators (only as required) - noting that it is preferable that the total number of NPR indicators decrease.
- Align with indicator selection principles.

The NPR is also not fit for purpose for assessing commitments made under the NWI. The Commission is required to assess the progress of urban water service providers towards full cost recovery against the requirements of the NWI and the *NWI Pricing Principles*. Previously, the Commission has used the economic real rate of return to undertake this assessment, although the measure is inconsistent with both the NWI and the *NWI Pricing Principles*. The BOM NPR Indicator Review should consider the merits of a return on asset measure that allows for an assessment of full cost recovery, as per the requirements of the *NWI Pricing Principles*. (This was also recommended by the Commission in 2017.)

For the return on asset measure to be compliant with the *NWI Pricing Principles*, both the income measure (the numerator) and the asset base (the denominator) must be compliant. As recommended by the Commission in 2017, the income measure should exclude contributed assets and developer charges. However, the asset base measure also needs to be consistent with the *NWI Pricing Principles*, and this is not always the case in the available data (*Assessment*).

Further, there are shortcomings in NPR data quality. Goldenfields Water County Council (sub. 25, p. 2) suggested that there are problems with data and information reporting in New South Wales.

... data referring to local water utility management within the NPR is either incorrect, very limited or not available ... Reported information from the State [Government] to other agencies such as BOM for the NPR, has been insufficient or neglected at times and this has posed a significant reputational problem for LWU’s [local water utilities] within NSW.

WSAA (sub. 88, p 52) also supported changes to the NPR, including greater commitment from jurisdictions.

The current National Performance Report (NPR) is out of date and no longer provides a fit for purpose data set for the industry ... The Bureau of Meteorology are reviewing the NPR, however, all jurisdictions should make a commitment to redeveloping a future focused national urban water dataset.

The NPR Indicator Review, which is scheduled for completion in March 2022, is the appropriate process to ensure that the current and future needs of the urban water sector (including future assessments of progress against the NWI) are met through the NPR, with indicators determined transparently with involvement from jurisdictions and service providers.

FINDING 12.1

The National Performance Report is not fit for purpose in reporting service quality, as envisioned under the National Water Initiative (NWI), nor is it adequate to assess progress against NWI commitments. The only measure for cost recovery, the economic real rate of return, is inconsistent with the NWI and the *NWI Pricing Principles*.

The current National Performance Report Indicator Review is well placed to address these inadequacies.

RECOMMENDATION 12.1: REPORT AN NWI-CONSISTENT FINANCIAL RETURN METRIC

State and Territory Governments, through the National Performance Report, should require urban water service providers to report a financial return metric consistent with the *National Water Initiative Pricing Principles*, alongside the existing economic real rate of return metric. This should include:

- an income measure that excludes developer charges and contributed assets
- an asset base measure determined by a methodology consistent with the *National Water Initiative Pricing Principles*.

Modernising performance monitoring and reporting under the NWI

Irrespective of the shortcomings of the NPR, there are sound reasons to maintain the requirements to monitor and report on service provider performance in a renewed NWI. These are to improve transparency and accountability, enable competition by comparison and assist in State and Territory government performance oversight. Performance monitoring should inform independent, public and annual reporting of key pricing and service quality indicators. The NWI could embed monitoring and reporting objectives across

all water services, and reinforce their importance for regional and remote urban services (SP G *Regional*). Monitoring and reporting should be designed to:

- increase transparency of service delivery
- enable performance comparisons to support continuous improvement by providers
- feed into economic oversight
- contribute to State and Territory government policy decisions and performance oversight)
- underpin regular assessments of progress of NWI implementation.

5 NWI Renewal

To improve the NWI, the Commission advises that a new agreement include significantly enhanced guidance for the provision of urban water services. The overall aspiration of the urban water sector, consistent with other water services, should be for effective, efficient and equitable provision that meets the needs of customers and communities in a changing climate. A set of new objectives should be established towards that end.

Aspects of the renewed NWI could be implemented differently for small utilities and for regional and remote services, acknowledging that the benefits of best-practice regulation may not outweigh the costs, necessitating a fit-for-purpose approach for smaller utilities in some areas. These issues are considered in SP G *Regional*.

5.1 Best-practice urban water system planning

Urban water system planning should be guided by customer- and community-agreed levels of service that establish the objectives of the water system — including broader amenity and liveability benefits, where relevant. Utilities should then focus on delivering those objectives efficiently, with a focus on integration across the water cycle and collaboration with land-use planners and other entities.

Many of the relevant principles build on those in the *National Urban Water Planning Principles*, which have been endorsed by jurisdictions but are non-binding. Jurisdictions should formally commit to principles for system planning in the renewed agreement. The principles would also form a yardstick for reviews of major utility planning.

Expansion of the principles in key areas would:

- better enable integrated water management and planning
- support consistent assessments of all water supply options
- clarify roles and responsibilities for system planning.

5.2 Improving pricing and service outcomes

There is more to do to improve pricing and service outcomes. In the first instance, jurisdictions should recommit to institutional separation, as well as the core principle of cost-reflective pricing, as currently under the NWI.

However, the *NWI Pricing Principles* could be updated in key areas to support integrated water management and improve pricing signals across the water system. This should be enforced by higher quality independent economic regulation, guided by best-practice principles. Public monitoring and reporting of pricing and service outcomes should be updated to further encourage competition by comparison and enable assessments of progress against the NWI.

NWI RENEWAL ADVICE 12.1: BEST-PRACTICE URBAN WATER SYSTEM PLANNING

Updating the *National Urban Water Planning Principles* and formally embedding them within the National Water Initiative would establish a standard for best-practice urban water system planning. A renewed National Water Initiative should include the following principles:

- Integrated management of water supply, wastewater and stormwater is embedded in urban water planning and management systems.
- Planning decisions align with system objectives for levels of water security, service quality, the environment and urban amenity.
- System objectives are discovered through a transparent and consultative approach and approved by governments in line with customer and community preferences.
- Urban water planning connects water planning across different scales and with land-use planning.
- All supply options are considered and their relative merits subject to a rigorous, consistent and transparent assessment of costs and benefits.
- Roles and responsibilities in the planning and management process are clearly assigned between relevant governments, utilities and other planning entities.
- Governments enable effective coordination between utilities, regulators, developers and land-use planners.

To support efficient service delivery by smaller providers, jurisdictions should consider developing national guidelines for both long-term system planning and contingency planning for regional and remote water systems.

NWI RENEWAL ADVICE: IMPROVING PRICING AND SERVICE OUTCOMES^a

Jurisdictions should maintain the core principle of cost-reflective, consumption-based pricing in a renewed National Water Initiative (NWI), with cost recovery from users. Jurisdictions should also update and recommit to the *NWI Pricing Principles* to provide guidance on achieving those pricing requirements, with direct reference to the pricing principles included in a renewed NWI. In doing so, they should:

- develop improved, practical guidance on funding stormwater management and incorporating stormwater into pricing frameworks
- recommit to the principle that developer charges are cost reflective.

Jurisdictions should maintain institutional separation of water resource management, standard setting and regulatory enforcement from service delivery.

The following national best-practice principles would improve the quality and consistency of independent economic regulation of water service providers.

- Regulatory decisions are guided by the objective of promoting the long-term interests of customers.
- Utilities have incentives to innovate and improve their efficiency.
- Regulatory decision-making processes include effective customer and community engagement.
- Prices reflect the full efficient cost of service provision.
- Regulatory decisions consider the long-term financial viability of utilities.
- Regulatory processes facilitate effective competition in potentially contestable parts of the industry.
- Regulatory processes are transparent to allow scrutiny.
- Regulatory frameworks are adaptable and flexible.

The NWI should include a framework to guide where different models of economic oversight can be applied, based on context. All large providers should be subject to best-practice independent economic regulation, unless a transparent analysis of regulatory costs and benefits shows that economic regulation imposes significant net costs. Where costs do outweigh benefits, jurisdictions should agree to a consistent assessment framework to inform decisions concerning the type of economic regulation to apply, based on the risk (and potential impact) of a provider exercising market power, and the cost of regulation.

(continued next page)

NWI RENEWAL ADVICE: IMPROVING PRICING AND SERVICE OUTCOMES (continued)^a

Through the NWI, jurisdictions should recommit to independent, public and annual reporting of key pricing and service quality indicators at a national level for all major urban water service providers. Monitoring and reporting should aim to:

- increase transparency of service delivery
- enable performance comparisons to support continuous improvement by providers
- feed into economic oversight
- contribute to State and Territory government policy decisions and performance oversight
- underpin regular assessments of progress of NWI implementation.

^a The following box incorporates renewal advice from chapters 11 and 12 of the summary report, specifically advice 11.1, 11.2, 11.3, 11.4, 12.2 and 12.3.

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Australian Government
Productivity Commission

Urban water services: regional and remote communities

Supporting Paper G

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Provision of water services can be more challenging and costly to supply to regional and remote communities than to major cities. Drought, bushfires and COVID-19 have brought service delivery issues into sharp relief across the country.
 - Parts of regional New South Wales and Queensland have experienced water security challenges, with some towns subject to severe and extended water restrictions. At the extreme, State governments have carted water into some towns.
 - Examples of poor drinking water quality have emerged. Some regional and remote towns have been forced onto poor-quality alternative water sources, and water source quality issues persist in some remote Aboriginal and Torres Strait Islander communities.
- Some providers have adapted to these shocks better than others, but at times State government responses have been ad hoc and reactive. Planning has been insufficient, which suggests inadequate capability in some local utilities. State and Territory government assistance programs could be better designed. Governance in the sector remains an issue, as does the interaction between utility operations and water resource management during extreme events.
- Water services across regional and remote Australia are likely to face greater challenges in the future.
 - Climate change projections point to drier and hotter conditions across much of inland Australia, affecting supply and demand for water, as well as the reliability of existing water sources in regional and remote areas.
 - Some regional towns are planning for growth, while others are contending with declining user bases and high asset renewal costs, posing financial sustainability challenges.
- State and Territory Governments should commit to ensuring access to a basic level of safe and reliable water for regional and remote communities. A renewed National Water Initiative should include principles for:
 - regional and remote urban water planning, including ensuring alignment between utility system planning, contingency planning and water resource planning
 - defining and ensuring access to a basic level of service, including guidelines for government subsidies for high-cost regional and remote water services
 - governance of regional and remote providers, including financial separation and a commitment to light-touch economic oversight for small urban water providers
 - performance monitoring and reporting of regional and remote water service outcomes, especially in remote Aboriginal and Torres Strait Islander communities.

The inquiry terms of reference request the Commission to consider ‘the provision of reliable water services to regional, rural and remote communities’. Provision of reliable, along with healthy and safe, water supplies is an agreed outcome of the National Water Initiative (NWI),¹ but the Commission’s assessment (*Assessment*: section 6.1) has highlighted that regional, rural and remote communities can face lower service quality (that is, service reliability and water quality) than residents of major cities. Although most jurisdictions are

¹ NWI paragraph 90(i).

taking steps to improve regional and remote service quality, some poor outcomes have been observed. These reflect a range of pressures — including drought, aging infrastructure, relatively poorer water sources and the capability and financial sustainability of some smaller providers.

Addressing disparities in access to essential services is a perpetual policy challenge, broader than water alone. In one reflection of that challenge, the 2020 National Agreement on Closing the Gap committed to develop a target towards parity of infrastructure, essential services (including water and sewerage services), and environmental health and conditions for Aboriginal and Torres Strait Islander communities (Australian Governments and the Coalition of Peaks 2020, p. 36). National water reform can play a role in supporting processes such as these.

Although the principles of best-practice urban water service provision (which encompass planning, pricing and institutional arrangements, regulation, and governance) apply in regional, rural and remote areas as well as major cities (SP F *Urban*), giving effect to best practice outside major cities can be more challenging. In recognition of that fact, this paper tailors the urban water principles outlined in SP F *Urban* to fit the context of regional and remote communities,² and proposes additional content for jurisdictions to consider in renewing the NWI.

The paper presents:

- background on regional and remote water service provision (section 1)
- an overview of challenges in supplying safe and reliable water services to regional and remote communities (section 2)
- principles for regional urban water planning and service delivery (section 3)
- advice for governments in supporting regional and remote water services (section 4)
- priorities to ensure safe and reliable water services in Aboriginal and Torres Strait Islander communities (section 5)
- advice to jurisdictions on content relating to water services to regional and remote communities in a renewed NWI (section 6).

² For the purpose of this paper, ‘regional and remote’ are defined in accordance with the ABS remoteness areas (ABS 2018). Broadly, this encompasses all areas (both urban and rural) outside of the capital cities and nearby major cities. Although separately referred to in the terms of reference, rural communities (smaller communities outside of cities and towns) are defined as a subset of ‘regional and remote’ communities in this paper.

1 Background

1.1 Why the Commission is looking at regional and remote water services separately from major metropolitan services

Access to reliable water services, at an appropriate quality, is essential for human health, hygiene and wellbeing. It primarily encompasses household access to safe water for drinking and washing, as well as wastewater removal and treatment — but also includes water for industrial uses, stormwater management and the maintenance of urban environments and green space.

Poor water quality can have a number of negative implications. It contributes to the prevalence of infectious diseases, affects the incidence and treatment of chronic conditions (especially in remote areas, section 5), and can have economic impacts (NHMRC, sub. 93, p. 3). Unreliable water supplies, which can lead to onerous water restrictions, or reliance on high-cost or poor quality alternative sources, also impose a range of direct and indirect costs on users.

Water service provision can be more complex (and costly) outside major cities

Although regional and remote water services are often subject to the same pressures as metropolitan services (including a drying climate, population changes and greater community expectations (SP F *Urban*)), they face additional challenges. Regional towns are smaller, with connections typically spread over a large area, such that fewer users are serviced by (and pay for) fixed infrastructure, such as water treatment plants. This leads to higher costs per connection and can mean a particular level of service is more expensive to provide in some areas compared with others (Engineers Australia, sub. 63, p. 17). Moreover, population decline can result in fewer users over the same network, while aging assets in some areas will necessitate substantial infrastructure renewals (relative to the number of users) (LGAQ, sub. DR183, p. 2). The supply of an appropriately skilled workforce is also limited in some areas which can affect the quality of service provision (qldwater, sub. DR142, p. 4) (SP K *Knowledge*).

Climate conditions vary significantly across regional and remote Australia, but rainfall can be less frequent or reliable, particularly in inland areas, and there may be fewer alternative supply options (such as seawater desalination or potable groundwater). Some remote communities are entirely reliant on a single groundwater source, without options to access surface water resources or to share bulk infrastructure (such as dams). And water quality issues can arise from many causes, including bushfires, algal blooms and other contaminants (NHMRC, sub. 93, p. 4). A lack of alternative water sources can make a water supply system vulnerable in the face of a water quality issue.

Access to safe and reliable water services is also an issue in some remote Aboriginal and Torres Strait Islander communities (*Assessment*: section 6.1). This can be due to poor quality water sources, inadequate water distribution and treatment infrastructure, and fragmented arrangements for service delivery.

Overall, it can be more costly, per consumer, to provide safe and reliable water supplies in some regional and remote communities, and there are fragilities in some supply systems. Many of these factors, however, vary between communities, and local circumstances (such as water source availability) affect the delivery of affordable and reliable water services.

1.2 Service delivery arrangements vary significantly between jurisdictions

In the past, regional urban water services were often provided by local governments. Over time, higher service standards, including those imposed by health and environmental regulation, have increased the cost and complexity of delivering water services. As a result, some State governments consolidated their regional providers into fewer, larger utilities with specialist expertise.

- In Victoria between 1982 and 2005, more than 400 local water utilities were divested from local governments and amalgamated into the current 13 State-owned regional utilities (PC 2017a, p. 231), to be 12 from 1 July 2021 following the merger of Western Water and City West Water (City West Water 2021). These are all subject to economic regulation by the Victorian Essential Services Commission (ESC 2019).
- Between 2008 and 2013, the Tasmanian Government amalgamated 29 local government-run utilities into a single state-wide provider (TasWater). TasWater is now co-owned by those local governments and the Tasmanian Government (TasWater 2018).

In South Australia, Western Australia, Tasmania, the Northern Territory and the ACT, a single jurisdiction-wide utility (owned by the State or Territory Government) is primarily responsible for regional and remote water services.

- The South Australian Government can direct SA Water to undertake non-commercial operations, including in Aboriginal communities, with government funding (SA Water 2019b). There are also 66 small or intermediate water service and/or wastewater providers (including local government providers) in parts of regional South Australia, (ESCOSA 2019).
- In Western Australia, the Water Corporation provides water services to most of the state, although there are three regional water corporations that supply Bunbury, Busselton and Kalgoorlie–Boulder (BOM 2020b, p. 126). There are also a number of small providers licensed to provide water and sewerage services.
- In the Northern Territory, Indigenous Essential Services (IES) (a subsidiary of Power and Water Corporation) delivers water and energy services to 72 remote communities (PowerWater 2019b).
- In the ACT, Icon Water services Canberra, although it does not provide potable water to some rural villages (BOM 2020b, pp. 111–112; SCETCS (ACT) 2020, p. 3).

In New South Wales and Queensland, a large number of small water service providers deliver regional and remote water services. Most are owned and/or operated by local governments, although there are different models in each state.

- In New South Wales, 90 (out of 92) regional water utilities are local government-owned and provide services to communities outside of Sydney and the Hunter Valley (NSW Water Directorate, sub. 37, p. 1). Some county councils supply bulk water to multiple local government owners, while many inland councils source bulk water from WaterNSW.
- In Queensland, 71 regional providers, including 15 Aboriginal councils and two Torres Strait Islander councils, provide water services (qldwater, sub. 47, p. 2). Most are owned and operated by local governments.

A summary of regional water service provision arrangements across Australia is in table 1.

Many rural properties self-supply their domestic needs through groundwater bores or rainwater tanks, as do some Aboriginal communities, particularly in remote locations. In some cases, this occurs with limited involvement or oversight from State and Territory Governments or water service providers. As a result, data on the quality of self-supplied water can be patchy.

The diversity of service models means that few general conclusions can be drawn about the effectiveness of regional water service delivery, nor is there merit in being prescriptive on the specifics of service provision. It does, however, allow for comparison of the benefits and costs of different models, and identification of better practice in delivering improved outcomes for regional and remote communities.

1.3 NWI coverage of regional and remote urban water services

Regional and remote water services are largely subject to the same NWI outcomes and actions as metropolitan urban water services — which, as discussed in SP F *Urban*, focus on best practice pricing and institutional arrangements, with relatively little treatment of urban water service delivery (beyond a commitment to ‘healthy, safe and reliable water supplies’).

NWI pricing commitments were designed so that water users would generally pay the long-run efficient costs of service delivery and so that utilities had adequate financial resources to deliver services without earning monopoly rents. Independent pricing regulators were to be given powers to set or review prices on a case-by-case basis, as well as report on pricing outcomes. The NWI also included requirements for institutional separation, and public reporting and benchmarking. (*Assessment*: section 3.1 outlines the NWI pricing and institutional commitments for urban water in more detail.)

Table 1 Regional potable water and wastewater providers

Excludes bulk water providers and self-supply schemes

Jurisdiction	Number of utilities	Providers by number of connections			Role of economic regulator in regional areas	Ownership in regional areas
		Total	> 100k	10k - < 100k		
NSW	92	1	27	64	Large providers licensed, others unregulated	Varies between State and local governments
Vic	13 ^b	1	12 ^b		Price setting	State Government
Qld	71	2	17	52	Large providers subject to monitoring, others unregulated	Varies between State and local governments
SA	67	1		66	Licensing, benchmarking and price determinations	Varies between State and local governments
WA	36	1	3	32 ^c	Licensing and benchmarking, some local governments exempt. Water Corporation subject to price monitoring	Varies between State and local governments
Tas	1	1			Revenue setting	Co-owned by the State and local governments
NT ^a	1		1		Licensing	Territory Government
ACT	1	1			Price setting	Territory Government

^a Includes Indigenous Essential Services, a subsidiary of the Power and Water Corporation. ^b From 1 July 2021, Western Water (approximately 75 000 connections) will merge with City West Water, reducing the number of regional utilities with 10 000–100 000 connections to 11 and the total number of regional utilities to 12. ^c Includes 16 licensed potable water and/or wastewater providers and 16 local governments exempt from licensing.

Sources: BOM (2020b); City West Water (2021); DPIE (NSW) (2020c); ERA (WA) (2020); ESC (2018); ESCOSA (2019, 2020); ICRC (2019); OTTER (2020); Power and Water Corporation (2019a); qldwater (2019).

The key distinction made for regional urban water was a lesser commitment to cost recovery, recognising that ‘there will be some small community services that will never be economically viable but need to be maintained to meet social and public health obligations’.³ ‘Rural and regional’⁴ water service providers were to set prices at lower bound levels (recovering all operational and asset replacement costs, but without a return on capital), with continued movement towards the upper bound (including a return on capital) ‘where practicable’.⁵

Where small community services are to be subsidised, the NWI requires that State and Territory Governments do so through a publicly reported community service obligation (CSO) payment and consider alternative management arrangements to remove the need for

³ NWI paragraph 66(v).

⁴ Defined as ‘water and wastewater services provided for rural irrigation and industrial users and in regional urban areas with less than 50,000 connections’ (NWI schedule B(i)).

⁵ NWI paragraph 66(v)(a)-(b).

an ongoing CSO.⁶ In other words, jurisdictions agreed that regional providers that can sustainably achieve full cost recovery should endeavour to do so, with CSOs provided as a last resort. State and Territory Governments were ultimately responsible for making a judgment on when a service is essential but unviable, and for determining the calculation of CSO payments to those services.

2 The challenge for regional and remote services

The difficulty (and cost) of maintaining safe and reliable water services to regional and remote communities is well understood. Yet since the Commission's 2017 inquiry, water quality and water security issues in a number of regional and remote communities have highlighted a range of shortcomings in the current arrangements.

2.1 A series of recent crises ...

Since 2017, persistent drought and severe bushfires across Australia have stretched local water supplies (*Report*: chapter 2).⁷ In the Murray–Darling Basin, the Sefton Review (2020, p. 63) found that some communities now faced:

... critical urban water supply and quality issues, as well as restrictions on water use. This situation has significant social and economic impacts, including costs from having water restrictions and accessing alternative supplies, reduced amenity and green open space, and poorer health and wellbeing outcomes from quality issues.

In New South Wales, more than 50 town water systems were identified as being at risk of failure in early 2020 (NSW Water Directorate, sub. 37, p. 13). Emergency water carting was needed in New South Wales (figure 1), Queensland and Western Australia (NSW Water Directorate, sub. 37, p. 13; AFA, sub. 45, p. 9; Western Australian Government, sub. 62, p. 3), while a number of emergency water infrastructure works have been undertaken in New South Wales to secure water supplies (figure 1).

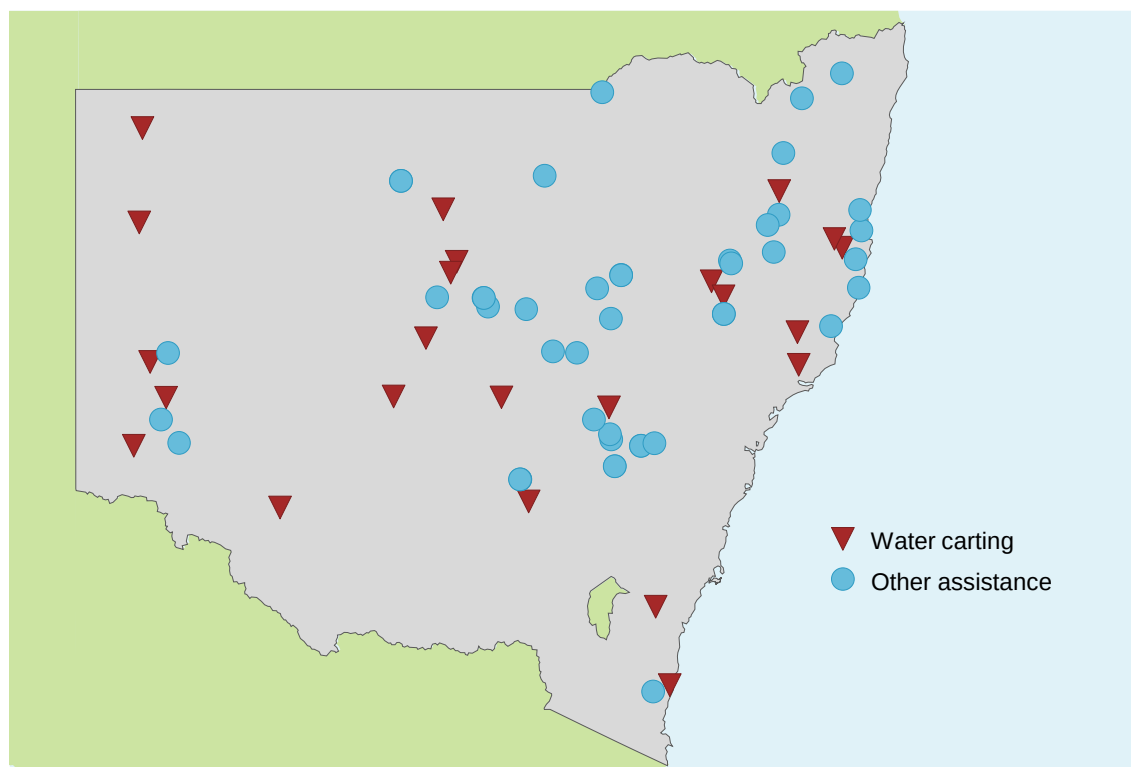
As noted above, some Aboriginal and Torres Strait Islander communities continue to lack access to safe and reliable water supplies. The NHMRC (sub. 93, p. 9) submitted that:

A high proportion of regional and remote Indigenous communities are experiencing intermittent and reoccurring water quality issues that lead to poor water safety and aesthetic outcomes. For example, the community of Walgett (NSW) has recently encountered elevated sodium concentrations in drinking water. In addition, elevated concentrations of uranium in drinking water have been a persistent problem in the remote community of Laramba (NT).

⁶ NWI paragraph 66(v)(c).

⁷ NSW Water Directorate, sub. 37; qldwater, sub. 47; CNSWJO, sub. 55.

Figure 1 **Map of New South Wales emergency water supply responses**



Source: DPIE (NSW) (2020b).

In many cases, poor water quality outcomes may persist because there are few alternatives to poor quality water sources. Zero Mass Water Australia (sub. 6, p. 5) highlighted that:

... all 72 remote communities in the Northern Territory that are supplied with drinking water rely on groundwater as the water source, even though there are known contaminants such as arsenic (Katherine region), barium (Bulla), chromium (Wallace Rockhole), fluoride (Alpurrurulam and Nyirripi), nitrates (Pmara Jutunta, Yuelamu) and uranium (Willowra, Wilora and Laramba).

2.2 ... has highlighted vulnerabilities in some regional water systems ...

Recent drought conditions in New South Wales, Queensland and Western Australia were, in some ways, unparalleled. The Bureau of Meteorology (2020a) reported that the recent drought:

.... was a situation with no clear historical precedent ... The three years from January 2017 to December 2019 were the driest on record for any 36-month period starting in January, when averaged over the Murray–Darling Basin and New South Wales ... Other areas affected by longer-term rainfall deficiencies included:

- eastern Victoria

-
- eastern and northern Tasmania
 - eastern South Australia except for the southeast and some parts of the southwest
 - Western Australia.

Yet some responses to the dry conditions indicated a lack of planning and preparation, or inadequacies in the emergency response plans in place prior to the drought. Local Government NSW (sub. 75, p. 4) highlighted that:

... the extensive and devastating drought ... 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.

In early 2020, Infrastructure Australia moved to add ‘Town and city water security’ as a ‘High Priority Initiative’ on its Infrastructure Priority List (IA 2021, pp. 70, 86). In certain regions, the need for greater infrastructure investment is particularly acute. The Central NSW Joint Organisation (sub. 55, p. 22) viewed that the New South Wales Government’s passing of the *Water Supply (Critical Needs) Act 2019*, which aimed to expedite certain major water security investments, demonstrates ‘the failure of the existing system’.

During 2020, the COVID-19 pandemic created further challenges for some regional and remote water supplies. Smaller providers were found to have little or no redundancy in essential skills, meaning water supply systems were vulnerable in the event of a shock (such as a local COVID-19 outbreak) (qldwater sub. 47, p. 9).

And the Local Government Association of Queensland (sub. 32, p. 4) observed that:

COVID-19 has brought to light issues in planning for future pandemics. Contingency planning for supplies (such as chemicals for treatment plants), critical spares (pipes, valves etc) and resources (technical and financial support) is imperative to ensure communities are supported throughout a public health crisis with safe and reliable water supply.

As noted by qldwater (sub. 47), the lack of preparedness reflects broader issues in the capability of some regional water suppliers: many are small, have limited financial resources, and do not have the skills or organisational capability to undertake complex planning activities. Ongoing under-pricing of some water services, alongside continued grant funding, indicates that some providers are not financially sustainable (*Assessment*: section 3.1). Where utilities do not earn enough revenue to cover ongoing operational and maintenance costs, they are unlikely to be able to fund the infrastructure renewals necessary to maintain service standards over time, including maintaining water supplies during extreme events.

The recent drought in eastern Australia has been severe enough to test even larger and more well-resourced regional utilities. The NSW Water Directorate (sub. 37, p. 7) highlighted the case of Tamworth (a regional city with a population of 43 200 people (ABS 2019)), reflecting both on local planning decisions and the catchment water sharing plan.

The current experience is that water sharing plans in some parts of regional NSW are not as effective as they could be for protecting town water supplies, notwithstanding some significant

investment in water security infrastructure. For example, Tamworth in the Namoi-Peel valley has been on Level 5 restrictions for 11 months since 23 September 2019. Tamworth's Level 5 restrictions require residents to limit their water usage to less than 150 litres per person per day and asks businesses to reduce their consumption by at least 25%. We do not think it is sustainable for cities the size of Tamworth to be on Level 5 restrictions for such a long length of time.

In some catchments, the interplay between water sharing plans and water allocation decisions is likely to require review in the face of climate change (Inland Rivers Network, sub. DR136, p. 8). In the case of Tamworth, the city holds high security water entitlements well in excess of average annual use, with priority provided under the relevant plan to meeting urban water needs before making allocations to general security access licences. Yet in the year leading up to Tamworth's level 5 restrictions, more water was distributed to general security licence holders than for urban water use (WaterNSW 2019). This example demonstrates that, in addition to effective local planning and investment to support regional and remote service provision, system-level water planning needs to also ensure an appropriate prioritisation of water sharing between productive, urban and other uses that takes account of climate change. As new water plans are developed, greater specification of prioritisation under drought scenarios should be included (SP A *Entitlements and planning*).

2.3 ... and opaque arrangements in some jurisdiction-wide providers

Inquiry participants have also highlighted concerns with the transparency of regional and remote services provided by larger State and Territory Government-owned utilities.

- South Australian Council of Social Service (sub. DR176, p. 2), and research they have commissioned (Aither 2021), have highlighted that the extent and magnitude of the problems in regional and remote South Australian communities remains unclear.
- While the Northern Territory's Power and Water Corporation services major towns, a not-for-profit subsidiary, IES, provides water and power to remote Aboriginal communities. According to the Central Land Council (sub. 35, p. 16), IES's 'operational structure and legal obligations are opaque, with no legislation mandating licensing or particular levels of service or standards'.
- The Aboriginal Health Council of Western Australia (sub. 97, p. 8) criticised the 'lack of transparency around water, particularly in relation to the dissemination of testing data' in Western Australia.

There are further complications in some remote Aboriginal and Torres Strait Islander communities where there are multiple service delivery agencies. Funding for essential services can come from a range of Australian, State and Territory government sources, including remote funding arrangements for housing, guided by intergovernmental agreements such as the *National Partnership on Northern Territory Remote Aboriginal Investment* between the Australian and Northern Territory Governments (DOH 2017).

2.4 Many of these pressures will remain in the future

Looking ahead, a changing climate (increased average temperatures, higher-intensity rainfall and other extreme weather events) is likely to lead to declines in water availability across Australia (*Report*: chapter 2). This could threaten long-term water security in regional and remote Australia, just as in major cities (SP F *Urban*).

Extreme events (including floods and bushfires) are also likely to occur more frequently. Unanticipated water supply shocks will challenge the ability of regional providers — especially smaller ones — to maintain water quality and sustain reliable water services.

Population change will also require some regional centres to plan for and manage demand growth, but declining populations in others will result in fewer users over a fixed network, affecting the viability of services. In some areas, particularly with aging infrastructure, significant investments may be needed to deliver the same levels of service and minimise the risk of water supply or quality issues. As the LGAQ (sub. 32, p. 6) submitted:

The capital requirement to maintain service capacity into the medium-term is beyond the fiscal capacity of local governments operating small regional and remote schemes. Service disruptions and water quality incidents will inevitably increase without substantial State and Federal capital assistance.

In terms of investment decisions, a key issue is the “infrastructure cliff” and the inability of many regional and remote local governments to fund capital costs of refurbishing aging water and sewerage infrastructure. A concomitant issue is emerging public health and environmental risks to communities.

There is ultimately a trade-off between service quality (including drinking water quality, the reliability of water supply and the expected frequency of water restrictions) and the affordability of the service for each community. Maintaining levels of service in those communities will require some combination of external funding, a sharp increase in operational efficiency, and/or higher user charges.

And while these challenges parallel those facing the major cities, the context of some regional and remote water supplies — smaller service providers, higher average costs and a lack of alternative supplies — can impair long-term water security planning and financial sustainability, limiting their ability to ensure reliable water supplies without imposing sudden cost increases on their customers.

3 Government commitments to address these challenges

3.1 Governments are responsible for providing safe water

Governments have made a number of commitments to provide healthy water in regional and remote communities, in addition to the NWI commitment to ‘provide healthy, safe and reliable water supplies’.⁸

Australia is a signatory to the United Nations Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs), which include ‘the pledge to leave no one behind’, were agreed by 193 countries, including Australia, in 2015 (DFAT 2018; UN 2015). SDG 6 focuses on improving outcomes in water and sanitation (box 1).

