



Australian Government  
Productivity Commission

Government investment  
in major water infrastructure

Supporting Paper I

National Water Reform 2020  
Draft Report

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## GUIDE TO THE SUPPORTING PAPERS (AND DESCRIPTOR)

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SP B	Water trading and markets ( <i>Trading</i> )
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## Key points

- Under the National Water Initiative (NWI), all jurisdictions agreed that proposals for new and refurbished water infrastructure (such as dams and irrigation distribution networks) would be assessed as both economically viable and ecologically sustainable prior to any investment occurring, and that costs would be recovered from users in most cases.
  - Failure to abide by this principle can burden taxpayers with ongoing costs, discourage efficient water use and result in long-lived impacts on communities and the environment.
- Multiple governments are planning major investments in water infrastructure — including projects that have not demonstrated compliance with the NWI requirements.
- Although the NWI requirements are sound, and should be retained, the agreement has little to say on criteria for demonstrating adherence with them, or the rationale for government funding or financing of infrastructure. Poor project selection and funding decisions still occur.
- Creation of the National Water Grid Authority suggests that future Australian government-funded projects will receive greater scrutiny. but the Authority's remit is limited to water for primary industry. This limitation should be removed. Moreover, the Authority's project assessment criteria are relatively broad and may allow subsidisation of private industry.
- A renewed NWI should address poor project selection and funding decisions through a new water infrastructure element that establishes:
  - a commitment to all options being on the table, including both infrastructure and non-infrastructure options where these can meet the investment objective
  - criteria for how project proposals demonstrate adherence to the NWI requirements, including conditions for environmental sustainability and economic viability, as well as principles for cost sharing between users and (in limited cases) governments
  - a framework for government investment in major water infrastructure, including project assessment and selection processes and institutional arrangements.
- Governments should also consider how to ensure new infrastructure development is culturally responsive to the aspirations of Traditional Owners.
- 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 water infrastructure).
- State and Territory Governments should have primary responsibility for 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 this infrastructure is costly to build, maintain and ultimately replace, and can create detrimental environmental and social impacts.

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Many of these costs are borne upfront, while the benefits accrue over a long operational period and may be difficult to estimate in advance, creating uncertainty over the viability of a proposed development. Yet the substantial costs of new infrastructure 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, long-term changes to the use and availability of water resources — as a result of climate change and demographic factors — are likely to generate more uncertainty and 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).

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## 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.<sup>1</sup>

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)).<sup>2</sup>

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 developer<sup>3</sup>) 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 (discussed in *SP G Regional*).

In either case, taxpayers (rather than users) bear a share of the costs of the investment.

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<sup>1</sup> NWI paragraph 64.

<sup>2</sup> 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 *Assessment*.)

<sup>3</sup> A developer may still pass on those costs to the final purchaser of the development so the user of the infrastructure ultimately pays.

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### **1.3 Most infrastructure investment is undertaken by service providers ...**

Planning for, constructing, maintaining and refurbishing water infrastructure is a core business of water service providers (urban water utilities, bulk water providers and irrigation operators). 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. Investments undertaken by corporatised entities would be expected to be consistent with the NWI requirement for economic viability. 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*.

In any case, infrastructure development proposals are then 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**

Government enthusiasm for investing in new water infrastructure (particularly for irrigation) was observed by the Commission in 2017 (PC 2017a, p. 267). This enthusiasm remains strong, with the Australian Government committing to a 10-year rolling water infrastructure program under the \$3.5 billion National Water Infrastructure Development Fund (NWIDF) reflecting this appetite to subsidise major water infrastructure (box 1).

The National Water Grid Authority (NWGA) is responsible for the NWIDF. 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 they must be brought forward by, or have strong support from, the relevant State or Territory Government (NWGA 2020b, p. 10).

#### **Recent crises have led to a greater impetus for investment**

Recent events, including drought in eastern Australia, have prompted further action to expedite major water infrastructure investments.

- In early 2020, Infrastructure Australia identified ‘Town and city water security’ as a high priority in its *Infrastructure Priority List* (IA 2020a, p. 65). It suggested incorporating both infrastructure and non-infrastructure responses, although it did not recommend who should develop or finance the projects.

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## Box 1 Australian Government water infrastructure initiatives

The Australian Government has committed to providing \$3.5 billion to fund new water infrastructure through 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 Infrastructure Development Fund (NWIDF) over ten years. As of 11 November 2020, \$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. It sits within the Department of Infrastructure, Transport, Regional Development and Communications and administers the NWIDF, 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.
- 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 funding from the NWIDF. 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. The evaluation threshold was \$100 million prior to 2021.

Sources: McCormack (2019, 2020b); NAIF (2021); NQWIA (2020); NWGA (2020b, 2020c, 2020d, 2020a).

- 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 River)
  - Western Weirs program (Barwon-Darling and Lower Darling Rivers).

Further, inquiry participants have pointed to the need for significant investment in regional urban water infrastructure to address a significant infrastructure backlog, with assets in some areas reaching the end of 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



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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 has assessed jurisdictional frameworks for investment in major water infrastructure (*Assessment*: section 3.2). Inquiry participants have also suggested that some government-supported projects do not comply with the NWI — particularly with respect to economic viability and cost recovery.<sup>4</sup> The Commission has also considered these specific projects.

In reviewing major infrastructure proposals since 2017, the Commission’s assessment has indeed found that not all projects adhere to the NWI principle (*Assessment*: section 3.2). The business cases for two projects (Rookwood Weir and Stage 2 of the Haughton Pipeline Project) conclude 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 Australian community.

Other projects, such as Dungowan Dam and the Wyangala Dam wall raising project in New South Wales, have been approved 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 commitments under the NWI. There is clearly still more to do to ensure that NWI signatories (