Box 1 The United Nations Sustainable Development Goal 6

The United Nations Sustainable Development Goal (SDG) 6 focuses on ensuring access to safe water sources and sanitation for all. Achieving SDG 6 would lead to improved health outcomes and overall wellbeing, but there are also major challenges in doing so, including high demand for water due to population growth, and the effects of climate change on water availability.

The United Nations acknowledges that some progress has been made in improving access to water and sanitation globally, but more could be done to improve outcomes. Several of the targets under SDG 6 are relevant to providing healthy water, particularly for remote Aboriginal and Torres Strait Islander communities in Australia, including:

- 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
- 6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all ...
- 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemical and materials ...
- 6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity ...
- 6.B Support and strengthen participation of local communities in improving water and sanitation management.

Sources: UN (2016, 2020).

Jurisdictions have adopted the Australian Drinking Water Guidelines

The *Australian Drinking Water Guidelines* (2016) (ADWG) are based on the best available evidence and aim to provide nationally consistent advice to maintain public health

⁸ NWI paragraph 90(i).

(NHMRC, sub. 93, cover letter). The ADWG are indirectly referred to in the NWI⁹ and underpin all state and territory regulations on drinking water quality (NHMRC, sub. 93, p. 1).

As discussed in the Commission's assessment, it is not clear whether or not the ADWG are being met in remote communities (*Assessment*: section 6.1). Although State and Territory Governments use the ADWG framework to guide regulation of water quality standards, they do not always publicly report on compliance with them, especially for small schemes and remote areas.

3.2 Compliance with the current NWI is mixed

Based on the Commission's assessment of progress against the NWI (*Assessment*: sections 3 and 6) pricing and service delivery outcomes in regional and remote communities are generally good, but with clear need for improvement in some areas.

- A number of regional utilities are unlikely to be charging at full cost recovery levels. Cross-subsidies from other local government operations, or State government programs, are not always transparent. And many regional service providers are not subject to independent economic regulation or oversight.
- Some improvements have been made in the targeting of State government grants to small providers in New South Wales by widening the scope of the *Safe and Secure Water Program* to also include non-capital projects, and by allocating funding based on a risk assessment (rather than grant applications). However, most funding in New South Wales and Queensland still does not meet the NWI's criteria of a transparent CSO payment.
 - The Queensland Government has also committed funding to stage 2 of the Haughton Pipeline to secure Townsville's water supply. The business case suggests that the project does not meet the NWI criteria for economic viability.
- The design and implementation of the Northern Territory's grants to both the Power and Water Corporation and to IES are not transparent, and Western Australia's CSOs to the Water Corporation for regional services are not separated from subsidies for irrigated agriculture.
- Household water quality generally meets the standards set by the ADWG, and outcomes in some jurisdictions (particularly Tasmania) have improved since 2017.
 - Tasmania has now removed all permanent boil water alerts for regional and remote communities, compared with 13 that were in place in 2017.
- However, as noted above, participants have raised concerns about drinking water quality in remote Aboriginal and Torres Strait Islander communities. Monitoring and reporting on those service outcomes is still patchy.

⁹ NWI paragraph 7 refers to the National Water Quality Management Strategy under which the ADWG are maintained.

Many of these issues were also noted by the Commission’s 2017 inquiry into *National Water Reform* (box 2). The provision of capital grants (instead of transparent and recurrent CSO payments) was a key area of NWI inconsistency, as were issues with the quality of monitoring, reporting and benchmarking of pricing and service outcomes.

Some progress has been made against the Commission’s 2017 recommendations. Queensland now publishes more detailed information for providers with fewer than 10 000 connections, while funding processes in New South Wales are no longer as closely tied to capital expenditure as they were in 2017.

However, the past three years have shown that many of the key shortcomings remain — particularly with regard to the funding and capability of small utilities, which affects their capacity to manage the complex challenges they face.

Box 2 PC 2017 recommendations and findings: regional water services

In its 2017 *National Water Reform* inquiry, the Commission identified two key areas for reform of regional and remote water services — largely focused on the regulation of local water utilities in New South Wales and Queensland.

1. **Better targeting of State government assistance** to provide high-cost utilities with additional resources so they can maintain adequate quality services.

The Commission recommended replacing capital grants with community service obligation payments. Those payments should not be tied to capital expenditure, and should target unviable or high-cost regional and remote water services (recommendation 6.6).

2. **Achieving economies of scale** to improve service delivery through either amalgamation or collaboration.

The Commission recommended that local water utilities and the New South Wales and Queensland Governments should strategically examine opportunities to improve service delivery through collaboration, including by using contingent community service obligation payments to promote collaboration (recommendation 6.7).

The Commission also recommended improvements to the public reporting of performance monitoring data (recommendation 6.5), with priorities being for:

- the Queensland Government to extend the public reporting of financial information to service providers with fewer than 10 000 connections

the New South Wales and Queensland Governments to require appropriately qualified independent bodies to review financial performance frameworks to ensure that the pricing practices of regional service providers are monitored for consistency with National Water Initiative pricing principles.

Source: PC (2017a, pp. 217–235).

3.3 How can a renewed NWI help?

Many of the challenges in providing safe and reliable water to regional and remote communities are not new. But solutions are complex; they vary across regional and remote Australia and require an understanding of local circumstances and priorities, balanced with expertise and resourcing from higher levels of government. Moreover, climate and population changes necessitate a long-term, forward-looking approach.

The NWI, which focuses largely on the pricing of urban water services, provides only cursory treatment of water service quality (water quality and service reliability). Jurisdictions committed to providing ‘healthy, safe and reliable water supplies’, but the NWI contains no guidance nor specific actions to define what that means or *how* jurisdictions can achieve that outcome — particularly during extreme events or in response to climate and population change.

Moreover, beyond the commitment to institutional separation, and the requirement to fund unviable services through CSO payments, principles for governance of regional and remote water services — including the roles of State and Territory Governments in regulating, overseeing and (in some cases) subsidising regional services — are underdeveloped.

A renewed NWI that is aligned with other government commitments (including the SDGs and ADWG) can be seen as a means of achieving these. Further, the commitment of all governments under the National Agreement on Closing the Gap demonstrates an aspiration to remove disparities in access to essential services (including water and wastewater) for Aboriginal and Torres Strait Islander communities (Australian Governments and the Coalition of Peaks 2020, p. 36). National water policy should look to enable this aspiration.

The remainder of this paper focuses on areas where the NWI could support improved water service outcomes for regional and remote communities. Broadly, these are:

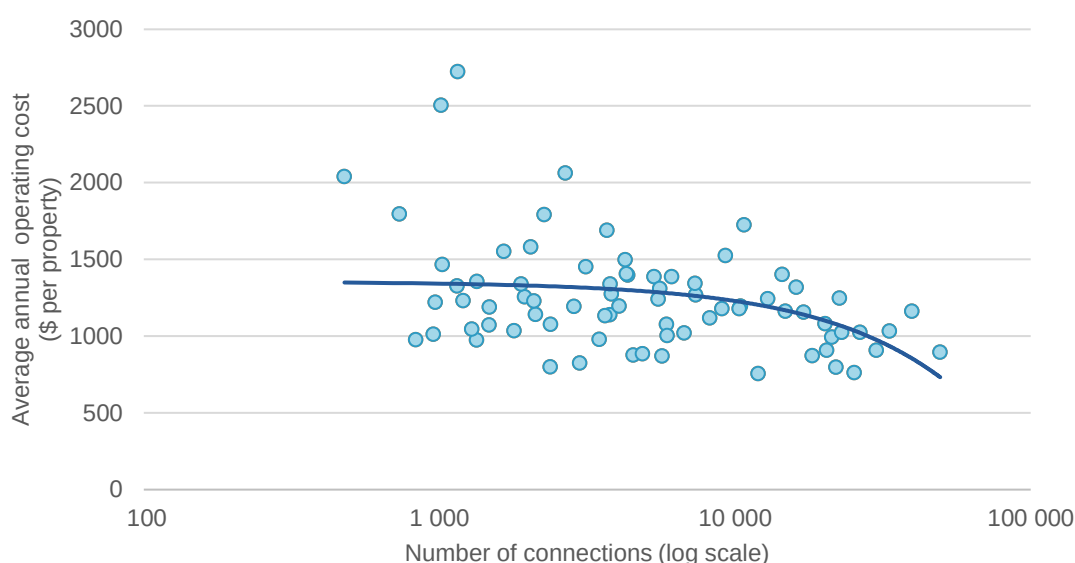
- better planning and service delivery arrangements for regional and remote urban water services (waste supply, wastewater and stormwater) which would include:
 - defining and planning for local levels of service (for safe and reliable water, as well as wastewater and stormwater), including during extreme events and in alignment with regional water resource planning
 - improving the capability of smaller providers through regional collaboration
- more efficient State and Territory government funding and oversight of regional and remote providers
- guidance on providing safe and reliable household water to remote Aboriginal and Torres Strait Islander communities.

4 Urban water planning and service delivery to regional and remote communities

In most jurisdictions, at least some responsibility for regional and remote water services is devolved to local or regional water service providers, which can either be owned and/or operated by local governments, or owned by the State or Territory government and operated at an arm's length. These providers come in many sizes (table 1), and their performance, in terms of service delivery outcomes and financial sustainability, is also variable (*Assessment*: section 3.1).

Provider performance does (somewhat) correlate with scale: smaller utilities tend to have higher costs per customer (figure 2) and are less likely to earn enough revenue to cover operational and asset renewal costs (*Assessment*: section 3.1). By contrast, larger regional utilities and jurisdiction-wide providers are usually more financially resilient and better equipped to manage risk.

Figure 2 **Average operating costs are higher for smaller utilities in New South Wales^a**



^a 2018-19 data. Connections displayed on a log scale, with trend line added. Central Coast Council excluded due to large number of connections.

Source: DPIE (NSW) (2020c); data accessed 12 October 2020.

Regardless of size, water service providers have a responsibility to deliver safe and reliable services to their communities. To achieve this outcome, they need to be adequately resourced, with enough capability to deliver those services efficiently. Although the NWI cannot be prescriptive, nationally-agreed principles could provide guidance for governments

and service providers in addressing challenges in regional and remote service provision across Australia.

4.1 Planning for defined levels of service

Long-term, strategic planning is necessary for utilities to affordably and sustainably deliver the objectives of a water system — including levels of service, as well as the health, safety and environmental standards set by governments — without imposing unnecessary costs on customers. Done well, planning ensures that investment in water infrastructure is efficient and community outcomes from those investments are maximised.

The principles of best-practice urban water system planning considered in SP F *Urban* apply to utilities of all sizes and in all locations. But embedding those principles in a renewed NWI provides an opportunity to account for the different circumstances between major cities and regional and remote communities, reflecting different circumstances and stages of maturity.

Regional water utilities can have different planning priorities

For system planning in major cities, the Commission’s NWI renewal advice has focused on overcoming barriers to integrated planning, incorporating all available water supply options, and establishing clear roles and responsibilities for utilities, governments and other planning entities — within the context of system objectives guided by community-agreed levels of service.

Although these are also worthy aspirations in regional and remote communities, there can be more pressing planning challenges for small utilities. Investment is a case in point. Major utilities may undertake millions of dollar in capital works a year, but as qldwater (sub. 47, p. 16) put it:

A new or upgraded water or sewage treatment plant will be one of the largest investment decisions a regional utility makes and is a rare occurrence not only in terms of political cycles but in the entire history of a council ... The ratio of the size of the initial and ongoing investment to the wealth and income of a small provider intensifies barriers to planning.

As outlined in section 2, the consequences of inadequate investment planning can be significant: poorer water security, impaired water quality and unnecessarily high ongoing costs imposed on a community.

Small utilities may lack the capacity to ensure these investment decisions are as efficient as possible and, under local government ownership, there may be political pressure to defer major investments in light of short-term priorities. Some urban water systems are reliant on bulk water infrastructure that services multiple towns and/or irrigation; in these circumstances, local investment decisions cannot be wholly divorced from the water resource management context.

By contrast, other elements of best-practice planning, such as integrated water management and diversifying water supplies, may be more straightforward than in major cities. Where utilities are owned by local governments, they may already be responsible for stormwater management. For example, the Orange City Council has undertaken stormwater harvesting to shore up its water supplies (CNSWJO, sub. 55, p. 15). And the smaller scale of some regional and remote water systems has allowed for innovative and decentralised supply options to be trialled — for example, in Borroloola (Zero Mass Water Australia, sub. 6, pp. 8–9).

Simply put, the priorities for system planning can be different in regional and remote communities. This section considers those fundamentals of urban water planning that should be in place for regional and remote water services, including how they could be embedded as part of renewing the NWI. These fundamentals, which should represent a lower-cost approach of implementing planning approaches consistent with the metropolitan utilities, include:

- defining levels of service for regional and remote communities, in consultation with residents
- long-term system planning at a regional level
- short-term contingency planning to maintain water supply and quality during extreme events (integrated with long-term plans at the local and catchment scale).

Levels of service in regional and remote communities should be clearly defined

Levels of service form part of the long-term objectives of a water supply system, along with standards established by government (such as health, safety and environmental regulations). Agreed levels of service represent a trade-off between service quality (particularly water supply reliability, service standards and certain aspects of water quality, such as palatability), and the prices that customers pay. The process for determining levels of service needs to consider the benefits and costs of additional water supply in the context of a particular system and water plan.

Many major utilities have clearly defined levels of service objectives (SP F *Urban*). Although regional and remote providers face similar requirements to major utilities in terms of government health, safety and environmental standards, explicit levels of service are less frequently defined for those communities.

- In Queensland, level of service objectives are legislated for south-east Queensland, while the government has published guidelines to assist regional service providers in developing their own objectives (which are not mandated) (DNRME (Qld) 2018b).
- In New South Wales, levels of service are not clearly defined — although the revised *Safe and Secure Water Program* aims to ‘ensure a minimum level of service in smaller towns where the cost of critical infrastructure outweighs the economic benefits provided’ (DPIE (NSW) 2020a).

Inquiry participants highlighted the importance of clearly-defined levels of service to guide service delivery in regional and remote areas. The Water Services Association of Australia (sub. 88, p. 45) recommended that a new NWI ‘includes a commitment to achieve affordable levels of services for water and wastewater in regional and remote communities’, including sustainable funding arrangements and regional-scale planning. Qldwater (sub. 47, p. 7) also recommended establishing ‘typical levels of service and minimum standards for different communities and mechanisms for improving customer understanding of costs and pricing structures for urban services’.

The process of establishing local levels of service can be difficult in regional and remote communities, especially for smaller providers, or for water systems where the long-term trade-offs between cost and service quality are not well understood (Aither 2021, pp. 11–12). Information on options and capacity to undertake detailed consultation can be lacking.

Further, establishing levels of service may bring affordability into question. As noted by Goldenfields Water County Council (sub. 25, pp. 7–8), higher service standards may need to be matched with greater funding in order for smaller utilities to meet them.

But regardless of how levels of service are established, the process requires a high degree of community engagement so that local preferences concerning the trade-offs between service quality and prices are understood. Residents would have to be consulted, for example, on decisions concerning different water sources (which vary in terms of cost, palatability and reliability), anticipated frequency of water restrictions and the overall cost of the system.

State and Territory Governments should define a ‘basic level of service’

To circumvent complex determinations of service levels in small and remote communities, governments could instead define a basic level of service. State and Territory Governments would specify minimum standards of service provision (including safe and reliable drinking water) that would cover all households.

A basic level of service could also underpin the allocation of State and Territory government support for regional and remote urban water systems, consistent with the rationale for a CSO more generally. Government funding of that CSO should generally be limited to those areas where providing a basic level of service would not be commercially viable, and where other options (such as self-supply) are not feasible. Government funding should not be provided to water systems that can be operated commercially (that is, sustainably funded through user charges), except to ensure all members of a community are able to afford access for their basic water needs. (CSO funding is discussed in more detail in section 5 below).

The Commission considered similar issues in its *Telecommunications Universal Service Obligation* inquiry (PC 2017b). In that inquiry, the Commission considered how to establish a ‘baseline’ level of service quality for broadband and voice services in non-commercial

areas. In keeping with principles established by the Commission in that inquiry (PC 2017b, p. 169), a basic level of water service provision should be:

- founded on a clearly-specified rationale
- based on clear definitions of a basic service
- specified in the form of measurable user outcomes
- subject to review.

In response to the Draft Report, inquiry participants expressed overall support for a basic level of service and offered a range of views on how to define this concept.¹⁰ Defining a basic level of service should be a decision for State and Territory Governments, based on their own circumstances and community needs.

It is the Commission's view that the provision of safe and reliable drinking water should be part of the basic level of service across all States and Territories. A renewed NWI should include a commitment to ensure access to safe and reliable drinking water for all Australians. The definitions of 'safe' and 'reliable' would be a government decision. The definition of 'safe' should be aligned with the ADWG parameters for health-based performance, and be nationally consistent. Local circumstances will influence State and Territory Government definitions of minimum service reliability — that minimum standard could include the quantity of water available, the frequency of water restrictions, and/or clear arrangements to maintain services during extreme events.

In addition to safe and reliable drinking water, the definition of a basic level of service across other dimensions of service provision could differ between states and territories, based on local circumstances. State and Territory Governments should each decide on the appropriate service mix (beyond safe and reliable drinking water) and the definition of minimum standards (for example, whether aesthetic water quality standards for drinking water should be part of a basic level of service in that particular State or Territory). State and Territory Governments could also provide guidance on a definition of 'healthy' drinking water that considers the costs and benefits of provision.¹¹

Beyond this basic level of service, communities could, of course, agree to a higher standard of service funded through user charges. Agreement on a community-acceptable level of service will require effective consultation (SP J *Engagement*).

Long-term system plans should be in place to guide investment

Once the system objective is defined (incorporating both levels of service and government-imposed standards), a long-term plan is needed to pursue that objective in the

¹⁰ IWF, sub. DR120, pp. 2-3; NHMRC, sub. DR125, p. 1; NLC, sub. DR134, p. 27; qldwater, sub. DR142, p. 4; PIAC, sub. DR156, p. 14; SACOSS, sub. DR176, p. 4; LGAQ, sub. DR183, p. 5.

¹¹ NWI paragraph 90(i).

most efficient manner possible. Planning guides infrastructure decision making, including the type and timing of investments.

Long-term planning would provide a framework for managing expected population growth or decline, and the impacts of climate change on water supplies. It would also help guide local infrastructure investment, including any State, Territory or Australian government investments if they occur. Where State and Territory Governments provide CSO funding, they should be involved in the upfront planning process to ensure adequate oversight of investment decisions and scrutiny of costs — as well as to ensure all water supply options (including self-supply, entitlement purchase and emerging technologies such as small-scale desalination) are considered.

The coverage and quality of long-term system plans can vary between regional providers. In New South Wales, for example, utilities are required to prepare an integrated water cycle management (IWCM) strategy which ‘sets out town water priorities, including infrastructure and non-infrastructure investments, water conservation and drought measures’ and is approved by the New South Wales Government (Audit Office of New South Wales 2020, p. 1). Although this requirement has been in place since 2004, the Audit Office of New South Wales (2020, p. 18) confirmed that, of the 92 utilities subject to the guidelines, just half had submitted a strategy to the State Government for review, and only eight had an approved strategy in place.

Many fundamentals of system planning, including assessing long-term demand, are the responsibility of the service provider. It is important that any plan takes account of local circumstances, and occurs at the right scale. In many parts of Australia, this local planning would be sufficient.

In some systems, planning should take place at a regional scale — for example, at a catchment level in connected systems with multiple urban water supply systems and/or irrigated agriculture systems. This would allow the most cost-effective water supply options (both infrastructure and non-infrastructure) to be considered, and ensure system planning is consistent with broader-scale water resource planning. Some systems may present opportunities for inter-catchment transfers, so the planning process should take place at a higher scale for those options to be assessed alongside smaller-scale local options.

For example, Victoria’s *Sustainable Water Strategies* take a long-term view of water resources and ‘guide the development, integration and implementation of management plans prepared by [urban and rural] water corporations and catchment management authorities operating within each region’ in order to, among other things, ensure secure water supplies for towns (DSE (Vic) 2012, p. 19). This ensures planning is integrated across scales, and between urban and rural water systems.

Planning at a higher-level regional scale would allow for collaboration between providers, which can also assist smaller providers that may not be able to finance the specialist skills required. And there may be a role for the State or Territory Government to enable regional-scale supply augmentation options, as well as to support capacity-building and

encourage collaboration between providers to share expertise (discussed below). However, this should not extend to detailed planning requirements — some have observed that the New South Wales IWC strategies are an onerous and overly-prescriptive process (Goldenfields Water County Council, sub. 25, p. 5).

Irrespective of capability, local utilities do not always have an incentive to undertake detailed long-term supply planning — particularly, where investments might impact on short-term customer affordability, or if the State or Territory government is likely to step in and guarantee water supplies during an emergency (a ‘provider of last resort’). This reflects a broader question concerning governance where regional utilities are owned by local governments — this is considered below.

Contingency planning for extreme events should be consistent across scales

As noted above, the recent drought highlighted inadequacies in the contingency planning of some utilities (section 2).

In some cases, multiple utilities share bulk water infrastructure and, while collaboration occurs in some places, there is not always a formal mechanism to ensure local utility extreme event plans align with the extreme event provisions in the broader catchment plans. This can lead to uncoordinated responses during extreme events. According to the Inland Rivers Network (sub. 86, p. 14):

Poor water quality and extreme events are mostly out of the control of regional and remote water service providers who are dependent on State level plans and policies. Thus any benchmarking of service levels required by small service providers should have reciprocal arrangements that ensure smaller providers have access to a certain standard of water quality and quantity.

There is a need to align centralised expertise and information with local knowledge to ensure that town water supplies do not fall through the cracks during a drought. Some jurisdictions have recently taken steps to address this: for example, Queensland’s *Regional Water Supply Security Assessments* aim to develop a shared understanding of the potential water supply security risks for prioritised communities — although water service providers are responsible for implementing actions to ensure water security (DNRME (Qld) 2018a).

Contingency plans should lay out clear triggers for imposing water restrictions and engaging emergency supplies, with reference to the extreme event provisions in the broader water plan (where relevant) as well as aligning to planned augmentations or access to alternative water holdings under the long-term system plan in a timely way (that is, ensuring there is enough time to undertake a planned augmentation or water entitlement purchase before a critical water shortage occurs). Contingency plans should also clarify if, when and how State and Territory Governments should intervene to alleviate critical supply shortages as a provider of last resort. This aspect in particular should be developed in concert with the relevant State or Territory government, with input from the community — particularly to ensure they understand the need for contingency measures (such as water carting) in an emergency.

4.2 Improving small utility capability through regional collaboration

Regional service providers need capability to efficiently and sustainably deliver water services to agreed levels of service. As highlighted in section 2, there are concerns with the capability and resourcing available to smaller providers to effectively achieve these outcomes — in part, because they lack of economies of scale, as well as ongoing under-pricing and a concomitant lack of financial resources in some cases.

The Commission’s previous work has found that economies of scale are often present in water service delivery; that is, the cost of supplying each litre of water tends to decrease as a given provider supplies more water (PC 2011, pp. 118–126). In this case a larger provider can (all else being equal) deliver the same service as a smaller one at a lower cost to consumers. Further, larger organisations are (generally) better able to plan for and manage risks and shocks. It can be unreasonably costly for every small provider to employ certain specialist or technical occupations, or to maintain enough redundancy in staffing to ensure service continuity during extreme events.

The benefits of economies of scale, however, must be balanced against the need to account for local circumstances, especially in areas of lower population density where average costs are higher and supply options fewer. Fit-for-purpose water supply options may be needed, and water service provision must still be accountable to the community.

Utilising collaboration to realise economies of scale

In its 2017 inquiry, the Commission considered that some benefits of economies of scale could be realised by small utilities collaborating on service delivery (PC 2017a). This view was endorsed by number of inquiry participants.¹²

Collaboration can take a number of forms, from informal information sharing, to contractual agreements to share staff, or commitments to construct and share infrastructure in accordance with regional-scale system planning (where warranted; discussed above). In some cases, smaller utilities have fully merged parts of their operations, such as under New South Wales’ county council model, which retains local government ownership of a joint bulk water entity (such as Goldenfields Water County Council (sub. 25)).

Collaboration between service providers has also helped address business continuity during extreme events (such as COVID-19). For example, qldwater (sub. 47, p. 9) noted that, in response to the risks created by the pandemic, ‘the qldwater membership responded extremely well, sharing business continuity planning experience and ideas to support continued services in the event of an outbreak’.

Collaboration, however, is not a silver bullet. Some submissions have argued that collaboration should not be seen as a replacement for institutional reform (such as

¹² LGAQ, sub. 32, pp. 5-6; NSW Water Directorate, sub. 37, p. 12; qldwater, sub. 47, p. 17; CNSWJO, sub. 55, p. 15; LGNSW, sub. 75, p. 5; WSAA, sub. 88, p. 42.

amalgamation of water utilities) where that is likely to improve outcomes (AWA, sub. 89, p. 10). Indeed, there may be limited economies of scale in sparsely populated regions and remote communities, and collaboration may do little to overcome the high costs of a spread out network.

State and Territory Governments can support collaboration

State and Territory Governments should look to facilitate collaboration where it is likely to improve service delivery efficiency. Some are doing so already, such as through the *Queensland Water Regional Alliance Program* (QWRAP) and the recently established *Town Water Risk Reduction Program* in New South Wales (NSW Government, sub. DR138, p. 9; qldwater, sub. DR142, p. 5; LGAQ, sub. DR183, p. 3).

One option available to governments (as recommended by the Commission in 2017) is to make any State or Territory support for high-cost water services (considered below) contingent on a certain degree of collaboration.

Peak bodies can also be a mechanism for collaboration. For example, arrangements are in place to support local government associations in Queensland and South Australia in undertaking functions on road access, with a national regulator assisting local governments in improving access decisions (PC 2020a, pp. 315–323). Similar arrangements could be considered for water infrastructure decisions. There may also be merit in larger providers supporting smaller ones, although this should not unduly burden those larger providers (LGNSW, sub. 75, p. 10).

5 Funding and governance for regional and remote services

In some cases, State and Territory Governments play a more active role in ensuring access to safe and reliable water services for regional and remote communities. This can encompass direct funding of some utilities, as well as ensuring appropriate governance arrangements are in place (including economic oversight, and monitoring and reporting).

NWI renewal provides an opportunity for jurisdictions to identify and endorse leading-practice approaches to government support (and oversight) of regional and remote water services.

5.1 State and Territory government support for high-cost services

State and Territory government funding for urban water can be warranted ...

Some high-cost regional and remote urban water systems are not commercially viable.¹³ This can mean that a service is not provided, or, even where a service is available, high prices can mean members of a community may be unable to afford their basic water needs — payment may represent an unacceptable cost burden, or some households might underutilise what is an essential service, with health and welfare implications.

To ensure access to a basic standard of safe and reliable drinking water in those areas, there is a role for State and Territory Governments to partially subsidise some urban water systems to reduce prices and prevent onerous cost imposts on consumers. The NWI requires that this occurs as a publicly reported CSO payment (although the agreement provides no additional guidance). Governments already provide CSOs for government-owned service providers to compensate them for the costs of delivering an essential service to a high-cost area, particularly where uniform pricing is in place. In the water sector, some State and Territory Governments provide CSO payments to government-owned utilities to cover the costs of servicing higher-cost regional communities, as well as concessional rebates for pensioners and other groups (box 3).

Box 3 Community service obligations in the urban water sector

In South Australia, SA Water's charter establishes the basis of State government funding to cover agreed non-commercial operations, including to some Aboriginal communities (SA Water 2019b, pp. 6–7).

The Western Australian Government provides operating subsidies to the Water Corporation, and the Bunbury and Busselton water corporations, to deliver services to high-cost country towns, pensioner and senior concessions, and charities (Western Australian Government, sub. 62, pp. 6–7).

The Northern Territory government provides community service obligation payments to the Power and Water Corporation for pensioner concessions, as well as capital and operational grants to Indigenous Essential Services for remote power and water services (PowerWater 2019a, pp. 80, 96).

¹³ That is, full user charging would exceed the willingness of users to pay (SP I *Infrastructure*). A commercially-focused entity would not provide the service as consumers would be unwilling (or unable) to pay prices that would meet the full cost of supply (inclusive of a competitive return on capital and management). This definition of a 'commercial' service is based on a provider charging at the 'upper bound' (Upper and lower bound pricing are discussed in *Assessment*.) Under the NWI, many regional providers charge at the 'lower bound' only and do not earn a return on existing capital. Permitting lower bound pricing, by accepting a lower rate of return for a government-owned corporation, constitutes a form of CSO funding for an uncommercial service (IC 1997, p. 24). The discussion in this paper focuses solely on where *additional* CSO funding is required to enable providers in high-cost areas to achieve lower bound cost recovery.

... but funding decisions are more complicated under local government ownership

In New South Wales and Queensland, where most regional and remote water services are delivered by local government-owned providers, State Governments often provide funding support through non-recurrent grants rather than untied CSO payments.

There are some reasons put forward for this approach. State Governments do not have a clear line of sight to service delivery costs in regional and remote communities. Local providers may have an incentive to misrepresent costs (or to underperform) in pursuit of an untied subsidy, or under-manage risks if the State government is likely to act as a provider of last resort. Grants are therefore said to provide a degree of scrutiny on infrastructure decision making, and are seen by funders as a way of ‘ensuring rigour around proposals’ (qldwater, sub. 47, p. 17).

Capital grant funding, however, is not consistent with the NWI (*Assessment*: section 3). In its 2017 inquiry, the Commission noted that grant funding creates a number of distortions (PC 2017a, pp. 228–229). In particular, capital grants are often poorly targeted to areas of need, are at risk of political interference, and the tying of funding to infrastructure projects introduces ‘capital bias’, in that infrastructure spending is preferred over other forms of operational expenditure, including planning, maintenance or staffing costs. Further, capital grant processes often give inadequate consideration to ongoing maintenance costs, compared with upfront construction costs, leaving recipients with high life-cycle costs for assets (IWF, sub. 30, pp. 14–15, qldwater, sub. 47, p. 16). And non-recurrent funding sources can undermine longer-term strategic planning by operators.

To improve compliance with the NWI, the Commission (2017a, p. 38) recommended that the New South Wales and Queensland Governments:

... replace existing capital grants to regional water utilities with transparent Community Service Obligation payments that are not tied to capital expenditure, and that are targeted at unviable (high-cost) regional and remote services.

A renewed NWI could outline principles for urban water CSOs

Beyond stating a preference for support in the form of CSO payments, the NWI does not specify how payments to unviable urban water systems are to be calculated, nor did it define scheme viability, leaving both as decisions for State and Territory Governments.

The lack of prescription has allowed State and Territory Governments to approach their funding decisions in ways that reflect the diversity in their service delivery models. But it has also meant that there are no agreed principles on how to fund regional and remote community services — which has arguably enabled inefficient funding processes in jurisdictions with many smaller regional providers. Qldwater (sub. 47, p. 13) submitted that:

The Commission’s past recommendations around the replacement of capital grants with CSOs are welcomed, however the lack of guidance on how to manage a transition seems likely to be used as an ongoing excuse for inaction.

There is therefore a case to include principles in a renewed NWI to guide CSO payments to unviable areas, with a focus on how governments can sustainably fund smaller providers while maintaining incentives for efficient service delivery. This requires a clear outline of the objective or rationale of the CSO (determined by governments), followed by consideration of how that CSO is funded (NSW Treasury 2019; PC 2017b, p. 33).

The Commission's advice on principles follows.

Design CSO funding to ensure access to a basic level of service

The justification for State government funding hinges on the costs of supplying water to a particular community, which informs whether or not a service is commercially viable if funded solely by users. Commercial viability is determined through a technical assessment of both the efficient long-run cost of service provision, the standard of service provided and the willingness of customers to pay. Each element introduces estimation challenges.

- The revealed cost of delivering services to a particular standard reflects both underlying cost drivers (such as population density and water source quality) and the operational performance of service providers. In the absence of economic regulation, disentangling the two to arrive at an estimate of an 'efficient' cost is complex.
- The standard of service provided also affects delivery costs. More stringent health, safety and environmental standards, although worthwhile, can increase costs and affect viability of some small schemes. Similarly, the levels of service objective for a water system (for example, a target for how frequently water restrictions will be applied) also affects costs — higher reliability will generally cost more.
- Assessing the willingness of a community to pay for water is contentious. In jurisdictions without postage stamp pricing, water prices can vary significantly and, in some cases, be below the long-run cost of service provision. Yet, as put by qldwater (sub. 47, p. 15), there is still a tendency for 'most communities' to consider their water and sewerage services to be overpriced.

In the absence of both a competitive market and economic regulation, establishing whether a service is commercially unviable requires judgment. A view on the service standard that *should* be provided (which forms the basis of the government objective) and the willingness of the community to meet the associated cost (given both their ability to pay and level of access to alternative supplies) are relevant. These are difficult estimations, and there are a number of ways to determine the cost of providing a CSO (IC 1997).

Some submissions suggested ways to estimate the ability of regional communities to pay, such as the ABS Socio-Economic Indexes for Areas (qldwater, sub. 47, p. 15). However, these indices tend to only provide averages across regions, and do not reflect the diversity of socioeconomic outcomes within them. Disadvantaged members of a community — who may have genuine affordability issues — can be better targeted through rebates (as already occurs; box 2), rather than place-based measures of disadvantage.

The Commission's view is that CSO payments should be designed to ensure access to a basic level of service (as defined by the relevant State or Territory government; discussed above) in those communities where such service provision would otherwise be unviable.

For those communities, the amount of funding provided under the CSO should be adequate to ensure that a basic level of service is affordable. That is, CSO funding should provide operational subsidies that allow the utility to achieve and maintain lower-bound cost recovery, subject to:

- there being no other more cost effective means to supply a basic level of service (such as self-supply)
- the utility charging a price considered to be affordable.

This determines what share of costs are borne by users (through user charges), and what share is to be subsidised by taxpayers.

Ultimately, assessing affordability is a decision for a government, depending on its budget priorities. Any specific affordability concerns for vulnerable community members should continue to be addressed through separate policy tools, such as the concessional rebates provided by governments for groups such as pensioners.

Clear and credible data are required to estimate the costs of delivering a basic level of service in each system, and in making assessments of affordability. A high-quality estimate is needed to ensure the estimate of commercial viability is credible, and that the subsidy is set at a prudent level and does not overly burden taxpayers.

State and Territory Governments already collect a range of performance information on utility operations that could contribute to this decision — although there is an argument for data collection to occur at an arm's length from policy-making to ensure data are credible. Independent economic regulators could have a role, as part of improving economic oversight of regional providers (discussed below).

CSOs should maintain local incentives to efficiently deliver services

Subsidies (including CSO payments) carry both direct costs to governments, as well as economic costs that arise from distortions to decision making. In the case of water utilities, there is a moral hazard problem. The availability of a subsidy dulls incentives for utilities to improve efficiency or to charge users cost-reflective prices. Maintaining user charges below cost-reflective levels can mean water use is higher than might be efficient, while imposing an ongoing cost on taxpayers across the state.

Any subsidy should be designed to ensure a utility has clear incentives (and adequate resources) to provide effective and efficient water services to their communities, including by enabling ongoing improvement at the local level. It should support improved operational performance, and not allow utilities to under-price their services in pursuit of affordability, or under-treat risk in hope of the State government stepping in during a crisis.

To help provide certainty for long-term water system planning by regional and remote providers, CSO payments should be calculated in a predictable fashion to provide a reliable source of funding.

Additionally, governments should make funding provided to regional utilities conditional on basic standards of corporate operations (such as reporting, planning and asset management, along with commitments to improve pricing practices where relevant), including any minimum system planning, monitoring and reporting standards embedded in a renewed NWI. Annual reporting against these performance indicators could form part of CSO determination. And as noted above, state government funding could also be made contingent on utilities pursuing regional collaboration, where this helps reduce the costs of service delivery and improves operational performance.

Summing up

Government subsidies to regional and remote urban water services should be:

- designed to ensure access to a basic level of service in those communities where such service provision would otherwise be unviable
- adequate to ensure a basic level of service is considered affordable
- based on credible data on efficient service costs, subject to a degree of independent oversight, following State or Territory government involvement in system planning
- calculated in a predictable fashion to provide a reliable source of funding
- conditional on ongoing operational improvements, such as improvements to utility governance, better service outcomes (based on performance monitoring), compliance with guidelines for system and contingency planning, or for pursuing collaboration.

5.2 Governance and economic oversight of regional and remote services

Many concerns with regional service provision stem from governance

A longstanding principle in the urban water sector is that of institutional separation: service providers should focus on delivering water services at the lowest cost, according to commercial objectives, at an arm's length from governments who set standards that providers must comply with. However, this does not always occur; governments can impose implicit policy obligations on utilities, or direct them to undertake non-commercial activities without compensation. Such governance challenges are acute in major cities but also in regional areas, particularly where:

- utilities are owned and/or operated by local governments, but subject to State government standards (such as environmental and health standards) and without economic oversight

-
- State government departments can be conflicted in simultaneously enforcing performance standards on utilities, while also trying to build the capacity of small providers to meet those standards.
 - ... The New South Wales Audit Office (2020, p. 17) observed, in the case of the New South Wales government, ‘a lack of accountability in why and consistency in how the department undertakes its dual responsibilities to oversee and support [local water utilities]’.
 - local government and utility finances and operations are not always separated
 - In Queensland, ‘the financial performance of most service providers is intricately linked with their owner councils, making it difficult to assess the financial performance of the water supply operations specifically’ (qldwater 2019, p. 22).
 - State and Territory Governments act as a provider of last resort, creating a moral hazard that can undermine incentives for extreme event planning, as well as enabling utilities to prioritise short-term affordability concerns over long-term investment priorities
 - multiple departments or service delivery agencies operate in remote communities, including municipal services, housing services, and community development services, leading to unclear responsibilities, funding and ownership of assets (this is considered in section 5).

In each case, there needs to be clarity on the roles and responsibilities of different actors to ensure a clear point of accountability for delivering regional and remote water services.

At a minimum, financial separation should apply to local government utilities

More could be done to ensure a clear accountability between State and local governments, and between local governments and their water businesses, where regional utilities are owned by local governments.

Local water utility operations should be made financially distinct from their local government owners, to ensure scrutiny on operational performance, transparent cross-subsidies, and to allow for better assessment of the costs and financial sustainability of regional and remote water supply systems. Ideally, this should constitute operational separation — although this may not be worthwhile for smaller providers where economies of scope exist between water service provision and other local government operations.

But at a minimum, this requires that water functions are financially ring-fenced from other local government operations, and any cross-subsidies between water services and other local government operations are explicit.

Further, clearer arrangements are needed to specify the responsibilities of local and State governments. This includes clarifying the role of the State Governments in setting and enforcing standards, building capacity, maintaining a basic level of service and (if

applicable) operating as a provider of last resort during extreme events (which should be clearly laid out in water system contingency plans as discussed above).

Economic oversight could be more widely implemented

SP F *Urban* outlined the importance of independent economic regulation in the water sector, including principles of best-practice economic regulation.

Economic oversight of large utilities usually occurs through processes that set, recommend or monitor prices or revenues, as well as public scrutiny of capital investment decisions through pricing submissions. This type of oversight is not generally applied to smaller providers because the high costs of implementing such a regime are likely to exceed the benefits — the overall consequences of a local utility exploiting market power can be relatively minor. Yet small regional water utilities still function as monopolies: there is no commercial pressure to spur improved performance, and they can have an incentive to prioritise short-term affordability (due to community pressure) over longer-term investments in water security — a temptation worsened by the position of State Governments as a provider of last resort.

In practice, economic oversight of small providers is minimal (or non-existent) in some jurisdictions. In New South Wales and Queensland, the utility performance data collected by State governments provides a basic level of oversight. But although beneficial in providing transparency on utility performance, the systems are not independent of policy-making and do not feed into formal or public processes that compare utility performance and incentivise improvement. As highlighted by the Commission in 2017, the performance data reported in New South Wales ‘have not been adequately scrutinised to highlight areas where pricing practices have been deficient’ (PC 2017a, p. 218). This appears to still be the case.

Jurisdictions should agree to a consistent assessment framework to inform decisions concerning the type of economic regulation to apply, based on the risk (and potential impact) of a utility exploiting market power, and the costs to utilities and taxpayers of economic regulation (particularly for smaller utilities). This should ensure that ‘light touch’ independent economic oversight is in place for small providers (with greater scrutiny applied to larger providers).

Economic licensing of small providers could be more widely used to provide assurance of utility capability. For example, the Essential Services Commission of South Australia licenses small water and wastewater providers in that state to provide independent assurance that the provider is fit and capable of delivering services to a satisfactory standard (box 4).

Licensing ensures service providers are responsible for maintaining performance standards, which limits the need for State and Territory Governments to impose prescriptive requirements. Instead, State and Territory Governments can prioritise building local utility capacity (as discussed above in the context of regional collaboration), while the economic

regulator ensures that minimum performance standards are being achieved by monitoring compliance with licence conditions.

More robust approaches to performance monitoring and reporting (discussed below) would also contribute to economic oversight. Although monitoring and reporting of service and pricing outcomes is important for transparency (discussed below), independent regulators should also ensure that the information gathered is analysed to assess where pricing practices should be improved.

Box 4 Small water retailer licensing in South Australia

In South Australia, all retail water service providers must be licensed by the Essential Services Commission of South Australia (ESCOSA). The licence issued imposes obligations on retailers to ensure they meet their regulatory requirements. Under the *Water Industry Act 2012* (SA), ESCOSA can only issue a licence where satisfied that ‘the applicant has the capacity (including financial, technical, organisational and other necessary capacity) to provide the services safely and to appropriate standards that would be authorised by the licence’ (s. 20(2)(d)).

ESCOSA determines the appropriate form of regulation for each entity by considering the scale and nature of their operations, with different requirements for major retailers (more than 50 000 connections; only applies to SA Water), and for intermediate (500 to 50 000 connections) and minor retailers (fewer than 500 connections).

There are 66 minor and intermediate water retailers subject to licensing, including local governments and private entities. Most primarily provide wastewater services. Economic regulation of these providers includes:

- a retail code
- reporting and information requirements
- a compliance system and reporting guideline and enforcement policy
- a price determination.

The price-setting process is less stringent for minor and intermediate retailers than for SA Water. The price determination requires minor and intermediate retailers to comply with the National Water Initiative Pricing Principles when charging for water and sewerage services, and to report annually to ESCOSA on how they are complying with those principles.

Sources: ESCOSA (2013, 2019, 2020).

Performance data should contribute to decision-making processes

SP F *Urban* outlined the importance of maintaining monitoring and reporting of water service quality outcomes — including water quality and reliability measures. However, there are concerns over the value of some data currently collected. Qldwater (sub. 47, p. 20) noted that some providers:

... question the value of reporting when aside from politically sensitive indicators (e.g. water security) there is little outward-facing evidence of how the information is used.

For regional and remote services, a balance needs to be struck between the costs of performance reporting and the benefits of the data collected.

Maximising the benefits of performance monitoring relies on how the information is used. Benchmarking — which connotes a measurement of performance against a predetermined standard — can be more difficult (and potentially less informative) when small, heterogeneous services providers are not easily comparable. Yet simply reporting performance data is unlikely to deliver competition by comparison.

As the Commission noted in 2017, independent bodies should ‘analyse reported information so as to provide greater scrutiny of outcomes and so better highlight where performance is poor and improvement is required’ (PC 2017a, p. 217). This recommendation remains pertinent and should be considered as part of the NWI renewal.

Data collected should also feed into decision-making processes to maximise the benefits of that information. For small regional utilities where light-touch economic oversight is applied, the independent economic regulator could publicly report on the performance monitoring data (as ESCOSA already does).

Performance monitoring data could also assist in determining the targeting and level of CSO payments to high-cost areas, with a degree of independent oversight to ensure cost estimates are credible. Although this should not extend to a complex determination of a regulated asset base, for example, it could include annual reporting against performance indicators that feed into the annual determination of CSO funding (discussed above).

Similarly, performance monitoring data should be fit for purpose to enable regular reviews of progress against the renewed NWI (SP F *Urban*).

6 Water services in remote Aboriginal and Torres Strait Islander communities

The Aboriginal and Torres Strait Islander population is highly urbanised, with less than 20 per cent of the population living in remote or very remote areas (ABS 2016a). However, remote and very remote Australia is home to a higher proportion of Aboriginal and Torres Strait Islander people than is the case in major cities and regional areas.

The Commission has adopted the ABS definition of remote Aboriginal and Torres Strait Islander communities¹⁴ as those that are inhabited predominantly by Aboriginal or Torres Strait Islander people, with housing or infrastructure (power, water, sewerage) that is managed on a community basis (ABS 2016b). These communities (which include homelands and outstations) are distinct from other types of settlements in remote Australia (such as mining towns, pastoral stations or larger towns like Alice Springs).

¹⁴ The technical ABS term is ‘discrete communities’.

Many of these communities are not serviced by regional water utilities, but may self-supply or be supplied by state-wide providers. User charges may not be levied. And the consequences of poor water service provision can be more serious in these communities than in others. As Infrastructure Australia noted:

Many remote communities are home to a high proportion of Aboriginal and Torres Strait Islander people, meaning poor standards of water and wastewater services compound historical hardships and reinforce disadvantage. (IA 2019, p. 602)

6.1 Water quality remains an issue for some remote Aboriginal and Torres Strait Islander communities

In 2017, the Commission found that remote communities in parts of Queensland, Western Australia, Tasmania and the Northern Territory often experienced poor drinking water quality (PC 2017a). Although jurisdictions were taking action, they faced challenges in providing water services due to the high costs of service delivery and the difficulty in attracting staff.

It is not possible to determine whether the situation has improved. Comprehensive national data on drinking water quality has been lacking since the *ABS Community Housing and Infrastructure Needs Survey* ceased in 2006 (SCRGSP 2016). But evidence from state-level data and case studies suggests that problems with drinking water quality remain in many remote Aboriginal and Torres Strait Islander communities.

Water supplies in some remote communities have chemical and biological contamination and palatability issues (*Assessment*: section 6.1). And many issues affect the provision of water, including community infrastructure. Recent studies have found a lack of functioning taps, showers and toilets in remote communities (Bailie et al. 2010; Hall et al. 2017; Torzillo et al. 2008, as cited in Hall et al., sub. 84, p. 6). Moreover, as discussed in section 2, water security challenges caused by drought and extreme events also affect remote Aboriginal and Torres Strait Islander communities.

Ongoing water quality issues in some remote communities indicate that current arrangements for providing safe water are not adequate in some places.

6.2 Water quality is especially important to health outcomes in remote communities

Medical and social research have demonstrated that poor quality water and sanitation have flow on effects for health outcomes in remote Aboriginal and Torres Strait Islander communities (DFAT 2018). There are also key economic benefits in higher quality water services, both from reductions in the burden of disease on individuals and communities, and in reductions of the burden on health systems (WSAA, sub. 88, p. 42; NHMRC, sub. 93, p. 3).

Water is a protective factor against infectious diseases

A lack of safe and reliable water and sanitation can increase the risk of preventable, hygiene-related infections, such as:

- diarrhoeal illnesses
- skin infections such as boils, scabies, school sores and leprosy
- eye infections such as trachoma
- ear, nose and throat infections, especially middle ear infections.¹⁵

A lack of access to safe water and adequate sanitation can also worsen existing health issues (IA 2019, p. 602) and, if repeated infections occur, this can result in ‘chronic diseases of limited growth (stunting and wasting), blindness, rheumatic heart disease, renal failure and anaemia’ (Hall et al., sub. 84, p. 6). Rheumatic heart disease disproportionately affects Aboriginal and Torres Strait Islander people. Of all the people in Australia living with rheumatic heart disease, it is estimated that between 71 to 94 per cent are Aboriginal and Torres Strait Islander people (Telethon Kids Institute 2020, p. 11).

Water quality enables medical treatment on Country

In addition to helping prevent diseases, clean water is needed for the treatment of some health conditions. For example, in 2012-13, 18 per cent of Aboriginal and Torres Strait Islander adults had biomedical signs of Chronic Kidney Disease (CKD), more than twice the prevalence of this condition among non-Indigenous adults (adjusting for differences in population age profiles) (AIHW 2020, p. v). Successful treatment of end-stage kidney disease requires clean water for dialysis. To overcome shortages of clean water, mobile dialysis services travel to remote communities bringing the safe water required to operate (Purple House 2020).

Water quality will make a significant contribution to the Closing the Gap agenda

In 2020, all Governments committed to a refresh of the Closing the Gap agenda under the National Agreement on Closing the Gap (Australian Governments and the Coalition of Peaks 2020). Many of the targets are aimed at supporting health outcomes (such as child mortality and community infrastructure targets), and others are dependent on good health outcomes (such as education and employment targets). As outlined above, safe and reliable water has a direct effect on the achievement of health outcomes.

There are also indirect interactions between water and other factors that contribute to health outcomes. One such factor is the provision of uncrowded and reasonably comfortable housing and associated community infrastructure. In the Central Land Council’s view (sub. 35, p. 11), the delivery of sufficient community housing is impaired by assessments of

¹⁵ Hall et al., sub. 84, p. 6; WSAA, sub. 88, p. 42.

water sources that indicate ‘no existing capacity for remote development’. This can limit the stock of available housing in remote areas and exacerbate health issues associated with overcrowding.

6.3 Commitments to Aboriginal and Torres Strait Islander people

Most government commitments to water service provision apply to all Australians, but some have a particular focus on the needs and unique circumstances faced by remote Aboriginal and Torres Strait Islander communities.

Commitments under the United Nations Sustainable Development Goals

There is evidence that some remote Aboriginal and Torres Strait Islander communities are not meeting the targets under SDG 6 (IA 2019, p. 602). The Australian Government’s report on implementation of the SDGs also recognises the challenges in delivering access to water and sanitation services in remote Aboriginal and Torres Strait Islander communities (DFAT 2018, p. 50).

The commitment to SDG 6 applies to all Australians, including Aboriginal and Torres Strait Islander people who live on Country. Governments are responsible for determining how their commitment to SDG 6 is achieved. As the Commission has noted in its previous reports on *Transitioning Regional Economies* (PC 2017c, p. 185) and *Remote Area Tax Concessions And Payments* (PC 2020b, p. 22), in some cases there are compelling reasons why people cannot move, including Aboriginal and Torres Strait Islander people living on Country. In these regions, there may be a need for governments to directly address the disadvantages of life in remote areas.

A refreshed Closing the Gap agenda includes commitments on household water

As noted above, safe and reliable water supplies will be integral to achievement of many of the health targets in the National Agreement on Closing the Gap. The Agreement recognises this, and includes a commitment to develop a community infrastructure target within 12 months. This target will measure progress towards parity in infrastructure, essential services and environmental health and conditions. Development of the target will require data collection to measure essential service provision, including water and sewerage, to Aboriginal and Torres Strait Islander communities (Australian Governments and the Coalition of Peaks 2020, p. 36). The 2020 National Agreement on Closing the Gap has also led to new targets for land and water rights (SP D *Cultural access*).

6.4 Water service systems in remote Aboriginal and Torres Strait Islander communities face significant challenges

Consultations have highlighted a number of specific barriers to the provision of safe water in remote Aboriginal and Torres Strait Islander communities. Many issues (including underfunding of services and operational capacity) reflect broader issues in regional and remote service delivery discussed above — although these issues can be more intense or have a disproportionate impact in remote Aboriginal and Torres Strait Islander communities.

Specific issues include:

- that consumption-based charges are not often applied, or only charged at the community level, meaning costs are not recovered
- a lack of culturally-competent and capable staff
- poor-quality water sources in remote areas, with few alternatives
- fragmented governance in remote service delivery.

Consumption-based water charges are often not applied

Remote Aboriginal and Torres Strait Islander communities can have transient populations and an informal economy (QPC 2018, pp. 47, 53). These factors (among others) contribute to those communities not generating enough market income to pay the full costs of service delivery. Many communities are not charged for essential water and sewerage services. For example, the 16 Aboriginal councils in Queensland do not directly charge residents for water or sewerage services (qldwater 2019, p. 7). According to Hall et al. (sub. 84, p. 11), this is due to:

... legislation prohibiting rates to be raised on Indigenous land held in trust — despite these councils being responsible for managing and delivering a range of essential water, energy and local health services ... Without a rates base, Indigenous councils rely on sporadic government grants.

Some Aboriginal and Torres Strait Islander individuals are charged at the community level, as a result of living in properties with a shared water meter. For example, the Department of Family and Community Services (NSW) (2015, p. 4) noted that:

[Housing] providers are to calculate the charges for water usage based on ... a method to be developed by the provider to apportion the costs in shared meter properties.

In some cases, community-based pricing is warranted. This is particularly the case when consumption is based on factors outside of an individual's control, such as leaks. For example, the Central Land Council (sub. 35, p. 29) noted that in the Northern Territory:

At Iwupataka, poor quality water infrastructure supplying 18 outstations under Iwupataka Aboriginal Land Trust has resulted in recurring leaks and high water bills, yet the Iwupataka Water Aboriginal Corporation has not received sufficient funding to complete the scoped works to upgrade infrastructure for more than four of those outstations.

In other cases, the absence of consumption-based pricing may reduce individual and household incentives to conserve water. For example, while a variety of household cooling methods are used in remote Aboriginal communities in the Northern Territory, about 5 per cent of residents use water-dependent cooling methods, such as sprinklers on the lawn and house (IES 2015, p. 245).

There is a lack of culturally-competent training that uses local skills

According to Hall et al. (sub. 84, p. 10):

... it is crucial that the on-site water operators in remote communities are appointed from the local population and well supported, have the appropriate training on the equipment they operate, and all external stakeholders engaging with the community have cultural awareness and competence.

This is often not the case, with remote communities facing challenges such as minimal staffing, high turnover (Hall et al., sub. 84, p. 7), and limited community engagement and water literacy (Satur and Robertson 2020, p. 3). Costs associated with training staff and ongoing engagement in remote areas are likely to contribute to these challenges. However, there are some case studies of strong partnerships with remote Aboriginal and Torres Strait Islander communities to provide safe water (box 5).

There are poor quality water sources in remote areas

Water sources can be of especially poor quality in remote areas. Challenges to the provision of safe drinking water will vary across different water sources (table 2). For example, Walgett in New South Wales faces poor quality sources of drinking water, such as Great Artesian Basin bore water, when the Barwon and Namoi Rivers cease to flow (Dharriwaa Elders Group and Walgett Aboriginal Medical Service, sub. 104, pp. 6–7). These sources have higher salinity, and have led to high sodium concentrations in drinking water in Walgett (NHMRC, sub. 93, p. 9).

Poor quality water sources often require additional treatment to ensure drinking water is safe for human consumption. This increases the costs of delivering safe drinking water in remote areas. While the treated water may be safe, it may have an unacceptable taste, odour or colour (Hall et al., sub. 84, p. 7). This can have flow-on effects on health outcomes through the purchase of soft drinks (which contributes to diet-related conditions such as obesity or diabetes) or reliance on expensive bottled water (which reduces the budget available for other essentials) (Hall et al., sub. 84, p. 7).

Box 5**Strong partnerships can provide safe water****New South Wales**

The New South Wales *Aboriginal Communities Water and Sewerage Program* is a partnership between the New South Wales Government and the NSW Aboriginal Land Council. The program was established in 2008, with a \$200 million investment over a 25 year period, and involved:

- the New South Wales Government delivering financing and technical expertise in partnership with the NSW Aboriginal Land Council and local Aboriginal land councils
- local Aboriginal land councils having long-term service agreements with local water utilities to implement routine maintenance, address repair backlogs and undertake emergency works
- Aboriginal community participation in four-monthly inspections and reviews.

As a result of the program, 63 Aboriginal communities are receiving improved water and sewerage services. Aboriginal communities in New South Wales generally achieved full chemical and microbiological compliance in 2018-19, although mixed outcomes were achieved on physical compliance, and samples were not collected in some communities.

Queensland

In 2016, there were 16 *E.Coli* detection incidents in the Torres Strait Islands. Several government and non-government agencies collaborated to address this issue, including the Queensland Departments of Health, Water, Infrastructure and Local Government and the Torres Strait Islands Regional Council. These organisations created the pilot program: *Safe and Healthy Drinking Water*, which carried out a variety of tasks including auditing water treatment, upgrading infrastructure, training and mentoring staff and conducting community engagement. Microbial drinking water incidents in the Torres Strait Islands fell from 16 incidents in 2016 to two incidents in 2018.

Western Australia

There have been a number of policy efforts to improve drinking water quality in Western Australia. In 2019, \$23 million was committed through the *Essential and Municipal Services Upgrade Program* to the WA Water Corporation to upgrade water services in three remote Aboriginal communities in the Kimberley. In 2020, \$38.9 million has been committed through the WA Recovery Plan to upgrade water services in a further four remote Aboriginal communities on the Dampier Peninsula in the West Kimberley. To deliver these services, the Water Corporation will partner with Aboriginal communities, and train and employ local Aboriginal people and businesses. As these initiatives are relatively new, it is too early to judge their effectiveness in delivering safe drinking water in remote Aboriginal communities in Western Australia.

South Australia

SA Water supplies water to 20 remote Aboriginal communities. Since taking management of water communities in the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands, SA Water has commenced community-driven water infrastructure upgrade programs. SA Water's Remote Communities team works with local people through the processes of engagement, planning, design, construction and ongoing management and maintenance. Relationships with the local communities help to ensure water infrastructure meets the needs of the people it is serving.

Sources: Assessment: section 6.1, Government of Western Australia (2019, 2020); Hall et al., sub. 84, p. 8; NSWALC (2020); SA Water (2019a); Water Corporation (2020)

Further, climate change is expected to worsen vulnerabilities in water supply as there are often few alternative water sources in these remote communities (Central Land Council, sub. 35, p. 11, Engineers Australia, sub. 63, p. 17, Hall et al., sub. 84, p. 9, NHMRC, sub. 93, p. 7). For example, SACOSS pointed to the town of Scotdesco, 100 km west of Ceduna on the far west coast of South Australia, which has experienced critical water shortages in the last few years stemming from low rainfall.

The community has a population of 50 and primarily relies on rainwater for its supply (rainwater tanks connected to individual homes as well as self-managing its own rainwater catchment). In 2019, the community experienced critical water shortages due to lack of winter rainfall and required emergency water to be carted in at a cost of \$1,400 per truckload. As the Scotdesco community falls outside of the boundary of a prescribed area, it was unable to access the subsidised cost of \$300 for the same amount of water. (sub. DR176, p. 3)

Table 2 Remote community water sources can be poor quality

<i>Source</i>	<i>Security issues</i>	<i>Quality issues</i>	<i>Contamination issues</i>
Groundwater		Salinity, inorganic chemical hazards, pathogens	Sewage or other waste into groundwater Pollution from farming and mining areas
Surface water	Rainfall dependent	Salinity, pathogens	Sewage or other waste into surface water
Rainwater	Rainfall dependent	Pathogens	Dust contamination

Sources: Hall et al., sub. 84, p. 6; WSAA, sub. 88, p. 44.

Governance is fragmented

Inquiry participants have highlighted the complexity of service delivery in remote communities. Many organisations need to coordinate to deliver safe and reliable water services (NHMRC, sub. 93, p. 3), and this can create confusion regarding roles and responsibilities (WSAA, sub. 88, p. 43) and limit visibility of outcomes in remote communities (SACOSS, sub. 74, attachment B, p. 13).

The service delivery arrangements in remote areas can be significantly different to arrangements in urban areas, contributing to fragmented responsibilities for water supply. For example, in the Northern Territory, while the Power and Water Corporation services major towns, its not-for-profit subsidiary, IES, provides water to remote Aboriginal communities. In the view of the Central Land Council (sub. 35, p. 4), IES is subject to less regulatory oversight than the Power and Water Corporation, and, as a result, there is no agency ‘directly accountable (via legislation) to the residents of Indigenous communities for the supply of water to them’ (p. 22).

Government arrangements for delivery of safe water supplies and associated infrastructure for remote communities can be complicated and fragmented. In some jurisdictions, multiple

agencies need to come together and coordinate activities to provide required services. This sort of complexity can result in confusion, reduce transparency and lessen public accountability.

The Commission's work on *Overcoming Indigenous Disadvantage* has highlighted that service delivery outcomes for Aboriginal and Torres Strait Islander people can be improved through stable policy environments, responsiveness to local contexts, improved coordination among government agencies, reduced duplication of services and learning from evidence (SCRGSP 2020, p. 5.38).

6.5 Greater attention in national water reform is needed

Although many of the water service delivery issues in Aboriginal and Torres Strait Islander communities are similar to those experienced elsewhere (section 2), some elements require more tailored policy attention to ensure delivery of safe and reliable water supplies.

A defined basic level of service should guide service delivery in remote communities

As discussed in sections 3 and 4, State and Territory Governments should be responsible for ensuring access to a basic level of service for safe and reliable drinking water in all communities. This objective should guide government funding of water service provision.

The specifics of providing a basic level of service will differ by community, depending on the type, quality and availability of water sources, but should focus on the local provision of drinking water to support health outcomes. Water supply options will need to be fit for purpose, based on available water sources and the technical expertise of the local community to operate and maintain the infrastructure in question.

The precise approach to a basic level of service is a decision for each jurisdiction, drawing on insights from community engagement, and this objective should guide the delivery of essential water services across all agencies with responsibility for remote service delivery.

Data collection and reporting in remote Aboriginal and Torres Strait Islander communities should be improved

A renewed NWI could help ensure safe and reliable water in remote communities by:

- ensuring that the community infrastructure target, under the National Agreement on Closing the Gap, is reflected in the renewed NWI
- linking NWI monitoring and reporting activities with any data collection and reporting undertaken as part of the National Agreement on Closing the Gap.

Under the National Agreement on Closing the Gap, the Australian, State and Territory Governments have committed to developing a national target for community infrastructure, including data development work to measure essential service provision to Aboriginal and Torres Strait Islander communities (incorporating water and sewerage services). Data to inform the reporting on progress against the Closing the Gap targets will be publicly available via the Productivity Commission’s Closing the Gap Information Repository, and the Productivity Commission will conduct three yearly reviews of progress under the National Agreement on Closing the Gap (Australian Governments and the Coalition of Peaks 2020, pp. 36–37, 41).

In the short term, reporting under the National Agreement on Closing the Gap could collate data available at the State and Territory level to produce an overview of outcomes at the national level. This could involve collaborating with the National Performance Report or the National Working Group on SDG 6 to undertake expanded reporting. However, current data reporting excludes some remote Aboriginal and Torres Strait Islander communities (for example, if they form part of a system with fewer than 10 000 connections), while state-wide providers may only publish state-wide averages which do not capture issues in particular communities.

In the long term, data collection needs to be improved at the community level. The Australian Government could build on previous initiatives, such as the ABS Community Housing and Infrastructure Needs Survey, which collected information on drinking water source, restrictions and quality in all communities, outstations and dwellings (ABS 2006).

7 NWI renewal

A renewed NWI should include expanded coverage of urban water services (SP F *Urban*), with a more nuanced treatment of regional and remote services. The overall aspiration of the urban water sector, consistent with other water services, should be for effective, efficient and equitable provision that meets the needs of customers and communities in a changing climate. The Commission has proposed a set of contemporised and detailed objectives towards that end (SP F *Urban*).

Many of the principles for best practice service delivery apply to major urban utilities as well as regional and remote water services; the key difference is how to balance efficiency and equity of service delivery in higher-cost regions of Australia. The NWI could support this through principles to guide planning, governance, economic oversight, and performance monitoring and reporting.

7.1 Ensuring access to a basic level of service

As in major cities, integrated urban water system planning for regional and remote communities should be guided by clear system objectives that incorporate levels of service

(across water supply and stormwater), compliance with government standards and contributions to broader amenity outcomes. Community and customer engagement should underpin the development of those objectives.

To support planning by smaller utilities, State and Territory Governments should define a ‘basic level of service’ that ensures access to an adequate quantity of safe and reliable water.

State and Territory Governments should accept responsibility to ensure access to that basic level of service, and to determine what share of costs are to be borne by users, and where State or Territory government funding is warranted. It should be defined with reference to health standards for water quality, and with reliability objectives based on local circumstances.

In some regional and remote areas, the high cost of providing a basic level of service may make it non-commercial. As under the current NWI, any operational subsidies to service providers should be provided as a transparent and untied CSO payment. The Commission has proposed principles to guide CSO funding.

In line with best-practice system planning principles for major utilities, the NWI could also include guidelines for both system planning and contingency planning for regional and remote communities. These guidelines should highlight the importance of:

- local fit-for-purpose water supply options, in line with relevant levels of service
- supply augmentation decisions occurring at the right regional scale to ensure the full range of options (including transferring water between sectors or regions) are considered
- ensuring that local system and contingency plans are integrated with catchment-level water resource planning
- realistic timing of planned augmentations under contingency plans, linked to system plans.

Government funding of regional water services could be made conditional on adhering to those guidelines.

NWI RENEWAL ADVICE 12.4: ENSURING ACCESS TO A BASIC LEVEL OF SERVICE

A renewed National Water Initiative should include a commitment by State and Territory Governments to each develop a definition of, and to ensure access to, a basic level of water services for all Australians. At a minimum, this would include safe and reliable drinking water. The definition of 'safe' could be nationally consistent, while the definition of 'reliable' will vary according to local circumstances.

Cost-reflective user charges should remain the default arrangement, but some regional and remote services in high-cost areas will require operational subsidies to maintain a basic level of service to all customers. Any subsidies to those areas should be provided as transparent community service obligation payments. Payments to local government-owned providers should be:

- designed to ensure access to a basic level of service in those communities where such service provision would otherwise be unviable
- adequate to ensure a basic level of service is considered affordable
- based on credible data on efficient service costs, subject to a degree of independent oversight, following State or Territory government involvement in system planning
- calculated in a predictable fashion to provide a reliable source of funding
- conditional on ongoing operational improvements, such as improvements to utility governance, better service outcomes (based on performance monitoring), compliance with guidelines for system and contingency planning, or for pursuing collaboration.

7.2 Governance and economic oversight

The NWI should reinforce good governance in the regional and remote urban water sector as part of principles for the urban water sector more broadly. The NWI should not prescribe particular service delivery models, but instead outline the principles that underpin efficient service delivery, including institutional separation (including under local government ownership) and transparent funding for uncommercial services.

As under the current NWI, institutional separation is key to ensuring efficient water service delivery. Service providers should continue to adopt a commercial focus to supplying services in line with the needs of their customers, while complying with the standards set by governments.

However, governance arrangements for local government-owned water services are more complex; clarity could be provided in the NWI. Financial separation requires that utility finances are, at a minimum, ring-fenced from local government finances, and any cross-subsidies are transparent. Ideally, water providers should be fully distinct entities. The roles of State and Territory Governments, including setting and enforcing health, safety and

environmental standards, building capacity and (in limited cases) operating as a provider of last resort to ensure a basic level of service, should also be clarified.

Further, governance of water service provision in remote Aboriginal and Torres Strait Islander communities can be fragmented and opaque, particularly where the roles of different service providers are not clear. Clarifying these arrangements would contribute to improved service outcomes in those communities.

As envisioned in the current NWI, independent economic oversight is key to providing assurance that utilities are delivering services efficiently. Independent oversight could be better utilised to increase the transparency of regional and remote service delivery and provide incentives for improved operational performance.

The best model of economic oversight depends on the benefits and costs of particular options in particular contexts. Comprehensive (and costly) price-setting processes are generally warranted for major utilities, but this does not necessarily apply to smaller providers — particularly where the risks from (and consequences of) monopoly pricing are relatively minor.

A renewed NWI should include a commitment to independent economic oversight of small providers, based on a transparent assessment of the benefits and costs of different models. Light-touch models for small providers could include licensing by independent economic regulators in order to provide assurance of utility capability.

NWI RENEWAL ADVICE: GOVERNANCE OF REGIONAL AND REMOTE SERVICES^a

A renewed National Water Initiative should contain agreed principles for governance of regional and remote water services where local governments retain ownership of utilities. Financial separation should be maintained, with utility finances ring fenced from local government finances. Clear roles for State and Local Governments during extreme events should be defined.

Jurisdictions should commit to light touch independent economic oversight for small regional and remote urban water providers.

^a The following box incorporates renewal advice from chapters 11 and 12 of the summary report, specifically advice 11.3 and 12.5.

7.3 Performance monitoring and reporting

Monitoring and reporting service outcomes should be maintained, with key performance indicators publicly reported for providers of all sizes (including those with fewer than 10 000 connections), including reporting water quality outcomes against the existing ADWG. This reporting could be incorporated within the existing National Performance Report if the likely benefits of doing so exceed the costs (as is currently being considered by the NPR Indicator Review, SP H *Urban*).

Operational and financial indicators should also be reported to contribute to economic oversight and policy making. The indicators used should be selected to enable independent oversight of utility performance, calculation of CSO funding (where relevant) and to enable regular assessments of progress against the NWI.

For small utilities, performance data should also be collected or overseen by an independent body, particularly where that information is used to calculate or determine eligibility for CSO payments. That body should also scrutinise outcomes and highlight where performance improvements are required.

There should also be a stronger focus on monitoring and reporting on water quality and service outcomes in remote Aboriginal and Torres Strait Islander communities, with explicit reference to priorities under the National Agreement on Closing the Gap.

NWI RENEWAL ADVICE: PERFORMANCE MONITORING AND REPORTING ON REGIONAL AND REMOTE SERVICE QUALITY^a

All urban water service providers, including those with fewer than 10 000 connections, should be subject to jurisdictional monitoring and public reporting.

Monitoring and reporting of water quality and service outcomes in remote Aboriginal and Torres Strait Islander communities should be coordinated with the development of data collection required to measure progress against the community infrastructure target under the National Agreement on Closing the Gap.

^a The following box incorporates renewal advice 12.3 and 12.6 from chapter 12 of the summary report.

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Australian Government
Productivity Commission

Water reform in rural Australia

Supporting Paper H

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Over the past 25 years, reforms promoting the efficient use of water have enabled significant gains for rural water users.
 - Statutory-based water entitlements provide clear and secure long-term property rights and have become valuable assets.
 - Market-driven water trade has resulted in higher-value irrigated production, including thriving new irrigated industries.
 - Trade gives irrigators flexibility in managing risks in water availability and facilitates longer-term investment planning.
 - Market signals also encourage irrigators to become more technically efficient, freeing up water for other productive uses.
- A drying climate and more variable seasonal conditions will further challenge irrigators and communities. Entitlement holders are well positioned to deal with future challenges and adapt to lower water availability. The ability to trade entitlements allows businesses to adjust their water portfolios to better reflect their risk profiles and assists less viable businesses to adjust or exit.
- National Water Initiative (NWI) renewal is an opportunity to strengthen the foundations of water resource management and better support rural water users. For example:
 - risk-based frameworks for managing water uses within entitlement regimes would better promote efficient management of shared resources
 - best-practice principles for community partnership and engagement would help to ensure water planning processes and outcomes reflect the diverse needs of rural communities
 - a new integrity element would build greater confidence in water resource management
 - stronger trading foundations and better market information would provide greater support for commercial decision making
 - guiding principles that help ensure government-funded infrastructure investment is economically viable would avoid future burdens on rural water users and communities.
- Inclusion of guiding principles in a renewed NWI would clarify how governments can best respond to any significant adjustment pressures faced by rural communities as a result of reform-induced reductions in water availability.
 - Generally-available measures targeting the welfare and skills of individuals, and regional development planning that builds on community-level capabilities and competitive advantages, are usually the most appropriate responses to adjustment pressures.
 - Where specific assistance is warranted, governments should facilitate change by focusing any direct assistance on building adaptive capacity in affected communities and securing employment or business opportunities for the most vulnerable individuals (those at risk of permanent disadvantage).
 - Assistance should reflect the needs of communities and be backed by a commitment to public monitoring and evaluation of outcomes.

National reform has transformed water resource management and water service provision in rural Australia, delivering substantial benefits. However, recent severe and extensive droughts, long-term declines in inflows across southern Australia and the risks posed by

climate change have created significant challenges for irrigators and other rural water users and their water-dependent communities. Looking forward, irrigators will likely need to contend with more frequent and severe droughts, and their businesses and communities will need to adapt to a world with less water.

This paper considers the realised and potential impacts of water reform on rural water users and communities. For rural water users, NWI-consistent reforms have provided tools and frameworks that support long-term business decision making and enable adaptation to changing conditions. NWI renewal could strengthen these supports (section 1). For rural communities, a revised NWI could provide clearer guidance on the role of governments in addressing adjustment issues (section 2).

1 Reform and rural water users

Rural businesses — mainly irrigators — are Australia’s largest water users. In 2018-19, water for agricultural purposes accounted for about 70 per cent of consumptive use (BOM 2020, p. 42). Given this, rural water users have the most to gain from effective and efficient water resource management, allocation and service provision policies.

1.1 NWI-consistent reforms have delivered large benefits

Over the past 25 years, reforms promoting efficient and sustainable use of water have enabled significant gains for rural water users. The establishment of NWI-consistent entitlement regimes, water markets and trading frameworks have been fundamental to unlocking these gains.

Secure property rights, separate from land, provide the foundations for better management of Australia’s water resources. As the National Farmers Federation (sub. 42, p. 13) noted, ‘for irrigated agriculture and the broader water management framework, the establishment of secure property rights has been a cornerstone that has underpinned much of the progress achieved under the NWI’.

Water markets and trade — enabled by secure property rights — provide choice and flexibility to irrigators and open up new business opportunities. By facilitating longer-term investment planning, including about decisions to change production or exit irrigated agriculture, farmers have more flexibility in managing their businesses (NWC 2011, pp. 62–71). Furthermore, irrigators now own valuable assets that can be used as collateral for loans — estimates put the total value of entitlements in the southern Murray–Darling Basin (MDB) at more than \$26 billion (Aither 2020, p. 5).

Market-driven water trade has also enabled equitable water recovery for the environment. Water property rights have been fundamental to addressing overallocation, particularly in the MDB, where farmers have been compensated for water recovery through a mix of market purchases and on-farm water efficiency measures.

Economic regulation and local ownership and management (especially by irrigators) of rural water service providers have improved the accountability, productivity, efficiency and responsiveness of these businesses to the needs of rural water users (PC 2017a, p. 237).

Water reforms have also led to significant efficiency gains by changing where and how water is used in rural Australia. Across the agricultural sector, market-driven trade has enabled water resources to move to higher-value uses. This has enabled the rapid development of new irrigated industries, such as nut growing. On-farm efficiency has also been encouraged by price signals that highlight the true value (or opportunity cost) of water (ACCC 2020, p. 84). And by highlighting the alternative uses of water, markets encourage farmers to become more technically efficient with the water they use, freeing up water for other productive uses. Research and development have also led to advances in technology and infrastructure that have improved water use efficiency (SP K *Knowledge*).

These reforms have also done much to position entitlement holders to manage risks by:

- establishing clear and well-defined property rights that can be traded (SP A *Entitlements and planning*, SP B *Trading*)
- requiring transparent and consultative water planning processes that establish the rules for how and when water rights can be used (SP A *Entitlements and planning*, SP J *Engagement*)
- mandating clear risk assignment frameworks for short- and long-term changes in water availability (SP A *Entitlements and planning*).

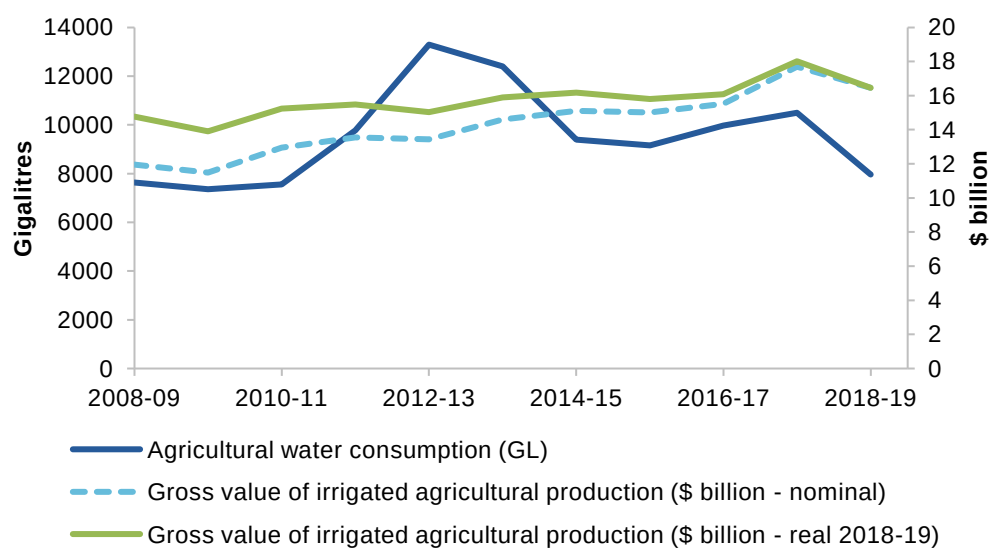
The above NWI frameworks — particularly tradable water rights — have helped rural water users better contend with drought. For example, some entitlement holders have been able to sell water allocations to provide revenue to support production changes and to manage debt, while purchasers of allocations have been able to maintain high-value production and permanent plantings. Allocation trade in particular allows water to move from producers with more flexible irrigation demands (such as rice and cotton growers) to those with less flexible demands (such as horticulturalists with perennial crops) in response to seasonal variations in water availability.

Studies of the economic benefits of water trading point to substantial value, particularly in times of drought. For example, research commissioned by the National Water Commission illustrated its significant value during the Millennium Drought. The research estimated that regional GDP in the southern MDB was about \$5.2 billion (in 2020-21 dollars) higher over the five years to 2010-11 than it would have been without water trading. Gains were concentrated in the driest years of 2007-08 and 2008-09 (NWC 2012, p. 103). A more recent study found that water markets generated benefits to water users in the southern MDB of \$117 million per year on average, due to both inter-regional trading and carryover (Hughes et al. 2021, p. vi).

Trading has allowed the gross value of irrigated agricultural production in Australia to increase in most years between 2008-09 and 2018-19, despite water use varying considerably

between wet and dry years (figure 1). From 2012-13 to 2014-15, production increased (in nominal and real terms) despite a 29 per cent reduction in water use for irrigation. And in 2018-19 the value of production was at its second highest level on record, despite record-breaking droughts across much of Australia.

Figure 1 Australia's gross value of irrigated agricultural production increased in most years despite variable water use^a



^a The real 2018-19 gross value of irrigated agricultural production was estimated using December quarter values for the consumer price index.

Sources: ABS (Water Account, Australia, 2016-17, table 12, Cat. no. 4610.0; Water use on Australian Farms, 2017-18 and 2018-19, table 1, Cat. no. 4618.0; Water Account, Australia, 2018-19, table 13.1, Cat. no. 4610.0); (Consumer Price Index, Australia, Sep 2020, Series ID A2325846C, Cat. no. 6401.0).

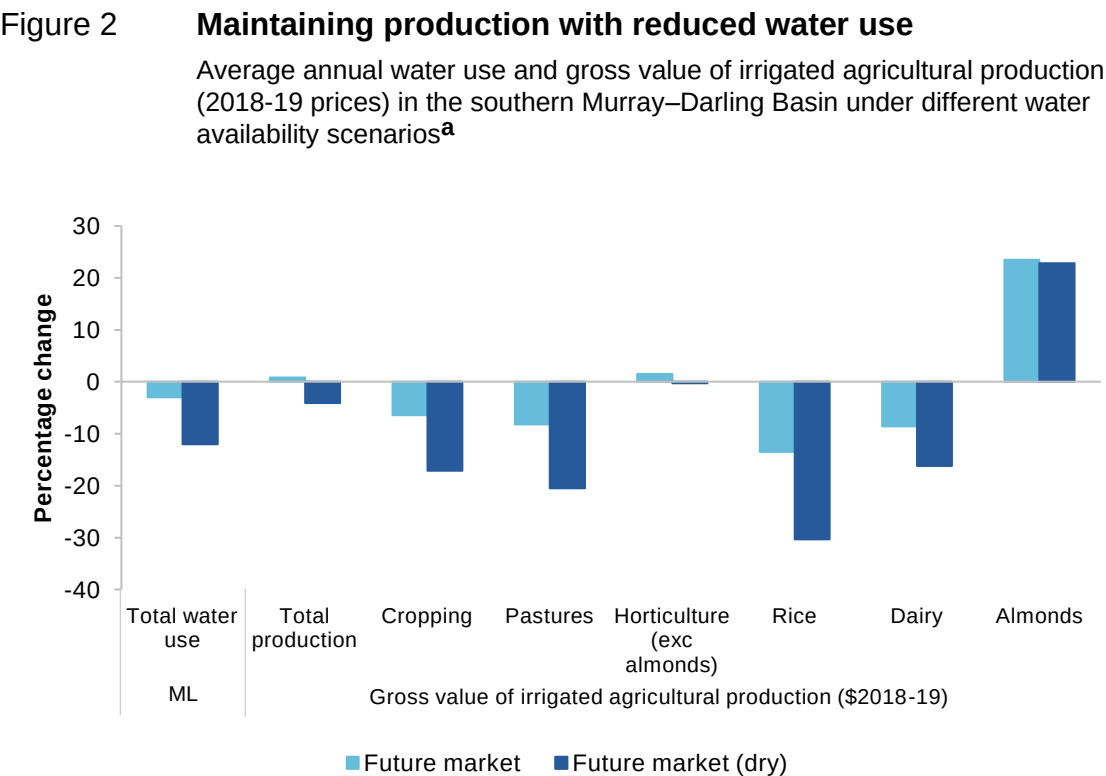
1.2 Reforms have also prepared water users to address future challenges

Looking forward, water trading will be vital to enabling businesses to adjust — and for less viable businesses to exit — in response to climate change and other pressures. Australian farmers will need to adapt their farming practices in response to changing water availability and trends in commodity markets, and trade will help businesses to adjust their water portfolios to better reflect their water needs and risk profile.

For rural Australia as a whole, continued transition toward higher-value industries will help to maintain the value of irrigated agricultural production. This point was illustrated by scenario analysis undertaken for the southern MDB (Gupta et al. 2020, p. 19).¹ The analysis

¹ Commissioned for the *Independent Assessment of Social and Economic Conditions in the Basin* (Sefton et al. 2020).

found that in a ‘future market’ scenario, where water recovery under the Basin Plan is completed and there is higher water demand, water use falls by 3 per cent, but the value of production is maintained as water is reallocated to higher-value uses (figure 2). In another (drier) scenario, where the assumptions include a decline in rainfall, continued adjustment of production — supported by water trading — would be even more important for maintaining the value of agricultural production with an even drier climate. Under this scenario, water use falls by 12 percent, but production value falls by only 4 per cent (future market (dry) scenario, figure 2). This shows that the value of production can be maintained despite reduced water use, as water trading supports the transition toward higher value uses.



^a Results for all scenarios are averages based on the historical climate sequence from 2005-06 to 2018-19 (a relatively dry period). The ‘current market’ scenario holds all water market drivers fixed at 2018-19 levels and is the baseline for comparison. The ‘future market’ scenario accounts for planned future water recovery measures and an increase in water demand. The ‘future market (dry)’ scenario makes the same assumptions, but also assumes a 3 per cent decline in rainfall and an 11 per cent decline in allocation volumes (water supply).

Source: Gupta et al. (2020).

While, at current commodity prices, nuts such as almonds are very profitable, the future may look very different, and efficient markets will be essential to ensure that water keeps moving to where it is most valued and can best support profitable Australian farmers.

1.3 A renewed NWI to lock in past benefits and enable adaptation

While rural water users have benefited from past water reform, attention to several issues in a renewed NWI would lock in the benefits of reform to date and ensure that irrigators can continue to adapt their businesses in response to changes in water availability.

As noted above, strong statutory-based water property rights are a pillar of the success of water markets in Australia. But there is scope to strengthen them, particularly in highly developed water systems where there is significant competition for water. More needs to be done to ensure that the current risk-based approach outlined in the NWI can be effectively applied in instances such as interception for on-farm dams or plantations. Inaccurate measurement of interception activities poses a risk to water availability and undermines the integrity of the entitlements system. Recommitting to a risk-based approach for managing interception activities would increase transparency and promote efficient management of shared resources (SP A *Entitlements and planning*).

Another pillar of success is robust water planning processes. However, these processes have been challenged by lower catchment inflows and instances of extreme water scarcity. Planning provisions proved inadequate to deal with the Millennium Drought and the recent drought in New South Wales and Queensland, and processes for rebalancing water use in response to climate change are unclear. Provisions to deal with low flows in water plans could give greater certainty to rural water users, while protecting the environment. And in responding to permanently lower water availability, there is a need for increased robustness in processes for adjusting how water is shared between consumptive users and the environment (SP A *Entitlements and planning*). Adoption of best-practice principles for community partnership and engagement would help to ensure water planning processes and outcomes consider and reflect the diverse needs of rural communities (SP J *Engagement*).

Investors, entitlement holders and communities must have confidence that the integrity of water resource management frameworks (including property rights, markets and planning processes) can effectively support irrigators and water-dependent businesses to adapt to a changing climate. This requires governments to invest in the underpinning systems of water accounting, monitoring, compliance and enforcement. A common theme from reviews of the MDB experience is that a lack of commitment by some governments to monitoring and compliance has undermined investor and community confidence, and trust in water resource management. To address this, a renewed NWI should include a new element focused on safeguarding the integrity of water use and system management (SP E *Integrity*).

Opportunity for improvement also lies in strengthening market frameworks and information to improve accessibility and better enable businesses to confidently make decisions and adapt to change. The Australian Competition and Consumer Commission (2021, p. 2) found that governance, regulatory and operational frameworks in the MDB have not evolved in step with the market and are now inappropriate. Lessons from 30 years of trading in the MDB can help jurisdictions ensure arrangements for water trading (beyond the MDB) are appropriate for the level of market development. And there is a need for more timely,

transparent and complete market information to support irrigators and other entitlement holders respond to short- and long-term challenges and opportunities (SP B *Trading*).

Governments are looking to invest in major water infrastructure to support regional development. However, clearer assessment criteria are required to ensure those investments are economically viable and environmentally sustainable (SP I *Infrastructure*). Where governments fund water infrastructure development to support irrigators and rural communities, it is important that these investments do not leave an excessive financial burden for future users and taxpayers, and that negative impacts on downstream communities, Traditional Owners and environments are appropriately mitigated. The Commission advises that for infrastructure investments (SP I *Infrastructure*):

- environmental sustainability should be demonstrated through environmental and social impact approvals, and compliance with a high-quality and NWI-consistent water plan
- economic viability should be demonstrated by a positive benefit–cost ratio determined through a transparent and rigorous cost–benefit assessment
- costs should be recovered from users as the norm, except where government funding is provided through a transparent subsidy
- infrastructure development processes should be culturally responsive to the interests of Traditional Owners.

If these issues are addressed, rural water users would be even better positioned to deal with future pressures on water availability and adapt as needed.

Finally, while markets and trade have, for some communities, enabled thriving irrigation industries to develop in response to emerging market opportunities, others have had to adjust to lower levels of irrigated agricultural production — bringing additional adjustment pressures. In addition, in the MDB, water recovery that intended to address past overallocation have contributed to these pressures in some instances.

Adjustment — whether from policy reform or broader market forces (including trends in international trade, commodity prices, and technology) — has been particularly challenging for some communities in the MDB. The recently completed *Independent Assessment of Social and Economic Conditions in the Murray–Darling Basin* examined in detail the social and economic impacts of water reform in the MDB, and expressed ‘significant concerns about the depth and distribution of past impacts in rural and regional Basin communities’ (Sefton et al. 2020, p. 17).

Section 2 considers the potential role of government when water reforms contribute to reduced water availability and associated adjustment pressures in rural communities.

2 Community adjustment to lower water availability

Communities and economies are dynamic — continually adjusting in response to forces that include market opportunities, technological change, shifts in community preferences, a changing climate and policy reforms.

Change and uncertainty will continue to be a key feature of life for irrigators and irrigation dependent communities into the future. Given this, it is important that government policies promote adaptation by rural communities in the face of changes to water availability. Indeed, the NWI expects that entitlement holders bear the risks of changes to the quantity or reliability of water allocations as a result of seasonal or long-term changes in climate, and natural events such as bushfire and drought.

The NWI recognised that the agreed government water reforms would lead to reduced water for consumptive use in some communities and contribute to adjustment pressures. Jurisdictions agreed to:

... address significant adjustment issues affecting water access entitlement holders and communities that may arise from reductions in water availability as a result of implementing the reforms proposed in this Agreement.²

Since 2004, concerns about significant adjustment issues associated with water reforms have mainly arisen in the MDB, where most highly developed water resources are located and where there has been a substantial government water recovery effort. While governments implemented water recovery in ways they thought would moderate impacts, there have been significant distributional effects, and governments have provided some assistance in response. By 2018, government spending on specific assistance programs as part of the Basin Plan reforms had totalled \$189 million (PC 2018, p. 114). And in 2019, through the new MDB Economic Development Program, the Australian Government approved further funding of up to \$39 million for MDB communities that were most impacted by water recovery activities (*Assessment*). The Commission notes that this program aims to support rather than impede adjustment, and that the Australian Government intends to evaluate and review the program in 2021-22.

Monitoring, evaluation and public reporting provide essential insights into whether adjustment assistance has been effective. However, many submissions argued that this activity has been inadequate for past assistance programs³, and that these programs have been poorly implemented, ineffective or both.⁴ The Commission's *Murray–Darling Basin*

² NWI paragraph 97.

³ NSWIC, sub. 27, p. 24; GSCC, sub. 34, p. 3; NFF, sub. 42, p. 23; Murray Irrigation, sub. 69, p. 3; RGA, sub. 82, p. 3.

⁴ NIC, sub. 13, p. 8; NIC, sub. DR174, p. 29; NSWIC, sub. 27, p. 23; NFF, sub. 42, p. 22; LBA, sub. 70, p. 5; VFF, sub. 99, p. 10.

Plan: Five-year assessment expressed similar concerns. Finding 3.5 summarised the Commission's view (PC 2018, p. 116).

There is little evidence to indicate that structural adjustment programs have been effective at supporting communities adjust to the Basin Plan.

- Assistance was not targeted to those areas considered most vulnerable to the Basin Plan.
- Some projects considered to provide community assistance have not done so.

The role of government in helping individuals and communities adjust has been considered by the Commission before, including in the 2017 *Transitioning Regional Economies* and 2001 *Structural Adjustment — Key Policy Issues* reports (PC 2001, 2017b). Drawing on this work, the following discussion outlines general principles for providing adjustment support.

2.1 Generally-available measures are usually the most appropriate response to adjustment pressures

Irrigators and rural communities will have to adapt to changing water availability and a changing climate. However, governments also need to recognise that regional communities are shaped by factors other than, or in addition to, the availability of water, such as long-term productivity trends, international commodity prices and macroeconomic conditions. Effective community engagement is critical to understanding this wider context (SP J *Engagement*).

When major policy changes are proposed, as a first step, evaluation of the potential socioeconomic impacts can help to understand the likely impacts and identify the types of support a community might need. In the process, it is important that the expected longer-term benefits that change can bring to the community are recognised. While policy changes may have significant adjustment impacts on affected communities, these impacts are typically transitory, while the intended benefits of the reforms are usually more enduring.

When adjustment pressures emerge, governments provide a range of generally-available supports targeting individual and household welfare, and skills. Supports include social security and welfare services that provide income support to individuals and households in need (primarily the responsibility of the Australian Government), and education and training programs that assist the movement of workers into alternative employment (usually a state or territory government responsibility).

Additional supports are also generally available for those living in rural communities. For example, the Australian Government funds the Rural Financial Counselling Service which aims to support farmers, forest growers and harvesters, and related small business owners experiencing, or at risk of, financial hardship (DAWE 2020). These generally-available measures are usually the most appropriate response to adjustment pressures. This is because they promote equity and fairness, target assistance to those in need (regardless of the cause) and collectively can address individuals' needs holistically.

For wider communities, regional development policy and strategic planning (the responsibility of State, Territory and local Governments) should identify priorities for transition and development that build on regional capabilities and local competitive advantages.

Several inquiry participants agreed that these generally-available measures are the most appropriate response to adjustment pressures (for example, IWF, sub. DR120, p. 6; LBA, sub. DR133, p. 15; CNSWJO, sub. DR164, p. 16).

2.2 If more support is needed, government assistance should promote efficient adjustment

In rare circumstances, policy changes that benefit the wider community may risk high levels of permanent disadvantage for some groups of individuals that cannot be adequately addressed through generally-available measures.

In these circumstances, additional support may be warranted — particularly if it improves the efficiency of the adjustment process by helping those affected adapt to change.

Support could take the form of policy modification, but this risks conferring benefits on a few, and larger-than-necessary costs on the broader community. For example, recovering water by modernising infrastructure in the MDB, rather than through directly purchasing entitlements, is estimated to have increased the budgetary cost⁵ by about \$2 billion (PC 2018, p. 81). Furthermore, while this has resulted in some positive outcomes, particularly for private irrigators receiving the subsidy, it has put entitlement holders that participated in earlier water market purchases and the communities that depend on them at a relative disadvantage.

Farms, farming regions and towns that have more water recovered through on-farm irrigation infrastructure upgrades have gained a competitive advantage compared with farms, farming regions and towns that have sold more of their water to the Australian Government through open tender buybacks. (Sefton et al. 2020, p. 22)

Better outcomes could be achieved at lower cost by addressing adjustment separately from the main policy reform. For example, Wittwer (2020, p. 18) found that each dollar spent on human services (namely the health, education and community care sectors) creates four times as many jobs as spending on infrastructure upgrades only.

Before establishing new stand-alone community assistance programs, jurisdictions should carefully consider how existing regional and economic development programs (not specific to water) could support the adjustment process. They should also consider whether policies and regulations (not directly related to water) unnecessarily impede change.

Options for assistance need to be considered on a case-by-case basis and consider all factors affecting a community (not just changing water availability). The MDB experience

⁵ Gross expenditure by governments through budget processes, not accounting for subsequent benefits.

illustrates that efficacy of adjustment support (whether through policy modifications or separately from the main policy reform) is not a given. So the chosen option should be the one that is expected to deliver the largest net benefits.

Any further assistance should build on existing supports and be focused on helping communities adapt to a future with less water. Measures should focus on improving adaptive capacity and securing employment or business opportunities and be targeted to individuals who are most vulnerable (at risk of permanent disadvantage). For example, this could include targeted programs to help people gain new skills and find employment in more profitable and viable industries or occupations (within or outside of their community).

Industry assistance and subsidies should be avoided as they have a tendency to lead to inequitable outcomes or lock in inefficient production (which is subsidised by taxpayers and diverts resources from other uses in the region or the broader economy).

Some inquiry participants disagreed, arguing that industry assistance is needed in some cases (NFF, sub. DR178, p. 42; NIC, sub. DR174, p. 30; SunRice and RGA, sub. DR181, p. 12). SunRice Group and Ricegrowers' Association of Australia noted that:

[There are] ... limits to the creation of new jobs and business opportunities in the impacted communities ... These individuals are often irrigation farmers who have invested much of their equity in developing their irrigation business. When water reform ... significantly handicaps their irrigation enterprise they cannot simply just leave their businesses and change careers. (sub. DR181, pp. 11–12)

The Commission maintains its view that industry assistance and subsidies should be avoided as they are often costly, ineffective, poorly targeted, inequitable and reduce incentives for industries to plan and adapt to change (Daly and Lancy 2011, pp. 25–27; PC 2009, p. 123, 2017b, p. 185). Measures that help impacted communities adapt to changing water availability would be more effective and sustainable in the longer term.

Finally, monitoring and publicly reporting evaluations of outcomes of any assistance programs should also be part of any specific response to adjustment issues. Policy evaluation is often overlooked, but without an understanding of the outcomes of past assistance initiatives, and what drove those outcomes, it is difficult to improve future initiatives. Evaluation information from past assistance programs is also useful for community consultation as it allows stakeholders to have more informed input into the decision-making process. And, project evaluations serve an important transparency and accountability function that can deter future poor decisions on adjustment assistance.

2.3 NWI renewal advice

Advice that summarises the Commission's view on how a renewed NWI could include clearer guidance on effectively addressing significant adjustment issues follows.

NWI RENEWAL ADVICE 13.1: HELPING COMMUNITIES DEAL WITH ADJUSTMENT PRESSURES

Inclusion of guiding principles in a renewed National Water Initiative would clarify how governments can respond to any significant community adjustment pressures resulting from policy-induced reductions in water availability.

- The socioeconomic impacts of any major potential policy change be assessed to identify possible community needs. Effective community partnerships and engagement are critical to understanding the wider context.
- Generally-available measures targeting the welfare and skills of individuals, and regional development planning and initiatives to leverage community capabilities and competitive advantages are usually the most appropriate responses to adjustment pressures.
- In rare circumstances, it may be appropriate to take additional steps to address adjustment issues if policy changes that are beneficial to the wider community impose increased risk of permanent disadvantage for groups of individuals. Where generally-available measures will be inadequate, more support could improve the efficiency of the adjustment process by addressing impediments to change.
- Where further support is warranted:
 - consideration should be given to how existing regional development programs support the adjustment process and whether policies and regulations not directly related to water unnecessarily impede change
 - options for further support need to be considered on a case-by-case basis and consider all factors affecting a community (not just changing water availability); and the chosen option should be the one that delivers the largest benefits relative to costs
 - measures that are likely to build adaptive capacity and secure employment or business opportunities should be the focus, and targeted to the most vulnerable individuals (those at risk of permanent disadvantage)
 - industry assistance and subsidies should be avoided
 - a commitment should be made to public monitoring and evaluation of the effectiveness of any assistance.

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Australian Government
Productivity Commission

Government investment in major water infrastructure

Supporting Paper I

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

SP A Water entitlements and planning (*Entitlements and planning*)

SP B Water trading and markets (*Trading*)

SP C Environmental management (*Environment*)

SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)

SP E Ensuring the integrity of water resource management (*Integrity*)

SP F Urban water services (*Urban*)

SP G Urban water services: regional and remote communities (*Regional*)

SP H Water reform in rural Australia (*Rural*)

SP I Government investment in major water infrastructure (*Infrastructure*)

SP J Community engagement (*Engagement*)

SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Under the National Water Initiative (NWI), all jurisdictions agreed that proposals for new and refurbished water infrastructure would be assessed as economically viable and ecologically sustainable prior to any investment occurring, with costs recovered from users in most cases.
 - Failure to abide by these requirements can burden taxpayers with ongoing costs, discourage efficient water use and result in long-lived impacts on communities and the environment.
- The NWI requirements are sound and should be retained, but the agreement says little on how to meet those requirements, or the role of government in funding water infrastructure. Poor project selection and funding decisions still occur — including those made by governments.
- The National Water Grid Authority's investment policy may improve scrutiny of future Australian Government-funded projects, but the policy's project assessment criteria include a broad rationale for government investment that may result in funding for projects that will not maximise national economic benefits.
 - Further, the Authority can only invest in infrastructure that provides water for primary industry. This limitation should be removed to ensure that the most beneficial projects can be funded.
- A renewed NWI should set a higher standard for project selection and funding decisions for major water infrastructure. This should form the basis of a new element that includes:
 - a commitment to all options being on the table, including both infrastructure and non-infrastructure options, where these can meet the investment objective
 - expanded requirements that include a commitment to infrastructure decision-making processes being culturally responsive to the interests of Traditional Owners
 - criteria for how project proposals can demonstrate adherence to the NWI requirements, including conditions for ecologically sustainable, economically viable and culturally responsive infrastructure decision-making processes, as well as principles for cost sharing between users and governments, and water allocation
 - a framework for government investment in major water infrastructure, including project assessment and selection processes, and institutional arrangements.
- Where governments choose to subsidise major water infrastructure in pursuit of broader strategic objectives, such as regional development, additional scrutiny is necessary to ensure water infrastructure is the best means of achieving that objective compared with alternatives.
 - Any investments made in pursuit of regional development must align with high-quality regional strategic planning, and only occur where water infrastructure has been shown to be a critical component of the most effective regional development option compared with alternatives (including those not reliant on new or redeveloped water infrastructure).
- State and Territory Governments have primary responsibility for overseeing major water infrastructure, with a limited (if any) role for the Australian Government. Independent bodies should assess major business cases prior to funding decisions, and publish their findings.

Major water infrastructure (including dams, weirs, distribution networks, desalination plants and water recycling facilities) is essential to delivering water services. But it is costly to build, maintain and ultimately replace, and can have significant (and at times detrimental) environmental and social impacts.

Many of these costs are borne upfront, but the benefits accrue over a long period. These benefits may be difficult to estimate in advance, creating uncertainty over the viability of a proposed development. Yet the substantial costs of infrastructure construction and refurbishment must still be paid for — either by users or taxpayers. How costs are shared between those parties affects both the prices faced by water users and any obligation borne by Australian taxpayers.

A decision to invest in new, expanded or refurbished water infrastructure therefore carries risk, and can have significant financial implications. Moreover, anticipated shifts in the availability and use of water resources — as a result of climate change and demographic factors — compound this uncertainty and create new risks for the viability of future infrastructure developments.

These factors reinforce the need for good decision making — particularly by governments, who must look to maximise the benefits of taxpayer funding and avoid facilitating developments that are not in the best interests of the community, including those which impose unnecessary costs on water users.

This paper includes:

- background information on government investment in water infrastructure under the National Water Initiative (NWI) and related guidance (section 1)
- issues raised about current decision making for major water infrastructure (section 2)
- a framework to guide government investment in major water infrastructure, including the principles to be satisfied — as requested by the inquiry’s terms of reference (section 3)
- the Commission’s view on how major water infrastructure should be included in a renewed NWI (section 4).

1 Background

1.1 The cost of uneconomic water investment motivated reform

For much of the 1900s, governments took a development-oriented approach to water resources by encouraging or directly funding the construction of major water infrastructure.

Some of these investments were not in the best interests of the Australian community. Government subsidisation allowed pricing below cost recovery levels, which spurred yet more proposals to construct unviable water infrastructure. Often, such calls were loudest during and after droughts. But these unviable infrastructure developments left a legacy of large debts, as well as the ongoing costs of maintaining assets. Much of this burden was placed on taxpayers.

The desire to avoid burdening water users and taxpayers with the costs of uneconomic investment decisions was one of the key drivers of national water reform, including the COAG water reforms (1994) and the NWI (2004).

1.2 NWI targets economically viable and ecologically sustainable infrastructure

Jurisdictions agreed that the outcomes of the NWI *Best Practice Water Pricing and Institutional Arrangements* element would include:

- promoting economically efficient and sustainable use of water resources, water infrastructure assets and government resources devoted to the management of water
- giving effect to the principle of user pays
- avoiding perverse or unintended pricing outcomes.¹

To guide investment in water infrastructure, NWI signatories agreed:

... to ensure that proposals for investment in new or refurbished water infrastructure continue to be assessed as economically viable and ecologically sustainable prior to the investment occurring (noting paragraph 66 (v)).²

The *NWI Pricing Principles* provide more detail on how to implement the ‘user pays’ principle — including where assets have been contributed by governments.

For new or replacement assets, [user] charges will be set to achieve full cost recovery of capital expenditures (net of transparent deductions/offsets for contributed assets and developer charges ... and transparent community service obligations). (NRMMC 2010, p. 6)

In other words, the principles allow for two circumstances where the full costs of government-funded water infrastructure are not recovered from water users:

1. where assets have been ‘contributed’ or paid for by a government (or another party, such as a housing developer³) with the intent of lowering water prices, or
2. where a government provides a transparent community service obligation (CSO) to fund a portion of the cost of the infrastructure (SP G *Regional*).

In either case, taxpayers (rather than users) bear a share of the costs of the investment.

¹ NWI paragraph 64.

² NWI paragraph 69. NWI paragraph 66(v) requires that infrastructure costs are recovered through user charges (set at lower bound levels) for all rural systems, with movement towards upper bound pricing where practicable. It also considers that, where subsidies are provided to meet social and public health obligations in areas where full cost recovery is unlikely to be achieved, any government-provided community service obligations (CSOs) should be publicly reported. (Lower and upper bound pricing are discussed more in the *Assessment*.)

³ A developer may still pass on those costs to the final purchaser of the development so the user of the infrastructure ultimately pays.

1.3 Most infrastructure investment is undertaken by service providers ...

Planning for, constructing, maintaining and refurbishing water infrastructure is a core business of corporatised water service providers (such as bulk, irrigation and urban water providers). Their decisions are, ideally, guided by internal assessments of the need for infrastructure in providing an agreed level of service to their customers, and the benefits and costs of alternative options (such as changing the operation of existing infrastructure).

Governments can also invest in infrastructure for the benefit of the environment. These investments are generally small, and include infrastructure that helps deliver water to key environmental sites (for example, channels and regulators) as well as fishways to enable upstream connectivity for native fish (SP C *Environment*).

Investments undertaken by corporatised entities would be expected to be consistent with the NWI requirement for economic viability. For example, user-owned irrigation networks have an incentive to ensure infrastructure decision making aligns with the interests of their users. And in urban areas, water service provider planning processes generally guide infrastructure decision making, with (in many cases) scrutiny from economic regulators. (These processes are discussed in SP F *Urban* and SP G *Regional*.)

Moreover, all infrastructure development proposals are subject to environmental, social, cultural heritage and other government approval processes, including water resource planning. Collectively, these processes help ensure compliance with the NWI requirement for ecological sustainability.

1.4 ... but government enthusiasm for public investment is strong

In addition, Governments have made significant commitments to invest in new or refurbished water infrastructure — particularly to support irrigated agriculture. Up to \$3.5 billion has been made available through the Australian Government’s 10-year National Water Grid Fund (box 1). Water projects are also eligible for concessional finance from the \$5 billion Northern Australia Infrastructure Facility.

The National Water Grid Authority (NWGA) is responsible for the National Water Grid Fund, and investment decisions are now subject to an investment policy framework (NWGA 2020a). Under that framework, eligible projects must involve new or additional infrastructure investment that increases water availability, reliability, efficiency and/or quality. Projects are limited to those that provide water for agriculture or primary industry, and must be brought forward by, or have strong support from, the relevant State or Territory Government (NWGA 2020a, p. 10).

Box 1 **Australian Government water infrastructure initiatives**

The Australian Government has committed \$3.5 billion to fund new water infrastructure through the development of the National Water Grid. The Grid aims to increase agricultural output, increase the availability and security of water, build resilience to a changing climate and support regional prosperity.

Programs

- Up to \$3.5 billion in water infrastructure funding will be provided through the National Water Grid Fund over ten years.^a As of 15 March 2021, \$1.5 billion has been spent or otherwise committed to projects.
- Water projects are also eligible for concessional finance from the \$5 billion Northern Australia Infrastructure Facility (NAIF).

Institutional arrangements

- The National Water Grid Authority (NWGA) was established in late 2019, following a 2019 election commitment. The NWGA sits within the Department of Infrastructure, Transport, Regional Development and Communications and administers the National Water Grid Fund, with all future commitments subject to its October 2020 *Investment Policy Framework*.
 - The National Water Grid Advisory Body was established in 2020 to provide independent expert advice to the Australian Government on infrastructure policies, projects and investment priorities. A charter guiding its operation was published in 2021.
- The North Queensland Water Infrastructure Authority was established on 12 March 2019 to coordinate the delivery of the Hughenden Irrigation Scheme project and the Hells Gates Dam Scheme with Australian Government funding. It sits within the infrastructure portfolio.
- Since 1 January 2021, Infrastructure Australia, the Australian Government's independent infrastructure advisor, is subject to a Ministerial statement of expectations to evaluate infrastructure project proposals where Australian government funding of more than \$250 million is sought. Prior to 2021, the evaluation threshold was \$100 million.

^a In the 2021-22 Australian Government budget, the National Water Infrastructure Development Fund was renamed to the National Water Grid Fund.

Sources: McCormack (2019, 2020b); NAIF (2021); NQWIA (2020); NWGA (2020a, 2020b, 2021d, 2021b).

Recent crises have led to a greater impetus for investment

Recent events, including drought in eastern Australia, have prompted action to expedite major water infrastructure investments.

- Infrastructure Australia's 2021 *Infrastructure Priority List* identified water security as a key investment theme, and included both 'bulk water supply security' and 'town and city water security' as high priority initiatives (IA 2021, pp. 70, 86).
- In response to drought conditions, the New South Wales Government passed the *Water Supply (Critical Needs) Act 2019*. The Act nominated four critical State significant infrastructure projects for expedited development — the:
 - Wyangala Dam wall raising project (Lachlan River)

-
- Mole River Dam (Border Rivers)
 - Dungowan Dam (Peel Valley)
 - Western Weirs program (Barwon-Darling and Lower Darling Rivers).

Further, inquiry participants have pointed to the need for significant investment in urban water infrastructure to address a significant infrastructure backlog in regional and remote areas, with assets in some areas reaching the end of their operational life and in need of replacement (TasWater, sub. 11, pp. 6–7; Goldenfields Water County Council, sub. 25, pp. 7–8; Urban Utilities, sub. 85, p. 3). Recent drought brought some of this into sharp relief (SP G *Regional*). The scale of renewals needed in some areas would require significant increases in prices, if funded entirely by users: LGAQ (sub. 32, p. 6) viewed that, in Queensland, the ‘capital requirement to maintain service capacity into the medium-term is beyond the fiscal capacity of local governments operating small regional and remote schemes’.

2 Issues with government investment in water infrastructure

As part of its assessment of progress against the NWI, the Commission considered whether jurisdictional frameworks for investment in major water infrastructure were adequate to enable NWI compliance (*Assessment*: section 3.2). And inquiry participants nominated some government-supported projects as non-compliant with the NWI — particularly with respect to economic viability and cost recovery.⁴ The Commission also considered these specific projects in its assessment.

In reviewing major infrastructure proposals since 2017, the Commission’s assessment found that not all projects adhere to the NWI’s requirements (*Assessment*: section 3.2). The business cases for two projects (Rookwood Weir and Stage 2 of the Haughton Pipeline Project) concluded that the benefit–cost ratios are likely to be less than one, indicating that their construction would cost more than the benefits they would generate for the broader community.⁵

Other projects, such as building a new Dungowan Dam and the Wyangala Dam wall raising project (both in New South Wales), have been publicly committed to prior to the development and publication of business cases. As discussed below, this is a failure of process that undermines proper scrutiny of investment decisions, and can result in poor projects being funded by governments.

The Commission’s assessment has concluded, overall, that jurisdictions are only partly achieving their rural infrastructure commitments under the NWI. There is clearly still more to do to ensure that NWI signatories (the Australian, State and Territory Governments) abide

⁴ IWF, sub. 30, pp. 16–17; Smit et. al., sub. 31, p. 3; AFA, sub. 45, pp. 9–10; WWF Australia, sub. 50, pp. 8–10; EDO, sub. 54, p. 16; LBA, sub. 70, pp. 27–28; Mackay Conservation Group, sub. DR150, p. 5.

⁵ Rookwood Weir is co-funded by the Australian and Queensland Governments and Stage 2 of the Haughton Pipeline is funded by the Queensland Government (NWGA 2021c; Townsville City Council 2021).

by the Agreement through their decision-making processes for new and refurbished infrastructure — a finding that reinforces the Commission’s 2017 conclusions (box 2).

Box 2 The Commission’s 2017 assessment: infrastructure

The Commission’s 2017 *National Water Reform* inquiry report concluded that:

Much of the recent direct government investment in water infrastructure has been shown to be inconsistent with jurisdictions’ commitments under the [NWI] to ensure all new and refurbished infrastructure is economically viable and environmentally sustainable. (p. 263)

In assessing progress against the NWI, the Commission concluded that jurisdictions had only partially achieved their commitment against the Agreement.

- For urban water infrastructure, the key shortcoming was the ongoing provision of capital grants to water service providers in regional New South Wales and Queensland.
- For non-urban water infrastructure, the Commission highlighted issues with the transparency of cost–benefit analyses and inconsistent application of the user-pays principle.

The Commission recommended that governments should not provide grant funding for infrastructure, or that part of infrastructure, that is for users’ private benefit. It proposed conditions for public funding or financing in a future NWI (recommendation 8.1).

Source: PC (2017a, pp. 263–287).

As noted above, investment decisions made by water service providers are generally guided by planning processes and those decisions are scrutinised (in most cases) by independent economic regulators. This usually ensures compliance with the NWI requirements for new and refurbished infrastructure (*Assessment*: section 3.2).

However, government investment in major water infrastructure can sit outside these planning frameworks, and scrutiny of these decisions is not as systematic. Further, the *NWI Pricing Principles* allow the costs of assets contributed by governments to be excluded from user charges, which means that government expenditure on new or redeveloped infrastructure may not be fully recovered from users.

This perpetuates the risk of governments investing in uneconomic infrastructure that imposes a range of long-lived legacy costs upon the community.

- Water infrastructure can operate for decades: operators require the capacity to finance the initial investment, adequate funding to operate and maintain it over its operational life, and the means to finance any necessary replacement.
 - These costs are usually borne by users, but if infrastructure is not economically viable, it can impose costs on users that exceed their willingness to pay. This can lead to excessively high water prices for users, or under-subscribed infrastructure.
 - Where full cost recovery from users is not in place, the cost of uneconomic investments can fall on governments (and therefore taxpayers), imposing direct costs (in either servicing public debt, or the second-round economic costs of raising

taxation revenue) and indirect costs (in that public funding is not allocated to more worthwhile uses).

- Major water infrastructure often carries significant environmental costs. For example, it can significantly alter flow regimes and connectivity along rivers and across landscapes, affecting seasonal wetting and drying cycles and impairing fish migration which, in some cases, can affect downstream commercial fisheries (NPFI, sub. DR155, p. 2). These long-lasting impacts can be difficult to ameliorate. It is not in the interests of the Australian community to incur these costs if there are no or limited net benefits from doing so.
- Projects can also impact on Aboriginal and Torres Strait Islander people's cultural heritage and values associated with water and water-dependent ecosystems. For example, constructing a dam can flood sites of cultural significance, and disrupt flow regimes that maintain the condition of cultural sites.

This section outlines concerns with the processes and frameworks that guide how governments invest in major water infrastructure, and considers whether the NWI should be amended to address those issues.

2.1 Inadequate project assessment and selection processes

Rigorous and transparent assessment processes are key to good infrastructure project selection (PC 2017a, p. 267). Inquiry participants have highlighted a number of shortcomings in recent processes.

- Project selection processes do not always identify a clear issue, or consider the full suite of options to address that issue (Smit et. al., sub. 31, p. 3).
 - Non-infrastructure options to improve water availability can include changes to seasonal water allocation policies or trade between sectors. These are often not considered — for example, the commitment to build a new Dungowan Dam was based on a feasibility study (discussed below) that explicitly excluded non-infrastructure options that could improve the security of Tamworth's water supply.
- Business cases are not long-term or comprehensive, and assumptions are not always rigorous or transparent.⁶
 - For example, if assumptions concerning the demand for irrigation water are too optimistic, there is a high risk that the infrastructure will fail to recover upfront and/or ongoing costs from users (WWF Australia, sub. 50, pp. 9–10). If a substantial proportion of entitlements from a new or expanded development remain unsold, this functions as an implicit (and opaque) subsidy to water users (PC 2017a, p. 256).
- Australian, State and Territory government infrastructure priorities are not clear, consistent or aligned, leading to unnecessary duplication (QFF, sub. DR161, p. 5).

⁶ IWF, sub. 30, pp. 16–20, sub. DR120, p. 6, FNQROC, sub. 51, pp. 2–3; Engineers Australia, sub. 63, p. 19; Wentworth Group of Concerned Scientists, sub. 68, p. 5.

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- Some State Government funding commitments (such as for Stage 2 of the Haughton Pipeline) have disregarded the recommendations of Infrastructure Australia’s independent project evaluations.
 - Multiple projects are being proposed in the same catchment without consideration of interdependencies (Business NSW, sub. 36, pp. 5–6; Mackay Conservation Group, sub. DR150, p. 6; NQCC, sub. DR157, p. 6).
 - Economic assessments for water infrastructure are too narrow compared with the well-developed methodologies in other infrastructure sectors. The Far North Queensland Regional Organisation of Councils (sub. 51, p. 3) noted that:

other applications of [Cost–Benefit Analysis] have well established methodologies that capture a fair swath of the external benefits that may accrue from large scale investments, for example roads. Cost Benefit Analysis of dam investment is more limited in its scope.
 - Some participants viewed that decision-making processes have lacked transparency. For example, in a submission to the draft report, the Institute for Water Futures (IWF, sub. 30, p. 16) observed the lack of transparency in the NWGA’s decision making.
- There is insufficient publicly available information to assess 21 projects (with a total Australian Government funding commitment of \$1.15 billion) against all NWI criteria.⁷

As of 22 March 2021, the Australian Government had made public commitments to five projects prior to the completion of business cases, including three that were already under contract with the relevant State government (NWGA 2021a). This situation is of particular concern: business cases, a key part of project planning, substantiate whether the infrastructure is in the interests of the Australian community, and they also establish the case (if any) for funding part of the project through a government subsidy, rather than user charges. Governments are unlikely to back down from funding a project they have publicly committed to, which creates a risk that suboptimal projects are funded — even if subsequent analyses show that the projects are not worthwhile (PC 2014, p. 106).

Indeed, it is common for the costs of major water infrastructure projects to increase substantially between early feasibility work and final construction. A project with marginal net economic benefits may result in imposing a net cost on the community if this occurs. As outlined by the IWF (sub. 30, p. 17):

Best-practice processes for public investment are particularly important for construction of new large dams because these projects are highly susceptible to major cost overruns (see Ansar et al. 2014 for a global review). In an Australian context, Petheram et al. (2019) found that the median and mean cost overruns (relative to immediate pre-construction estimates) were 49% and 120% respectively for a sample of 40 historical projects where sufficient data was available.

One example is Dungowan Dam (box 3). The original proposal was based on an indicative cost of \$150 million (PC 2017a, p. 266). The revised cost of the preferred project (incorporating a new dam and pipeline) identified in a subsequent 2017 feasibility study

⁷ As of March 2021, the NWGA now publishes a summary table of project progress, including the status and expected timing of business cases and environmental approvals (NWGA 2021a).

(GHD 2017, p. 56), was \$484 million and it is likely that the costs will again change during the final business case development. Nevertheless, the Australian and New South Wales Governments have publicly committed to the project (although the funding agreement between the governments includes a ‘pause point’ that allows the Australian Government to reassess its funding contributions following the outcomes of the final business case (RRATLC 2021, pp. 47–48)).

Box 3 Poor decision making for Dungowan Dam

In 2016, the Australian and New South Wales Governments committed \$150 million to the construction of a new Dungowan Dam (PC 2017a, p. 266). The rationale for the project was that growth in Tamworth’s urban water demand would affect reliability for general security licences in the Peel system, as well as downstream licences in the Namoi (WaterNSW 2018, p. 26).

A 2017 feasibility study estimated a benefit–cost ratio of 1.06 for constructing a new 22.5 GL dam and pipeline, increasing water availability by 6 GL a year on average with a total project cost of \$484 million (including \$282 million for a new dam) (GHD 2017, pp. i, 13, 56, 68). Most of the estimated benefits were derived from improving Tamworth’s town water security, with increased irrigated agricultural production representing less than 2 per cent of the project benefits (GHD 2017, p. 68).

In 2019, the Australian and New South Wales Governments each committed to provide half of the project cost (McCormack et al. 2019), with a contract signed by the two governments on 22 January 2021 (NWGA 2021d). The contract includes a ‘pause point’ that allows the Australian Government to reassess its funding contributions following the outcomes of the full business case (RRATLC 2021, pp. 47–48), which is expected to be completed in late 2021, alongside environmental impact assessments (WaterNSW 2020).

Discussion

The feasibility study underpinning this funding commitment has three key shortcomings.

- The benefit–cost ratio of 1.06 is marginally viable and contingent on many assumptions (such as the willingness of Tamworth residents to pay to avoid water restrictions).^a Any changes to assumptions, including increases in construction cost, risk the project becoming unviable.
- Non-infrastructure options to improve Tamworth’s water security were explicitly excluded from the analysis (GHD 2017, p. 14). Some of these options may be a considerably more cost-effective means for the New South Wales Government to secure Tamworth’s water needs.
 - For example, Tamworth City Council could purchase equivalent general security entitlements (in long-term annual average terms) for about 2 per cent of the cost of Dungowan Dam.^b

(continued next page)

Box 3 (continued)

- The project scope was narrowly defined. Although the study was prompted by pressure on Tamworth's bulk water supplies during the Millennium Drought, the analysis focused on long-term water supply, rather than ensuring water security during extreme events.
 - The NSW Water Directorate (sub. 37, p. 7) observed that, during the 2017–19 drought, the seasonal water allocation process under the catchment water plan was not as effective as it could have been in protecting town water security, even with the expansion at Chaffey Dam. Indeed, in the year prior to Tamworth's level 5 restrictions, more water was allocated to general security licence holders than for urban water use (WaterNSW 2019).

The justification for the project is to ensure water security for Tamworth while maintaining access for general security irrigators. However, doing so through the proposed dam is likely to be costly relative to the value of that water. The project is estimated to provide an additional 6 GL of water a year (on average) which, based on current market prices for general security entitlements, would cost about \$11 million.^c If the additional water from the project were sold to irrigators at full cost, it would be valued at more than \$60 000/ML.

Moreover, as the proposed project is within a fully-allocated water system, it will result in an implicit (and expensive) transfer of water. Any infrastructure that improves reliability for one user will affect water availability for others. In this case, the feasibility study identified that a larger storage would lead to the Peel water sharing plan cap becoming binding, thereby reducing supplementary access (water extractions during infrequent high-flow events) for Namoi River irrigators (GHD 2017, p. 19).

^a The study assumed that the current pipeline is replaced under the base case, and the estimated project benefit–cost ratio includes the avoided cost of this capital (GHD 2017, pp. 54–55). ^b Based on 75 per cent reliability, a Peel General Security entitlement price of \$1341/ML (the 2018-19 weighted average Peel General Security entitlement price (Aither 2019)), and a maximum potential shortfall of 5.5 GL a year by 2065. ^c Based on 75 per cent reliability and a Peel General Security entitlement price of \$1341/ML.

The creation of a dedicated Australian Government body in 2019 to assess water infrastructure projects suggests that there should now be greater scrutiny of decision making, and many aspects of the NWGA's *Investment Policy Framework* (box 4) — including the requirements for State support and alignment with the NWI — represent potential improvements in project assessment and selection. If implemented, the framework will address some of these shortcomings for future government funding commitments.

But that said, more than \$1.5 billion of the \$3.5 billion made available by the Australian Government has (as of 15 March 2021) already been committed to projects, and many of those commitments preceded the publication of the investment policy: about \$1 billion reflects completed projects or projects under contract with State governments, and a further \$490 million reflects funds committed to projects in the planning stage (NWGA 2021d). The Commission's assessment found that some of those committed projects have unviable or marginal benefit–cost ratios, while others do not yet have completed business cases.

Box 4 Principles of the NWGA Investment Policy Framework

1. Projects should be of demonstrable public benefit and have a national interest element, including through securing the nation's water security, building resilience to future drought, supporting primary industries and promoting regional prosperity, including through the creation of jobs.
2. There must be strong State support including funding contributions, and involvement of the private sector and local government, where appropriate.
3. The investment should provide the highest net benefit of all options available to increase access to water, taking into account economic, social and environmental impacts.
4. Projects should look to address circumstances which cannot be effectively addressed by private proponents, states or territories or other stakeholders alone.
5. Projects should align with the National Water Initiative principles including appropriate cost recovery, and where full cost recovery is not deemed feasible, any subsidies are fully transparent.
6. If providing capital, a consistent, robust analysis of costs and benefits is used and assessment of appropriate funding and financing arrangements is undertaken.
7. Earlier involvement in project identification and development, including through the NWGA's science program, support for business case development, and close collaboration with states and territories and other project proponents.

Source: NWGA (2020a, p. 4).

2.2 The case for rural water infrastructure subsidies is not clear

Government subsidies can be warranted in limited cases ...

In principle, government infrastructure funding can be warranted where projects generate public benefits — for example, where non-users receive economic benefits from the infrastructure (indirect beneficiaries), or where it would be too costly (or inequitable) to identify and charge each individual user. The presence of public benefits may lead to under-provision of otherwise worthwhile infrastructure if investment funding is left solely to the private sector (PC 2014, p. 110). In the case of water infrastructure, public benefits can include flood mitigation and dam safety.

Similarly, a degree of government funding for urban water service provision may be justified on equity grounds to ensure access to a basic essential service in high-cost regional or remote areas (SP G *Regional*). In those cases, a government subsidy for a share of infrastructure costs can be warranted.

... but some government investment frameworks take a broader view

However, the NWGA's *Investment Policy Framework* takes a broader view of the rationale for government investment in major water infrastructure (box 4: principle 1). Reflecting the

objectives of the National Water Grid (box 1), the NWGA (2020a, p. 4) will consider Australian government funding for projects that are:

... of demonstrable public benefit and have a national interest element, including through securing the nation's water security, building resilience to future drought, supporting primary industries and promoting regional prosperity, including through the creation of jobs.

Under their investment principles, the NWGA also considers that Australian government involvement can be justified to 'address circumstances which cannot be effectively addressed by private proponents, states or territories or other stakeholders alone' (box 4: principle 4). Overall, the investment framework looks to underpin a role for the Australian Government in supporting regional development through water infrastructure projects.

Regional development risks being used to justify unviable projects

At times, Governments choose to fund economically unviable water infrastructure in pursuit of broader objectives such as regional development. But unless governments recover funding provided for water infrastructure developed for the benefit of primary industry from users, then this investment equates to subsidising a commercial operation and undermines the NWI user-pays principle. This is the case for both new infrastructure, and redevelopments that aim to improve reliability for existing users. As the Commission noted previously:

Past irrigation infrastructure projects have been justified by private benefits captured by irrigators. The use of government grants to build such infrastructure results in the associated cost being borne by taxpayers even though they (as part of the broader community) receive little of the resultant benefits. (PC 2017a, p. 279)

Although the NWGA framework excludes projects that supply water for the exclusive use of a private business or individual (NWGA 2020a, p. 1), and prioritises investments that 'provide the highest net benefit of all options available to increase access to water, taking into account economic, social and environmental impacts' (box 4: principle 3) — both of which are good practice — the framework does not require a *positive* net benefit. Moreover, the NWGA does not fund solutions that may address the investment objective through non-water infrastructure means, such as inter-sectoral trade, or changes to seasonal water allocation policies.

The NWGA framework may therefore facilitate funding for projects that would not pass a strict economic viability test (based on delivering a positive net benefit), because the framework's national interest test recognises broader outcomes that are not considered as benefits within an economic assessment. This includes secondary impacts (such as job creation) that are not included in a benefit–cost calculation as they represent double-counting (ATAP nd).

Care must be taken when selecting infrastructure projects on the basis of secondary impacts. Any public expenditure in an area creates flow-on economic impacts, which can simply represent a transfer of resources and jobs between regions. Instead, this type of spending should be compared against other means of increasing regional employment, which may be more cost-effective than a water infrastructure investment. The availability of Australian

Government funding through the National Water Grid Fund, alongside its broad public interest test, risks biasing State and Territory priorities towards infrastructure solutions — without assessing other, more cost-effective means to enable regional economic growth or improve water security.

Major water infrastructure is not always an effective form of regional development

A further risk from government funding of major water infrastructure in pursuit of regional development is that the desired outcomes may not materialise. An approach of ‘just adding water’ (without securing demand) assumes that any additional water access or security will necessarily be put to productive use and generate employment — an assumption that is not always borne out even with subsidised water charges.⁸ The Commission’s 2017 analysis suggested that major irrigation infrastructure developments tended to create few ongoing jobs, and often at a high cost (table 1). Some major investment decisions have similarly lacked a demonstrated demand for water prior to the decisions being made — with business cases failing to build the case for irrigation infrastructure being a sound and preferred means to advance regional development.⁹

Overall, this approach perpetuates the risk of public investment in projects that are unlikely to achieve their anticipated objectives (in terms of regional development), despite substantial public cost.

⁸ For example, in 2017 the Commission noted that 85–90 per cent of the water made available by the construction of Paradise Dam had not yet been sold to users (PC 2017a, p. 275). As of May 2020, 80 per cent of the Paradise Dam entitlements remained unsold (SunWater 2020, p. 9).

⁹ For example, the business case for Rookwood Weir (also discussed in *Assessment*: box 3.4), highlighted a ‘potential opportunity’ to expand agricultural production (Building Queensland 2017, p. 14), but this was not determined through a holistic regional development strategy, nor was the weir identified elsewhere as being critical to supporting increased agricultural production. The *Rockhampton Regional Water Security Strategic Assessment* also did not identify robust demand for irrigation water in that region (Queensland Government 2016).

Table 1 Sample of irrigation infrastructure employment outcomes

	Ord Stage 2	Duck	Swan Valley
Jurisdiction	WA	Tas	Tas
Cost to government (\$m)	334 ^a	32	18
Project completion	2014	2018	2018
Number of irrigators holding entitlements	150 ^b	26	15
Ongoing jobs created	61 ^c	50 ^d	16 ^e
Cost per job created ^f (\$m per full-time equivalent)	5.5 ^c	0.6	1.1

^a Funding from the Western Australian Government for irrigation infrastructure works only. A further \$195 million was provided by the Australian Government for supporting social projects and infrastructure.

^b There are approximately 100 surface water and 50 groundwater licences in the Ord River region; data limited to the Stage 2 area were not available. ^c Excludes 10–15 seasonal workers. Cost per job excludes Australian Government funding. ^d Approximate. ^e Estimate; actual data not available. ^f Calculated by dividing the cost to government by the number of jobs created.

Sources: BOM (2018); Minister for Agriculture and Water Resources and Senator for Tasmania (2019); Minister for Agriculture and Water Resources, Minister for Primary Industries and Water (Tas) and Federal Member for Lyons (2016, p. 2); Minister for Primary Industries and Water (Tas) (2018); Public Accounts Committee (2019, p. 3); Tasmanian Irrigation (2018b, 2018a, 2020); Western Australian Auditor General (2016, pp. 7, 23).

2.3 Climate change elevates the need for careful project selection

Planning for long-lived water infrastructure in an increasingly dynamic world is difficult, and with a changing climate, parts of Australia are experiencing more variable patterns of rainfall, streamflow and evaporation (IWF, sub. 30, pp. 12–13; EDO, sub. 54, p. 14; Engineers Australia, sub. 63, p. 19).

This has implications for infrastructure planning.

- The expected yield and reliability of new (and existing) infrastructure assets will change, and estimates may become less reliable because of uncertainty over the magnitude of rainfall or runoff changes. This affects estimates of sustainable extraction from particular catchments (EDO, sub. 54, p. 16), as well as increasing the likely cost of water to users as infrastructure development and operational costs will have to be spread across lower water allocations.
- A drier climate may create a ‘premium’ for water security, and greater value for water source diversification in urban areas (SP F *Urban*). But it may also lead to increasing demands on governments to help communities and industries contend with drier conditions, particularly if there are critical shortages in a water system during drought.
- Economic change, as a result of climate change and other economic drivers, will continue to affect land use patterns in regional Australia. This will create demand risks for fixed

infrastructure, such as irrigation distribution networks where supply costs may be particularly sensitive to reductions in water use.

Each of these factors affects the viability of current and future infrastructure, emphasising the need to ensure that proposals for government-funded water infrastructure are rigorously assessed.

Careful consideration of proposals is unlikely to occur where governments commit funding prior to the development of robust business cases, where project selection and assessment processes are uncoordinated and opaque, or where assumptions underpinning economic analyses or purported regional development outcomes are not published and scrutinised by the wider community or independent expert bodies.

2.4 Should the NWI be amended?

Maintaining the past approach to major infrastructure project selection is likely to impose more unnecessary costs on taxpayers, water users and the environment.

This situation, in part, reflects shortcomings of the NWI and its minimalist requirements for new and refurbished infrastructure. The requirements are sound and, if complied with, would ensure that government investment in major developments only occurs rarely and where clearly justified. But on their own, they are inadequate to ensure that only the most beneficial projects are selected (or funded) by governments. Particularly, the NWI does not:

- provide a framework to ensure only the most worthwhile projects are selected
- specify the circumstances where government subsidies for water infrastructure are justified.

Some improvements are likely to arise through other recent policy tools, including some State-based infrastructure prioritisation publications, as well as the NWGA's 2020 *Investment Policy Framework* which includes NWI compliance as a principle.

However, the questionable merits of some existing commitments indicate that the problems are not yet solved. As noted above, the NWGA's broad public benefit test is not fully consistent with NWI requirements. The risk of suboptimal infrastructure investments has not been fully mitigated.

A clearer standard for infrastructure decision making in a renewed NWI would ensure that a set of criteria, agreed to by the Australian, State and Territory Governments, are embedded as part of longer-term water reform. This would allow for major infrastructure decisions to be held to account against those requirements, while allowing for ongoing independent assessment of implementation of those principles by all governments.

3 A framework for investment in major water infrastructure

The terms of reference ask the Commission to consider the ‘principles to be satisfied for any government investment in major water infrastructure projects’.

The NWI requirements are sound in principle: proposals should be demonstrated as both ecologically sustainable and economically viable prior to investment (although neither term is defined in that agreement), and, in accordance with the NWI pricing commitments, users should ultimately bear the costs of infrastructure. This requirement should continue to guide all investments in water infrastructure — including where governments make significant investments in new or redeveloped infrastructure.¹⁰

Further, this high-level requirement should be expanded to ensure that the development of major water infrastructure is culturally responsive to the interests of Aboriginal and Torres Strait Islander people. As discussed below, for major projects this could include commitments to deep consultation with affected Traditional Owners, and identifying and addressing impacts on cultural heritage.

Yet the Commission’s assessment has highlighted project selection that is inconsistent with the existing NWI — and with public infrastructure funding principles more generally. The issue is not one of principle, but of implementation, in that the minimalist NWI requirements have not been adequate to prevent poor investment decisions.

This section outlines a framework to guide government investment in major water infrastructure, including:

- high-quality and transparent project selection and assessment processes
- clearly-defined criteria to give effect to an expanded NWI infrastructure requirement in project assessment for major water infrastructure
- principles for cost sharing (including government subsidies) and allocating water from developments
- institutional arrangements to underpin the framework.

Section 4 provides the Commission’s overall advice on NWI renewal.

3.1 Project assessment and selection processes

The objective of project selection is to ensure, at a minimum, that any major water infrastructure development is in the public interest; that is, the benefits of the option selected clearly outweigh the cost, and no alternative to address the issue at hand is likely to deliver

¹⁰ One exception where government investment in economically unviable infrastructure may be justified is to provide safe drinking water to a regional or remote community. This case is considered below.

a larger net benefit. This should be based on a robust and transparent assessment of the relative merits of different options (including non-infrastructure options).

In 2019, Infrastructure Australia published a set of principles to guide infrastructure decision-making processes across all sectors (box 5). The principles were developed in response to Infrastructure Australia's concerns over transparency in decision making, projects being developed without fully considering all available options to address the problem, and projects being committed to before a business case or economic assessment had been prepared (IA 2018b, p. 1).

As discussed in section 2, similar issues afflict decision-making processes for major water infrastructure — particularly, long-term planning is not consistently used to identify explicit problems or opportunities, multiple options (including both infrastructure and non-infrastructure solutions) are not always considered, and governments have announced their preferred options prior to business case development on a number of occasions.

Box 5 Infrastructure Australia's decision-making principles

In 2018, Infrastructure Australia published a set of principles to guide infrastructure decision making.

1. Governments should quantify infrastructure problems and opportunities as part of long-term planning processes.
2. Proponents should identify potential infrastructure needs in response to quantified infrastructure problems.
3. Proponents should invest in development studies to scope potential responses. This includes responses that make better use of existing infrastructure, or reform of regulatory and pricing settings.
4. Where an infrastructure need is identified, governments should take steps to ensure potential responses can be delivered efficiently and affordably.
5. Governments should undertake detailed analysis of a potential project through a full business case and should not announce a preferred option or cost profile before undertaking detailed analysis involving multiple options.
6. Proponents should assess the viability of alternative funding sources for each potential project.
7. Project proposals should be independently assessed by an appropriate third party organisation.
8. Governments and proponents should undertake meaningful stakeholder engagement at each stage, from problem identification and option development to project delivery.
9. Governments and proponents should publicly release all information supporting their infrastructure decisions.
10. Governments should commit to, develop and release post-completion reviews.
11. Where projects are funded as part of a broader program, the corresponding decision-making processes should be robust, transparent and prioritise value for money.

Source: IA (2018b).

In general, Infrastructure Australia's principles would provide a sound basis to underpin water infrastructure project selection processes, and adherence to this decision-making process would help avoid uneconomic investments. Many are already reflected under the NWGA's *Investment Policy Framework*, although endorsement through a renewed NWI would allow for ongoing independent assessment of implementation of those principles.

At the very least, project proponents should ensure they:

- identify and quantify a clear problem or opportunity, with reference to existing long-term planning
- undertake options assessments and feasibility studies to identify the most promising solutions (which may not require additional water infrastructure, nor government investment — all options should be on the table)
- develop a robust business case to establish whether those options are economically and/or commercially viable (based on criteria discussed below)
- subject the business case to public and/or independent critique (discussed below as part of the criteria for economic viability)
- select the most worthwhile option based on that business case.

Each stage of the decision-making process should be coupled with meaningful stakeholder engagement, including with local governments, communities, natural resource management bodies, Traditional Owners, water service providers and infrastructure advisory bodies. Further, those decisions should be transparent and based on the best available evidence and information.

Importantly, government funding or financing for a project should only be committed following an assessment of all sources of funding (consistent with box 5: principle 6), which occurs after the business case is prepared. (The conditions where government investment may be warranted are discussed below as part of cost-sharing arrangements.)

Post-completion review

A clear evidence base should be developed to support an adaptive approach to improve the quality of business cases and to support effective project selection. As Engineers Australia (sub. 63, p. 19) noted, there is clear value in a public review of the outcomes of major projects. For example, the Infrastructure Australia (2018b, p. 3) model of a post-completion review (box 5: principle 10) focuses on:

- measuring whether the economic case for a project established in its business case is realised over time through performance measures
- whether the project was delivered on time and on budget
- whether unforeseen risks emerged and how they were managed
- extracting lessons to feed into future infrastructure development and delivery processes.

Ensuring post-completion reviews of major water projects would, over time, help project proponents address the risk of overly-optimistic project estimates (such as for water demand, job creation or social benefits) by better refining the assumptions used to underpin those estimates.

3.2 Criteria for major infrastructure development under the NWI

The following considers the necessary criteria to be fulfilled in order for a major water infrastructure project to comply with the expanded NWI requirements — irrespective of whether government funding is sought. The detailed business case for a major project should demonstrate how these criteria are fulfilled, as part of the project selection process and prior to both the commencement of works and any commitment of public funding for construction.

In many cases, the Commission’s suggested criteria simply embeds existing practice under State and Territory project development and approval processes, as well as the NWGA’s *Investment Policy Framework*. But in other cases, these criteria will guide improvement in project assessment and address identified shortcomings in infrastructure decision making (section 2). Any agreed criteria need to be fit for purpose and proportionate to the size of the investment (with major projects requiring more detailed scrutiny).

Ecological sustainability

Ecological sustainability is a fundamental requirement of any major development, and the environmental impacts of a proposed development should be identified as part of the business case (including in the assessment of benefits and costs of the project) to inform the project selection process.

In keeping with current practice, ecological sustainability is also contingent on:

- compliance with high-quality and NWI-consistent entitlement and planning frameworks, which should be in place prior to construction,
- compliance with State, Territory and/or Australian government environmental approval processes (undertaken after project selection).

Ensuring water plans are of high quality

As discussed in SP A *Entitlements and planning*, the NWI’s water planning framework does not adequately account for the long-term impact of climate change on water resource availability and reliability.

To ensure future major developments are ecologically sustainable over the long term, and to provide greater assurance over the reliability characteristics of any consumptive entitlements provided, a high-quality water plan (based on the best available information and best

practice) should be in place *before* infrastructure is constructed. To ensure ecological sustainability of new or redeveloped infrastructure, a high-quality water plan should:

- establish the environmental water provisions necessary to meet agreed environmental outcomes against anticipated regional-scale climate change
- set out the social, economic and cultural outcomes sought from the water plan
- clearly define the expected reliability of water rights, taking into account the likely impacts of climate change on the region
- be developed with robust community engagement to reflect community values. (SP A *Entitlements and planning*).

Where a major development is approved in an area without a water plan in place, the relevant State or Territory government should develop a plan that specifies the agreed environmental outcomes, accounting for the anticipated impact of the water infrastructure, and ensure that the plan is in place before the infrastructure is commissioned.

Where a major development is approved in an area subject to a water plan, all projections of water availability should be made with an understanding of the impact of climate change, as well as the impact that the proposed development will have on existing entitlements and all aspects of current planned environmental flows.

Projects must also comply with relevant State, Territory and/or Australian government environmental approval processes. Although this occurs after project selection, the costs of complying with those approvals should be considered as part of the business case.

Economic viability

As required by the NWI, the economic viability of any new or redeveloped infrastructure should be established during the development of a comprehensive business case. This helps ensure that the full range of options are considered, the option which offers the greatest net benefit to the community is selected, and projects that represent a net cost to the Australian community are avoided.

Cost–benefit analysis (CBA) is the key tool underpinning an economic appraisal. It allows ‘the economic, social and environmental merit of a project proposal to be identified, measured, valued and compared’ (IA 2018a, p. 18). This demonstrates whether a project is in the best interests of the Australian community in aggregate, while also considering the nature and distribution of benefits and costs, and comparing each of those with alternative ways of addressing the policy issue (such as alternative infrastructure projects, or changes to policy or regulatory settings).

The basic principle is that the detailed business case for a major infrastructure development should demonstrate that the expected benefits of the project exceed the likely costs over its full expected lifetime — usually considered as a benefit–cost ratio (BCR) greater than one.

These economic assessments inevitably rely on assumptions, forecasts and projections — each of which embodies a level of uncertainty. Marginally positive BCRs warrant close attention. For example, the Commission has previously found that ‘unless the tendency for optimism bias [overestimated benefits and underestimated costs] is successfully overcome ... a project with a benefit–cost ratio just over one will likely impose net costs’ (PC 2014, p. 93). Such projects should not be considered as economically sound unless supported by appropriate risk and sensitivity analyses that account for the possibility of key assumptions not holding, particularly in regard to demand for water (discussed below).

In general, the quality of water infrastructure businesses cases can be variable. These analyses should be robust. Achieving this requires a few conditions to be met.

Transparent and rigorous economic assessment

Economic assessments must consider long-term benefits and costs for users (including irrigators, communities and Traditional Owners) from improved access to water, relative to a clearly defined base case. Assessments should also consider the benefits and costs for non-users, including downstream communities, the environment, and Aboriginal and Torres Strait Islander people’s cultural heritage and values associated with water.

Many of these benefits and costs are difficult to quantify, and will often be reliant on assumptions. For example, although climate change may create a premium for water security, uncertainty over future rainfall and evaporation creates further uncertainty over the likely benefits and costs of an infrastructure investment. An important way to ensure the assumptions underpinning these estimates are robust is for them to be subject to public or independent scrutiny. For major water infrastructure projects, business cases should be published as a matter of course. This is not currently the case in all jurisdictions (*Assessment*: section 3.2). For example, the Queensland Government publishes business cases for projects funded under Australian Government water infrastructure programs (Queensland Government, pers. comm., 15 September 2020), while the New South Wales Government typically does not (sub. DR138, p. 12).

A common reason that business cases are not published is to protect commercially sensitive information (BHP, sub. 26, p. 5; NSW Government, sub. DR138, p. 12). Failing to publish business cases on the basis of commercial confidentiality should not be the norm. In some instances, sensitive information may simply be redacted from publicly available business cases, if this does not significantly detract from assessing investment merits. In cases of material commercial sensitivity, a qualified independent body should assess the quality of business cases for major projects in-house and publish their findings prior to project approval, as Infrastructure Australia currently does for major Australian Government investments. (This is also considered as part of the institutional arrangements below.)

Validating demand for water infrastructure

As noted above, overly-optimistic estimates of water demand are a key shortcoming of some major water infrastructure projects (PC 2017a, p. 273). This ‘optimism bias’ is a key risk in many infrastructure projects (PC 2014), putting further uncertainty over the viability of some projects: many of the mooted economic benefits may not materialise, and projects with marginally positive net benefits may turn out not to be worthwhile.

Tools exist to help address this bias upfront, and help to ‘de-risk’ investments by demonstrating that the project is worthwhile under a range of scenarios (and limiting the government’s ongoing liability in the event that reality falls materially short of expectations).

In keeping with better practice, sensitivity analysis should be utilised to consider the impacts of alternative scenarios — such as climate change and regional economic change — on demand and supply for water.

It should also become common practice to secure demand for any new or expanded irrigation infrastructure upfront, for example, by auctioning a share of water access entitlements to users prior to construction — as has been done in the Tasmanian Irrigation program (PC 2017a, p. 286). This ensures ‘buy-in’ and provides investor certainty. The Queensland Government has also published guidelines on how to assess the demand for water in business case development, including a customer commitment strategy through the phases of project development (DNRME (Qld) 2020).

Identifying social and distributional impacts

A robust CBA should also consider the wider socioeconomic impacts of major infrastructure, which can be positive or negative (IA 2018a, p. 32), and include distributional effects, such as income losses or gains for different regions or income groups. These impacts are not always considered within the economic costs and benefits that form the benefit–cost ratio — in many cases they represent transfers between sectors of the economy, rather than economic gains or new activity. However, they can be a key area of community concern.

Identifying the anticipated socioeconomic impacts of major water infrastructure can help governments manage negative adjustment pressures resulting from the development if it occurs, especially in shared systems (SP H *Rural*).

Further, some government funding decisions are made in an attempt to influence those distributional outcomes (for example, favouring economic activity in one region over another in order to encourage regional development). Such decisions require a high standard of rigour and transparency to justify the public expenditure — prior examples have shown that, similar to estimates of water uptake, estimates of job creation can undershoot expectations (at times, spectacularly). In this case, the onus is on governments to demonstrate that the project in question is likely to be a cost-effective means of achieving their policy objective (discussed below under cost sharing).

Culturally responsive infrastructure development processes to incorporate the interests of Traditional Owners

In addition to the existing NWI requirement for new and refurbished infrastructure, proponents should be required to account for impacts on Aboriginal and Torres Strait Islander people's heritage and other cultural values associated with water separate from ecological sustainability considerations.

As noted in SP D *Cultural access*: section 4, consideration of impacts on cultural heritage is usually done through compliance with State, Territory and Australian government cultural heritage assessments that occur once a project has been selected, as well as engagement with the relevant Traditional Owners.

However, to better protect the interests of Traditional Owners — and to support the inland waters target under the National Agreement on Closing the Gap — a renewed NWI should ensure that the processes for developing major water infrastructure are culturally responsive. That is, the aspirations and concerns of Traditional Owners are understood, discussed and considered in developing plans for major infrastructure, and project proponents specifically identify and account for impacts on Aboriginal and Torres Strait Islander people's heritage and other cultural values associated with water.

In its draft report, the Commission requested information on how a refreshed NWI could ensure that major water infrastructure investments most effectively promoted the aspirations of Traditional Owners. Feedback on the draft report supported an additional requirement to ensure infrastructure development is culturally responsive.¹¹ However, many participants requested that the requirement for cultural responsiveness stipulate what this would entail, particularly in relation to protecting heritage, sacred sites and culturally important places (NLC, sub. DR134, p. 28; MLDRIN, sub. DR185, p. 6) and requirements for consultation with affected Traditional Owners (LBA, sub. DR133, p. 16; MLDRIN, sub. DR185, p. 7). The Northern Land Council (sub. DR134, p. 29) suggested that:

The NWI refresh [should] promote the requirement to undertake activities that go beyond the minimum level of cultural site protection, and recognise that to promote the aspirations of Aboriginal people, effective and meaningful engagement must occur early and often.

The Commission sees two criteria that could underpin a requirement for culturally responsive water infrastructure development. At a minimum, culturally responsive infrastructure development would:

1. incorporate deep engagement with the Traditional Owners of potentially affected areas (both at the infrastructure site and downstream) as part of business case development
2. comprehensively identify and manage impacts on cultural heritage in affected areas.

¹¹ LBA, sub. DR133, p. 16; NLC, sub. DR134, p. 28; IRN, sub. DR136, pp. 12-13; NSW Government, sub. DR138, pp. 16-17; LGNSW, sub. DR147, p. 10; NQCC, sub. DR157, p. 3; MLDRIN, sub. DR185, pp 6-8; VicWater, sub. DR191, p. 2.

Determination of the specific criteria that should be met by major infrastructure developments and included in a renewed NWI should occur as part of the co-design process led by the national Committee on Aboriginal Water Interests (SP D *Cultural access*). This process could consider existing frameworks for engagement with Indigenous Peoples, the principle of free, prior and informed consent (as set out under the United Nations Declaration on the Rights of Indigenous Peoples), and look to align with (rather than duplicate) State and Territory cultural heritage protection legislation.

In undeveloped systems, there is an opportunity to consider providing consumptive entitlements to Aboriginal and Torres Strait Islander people. These may be provided to compensate for the identified impacts of an infrastructure project, to contribute to the future development of that community and to assist in meeting commitments under the National Agreement on Closing the Gap. Governments should give serious consideration to providing those entitlements in allocating water from new or expanded infrastructure (discussed below).

The addition of a third headline requirement for infrastructure development to be culturally responsive may require governments to make trade-offs when proposing and approving projects. Any such trade-offs must occur transparently as part of the business case and environmental impact statement processes, be based on community input, and not form an excessive barrier to infrastructure development. The reasons for any deviation from criteria included in the NWI should be published.

3.3 Cost sharing between users and governments

Funding and financing arrangements, including any government subsidies, should only be determined after the project has met all other criteria through the development of a business case.

The specific cost sharing arrangements will vary from project to project, but depend in part on upfront economic and financial assessments of economic and commercial viability, and the distribution of benefits and costs from the project.¹² The following should operate as high-level principles for cost sharing.

- Infrastructure investment that is both economically and commercially viable should be undertaken by the relevant water service provider, with full cost recovery from users and generally without government subsidy.
 - The role of government should be limited to project approval, such as environmental, social and cultural heritage impact assessments. Any government expenditure should be recouped from users, except in cases of substantial public benefits.

¹² Economic viability requires a benefit–cost ratio exceeding one, as determined by the business case. Commercial viability is determined by whether infrastructure users are willing (and able) to pay the full costs of infrastructure construction and maintenance — simply put, whether the benefits that accrue to infrastructure users are sufficient for them to fund the project without a subsidy, in which case a commercially-focused service provider would have incentive to develop the infrastructure.

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- Public benefits can include dam safety, flood mitigation and recreational use of dams, but does not extend to regional development or similar strategic investments. (Investment for these purposes is considered below.)
 - Governments should not fund public benefits that are incidental to the operation of the infrastructure, but should contribute where additional expenditure is necessary to realise that public benefit (such as a dam safety upgrade).
 - Major water infrastructure that is not economically viable should not proceed, except where necessary to provide a basic essential service.
 - Some small projects may not pass a strict benefit–cost test, but may be necessary to maintain an essential service in high-cost regional or remote areas. Transparency concerning any government funding is required, and water service provider planning should guide that process. (However, a transparent CSO is generally preferable to infrastructure expenditure; this is discussed in *SP G Regional*.)
 - Where governments choose to subsidise infrastructure in pursuit of a strategic objective, including in support of projects that are not commercially viable, additional scrutiny is required to maximise the effectiveness of that investment, while minimising the costs and risks to taxpayers (discussed below).

Full cost recovery from users should remain the norm

Some major infrastructure developments can provide both private and public benefits, and, consistent with the user-pays principle, the beneficiaries of the investment should bear the cost. For example, the National Farmers Federation (sub. 42, p. 29) suggested that:

Future approaches to water pricing should recognise that there are multiple benefits, including private and public, of water infrastructure that should be reflected in cost sharing arrangements.

The Commission considered this issue at length in its 2017 inquiry. While acknowledging that there are multiple benefits from major infrastructure, the mere existence of an incidental public benefit is not sufficient to justify government funding (PC 2017a, p. 271). Where public benefits are small or not genuinely additional (that is, would have been realised anyway), government funding is essentially a subsidy to commercial operations that undermines the user-pays principle and distorts private decisions. Further, partial funding requires complex assessments of contribution levels and the form of government assistance — a difficult design task that is (particularly) unlikely to be warranted for projects with small public benefits.

Where public benefits are substantial, widely shared and/or it is not cost-effective to recover relevant costs directly from the community, there may be a role for government to fund that part of the infrastructure required to deliver the additional benefits (PC 2017a, p. 272). As for other government infrastructure subsidies, this should occur as a transparent CSO payment to the infrastructure operator.

This, however, should remain the exception rather than the rule, and full cost recovery from users should remain the norm for all new or redeveloped major water infrastructure.

Government infrastructure funding in pursuit of strategic objectives

However, at times, governments choose to fund major water infrastructure in pursuit of broader strategic objectives. These may include:

- regional or industry development, such as enabling irrigated agriculture or job creation in a particular region
- ensuring access to an essential service, such as town water supply
- short-term stimulus in response to an economic shock.

Decisions to invest in pursuit of these strategic objectives are ultimately a matter for governments. But this should not provide a blank cheque to bypass project selection processes, including those that require governments to consider all options for achieving their objective.

Ultimately, governments should look to maximise their chance of successfully achieving their objectives, while minimising the costs and risks to taxpayers. As a principle, they should justify how water infrastructure is the most effective means of achieving that broader policy objective, compared with alternatives. This could be done by demonstrating strategic alignment with relevant long-term planning (as discussed as part of the project selection process above).

Major developments in pursuit of regional development require scrutiny

Decisions made by governments to invest in water infrastructure in pursuit of regional development require additional scrutiny, largely because previous efforts to spur economic development through major water infrastructure have imposed costs, but had mixed success (section 2). The key issues stem from:

- overly-optimistic estimates of demand for water and flow-on impacts of water infrastructure
- a failure to consider alternatives to water infrastructure in spurring regional growth
- a lack of facilitating arrangements in place to maximise the effectiveness of any investment in water infrastructure.

As discussed above, optimism bias in water infrastructure demand can be managed by enforcing pre-commitment on potential users. Further, having high-quality estimates for the employment and other socioeconomic impacts of the infrastructure (developed in a robust business case) will also reduce the scope for optimism bias, as will post-project assessments of how accurate those estimates were. This can contribute to more realistic estimates over time.

A further shortcoming is a propensity to view rural water infrastructure in isolation from other options to promote regional development. All public expenditure will create *some* degree of economic activity — but governments must direct their limited funds to projects that provide the greatest return for public investment over the long term. As highlighted by the Commission in 2017:

... the commitment of government to water infrastructure projects may preclude alternative investments in more effective projects to promote regional development. ... There is little evidence to suggest that the regional development benefits claimed to accrue from the construction of water infrastructure to support irrigated agriculture are greater than those that would accrue from alternative investments. (PC 2017a, p. 277)

The practical reality is that the evidence of job creation from regional infrastructure projects is often weak (PC 2017b, pp. 149–153). Job creation is often job diversion, and people may have many job opportunities at a given time — policy measures that encourage them to work in one job will often entail them giving up another opportunity. In the case of water, the Commission has previously found that few direct jobs are created from major water infrastructure developments (and often at a high cost; table 1).

Further, the success of water infrastructure in supporting regional development is often dependent on facilitating arrangements, such as transport infrastructure and supporting industries. These may not be in place — or considered in infrastructure proposals — and are often a more substantive barrier to regional development than the absence of water infrastructure.

To help address these shortcomings, governments should demonstrate that water infrastructure is likely to be the most effective way to facilitate economic development in an area, and ensure that they consider facilitating arrangements as part of a holistic strategy. As put by the Institute for Water Futures (sub. 30, p. 18):

... project proponents or state/territory government partners should be required to conduct a cost–benefit analysis for the use of Australian government funding for alternative regional growth programs in the specific location, including but not restricted to infrastructure construction.

At a minimum, governments should demonstrate that major water infrastructure forms part of an existing, comprehensive and public regional strategic plan, and that any necessary supporting infrastructure is (or will be) in place to maximise the benefits of the investment. This planning should inform the strategic case for a major water infrastructure investment — rather than an infrastructure commitment pre-empting the development of any strategy. As outlined in the Commission’s 2017 *Transitioning Regional Economies* study (PC 2017b, pp. 166–169), a high-quality regional strategy should:

- be led by the relevant State or Territory Government, and developed at a regional scale with input from local governments and the broader community
- identify the capabilities and attributes of the region
- identify priority actions and processes to facilitate regional economic development

-
- this work should consider multiple potential sources of local economic development (rather than focus only on water infrastructure).

As State and Territory Governments are responsible for regional development policy, they are best placed to determine the need for, and feasibility of, major water infrastructure development, and to align any such developments with regional priorities. Strategic frameworks that clearly outline and align infrastructure investment priorities, such as Queensland’s *Bulk Water Opportunities Statement*, provide a good basis for this type of decision making (box 6). Long-term planning of this nature is also consistent with Infrastructure Australia’s decision-making principles (box 5: principle 1).

Box 6 Queensland’s Bulk Water Opportunities Statement

The Queensland Government’s *Bulk Water Opportunities Statement Strategic Framework* outlines the state’s ‘framework for sustainable regional economic development through better use of existing bulk water infrastructure and effective investment in new infrastructure’ (p. 1). It specifies that Queensland’s investment priorities are based on:

- improving the safety and reliability of dams and urban water supplies
- using existing water resources more efficiently
- supporting commercially-viable infrastructure development by bulk water providers
- considering projects that will provide regional economic benefits.

The framework also outlines the Queensland Government’s principles for investment in bulk water supply infrastructure, which include that:

‘[p]rojects should align with the National Water Initiative principles, including appropriate cost recovery. If full cost recovery is not deemed feasible (including capital), any federal, state or local government subsidies should be transparent to the community’ (p. 6).

Source: DNRME (Qld) (2019).

In any case, Australian Government funding for major water infrastructure should not exceed the contribution of the relevant State or Territory Government. This helps ensure buy-in from the relevant government, supports consistency in priorities between levels of governments, and reflects the comparative advantage of State and Territory Governments in aligning any water infrastructure with local planning.

Investments made to deliver essential services must be transparent

As noted above, one justification used for public infrastructure funding is equity — the need to ensure a basic level of essential service in regional and remote communities. While the case for government involvement here is clearer, major water infrastructure is not always the most effective or least-cost instrument to ensure regional urban water security.

Any investment should provide a fit-for-purpose solution that aligns with the relevant service provider’s agreed levels of service, and does not burden smaller providers (or their users)

with significant ongoing maintenance or operational costs. An effective way to do this is to ensure projects align with local long-term planning by the relevant water service provider. For example, as put by the Local Government Association of Queensland (sub. 32, p. 8), ‘projects must demonstrate commitment to long-term water and wastewater service delivery planning, management, and maintenance for the region’. Government investment could be made contingent on an appropriate standard of planning being in place (these issues are considered in *SP G Regional*).

In particular, where investments are not economically viable, governments need to demonstrate (ideally through existing long-term infrastructure or water supply planning) that the investment in question is the most cost-effective option to deliver that essential service.

Major water infrastructure projects are not an effective form of economic stimulus

During major recessions (such as the one Australia has recently experienced), policies that stimulate demand and increase employment rates can provide economic benefits. Such circumstances usually suggest general macroeconomic policies (like reductions in interest rates) and/or the cautious encouragement of the highest-value short-run (‘shovel-ready’) investments to utilise excess labour. Policymakers should not favour particular locations and or infrastructure sectors — they should focus instead on maximising the effectiveness of the investment by targeting those regions and sectors most affected by an economic downturn, or where investment is likely to best support economic recovery.

Where infrastructure investments are adopted as a solution, the usual discipline of CBA should still apply so that there is an explicit awareness of the relative price of job creation for a range of alternative investment proposals. As noted by the Queensland Productivity Commission (QPC) (2020, p. 23):

... infrastructure projects that meet a genuine economic need aid economic recovery and create employment. They can provide an opportunity to improve productivity, social outcomes and future resilience ... This means that robust project selection during crises is essential to promoting ... long-run economic growth and resilience.

The QPC also proposed a set of criteria for ensuring that crisis infrastructure spending will aid recovery, which emphasise the need for infrastructure to address the specific problems emerging during any economic crisis, rather than stimulating industries unaffected by the economic shock (QPC 2020, p. 24). Their criteria point to the need for a clear net benefit from any project, including social benefits (such as improving equity in access to public services) and improved resilience to natural disasters and climate change. Similar principles were developed by Infrastructure Australia (alongside State and Territory infrastructure bodies), which also emphasise the need for intervention to be targeted, and for projects to deliver lasting benefits (IA 2020a).

Considering the long timeframe and large scale of major water infrastructure developments, these investments do not fit the criteria for an effective stimulus response. Many are not ‘shovel-ready’, and do not target the employment sectors or regions most affected by the

recent recession. Further, the long-term ongoing costs of maintaining and replacing major water infrastructure means that a hasty decision made on a major development can create an ongoing impost on users and/or taxpayers if that infrastructure proves to be unviable.

3.4 Water allocation

Where a major project creates additional water rights, State and Territory Governments must decide how those rights are assigned between different users.

The NWI suggests that market-based mechanisms should be used ‘to the extent practicable’, although acknowledges that allocations are a decision for State and Territory Governments.¹³ This remains sound as an approach: market-based approaches encourage efficiency in water use. And market-based mechanisms include the pre-sale of entitlements prior to construction, which has a range of other benefits (such as helping to address optimism bias, discussed above).

However, State and Territory Governments may also choose to allocate some entitlements to particular sectors, including urban providers or Traditional Owners. Although not a market-based approach, this is not necessarily inconsistent with allocating water on the basis of efficiency. As discussed above, governments should consider providing water entitlements to Traditional Owners in less developed systems, including where this contributes to meeting commitments under the National Agreement on Closing the Gap, and closely engage with relevant Traditional Owners in these decisions.

In allocating water from a new development, State and Territory Governments should be transparent on the reasons for their choices.

3.5 Institutional arrangements

Government investment in major water infrastructure often falls outside of the usual institutional arrangements (that is, decisions made by water service providers). Clearer institutional roles and responsibilities for governments should underpin an agreed assessment and selection process (discussed above) to coordinate any government investment. This ensures that risks are identified and managed, accountability is clearly allocated and decisions are made on the basis of the best available information.

State and Territory Governments have primary responsibility for major water infrastructure

State and Territory Governments have primary responsibility for overseeing major water infrastructure developments in their jurisdictions, and for undertaking the approval processes

¹³ NWI paragraphs 70–72.

discussed above. If and when governments invest in major water infrastructure, the State or Territory government should likewise be responsible for assessing and selecting projects. This corresponds with their ownership of bulk water service providers (in many cases), as well as their responsibilities for water resource management, infrastructure development, regional development (as noted above) and most stages of project approval (such as requiring environmental impact assessments).¹⁴

Clear roles and responsibilities concerning infrastructure decisions and cost-sharing arrangements between State and Territory Governments, State-owned service providers and economic regulators are also necessary, consistent with the principle of institutional separation under the NWI (*Report*: chapter 11).

The Australian Government should have limited involvement in project selection

The Commission does not see a national interest argument that justifies a general or ongoing role for the Australian Government in water infrastructure decision making — particularly, with regional development under the purview of State and Territory Governments. An exception may be in shared systems, where the benefits of infrastructure are divided across multiple jurisdictions. And agencies funded by the Australian Government (for example, BOM and CSIRO) can have a role in providing credible information on climate change and water resource availability (SP E *Integrity*).

There are some in-principle arguments for Australian Government funding of some major infrastructure, as Australian Government taxation is generally more efficient than State government revenue raising (PC 2014, p. 286). Any Australian Government funding should only be provided on a case-by-case basis where it aligns to nationally-significant priorities (identified by Infrastructure Australia or a similar independent body), or where State and Territory prioritisation processes identify and select major projects with significant public benefits that accrue outside of that jurisdiction.

Such funding, if warranted, should be sector-blind; that is, Australian Government investment in worthwhile projects should not be limited to providing water for agriculture if there are material net benefits in investing in other sectors, such as in regional urban water projects. Projects that provide water for urban needs, without an irrigated agriculture component, are currently ineligible for funding under the NWGA's *Investment Policy Framework*. This limitation should be removed.

¹⁴ The Australian Government has some responsibilities for major developments under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth), although the Australian Government is negotiating 'approval bilateral agreements' with State and Territory Governments to allow them to make approvals over certain matters of national environmental significance (DAWE 2021).

RECOMMENDATION 14.1: BROADEN THE REMIT OF THE NWGA'S INVESTMENT POLICY

Australian Government investment in major water infrastructure, where it occurs, should neither prioritise a particular sector or class of water user, nor be limited to providing water for primary industry. The National Water Grid Authority should broaden its *Investment Policy Framework* to allow funding for all projects where government involvement may be warranted, including supporting access to essential town water supplies in regional and remote communities.

An independent body should scrutinise significant business cases

Because of the nature of the NWI, it would be impractical for a renewed Agreement to specify a standard of CBA for major water investments. An alternative model to ensure the quality of proposals is to require a qualified independent institution to review the business cases for major water projects and confirm that the analyses are rigorous (or otherwise).

This already occurs for Australian Government investments, where all water infrastructure proposals requesting more than \$250 million of Australian Government funding are evaluated by Infrastructure Australia (box 1). Four projects have been reviewed since 2015,¹⁵ although a number of projects meeting that threshold are yet to be reviewed. Further, the increase in the review threshold from \$100 million to \$250 million will reduce the number of major water projects that are subject to independent scrutiny.

In September 2020, the Australian Government announced the establishment of an independent National Water Grid Advisory Body (McCormack 2020a). The body's charter, published in January 2021, specifies its key roles as being to provide independent expert advice to the Government, on request of the Deputy Prime Minister, and to build public understanding and awareness of NWGA investments (NWGA 2021b, p. 2).

Transparency will be essential to provide public assurance that the Body's advice is genuinely independent of the NWGA and places proper scrutiny on project assessments — particularly in light of the reduced scope of Infrastructure Australia project evaluations.

To ensure business case oversight is (and is seen to be) independent and rigorous, reviewing bodies should make public their reasons for supporting a proposal, rather than just stating support for them. And independent scrutiny should not preclude a requirement (discussed above) to publish feasibility studies and business cases for major projects as a matter of course.

¹⁵ Tasmanian Irrigation Tranche Two (Tas), Myalup-Wellington Water Project (WA), Lower Fitzroy River Infrastructure Project (Rookwood Weir) (Qld) and Haughton Pipeline Project Stage 2 (Qld) (IA 2015, 2017, 2018c, 2020b).

4 NWI renewal

To help minimise the costs of poor infrastructure investments, and to maximise the outcomes of investments that do take place, a renewed NWI should include an element dedicated to new major water infrastructure.

In the first instance, the current high-level requirements for investment in new or refurbished infrastructure are sound and should be retained as guidance for all investment. However, they should be expanded to include an additional requirement that infrastructure development processes are culturally responsive to the interests of Traditional Owners. Jurisdictions should agree to criteria to demonstrate how major investments adhere to those requirements (regardless of who the proponent is) — ensuring that the criteria for demonstrating ‘culturally responsive infrastructure development’ are developed as part of the co-design process for a new element on Aboriginal and Torres Strait Islander people’s water access (SP D *Cultural access*).

The element should also establish an agreed framework to guide government investment in major developments, where it occurs. This framework is not intended to replace the NWGA’s *Investment Policy Framework*, but instead to ensure consistent principles are agreed to by all parties to a renewed NWI, including where the Australian Government is not an investor. Doing so would also enable transparency and accountability in how the framework is implemented by all governments, including through independent review of implementation of the agreement.

NWI RENEWAL ADVICE 14.1: A NEW WATER INFRASTRUCTURE ELEMENT

In renegotiating the National Water Initiative, jurisdictions should develop an element to guide investment in water infrastructure.

The new element should restate the high-level requirements for all infrastructure to be assessed as economically viable and ecologically sustainable prior to the commitment of funding, with cost recovery from users as the norm, and add a further requirement that infrastructure development processes are culturally responsive to the interests of Traditional Owners.

The new element should also include:

- an agreed framework to guide government investment in major water infrastructure, incorporating project selection and assessment processes and clear roles and responsibilities for governments and service providers
- principles for cost sharing (including government subsidies) and allocating water from new developments.

As part of this element, jurisdictions should agree to specific criteria for *how* adherence to the NWI requirements should be demonstrated for major projects, including:

- conditions for ensuring ecologically sustainable, economically viable and culturally responsive infrastructure development
- principles for cost sharing (including any government funding) and water allocation.

Further, the framework should clarify the conditions for where governments subsidise major water infrastructure in pursuit of a strategic objective (such as regional or industry development). The aim should be to ensure that any such investments are likely to be effective in their goal, while minimising the risks and costs of uneconomic investments on users and taxpayers.

NWI RENEWAL ADVICE 14.2: ASSESSMENT CRITERIA FOR WATER INFRASTRUCTURE

As part of the new infrastructure element, jurisdictions should agree to criteria on how major projects can demonstrate adherence with the NWI requirements for infrastructure.

Economic viability should be demonstrated by a positive benefit–cost ratio determined through a transparent and rigorous cost–benefit assessment, with:

- an assessment of a range of options, including non-infrastructure options where these can meet the investment objective, and selection based on the highest (positive) expected net benefit
- transparency supported by publication of business cases as a matter of course (except where commercially-sensitive data limits publication, in which case the business case should be reviewed by a qualified independent body)
- use of entitlement pre-sale to limit optimism bias
- robust estimates of social and distributional impacts.

Ecological sustainability should be demonstrated through environmental and social impact approvals, and compliance with a high-quality and NWI-consistent water plan that:

- establishes the environmental water provisions necessary to meet agreed environmental outcomes under a changing climate
- sets out the social, economic and cultural outcomes sought from the water plan
- clearly defines the expected reliability of water rights, taking into account the likely impacts of climate change
- is developed with robust community engagement to reflect community values.

(continued next page)

NWI RENEWAL ADVICE 14.2: ASSESSMENT CRITERIA FOR WATER INFRASTRUCTURE (continued)

Criteria for culturally responsive infrastructure development should be determined through the co-design process led by the national Committee on Aboriginal Water Interests. At a minimum, culturally responsive infrastructure processes would:

- incorporate deep engagement with the Traditional Owners of affected areas (both at the infrastructure site and downstream) as part of business case development
- comprehensively identify and manage impacts on cultural heritage in affected areas.

Costs should be recovered from users as the norm, with any government funding provided through a transparent subsidy. This should be limited to situations where:

- substantial public benefits associated with water infrastructure impose additional costs that are best borne by governments
- an equity argument exists (for example, to support access to an essential service in high-cost regional town water systems where the cost of supplying a basic level of services is considered unaffordable).

Governments should not subsidise major water infrastructure for strategic objectives, such as regional development, without first demonstrating that the project is the most effective means of addressing that objective. This requires alignment with broader high-quality and long-term strategic regional planning processes.

Jurisdictions should maintain the principle supporting use of market mechanisms for allocating water, although they should consider allocating a share of new entitlements in undeveloped systems to Traditional Owners.

In renegotiating the NWI, jurisdictions should agree to clear institutional roles and responsibilities to coordinate any government investment, if and when it occurs.

NWI RENEWAL ADVICE 14.3: INSTITUTIONAL ARRANGEMENTS

A new water infrastructure element should clarify relevant institutional roles and responsibilities underpinning government investment in major water infrastructure, if and when it occurs.

- State and Territory Governments should have primary responsibility for proposing (and overseeing) government involvement in major water infrastructure developments in their jurisdictions.
- Any Australian Government funding should not exceed the contribution of the relevant State or Territory Government.
- Independent infrastructure advisory bodies should transparently review the business cases of major projects.

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Australian Government
Productivity Commission

Community engagement

Supporting Paper J

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

- SP A Water entitlements and planning (*Entitlements and planning*)
- SP B Water trading and markets (*Trading*)
- SP C Environmental management (*Environment*)
- SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)
- SP E Ensuring the integrity of water resource management (*Integrity*)
- SP F Urban water services (*Urban*)
- SP G Urban water services: regional and remote communities (*Regional*)
- SP H Water reform in rural Australia (*Rural*)
- SP I Government investment in major water infrastructure (*Infrastructure*)
- SP J Community engagement (*Engagement*)**
- SP K Knowledge, capacity and capability building (*Knowledge*)

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Key points

- Effective, thorough, well-informed community engagement is needed to support reform in all aspects of water resource management and water services provision.
- The National Water Initiative (NWI) commits Australian governments to ensuring that community engagement happens, but provides little guidance on how they should go about it.
- Significant evolution has been observed since the NWI was agreed in 2004 in:
 - community engagement principles and practices
 - community expectations as to how, when and for what matters they should be consulted by their governments.
- Practice has improved since 2004, however its quality remains inconsistent.
- In redesigning the Community Partnership element of the NWI, Australian governments should consider developing an organising framework based on the following objectives:
 - continuously improving and sustaining government engagement effort across all aspects of water resource management and service provision
 - coordinating engagement actions between all levels of government, particularly in multi-jurisdictional activities
 - ensuring that engagement effort and resourcing is fit for purpose, taking into account the scale of the proposed change or reform, its sensitivities and its impacts
 - ensuring that governments are clear about the purpose of their engagement and the role of communities in decision making
 - ensuring that all stakeholders have the opportunity to meaningfully input to the engagement process, and are proactively encouraged to do so
 - improving the effectiveness of community engagement through enhancing:
 - ... water information accessibility and comprehensibility (SP E *Integrity*)
 - ... community water literacy (SP E *Integrity*)
- Characteristics of effective community engagement include inclusiveness, timeliness, partnership, respect, access to information, transparency, responsiveness and continuous improvement. These represent a foundation for guidance on best practice in a renewed NWI.

Community engagement is an important foundation for successful water reform. With renewal of the National Water Initiative (NWI) pending, it is timely to assess whether current NWI settings for the conduct of community engagement are fit for purpose. Recent Murray–Darling Basin (MDB) experience contains important lessons for national policy in this regard, and recent government responses to this experience also offer insights on best practice.

This paper sets out the Commission’s views on:

- the uses and benefits of effective engagement practice, and the outcomes sought through the NWI (section 1)
- recent performance and key issues for governments to address (section 2)
- the characteristics of effective engagement practice (section 3)
- a best-practice approach to support effective engagement practice within a renewed NWI (section 4).

1 Effective community engagement matters

Water reform can be contentious. At its heart, there will be ‘a series of trade-off decisions, all with real-life implications for individuals, water users, industries, communities, their local environments and their regional economies’ (Doolan 2016, p. 18).

Effective engagement plays a crucial role in ensuring that all stakeholders understand why decisions have been taken (even if they do not agree with the outcomes), and that their views are seriously considered. As the National Farmers’ Federation (NFF) reflected:

Genuine and meaningful consultation processes are required to address complex, interdependent and often contentious water reform processes. The trade-off of poor consultation is often the erosion of trust and confidence from communities which has long-term implications for achieving further reform processes. (sub. 42, p. 7)

Effective engagement practice enables:

- differing community views to be heard and understood
- facts and evidence to be disseminated to all participants
- innovative local solutions and preferred options to be explored
- a shared understanding of management options and their benefits and costs to evolve
- buy-in of parties to the recommended solution
- longevity for that solution, to which all parties have contributed (Doolan 2016, p. 16).

Australian governments have successfully implemented a wide range of water reform initiatives over the past half century. Community engagement mechanisms that enabled informed and transparent community participation in these reform processes have been essential to these successes. Future conduct of water reform in Australia will rely heavily on Australian governments sustaining their efforts to effectively engage communities within structured processes.

The Community Partnerships subsection of the NWI (box 1) commits Australian governments to engage water users and other stakeholders in achieving its objectives through consultation and information provision. However, there is little guidance on how they should go about this task.

Whilst the intended NWI outcome remains relevant, its associated actions have arguably become dated and no longer fully fit for purpose. These actions have a very specific focus on issues relating to overallocation, water planning, entitlement security and water use sustainability. These aspects were key reform priorities in 2004; however, with the passage of time, the range and nature of water management reform priorities has broadened considerably, such that community engagement is now highly relevant to all aspects of water resource management and to water service provision.

Box 1 **Governments committed to engagement with all stakeholders through consultation and information provision**

Parties to the National Water Initiative agreed that the outcome of the community partnership subsection of the agreement is to:

... engage water users and other stakeholders in achieving the objectives of this Agreement by:

- i) improving certainty and building confidence in reform processes;
- ii) transparency in decision making; and
- iii) ensuring sound information is available to all sectors at key decision points.

And that governments would undertake actions to:

... ensure open and timely consultation with all stakeholders in relation to:

- i) pathways for returning overdrawn surface and groundwater systems to environmentally sustainable extraction levels ... ;
- ii) the periodic review of *water plans* ... ; and
- iii) other significant decisions that may affect the security of *water access entitlements* or the sustainability of water use.

And also, would:

... provide accurate and timely information to all relevant stakeholders regarding:

- i) progress with the implementation of water plans, including the achievement of objectives and likely future trends regarding the size of the consumptive pool; and
- ii) other issues relevant to the security of water access entitlements and the sustainability of water use, including the science underpinning the identification and implementation of environmental and other public benefit outcomes.

Source: NWI paragraphs 93, 95 and 96.

2 **The NWI has facilitated improved engagement practice**

Looking back on the NWI journey since 2004, there has been significant evolution in community engagement best practice. The narrow scope of the current NWI provisions has not constrained governments and water agencies from innovating or experimenting with their approaches to community engagement.

What can be observed is a growth in effort towards, and discipline in the conduct of, consultation and engagement efforts. In many cases, this has been driven by a failed approach in the first instance, that encouraged the search for alternatives and a willingness to try these out. Over recent years, the Murray-Darling Basin Plan (Basin Plan), particularly in New South Wales, offers good examples in this regard.

This process of evolution by circumstance has been encouraged along the way by ongoing development of conceptual best-practice community engagement frameworks. A good example of this being the evolution of the International Association for Public Participation's spectrum (IAP2). There has also been regular updating of best-practice guidance from

international organisations such as the OECD, as well as Australian Government agencies such as the former Murray-Darling Basin Commission, the Murray-Darling Basin Authority (MDBA) and the Office of Best Practice Regulation.

Prior to 2017, the former National Water Commission (NWC) made a number of observations on the evolution of community engagement best practice. For instance, in its 2014 assessment of NWI progress, the NWC commented that:

Water reform has also supported people and communities. Consultation requirements for the development of water planning arrangements have now been incorporated into state and territory legislation or policies, and applied in practice in most cases. (NWC 2014, p. 83)

The NWC further noted that:

In the urban context, the capacity for customers to provide input to service preferences and pricing structures has been improved, although it has a way to go; and that while evidence suggests that the urban sector is in the early stages of the implementation of customer choice options, there is still significant scope to improve the degree to which customers are able to influence customer service offerings, pricing outcomes, setting of strategic objectives and ensuring customer protection arrangements are in place. (NWC 2014, p. 124)

In its 2017 assessment of NWI progress, the Productivity Commission found that jurisdictions were largely meeting their commitments. Specifically, the Commission noted that:

... State and Territory Governments had delivered improved decision making through open and timely consultation with stakeholders on water planning. This had been supported by the publication of relevant supporting information for consultation at key decision points.

State and Territory Governments had taken steps to document the outcomes from water plans and whether plan objectives had been achieved. (PC 2017, p. 484)

Since 2017, jurisdictions have continued to largely meet their NWI commitments (*Assessment*) with respect to consultation. That said, some inquiry participants have raised instances of poor consultation practice (box 2) in New South Wales and in the MDB. An overall synthesis of MDB concerns is captured in Sefton et al:

Across the [Murray-Darling] Basin trust in governments — particularly federal and state — to deliver good long-term policy and support rural and regional communities has been severely diminished. This fall in trust has resulted from a failure to adequately include people in conversations about government policy and their future, especially those who have not been on the upside of change. (2020, p. 1)

Box 2 Evidence on engagement practice is mixed

Inquiry participants and the Commission identified instances of inadequate and ineffective engagement processes over the past three years, generally within the NSW portion of the Murray–Darling Basin (MDB).

Review of NSW Water Sharing Plans

The Commission was advised by the office of the Interim Inspector-General of MDB Water Resources of a significant number of complaints regarding the NSW Department of Planning, Industry and Environment's consultation process in developing the next iteration of NSW Water Sharing Plans (Interim Inspector-General of MDB Water Resources, pers. comm, 30 June 2020). This position has also been confirmed by other inquiry participants.

Government processes have failed to sufficiently consult with, engage and/or empower community members and stakeholders to contribute to and participate in water reform. This has resulted in a significant erosion of trust and confidence in water reform decisions and processes. The recent NSW water sharing plan review process is a good example of this. This can be contrasted with the previous Land and Water Management Plan program, which are often described as the leading example of effective community water reform process and decision making. Nevertheless, a commitment by all governments to improved community engagement in water reform is required. (SunRice and RGA, sub. 82, p. 3)

NSW Water Rural Water Infrastructure engagement

The Murray Valley Private Diverters expressed a view that:

A combined MDBA/Water NSW 20-year Infrastructure Options Plan is a good example of poor processes and failure to acknowledge the need for collaboration and involvement in early planning for stakeholder involvement and consultation ... Consultation was subsequently described by NSW Government – Water NSW as being comprehensive, yet stakeholder feedback was limited to one meeting with little or no details provided. (sub. 101, pp. 22–23)

In response, the NSW Government advised that:

WaterNSW undertook 101 meetings with customers and stakeholders through the three iterations of the 20-year Infrastructure Options Plan project (2016 to 2019). (sub. DR138, p. 13)

The Commission notes that WaterNSW did not confirm how many of its 101 meetings involved the Murray Valley Private Diverters group.

Environmental Watering

In its submission, the Murray Lower Darling Rivers Indigenous Nations noted that:

There is still a strong need for the [Commonwealth Environmental Water Office] to develop a more transparent and structured engagement approach so that all Nations are informed of options to participate and influence planning. (sub. 105, p. 6)

Aboriginal and Torres Strait Islander people's engagement

The NSW Aboriginal Land Council stated that 'there are limited opportunities for Aboriginal people to influence water management' (sub. 96, p. 2). The Council similarly observed in a submission to the Commission's 2018 assessment of the Basin Plan that land councils in NSW had not been properly engaged in processes to develop water resource plans, and that engagement generally occurred 'at very short notice and not on the basis of free, prior and informed consent' (PC 2018, pp. 207–8).

(continued next page)

Box 2 (continued)

The Murray Lower Darling Rivers Indigenous Nations said that:

There remains urgent concerns and deep suspicion regarding the development of [MDB] Supply Measure infrastructure projects. Current engagement and planning processes are grossly inadequate to address these concerns. ...

In NSW a series of new dam projects has highlighted deficiencies in First Nations consultation. Despite an announcement that pre-construction works on the Wyangala Dam wall-raising project will commence in October 2020, the NSW Government has not undertaken any meaningful consultation with Wiradjuri and other First Nations. (sub. 105, p. 12).

The Northern Land Council said that:

In the NT over recent years, we have seen the continued erosion of the ability for community and stakeholders to be involved in water management decisions made by government which affect their rights and interests. (sub. DR134, p. 6)

In addition, the Council also expressed the view that:

As highlighted in Part A of this submission, community engagement arrangements associated with water planning, licensing and management in the NT need to be significantly improved. (sub. DR134, p. 29)

Of particular note in this regard, the Council advised that:

Based on information available through the water advisory committee minutes online, in 2017 there were a total of 80 people appointed to water advisory committees. As at 1 March 2021 there are 12.

As there are no other formal mechanisms for the NT Government to involve community and stakeholders in water allocation planning, the substantial diminishing of water advisory committees since 2017 is of concern to the NLC. (sub,DR134, pp. 13-14)

Inquiry participants and the Commission also identified instances of innovative engagement practice — in the areas of water resource management and service provision.

- Sydney Water and Hunter Water, as part of preparing their most recent pricing submissions to the NSW Independent Pricing and Regulatory Tribunal, used willingness-to-pay research to inform benefit-cost analysis of service options, supported by subsequent validation of survey findings at deliberative forums (Gillespie Economics 2020; The CIE 2020).
- Yarra Valley Water, as part of preparing its 2018–2023 pricing submission to the Victorian Essential Services Commission (ESC), used a Citizens Jury to help the organisation to understand and describe the services and outcomes that its customers expect (YVW 2017).
- The ESC implemented the PREMO water pricing framework on 1 July 2018 to encourage Victorian water businesses to deliver better value to their customers through the PREMO incentive mechanism, which focuses on five elements: performance, risk, engagement, management and outcomes. An independent performance review of PREMO released by the ESC in March 2019 found that it was successful in giving stronger emphasis to customer engagement, leading to price submissions that better reflected customer views (ESC 2019).
- The then Queensland Department of Natural Resources, Mines and Energy (now the Department of Regional Development, Manufacturing and Water) continued to operate its standing Water Engagement Forum across this period, which has enabled the Department to maintain regular monthly contact with its major stakeholders with a policy interest in water resource management and water service provision matters.

As a case study of contentious water reform, implementation of the Basin Plan illustrates very clearly the consequences of poorly executed community engagement. Despite many

engagement efforts, there are significant sections of the MDB community who remain highly dissatisfied with aspects of the Basin Plan.

This sentiment was reflected by a number of inquiry participants. For instance, Southern Riverina Irrigators expressed a view that:

Water management in the Murray-Darling Basin is in absolute disarray as a result of consecutive governments not fully implementing the now largely mandated NWI 2004. (sub. 77, p. 2)

The Victorian Farmers Federation also commented that:

Farmers remain confused about the inconsistencies in the NWI and conflicting policies in the National Water Initiative and the Commonwealth Water Act/Basin Plan Act. (sub. 99, p. 4)

And the MDBA (sub. 23, p. 12) added that:

despite recent commitments by government to improve transparency and information sharing, stakeholder consultation continues to find that the needs of water users, communities and the broader public [in the MDB] are not being met.

This offers lessons for NWI renewal in particular highlighting the importance of clearer guidance on what would constitute contemporary best practice in this field.

Improvements in practice are needed. Apart from evidence of a need to address recent failings, communities increasingly expect to be actively engaged by governments when reform proposals are presented for their consideration. As the Victorian Water Industry Association observed:

Communities must be more deeply involved in setting the overall direction for water resource management, which subsequently influences the choice and adoption of such policy instruments. (sub. 66, p. 1)

To improve the conduct of engagement practice, there are a number of issues for Australian governments to address.

2.1 Engagement processes are not always sufficient or effective

The Commission has heard a range of views on the sufficiency and effectiveness of community engagement processes conducted by some Australian governments during the past three years on water matters, particularly some of those conducted within the MDB. These, in turn, offer important learnings for national policy guidance in this field.

Engagement practice for MDB water matters was a particular focus for criticism from some inquiry participants. For instance, the Interim Inspector-General of MDB Water Resources found that:

Many of the concerns that the inquiry heard *might have been redundant if individuals were able to readily see and understand the way available water has been shared over time.* (2020, p. 14) [emphasis added]

The Environmental Defenders Office also commented that:

... many clients tell us that they do not think that they are able to influence outcomes through consultation processes (as they perceive outcomes as being largely pre-determined). Put differently, for many people the process itself lacks legitimacy which in turn means that they are suspicious of, and unwilling to accept, outcomes. (sub. 54, p. 20)

The Australian Water Association noted that:

... the conduct of community partnership and engagement practice can be made more effective by enabling community input into water governance arrangements and enhancing the level of communication with community representatives. This gives a community greater confidence in the sustainable management of water resources. And stronger communications and near real-time reporting of information to community members enhances their level of trust. (sub. 89, p. 11)

Drawing from these comments, dissatisfaction about engagement practice will usually arise when:

- all impacted stakeholders are not heard, or when they are, they do not hear back anything in the discussion that indicates that they have been heard
- stakeholders could not understand why decisions were taken in the way that they were.

Differing stakeholders and issues may warrant different engagement approaches. Water users may have different needs from other stakeholders. The needs of rural and urban communities might likewise be different. Approaches to engaging during water planning might need to be different from those adopted in determining community preferences for water services provision. Governments need to ensure that their engagement efforts are fit for purpose, taking into account the scale of proposed change or reform, its sensitivities and its impacts. They also need to ensure that all stakeholders are provided with a real opportunity to meaningfully participate in the engagement process, and are proactively encouraged to do so.

2.2 Community engagement lacks constancy

While discrete, issue-based consultation is suitable for some water matters, many of the water management challenges now facing communities require ongoing engagement. A more effective approach in such instances would be a genuine and meaningful ongoing conversation with communities, particularly those seen to be at highest risk of rapid and significant impact from these challenges. Enduring and effective ongoing engagement will be particularly important for Traditional Owners.

As an example of this approach being put into action, the Commission notes that the MDBA has started to regionalise a presence across the MDB. While time will be needed to assess

the full benefit of this initiative, such proximity may allow more regular contact and conversation to occur. As the MDBA recognised in its submission:

... audiences and stakeholder needs change both spatially and temporally in response to complex, interacting factors such as market forces, urbanisation, drought and water reform progress. Governments need to recognise this and continually evolve their approaches to meet the changing needs of stakeholders. (sub. 23, p. 12)

Reflecting this, the NFF observed that:

While significant progress has been made in jurisdictions to improve consultation processes, many elements of the Basin Plan are complex, interdependent and contentious (particularly the implementation of the supply measures) and require committed and extensive consultation with communities, and other relevant stakeholders, over a reasonable timeframe. (sub. 42, p. 17)

The message for governments and NWI renewal is that conduct of genuine and meaningful engagement with communities on water management matters (particularly in any future rebalancing processes) should be more frequent; in effect, shifting from a case-by-case approach to one of ongoing business as usual. Greater frequency in engagement also needs to be supported by better coordination of these efforts between all levels of government including local government (LGNSW, sub. DR140, pp. 4,9), and particularly in multi-jurisdictional activities (as observed above by the NFF with respect to the Basin Plan).

Recognising the value of continuity in engagement practice in a renewed NWI will, as the Water Services Association of Australia observed, help to:

... provide a transparent approach for Australians to engage on how water is managed, the effectiveness of the various institutions, and to a certain extent de-politicise direction setting and decision making by enabling customer and community views to be the lead voice. (sub. 88, p. 52)

2.3 Engagement is more effective where there is an informed community but there is a lack of consistent access to accurate and comprehensible water information

Since 2017, the Commission has observed evidence of growing public mistrust and a lack of confidence in aspects of Australian water management practice, particularly in the MDB (SP E *Integrity*). This is reflected in on-going concern from MDB stakeholders and communities about: a perceived lack of available water information; poor communication of water information that is available; difficulties faced by stakeholders in accessing and navigating public water data collections; and a perception of recent poor partnership and engagement performance across the MDB.

While Australian governments publish a wide range of water information products for use by different customer groups, these products can be difficult to access, navigate and understand. Again, recent MDB experience offers important lessons to all Australian governments in resetting NWI policy guidance on information provision. For instance, the Interim Inspector-General of MDB Water Resources found that the MDBA's management

of the River Murray system was not well understood by the community, and its processes and outcomes were not clearly set out in an easily accessible and readily available format (IIGMDB 2020, p. 29).

Where governments have information, they should endeavour to make it consistently available to water users and other water sector participants in:

- a public, and easily accessible manner
- as timely a manner as possible
- a form that is comprehensible, yet understandable and cost-effective without diminishing its accuracy.

In working towards this outcome, the MDBA (sub. 23, p. 12) has suggested shifting focus from providing more information about ‘what Governments are doing’ to providing better information addressing ‘what water users need’ to navigate the system, run their businesses and have confidence in management arrangements. A shift of this type would work towards creating an effective operating environment in which water users and communities have information that is accessible, understandable, timely, relevant and credible.

Water users and the broader community would benefit from having a greater understanding of water system management (SP E *Integrity*). In this vein, the Victorian Water Industry Association observed that:

The new NWI will have great effect if it enables and empowers a new community-values narrative for water reform ... Resilient decision-making requires communities to understand the water management risks and challenges so as to choose a collective destiny and a productive legacy. (sub. 66, p. 4)

To facilitate this, Australian governments should update the NWI’s Community Partnership actions relating to information provision to include principles covering relevance to water sector participants’ needs, public accessibility, accuracy and comprehensibility, timeliness and cost effectiveness. This will assist in creating an informed community who will be better able to engage in some of the potentially difficult water management decisions in the future. Having well-informed participation by all parties in the engagement processes leading up to such decisions will be crucial in achieving a broadly accepted and enduring agreement on the appropriate step(s) to be taken in responding to the particular water management challenge in question.

2.4 Engagement with Aboriginal and Torres Strait Islander communities

Principles specifically for future engagement with Aboriginal and Torres Strait Islander people on water matters should be developed by the newly created national Committee on Aboriginal Water Interests. Effective engagement of Traditional Owners in key areas, including water planning, natural resource management and environmental water planning,

will need long-term relationships with local agencies working on Country. This is likely to require the provision of government funding support.

3 Embedding effective practice in a renewed NWI

As previously stated, recent MDB experiences offer lessons for NWI renewal. Foremost among these is the potential value of including a principles-based framework within the NWI to provide guidance on how to conduct effective engagement practice on water matters. As the NFF (sub. 42, p. 7) observed, ‘more can be done by governments to clarify the principles of effective consultation processes in the NWI’. These principles should be based on the characteristics of effective engagement practice.

3.1 Developing a principles-based framework for effective practice

Engagement practice is an area not short on advice about what constitutes ‘best practice’. There are many guidelines and leading-practice examples of community engagement. For instance, the Australian Government’s Best Practice Consultation guidance note issued by the Office of Best Practice Regulation suggests that policy makers should consult:

... in a genuine and timely way with affected businesses, community organisations and individuals; and with each other to avoid creating cumulative or overlapping regulatory burdens. (OBPR 2016, p. 1)

The same guidance note also suggests that consultation processes should be: continuous, broad-based, accessible, not burdensome, transparent, consistent and flexible, subject to evaluation and review, not rushed and not a means to an end (OBPR 2016).

Bassler et al. (2008) emphasised the following features of effective engagement: inclusivity, diversity, equality, transparency, legitimacy, deliberation, substance, influence, ongoing and accommodating.

Other leading practice examples include guidelines from:

- Australian Government agencies and the then Council of Australian Governments (COAG) (Australian Government 2016; COAG Energy Council 2016; MCMPIR 2005)
- State and Territory Government departments (for example, NSW DPE 2017; NT EPA 2020; Vic DJPR 2019)
- international organisations, such as the OECD (OECD 2017a; OECD 2017b), the International Association for Public Participation (IAP2 2014), the US Environmental Protection Agency (US EPA 2008) and the National Coalition for Dialogue and Deliberation (NCDD 2009).

No description of best practice is markedly superior to the others. They cover similar ground, suggesting to the Commission that the characteristics of inclusiveness, timeliness, partnership,

respect, access to information, transparency, responsiveness and continuous improvement should be used by Australian governments as the building blocks for national guidance on effective community engagement and information provision practice in water resource management and water service provision.

Frameworks are a useful tool for crafting a principles-based approach to the conduct of community engagement and information provision practice. A commonly cited engagement framework is the IAP2 public participation spectrum, which posits that effective engagement:

- enables those affected by a decision to be involved in the decision-making process
- promises that the public's contribution will influence the decision
- recognises and communicates the needs and interests of all participants
- seeks out and facilitates the involvement of those potentially affected by, or interested in, a decision
- seeks input from participants in designing how they participate
- provides participants with the information they need to participate meaningfully
- enables participants to see how their input affected the decision (International Association for Public Participation 2019a).

Using the IAP2 spectrum would enable governments to adopt a fit-for-purpose approach to designing engagement processes taking into account, the goals, timeframes, resources and levels of impact of the decision to be made (figure 1). In addition, governments must be honest and transparent with communities about the purpose of their consultation and their role in that instance of decision making, and ensure that all stakeholders are provided with a real opportunity to meaningfully participate in the engagement process, and are proactively encouraged to do so.

Drawing on the above, the Commission considers that a useful starting point for Australian governments in redesigning the community partnership element of the NWI would be to develop an organising framework based around objectives of:

- continuously improving and sustaining government engagement effort across all aspects of water resource management and water service provision
- coordinating engagement actions between all levels of government, particularly in multi-jurisdictional activities
- ensuring that engagement effort and its resourcing are fit for purpose taking into account the scale of proposed change or reform, its sensitivities and its impacts
- ensuring that governments are clear about purpose of their engagement and the role of communities in decision making
- ensuring that all stakeholders have the opportunity to meaningfully input to the engagement process, and are proactively encouraged to do so
- improving the effectiveness of community engagement through enhancing:

- water information accessibility and comprehensibility (SP E *Integrity*)
- community water literacy (SP E *Integrity*).

Figure 1 **The IAP2 community engagement spectrum^a**

Increased community influence on decisions					
	Inform	Consult	Involve	Collaborate	Empower
Participation goal:	To provide the public with information to help them understand issues and opportunities	To obtain feedback	To work with the public to ensure that concerns are understood and considered	To partner with the public in each aspect of the decision	To place final decision making in the hands of the public
Participation promise:	We will keep you informed	We will keep you informed, listen to concerns and seek feedback	We will work with you to ensure your concerns and aspirations are reflected in the alternative options developed	We will look to you for advice and incorporate your advice to the maximum extent possible	We will implement what you decide

^a IAP2 is the International Association for Public Participation's framework for community engagement.

Source: International Association for Public Participation (2019b).

Development of best-practice principles to support achievement of these objectives should aim to establish a platform enabling:

- effective consideration of diverse interests and expectations through processes that offer all participants genuine opportunities to influence decisions
- design of engagement processes that are fit for purpose
 - processes should be in line with the IAP2 spectrum; and the participation promise, or planned level of engagement, should be clear at the outset of any process
- participants to access the information for analysis; and time for participants to contribute
- building of an engagement culture, where all stakeholders' views are valued
- communication of decisions in an open, transparent and accessible manner
- regular review and reporting by governments of their engagement efforts to ensure ongoing effectiveness.

4 NWI renewal advice

Effective, thorough, well-informed community engagement practice is needed to support reform in all aspects of water resource management and service provision. The Commission's advice aims to contemporise guidance on effective community engagement practice and information provision in a renewed NWI.

NWI RENEWAL ADVICE 15.1: COMMUNITY ENGAGEMENT FRAMEWORK

Australian governments should recommit to best-practice, cost-effective engagement with their communities on all water matters. To achieve this, a renewed National Water Initiative should develop a community engagement framework focused on:

- continuously improving and sustaining government engagement effort across all aspects of water resource management and water service provision
- coordinating engagement actions between all levels of government, particularly in multi-jurisdictional activities
- ensuring that engagement effort and its resourcing are fit for purpose taking into account the scale of proposed change or reform, its sensitivities and its impacts
- ensuring that governments are clear about the purpose of their engagement and the role of communities in decision making
- ensuring that all stakeholders have the opportunity to meaningfully input to the engagement process, and are proactively encouraged to do so
- improving the effectiveness of community engagement through enhancing:
 - water information accessibility and comprehensibility
 - community water literacy

This framework should adopt the characteristics of inclusiveness, timeliness, partnership, respect, access to information, transparency, responsiveness and continuous improvement as a best-practice foundation for effective community engagement and information provision practice in water resource management and water service provision.

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Australian Government
Productivity Commission

Knowledge, capacity and capability building

Supporting Paper K

National Water Reform 2020
Inquiry Report no. 96

28 May 2021

GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

- SP A Water entitlements and planning (*Entitlements and planning*)
- SP B Water trading and markets (*Trading*)
- SP C Environmental management (*Environment*)
- SP D Securing Aboriginal and Torres Strait Islander people's interests in water (*Cultural access*)
- SP E Ensuring the integrity of water resource management (*Integrity*)
- SP F Urban water services (*Urban*)
- SP G Urban water services: regional and remote communities (*Regional*)
- SP H Water reform in rural Australia (*Rural*)
- SP I Government investment in major water infrastructure (*Infrastructure*)
- SP J Community engagement (*Engagement*)
- SP K Knowledge, capacity and capability building (*Knowledge*)**

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Key points

- Knowledge generation has been integral to water reform achievements under the National Water Initiative.
- Governments have a role in funding knowledge generation that is in the public interest. Further investments in knowledge generation will be key to filling existing knowledge gaps, supporting the ongoing reform process and responding to emerging challenges.
 - Investment in knowledge will provide a foundation for evidence-based decision making, innovation, continuous improvement and the development of community water literacy. It will support water planning, inform decisions about the use of environmental water and help utilities meet growing water and service demands.
- Efficient investment should be supported by a formal process of research priority setting and improved coordination between jurisdictions.
- Inclusion of an expectation in governing documents that regulated utilities invest in research and development activities to improve service delivery would empower utilities and ensure that economic regulators include associated expenditure when making price determinations.
- Provision of good information is not enough to realise evidence-based policy.
 - Decision makers need to know that information exists. Success requires sound relationships between knowledge generators and users. Institutional mechanisms like communities of practice and Cooperative Research Centres can support the development and maintenance of these relationships.
 - Those working in the water sector also need the capacity and capability to use information. Governments need to ensure that water planners, managers, regulators and policy makers have both the resources and the knowledge, skills and experience required to effectively implement the National Water Initiative. The staff of water utilities also need support, training, skills and qualifications to be able to effectively discharge their functions.

Success in sustainably managing Australia's water resources and delivering efficient and affordable water services in the coming decades will, in part, rest on the generation and application of knowledge. New knowledge will be critical in helping the water sector to respond to current and future challenges, such as climate change and increasingly frequent droughts. It will support improved decision making based on the best available information, innovation and continuous improvement, and development of community water literacy — three of the overarching policy objectives that the Commission suggests should be applied in all reform areas (NWI renewal advice 4.1).

The need for knowledge and capacity building was recognised in the National Water Initiative (NWI).¹ Specific areas meriting investment were listed, and knowledge and capacity building were recognised as underpinning elements for implementation of the Agreement. Parties agreed to:

- identify the key knowledge and capacity building priorities needed to support ongoing implementation of the Agreement

¹ NWI paragraphs 98-101.

-
- identify and implement proposals to more effectively coordinate the national water knowledge effort.

1 Knowledge generation

Information, knowledge and their application are key for all elements of the NWI. Since the NWI was implemented in 2004, all States and Territories, as well as the Australian Government, have made investments in knowledge generation. Box 1 describes some key government knowledge generation programs currently underway and the Commission's assessment summarises activities undertaken in each of the jurisdictions over the past three years (*Assessment*).

New information (scientific and socioeconomic) has supported evidence-based decisions: water planning is becoming more sophisticated based on scientific input; environmental objectives have been identified; water modelling tools and datasets have been developed; information on water-dependent cultural values has been gathered and incorporated into water plans and management approaches; and mapping and water forecasting has improved (NWC 2014, pp. 5, 9, 11, 13, 17). Overall, the country is now better informed about our water resources, of the impact of water and land-use decisions and the likely effect of climate change. In addition to public-good directed research, the Australian Government has also contributed to agriculture-focused research and development with implications for water use. For example, 23 of 219 project clusters assessed under the Rural Research and Development Corporation program reported improved water use efficiency or water quality impacts (Agtrans Research 2019). Improvements in water use efficiency can help agricultural industries adapt to reduced water availability (SP H *Rural*).

Despite the past investments, continued effort is required to prepare for coming challenges.

We suggest that further reform of the NWI should be supported and underpinned by independent, nimble and well funded research, that can provide additional decision support to allow for sound responses to either sudden system shocks (such as climate emergencies or pandemics) or more gradual changes over time that warrant more systematic addressing. (WaterRA, sub. 98, p. 2)

The commitment to knowledge generation should be retained in a renewed NWI. The following sections discuss: the contribution of knowledge to decision making and management in the water sector; the role of governments in creating knowledge; principles for efficient and effective knowledge generation; the need for coordination and priority setting; and strategies to improve the use of information by decision makers.

Box 1 **Selected water knowledge building activities**

The following are selected examples of some knowledge building activities being undertaken by Australian Government agencies. This is not an exhaustive list, but rather illustrates the nature and breadth of activities.

The Murray–Darling Basin Authority is managing a \$20 million program over 2020–2024 to strengthen scientific knowledge — the Murray–Darling Water and Environment Research Program. The program will provide strategic research and practical information, and include tactical investment in high need projects. Priority themes for the program are climate adaptation, hydrology, environmental outcomes and social, economic and cultural outcomes. These priorities were identified in collaboration with the Commonwealth Environmental Water Office and the Department of Agriculture, Water and the Environment. The strategic research component will be delivered by consortia led by CSIRO and La Trobe University, who, combined, will contribute a further \$7 million to the program (MDBA 2020).

The National Water Grid Authority Science Program supports the delivery of the National Water Grid through three themes: water resource analysis, assessing alternative and emerging options for addressing water security, and communicating science (NWGA nd). Some of the work under the program is being undertaken by CSIRO and the Bureau of Meteorology.

The CSIRO maintains a water research stream to help Australia better manage its river basins and groundwater resources. Their research covers a wide range of applications including developments to support climate and hydrological modelling, water resource assessments, ecosystem research and monitoring, drought and efficiency research for agricultural production, and social research into the impacts of water reforms. CSIRO frequently conduct research and analysis for Australian, State and Territory Governments. Recent water projects have included:

- water resource assessments across northern Australia to investigate the potential for regions to support increased regional development (CSIRO nd)
- an assessment of water resources in Norfolk Island to support improved water security (CSIRO nd)
- a risk assessment for the Australian Government regarding the release of a Carp virus to manage Carp numbers in the Murray–Darling Basin (CSIRO 2020, p. 3)
- contributing to enhanced national climate change projections, and a framework to integrate climate and hydrological science modelling with the aim of informing water resource planning activities through the Earth Systems and Climate Change Hub (2020)
- monitoring and evaluating the benefits of environmental water releases, in conjunction with the Commonwealth Environmental Water Holder (CSIRO 2020, p. 9).

The Bureau of Meteorology maintains and updates a range of water information products. These include data on available water volumes, historical rainfall and stream flow data, hydrological geospatial information, water markets information, water assessments, soil moisture, runoff and evapotranspiration data and national performance reporting for urban water service providers. They also produce a range of short- and long-term forecast products (BOM 2021).

Other examples of knowledge generating activities, including those by State and Territory Governments, are listed in *Assessment*.

1.1 Knowledge enables informed decision making and management

Decisions based on systematic evidence produce better outcomes (Evidence-Based Policymaking Collaborative 2016, p. 2; Sutcliffe and Court 2005, p. iii). And high quality information can lead to improved policy settings (PC 2010, p. 19). Governments being seen to take knowledge-based decisions can also be crucial to community acceptance of policy decisions (PC 2010, p. 2).

Ideally, all decisions should be based on the best available evidence.² Where decisions need to be made quickly, this will be the highest quality evidence to hand. Where more lead time is available, the evidence base can be built through strategic investments that consider the costs, risks, timing and knowledge that could be made available to support the decision-making process.

Sources of evidence used to inform decision making can be varied (Evidence-Based Policymaking Collaborative 2016, p. 3; Sutcliffe and Court 2005, p. 4). Academic research is one. Others include, for example, policy or operational reviews, monitoring data, climate or hydrological modelling exercises, expert judgment, Aboriginal and Torres Strait Islander knowledges, outcomes of experimentation and information collected by the private sector (for example investigations completed for environmental approvals).

Knowledge is used by decision makers in resource management and service provision (policy makers, water planners and water utilities) as well as by entitlement holders and the general public. The importance of trusted and credible water resource management information for water users, managers and the wider public is described in SP E *Integrity*.

Many of the supporting papers accompanying this one have flagged the need for decisions to be based on the best available evidence. For example, SP C *Environment* states best-practice principles to establish environmental objectives and agreed outcomes include a decision-making framework that is based on good scientific, objective and on the ground knowledge. And SP F *Urban* notes that acquiring information and conducting analysis on supply augmentation and demand management options will support best-practice planning.

1.2 Knowledge generation requires support and management

Knowledge related to management of Australia's water resources covers a wide range of disciplines, including engineering, hydraulics, hydrology, hydrogeology, climatology, ecology, chemistry, agriculture, Aboriginal and Torres Strait Islander knowledges, psychology, sociology, geography, economics, law and history (box 2). Building and maintaining expertise across these areas is important for informing water management. As the Murray–Darling Basin Authority (MDBA) (sub. 23, p. 14) noted:

² Evidence includes data, other sources of information and knowledge, where the latter is a product of processes that draw meaning from data and other information.

Investments in science and monitoring are critical to the development of water policy and the ongoing adaptive management of water policy.

Water-related knowledge generation is funded from a variety of sources, including the Australian, State and Territory Governments, research corporations and the private sector (including water utilities). Knowledge generation is also undertaken by a variety of bodies — government research institutions, universities and the private sector including consultants and water utilities.

Box 2 Applications of knowledge across a range of disciplines

Knowledge relevant to water resource management and water service provision spans a wide range of disciplines.

For example, water planning decisions require:

- an understanding of the hydrology and hydrogeology of a system and how it behaves under different climate scenarios, generally captured in water system models
- regional climate change modelling to provide credible future climate scenarios
- an understanding of key ecological assets and their water requirements at different life history stages and their ecological tolerances
- an understanding of cultural values and their dependence on flow regimes
- an understanding of the demands of alternative consumptive water users (such as irrigation or town water supplies) across a connected system, including how these change
- socioeconomic tools to assist in trade-off decisions and scenario planning.

Advances in global satellite data accessibility and availability are being used to assist with compliance of water take and other controlled activities (*Assessment*).

The provision of safe drinking water requires human health and toxicology studies to determine appropriate standards for key parameters in drinking water guidelines and ongoing monitoring is required for emerging pollutants, such as Per- and polyfluoroalkyl substances (PFAS). Research is also required across chemistry and engineering to develop efficient treatment technologies, for example desalination membrane technology.

In recent pricing submissions, utilities have used innovative community engagement such as citizen juries (YVW 2017, p. 26). Utilities have also used choice modelling techniques, drawing on economics and psychology, to provide insights into customer willingness to pay for service improvements.

Governments have a role to play in ensuring the funding of knowledge generation

Governments have a role in funding knowledge generation that is in the public interest. This includes where research is a public good, or is supporting government delivery of public goods (PC 2007, p. 74). The management of water resource systems, environmental water management and the development of water quality standards are all examples of public goods. Without government support, knowledge creation would be under-provided, risking inefficient or poor provision of government services, and failure to achieve objectives.

Governments, in the past, have recognised and invested in long-term research and training to support water-related knowledge generation. For example, in 2008 the Australian Government recognised a gap in knowledge about groundwater and a shortage of skilled groundwater scientists and managers. In response, the National Water Commission (NWC) and the Australian Research Council co-funded the National Centre for Groundwater Research and Training. Between 2009 and 2014, the Centre received approximately \$6.9 million in funding for the training of Honours, PhD and post-doctoral researchers (UNSW 2015, p. 13). The Centre continues to serve as a training and research institution; for example, it partnered with the MDBA to deliver a strategic groundwater research program between 2015 and 2018 to support enhanced groundwater management in the Murray–Darling Basin (MDB) (Simmons et al. 2019, p. 6).

In addition, other ongoing government-funded monitoring, data collection, technology development, modelling and analysis activities feed into knowledge-based decisions and further research. Examples include water trade data collection by the Bureau of Meteorology; water accounts maintained by the Bureau of Meteorology, the ABS and the MDBA; development of hydrological models within and across jurisdictions; and regular market analysis conducted by the Australian Bureau of Agricultural and Resource Economics and Sciences and the Australian Competition and Consumer Commission. Ongoing monitoring of water quantity and quality is undertaken in each State and Territory, and ecological monitoring is undertaken to support environmental management (SP C *Environment*).

In the coming decades: knowledge about the expected impacts of climate change on regional water resources will have important implications for water planning; understanding of ecological and environmental water needs will underpin decisions about the use of environmental water, including during periods of water scarcity; and projections of climate change and population growth will help water utilities manage water supply options to meet demand. Ongoing government-funded research effort will be needed.

Economic regulation should allow for investment in knowledge generation by water utilities

Other aspects of water knowledge generation are best funded by businesses. A clear example is knowledge that supports the operation of water service utilities. Improved understanding of urban water use, values and systems has the potential to lead to efficiency improvements, better outcomes and possibly lower service provision costs.

However, research, knowledge building or innovation do not feature strongly in documents specifying operational expectations of water utilities. For example, in New South Wales, obligations of water utilities are specified in operating licences. The operating licence for Sydney Water (2019–23) does not include reference to investment in innovation, research or knowledge building activities (Sydney Water 2019). An exception is in Victoria, where the *Ministerial Statement of Obligations* for water utilities states that water corporations must ‘undertake continuous review, innovation and improvement’ (Neville 2015, p. 5).

These documents are used by economic regulators to identify acceptable expenditure in pricing determinations.

Inclusion of an expectation that regulated utilities invest in research and development activities relevant to their business in statements of obligations, or similar governing documents, would empower utilities and ensure that economic regulators include associated expenditure when making price determinations.

A clear requirement of the NWI for research in this space would alleviate the need for justifying investment in research to price regulators on an individual basis, especially in situations where benefits are long-term or intangible. (WaterRA, sub. 98, p. 2)

In NSW, the Independent Pricing and Regulatory Tribunal is currently undertaking a review which will consider how to encourage innovation in regulated water businesses to deliver greater value to customers (IPART 2020).

Funding is needed for water-related knowledge generation to fill information gaps and support evidence-based decision making

The variety of funding sources and breadth of relevant topics make it difficult to identify how much research funding has been directed toward water-related issues and how it has changed over time. Some have suggested that funding has fallen. The Australian Academy of Technology and Engineering and the Australian Academy of Science (sub. 90, p. 6), for example, stated that current funding levels are near historic lows after the peak levels seen in the mid-2000s.

The academies also noted that most of the Australian Government research and development funding programs in the past three decades have lasted less than five years. Examples of programs that have ended, and it is not clear they have been replaced with similar programs, include Land and Water Australia, six different Cooperative Research Centre (CRC) programs, the National Program for Sustainable Irrigation, Raising National Water Standards, the Australian Water Recycling Centre of Excellence, and the National Centre for Excellence for Desalination. The NWC was also abolished in 2015. It had a number of functions related to the national water reform agenda, one of which was to ‘identify and address significant knowledge gaps critical to implementing the NWI’ (Rosalky 2011, p. 11). Knowledge generation activities initiated by the NWC included the *National Groundwater Action Plan*, projects to improve knowledge of northern Australian resources and initiatives to enhance Aboriginal and Torres Strait Islander engagement in water planning (Rosalky 2011, pp. 11–12).

Inquiry participants have called for the NWI to be supported by well-funded and managed research:

We ... recommend a national water research funding agency to professionally and strategically direct, administer and evaluate the investment of research funding, on a stable ongoing basis that nurtures long-term dividends for the nation. Such an agency would ensure the water research and

development community is supported to provide contemporary evidence-based advice on approaches to water policy. (ATSE and AAS, sub. 90, p. 6)

... a strategic knowledge generation function similar to that performed by the former Land and Water Australia, [is] needed. (Wentworth Group of Concerned Scientists, sub. 68, p. 5)

Engineers Australia recommends continued investment in basic hydrological and ecohydrological research, and the long-term and targeted data monitoring networks that underpin them, to provide a strengthened knowledge base for future water resources development, management and reform. (Engineers Australia, sub. 63, p. 4)

... national research needs to be continued and adapted to regional Australia ... (NSW Water Directorate, sub. 37, p. 6)

The MDBA supports ... calls for policy makers to prioritise ... investment in research and development. (MDBA, sub. 23, p. 10)

And for investment in research capacity.

Australia should ensure sufficient support for research training and early career development in water-relevant disciplines, and in particular multidisciplinary doctoral programs. It is important to retain and develop capacity in research at a generational level, to ensure long-term continuity of expertise. (AAS, sub. 95, p. 1)

While the Commission has not assessed the current level of funding across all jurisdictions (due to challenges with identifying all funding sources), nor sought to determine the optimal level of funding, inquiry participants and others have identified knowledge gaps that are affecting various aspects of water management.

- Inland Rivers Network (sub. 86, p. 18) stated that ‘significant knowledge gaps have been recognised’ in the Great Artesian Basin and that water plans for the region require accurate calculation of planned environmental water and improved knowledge of annual recharge and flux due to its fragility. It suggested that the new NSW water plan for the Basin will not deliver on the environmental outcomes sought through the NWI because of these gaps.
- WWF Australia (sub. 50, p. 5) observed the then Queensland Department of Natural Resources, Mines and Energy’s ability to assess environmental outcomes in some water plan areas is undermined by poor data and knowledge gaps.
- Water Services Association of Australia (sub. 88, p. 16) noted that recent drought conditions and declining water supplies exposed gaps in understanding of water security.

Investments in knowledge generation have contributed to success in water reform and management over the 17 years since the NWI was agreed. For example, outputs of the *National Hydrological Modelling Strategy*, first initiated in 2008, are still being applied to water planning, operations and governance processes through the use of eWater Source, a national hydrological modelling platform (eWater 2019, p. 1). However, many other programs of research and development have come to an end yet water reform is still a work in progress. Further investments in knowledge generation will be key to filling existing knowledge gaps, supporting the ongoing reform process and responding to emerging challenges.

Coordination between jurisdictions will lead to more efficient investment

While some water knowledge needs are specific to a particular location or region, many are shared across jurisdictions. Coordination between jurisdictions on knowledge generation efforts and sharing of findings may have a number of benefits, such as avoiding duplication of effort, pooling of resources to realise more activities, greater knowledge dissemination and greater consensus on common issues. Smaller states can be more reliant on collaborative efforts and information sharing, as they can lack the capacity to undertake larger research tasks independently.

In 2017, the Commission noted that two national institutions for coordinating knowledge generation efforts — the NWC and the National Water Knowledge and Research Platform (NWKRP) — had ceased. The NWKRP was an outcome of the 2008 COAG *National Water Knowledge and Research Strategy*. It brought together representatives of each jurisdiction to discuss research plans, allow for collaboration and share findings. The NWKRP ceased in 2016 as it was not delivering on its objectives (PC 2017, p. 472).

There is currently no national platform to coordinate knowledge generation and sharing. The only cross-jurisdictional program identified by the Commission is within the MDB — the Basin Science Platform was established by MDB jurisdictions in 2019 to better understand and prioritise knowledge and science investment across the MDB (Joint Basin Governments 2019). However, a lack of coordination remains an issue:

Due to the lack of coordinated investment, and monitoring investment directly to the MDBA, the Basin Plan water reform remains under pressure. The lack of relevant information means that government cannot effectively describe the conditions of the Basin and the contributions the water management framework has made to the environment and Basin communities and economies. Additionally, the lack of relevant and accessible information has left a vacuum in the public domain, which is consequently filled with misinformation, misperceptions or misappropriation of available information, that only further erodes trust and support. (MDBA, sub. 23, p. 14)

In renewing the NWI, jurisdictions should recommit to a principle of effective coordination of knowledge building activities. The National Water Reform Committee appears well placed to coordinate research efforts by bringing jurisdictions together. Other options for how coordination is implemented may include re-establishing a standalone platform, standing up an additional committee of officials from each jurisdiction, or including the task as a function of an existing water policy agency.

Identifying the priorities for knowledge generation efforts is important

Funding to support knowledge generation in water resource management and service provision will always compete with other areas of public expenditure, and the amount available should be reflective of expected research payoffs. Research priorities can therefore help to secure and maximise the value of research funding. Setting research priorities helps to direct research efforts into areas of strategic importance and policy relevance and, through

this, maximise the benefits of research investment. Research priorities can inform the funding decisions of governments, research institutions and other research funding bodies. They should reflect current and emerging issues and should be regularly reassessed and updated as required.

A number of areas of significant knowledge and capacity building needs were identified in the NWI to support the implementation of the Agreement. And in 2012 the NWKRP identified priority research themes for a five year period, but this national effort ceased when the platform was defunded.

Some jurisdictions formally identify their science or research needs. In Victoria, the Applied Aquatic Ecology Research Hub, established in 2017, adopted key themes to guide research and monitoring needs, and these themes will be updated as priorities change (Victorian Government 2017, p. 6). Queensland's *Water Planning Science Plan* sets out the state-wide science needs for water plans, and is updated every five years (DRDMW (Qld) and DES (Qld) 2020, p. 7). The MDBA has also identified knowledge priorities to guide the Murray–Darling Water and Environment Research Program and other investments (*Assessment*: section 7).

Knowledge and capacity needs continuously evolve. Some of the priority areas identified under the NWI are of less relevance now as understanding has improved. Contemporary issues such as climate change and population growth, mean new knowledge gaps emerge. Knowledge gaps are also identified through experience. For example:

Observations from the Basin Plan implementation experience are that:

- Real-time information is limited, with significant time-lags in being able to report on water use and outcomes, particularly in terms of environmental water use.
- There remain significant gaps in being able to monitor and report an integrated view of the Basin's social, cultural, economic and environmental conditions over time. (MDBA sub. 23, p. 14)

A number of candidates for research effort have been identified through this inquiry and previous Commission research (box 3).

Only some parties to the NWI have a clear process for identifying and updating research priorities for the water sector. In the absence of State and Territory processes, a system for identifying water research priorities could be formalised at the national level. The National Water Reform Committee appears well placed to oversee a process to identify and report the highest research priorities. To remain current, priorities identified through the process would need to be updated regularly — for example, on a three-yearly basis. And an effective process would involve all jurisdictions and draw on input from the research community and research users. Research priorities should be provided to the Australian Research Council and other relevant funding bodies to help inform decisions on the provision of Australian government funding for research related to water.

Box 3 **Possible water-related research priority areas**

On the basis of issues canvassed in other supporting papers and previous Commission research, potential priorities for water-related research include knowledge that would underpin:

- adjusting water resource management to respond to climate change
- adaptive approaches to managing environmental water
- understanding the cultural value of water systems
- managing uncertainty in water supply planning processes
- costs and benefits of integrated water cycle management
- designing and testing regulation, policy and technologies for novel water supply sources in fully allocated catchments with a view to improve water security.

Submissions to the inquiry also noted the need for research related to groundwater, including development of groundwater models and improving linkages with surface water models, the impacts of other activities (such as the growing energy sector) on groundwater and use of groundwater for water supply for inland towns (International Association of Hydrogeologists, sub. 15, p. 2; NSW Water Directorate, sub. 37, p. 4; Holley et al., sub. 46, pp. 6–7).

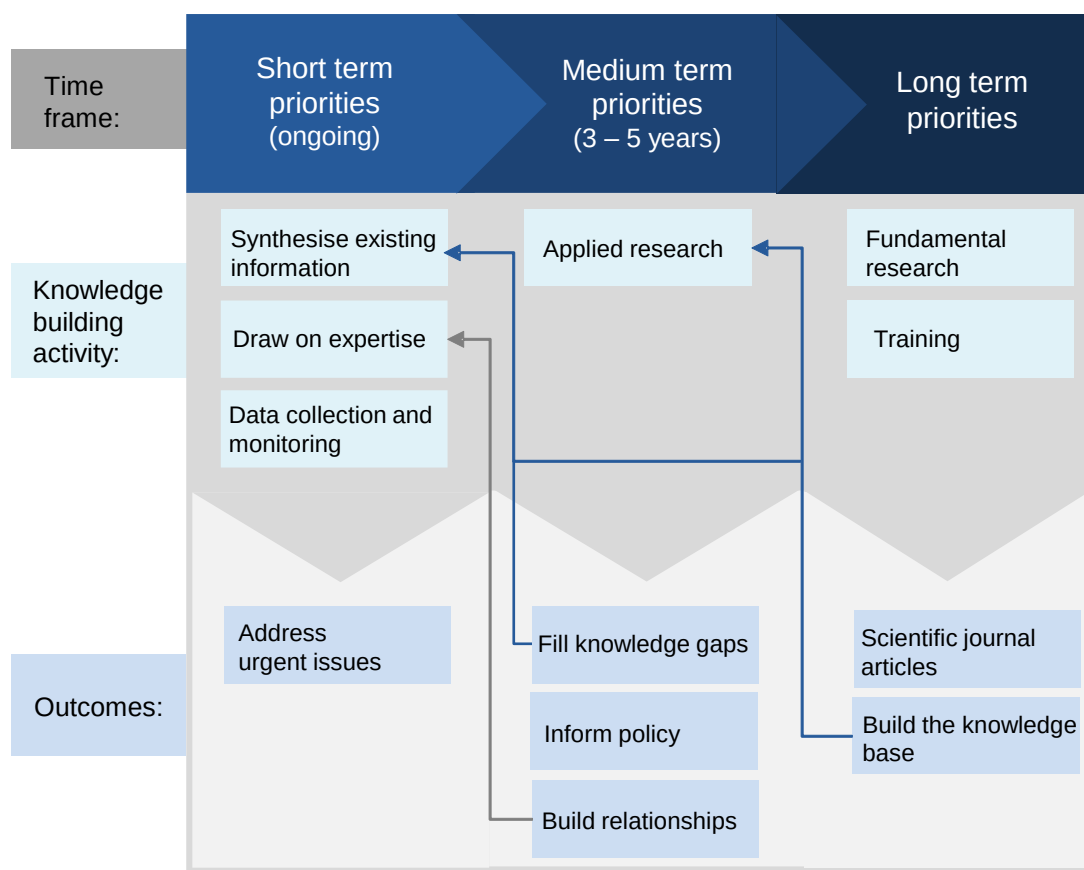
1.3 Governments also need to act to optimise the use of knowledge

Provision of good information is not sufficient to realise knowledge-based policy. Decision makers need to know information exists. They are also more likely to use information if they trust its source and have confidence in the quality of the work. Channels for the flow of information between producers and users need to be fostered (PC 2010, p. 19).

Strong partnerships are needed

Approaches to knowledge production and use can be described across three timeframes — short, medium and long term (figure 1) — and range from fundamental research to highly applied questions. The needs of decision makers (timely and relevant information) and knowledge generators (opportunities to produce work for publication and funding for research) can be met across these timeframes through ongoing partnerships that foster trust and communication.

Figure 1 Knowledge building activities



A short-term need characterises many policy situations. Decisions frequently need to be made in relatively short timeframes, without the opportunity to conduct new research. Decision makers will look for information that is currently available to help understand an urgent issue and respond. In this situation, data from regular monitoring activities are likely to be useful as well as the results of systematic reviews. Additionally, if these decisions are to be informed by the latest knowledge, decision makers may look to the research community for recent findings and expert opinion with integration through the creation of expert panels. To best support decision makers when these situations arise, investments should be made in data gathering and monitoring activities (SP E *Integrity*), in fundamental and applied research (on which they draw) and also in establishing durable links and building trust between decision makers and the research community.

The importance of sustaining links with the science community and maintaining data on river conditions is highlighted in the response to the 2018-19 fish deaths in the Lower Darling. In early 2019, meetings were convened of water holders, river operators and water policy officers from the MDB jurisdictions, along with fish scientists. Together, they shared and considered the available information on fish deaths, water quality and drought risks and proposed responses to the fish deaths (MDBA 2019b, p. 6). The independent assessment of

the event found that the community and government actions in response to the deaths helped protect remaining fish (Vertessy et al. 2019, p. 12).

For the medium-term, decision makers will have an understanding of issues that are expected to arise and where there are knowledge gaps. Filling these knowledge gaps provides opportunities to establish and build on collaborative relationships. Over this timeframe, decision makers can work closely with researchers to undertake targeted applied research or synthesise existing information to fill identified knowledge gaps. Many of the research projects initiated by jurisdictions outlined in *Assessment*: section 7 fit this category.

Over the longer term, researchers have the opportunity to investigate ongoing, new and emerging issues likely to be of interest to policy makers and managers. Long-term research activities help generate and maintain the skills and knowledge base of water researchers. It should be strategic and directed at developing the knowledge, models and data likely to be helpful in meeting policy needs as well as identify the issues and opportunities for the future. WaterRA (sub. 98, p. 2) acknowledged the importance of longer-term, fundamental research to support relationships and provide the best available information required for shorter-term work when it arises:

More than ever, recent climate and health emergencies have emphasised the need for a high degree of collaboration between governments, research organisations and the community, to develop solutions in a timely manner. WaterRA has been involved in some of these efforts and can confirm that success was born from longstanding trusted relationships and foundation research conducted over previous decades, which provided the springboard for conducting research in a shorter time frame.

Several approaches to establishing constructive relationships can be identified

Expert panels or communities of practice are frequently used to advise water policy makers and managers.

Expert panels established to address a particular problem in the short term, frequently draw on experts across a range of disciplines — helping to integrate the best available information for water managers or policy makers. For example, Icon Water drew together an expert panel over the period of May–June 2020 to provide perspectives on long-term water security (Icon Water 2020). And in 2019, the Australian Government established an independent expert panel in response to the 2018-19 fish deaths in the Lower Darling (Vertessy et al. 2019, p. 15).

Communities of practice are groups of experts that come together on a regular basis to discuss issues and best-practice responses, building relationships and trust. For example, until 2013 the Commonwealth Environmental Water Holder was advised by the Environmental Water Scientific Advisory Panel, the Stakeholder Reference Panel and the Commonwealth Environmental Water Advisory Council (PC 2017, p. 159). The MDBA established three communities of practice in 2018 that continue to improve the application of scientific knowledge to environmental water management (MDBA 2019a, p. 110). Communities of practice in particular, allow for two-way information flows so that the

expert scientific community understands the needs of decision makers; and decision makers gain knowledge and support for the implementation of policy decisions.

Cooperative Research Centres (CRCs) have been another good model for creating partnerships and relationships between industry and researchers. The model also addresses the different timeframes for research and fosters discussion across different disciplines. To be eligible for funding under the program, CRCs must be medium to long term, include an education and training component and work to encourage application or take up of research. There is currently a CRC for Water Sensitive Cities, set up in 2012 and due to end in June 2021, and there have been a number of water-related CRCs in the past. Previous CRCs include the CRC for Catchment Hydrology (1992–2005), the CRC for Freshwater Ecology (1993–2005), the CRC for Water Quality and Treatment (1995–2008), the CRC for Irrigation Futures (2003–2010) and the eWater CRC (2005–2012).

However, with the decline in water-related centres through the mid-2000s and cessation of other mechanisms for policy–researcher collaboration such as Land and Water Australia (in 2009), there are few institutional mechanisms to regularly bring decision makers and researchers together beyond the MDBA communities of practice. There is a risk that, without such a mechanism, a disconnect between science and policy will grow.

Over time the Australian Government has progressively shifted the CRC program toward a commercial focus, away from areas of public goods. This is likely to mean fewer successful CRC bids from the water sector, where most of the benefits from research are public goods. The Commission has previously stated it does not support the move away from a public good focus in the CRC program (PC 2007, p. xxix):

The original objectives of the program should be reinstated — namely, the translation of research outputs into economic, social and environmental benefits, rather than focusing public support on the commercialisation of industrial research alone.

The CRC model is well-suited to the research needs of the water sector, operating across disciplines, timeframes and encouraging collaboration. If water sector programs with a strong public good focus are not eligible under the CRC program, consideration could be given to alternative research investment models that share these features.

For water service delivery issues, Water Research Australia brings together researchers, regulators and industry to help develop links between decision makers and the science community. Water Research Australia helps to define and conduct targeted research for the water industry (WaterRA 2020b). Its members include water utilities, consultants, government departments and universities; and research is mostly focused on issues for water utilities such as customer engagement, management of source water and contamination, water recovery and reuse, and economic regulation (WaterRA 2020a, 2021).

2 Capacity and capability building

To effectively implement a renewed NWI, water planners, managers, regulators and policy makers will need both capacity and capability — that is, resources to identify and access the best available information and the requisite knowledge, experience and skills to evaluate and use them. Without adequate capacity and capability, new knowledge that is generated will be of little value. This requirement applies equally to the water resource management and service provision areas.

2.1 In water resource management

The Commission has limited evidence to suggest that the current capacity and capability of policy makers and water planners are inadequate to manage Australia's water resources.

On a principles basis however, the recognition of capacity in the current NWI should be retained, and a commitment also made to capability development, in a renewed agreement. Efforts to build the capability of people involved in water resource management through education, training and collaboration would support their ability to put new knowledge to its best use and help optimise the return on investment in any knowledge building.

2.2 In water service provision

There appear to be greater challenges in ensuring adequate capacity and capability in service provision, particularly in small-scale utilities and in regional and remote areas of the country (SP G *Regional*). Participants have raised concerns about the capacity in local governments to implement best practice urban water planning and to provide water services. In particular, issues raised include that:

- local governments are under-resourced to implement priority reforms (HLW, sub. 65, p. 5)
- there are challenges recruiting and retaining skilled operational staff, particularly for regional and remote locations (Unity Water, sub. 44, p. 3, qldwater, sub. DR142, p. 4, LGNSW, sub. DR147, p. 11)
- there is a shortage of Registered Training Organisations and trainers to deliver training programs required by utilities, particularly in regional areas (LGNSW, sub. DR147, p. 11)
- there is no nationally consistent or minimum mandatory standard for water treatment operators, and competency mapping is required to ensure recognition of water professionals' capabilities (WIOA, sub. 53, p. 4, AWA, sub. 89, p. 12, qldwater, sub. DR142, p. 5, LGNSW, sub. DR147, p. 11).

Hall et al. (2017) also discusses the lack of capability in Aboriginal and Torres Strait Islander communities to maintain water treatment facilities.

Building the capacity and capability of water utilities' staff is primarily within the remit of the utilities. However, given the importance of the sector to the community and its wellbeing, governments have a responsibility to monitor and ensure appropriate systems are in place to maintain capability. In New South Wales, for example, the need for capability, training and certification of water utility staff was recognised in its infrastructure strategy (INSW 2018, p. 163).

As noted in *SP G Regional*, collaboration between service providers can help to overcome some scale challenges and could be facilitated by State and Territory Governments. Peak utility bodies also aid in collaboration and help to monitor developments, share information and support utilities in maintaining the skills of their staff. The Queensland Water Regional Alliance Program is an example of industry-led collaboration, including on issues associated with skills and training, supported with funding from the Queensland Government.

There are existing frameworks, outside the NWI, appropriately tasked to deal with training and qualification concerns. The Water Industry Reference Committee is responsible for the qualifications under the National Water Training Package, and is tasked with consulting widely with industry and other interested parties in developing the package (AISC 2020). And the national vocational education and training regulatory framework (DESE 2020) is the forum for concerns about delivery of training. Governments have a role in supporting these formal qualification and skills recognition frameworks, accrediting qualifications and training providers to ensure they meet quality requirements and the needs of the industry. The Productivity Commission has recently conducted a review of the National Agreement for Skills and Workforce Development which looks at Australia's vocational education and training system in detail (PC 2020).

The 2019 Water Industry Reference Committee skills forecast found that the primary reasons for skills shortages in the water industry were low wages, competition from other organisations and geographic location of work (AIS 2019, p. 22). These factors are likely to be more acute in the case of small utilities in regional and remote areas with limited resources. Consideration of the provision of community service obligation payments, where utilities are not able to adequately recover costs (*SP G Regional*), should take account of these challenges to ensure utilities maintain the capability to provide a basic level of service.

3 NWI renewal advice

Knowledge, along with the capacity and capability to use it to best effect, has underpinned implementation of all elements of the NWI. This critical role will continue. An ongoing commitment to relevant knowledge generation and its effective use will be fundamental in enabling the Australian water sector to meet the challenges of climate change and population growth, innovate and continue to improve management approaches.

As an overarching principle, decisions across all facets of water resource management and service provision should be based on the best available information. Achieving this will

require investments, both in knowledge creation and the relationships that enable policy makers and water managers to tap into expertise when it is needed.

NWI RENEWAL ADVICE 16.1: EFFECTIVE KNOWLEDGE GENERATION

Commitment to a culture of evidence-based decision making, innovation and continuous improvement will underpin successful implementation of a renewed National Water Initiative. Inclusion of the following principles in a renewed National Water Initiative would bring that to effect.

- Knowledge building priorities are identified through processes that involve all jurisdictions and draw on input from the research community and research users.
- Governments invest in knowledge generation activities that align with identified priorities and serve the public good.
- Investments are streamlined through effective coordination between jurisdictions.
- Utilities are empowered to invest efficiently in knowledge generation.
- Strong, durable partnerships between decision makers and knowledge generators are developed and actively managed.
- Decision makers have the capability and capacity to use knowledge effectively in making evidence-based decisions.
- Water utility staff have the capacity and capability to discharge their functions.

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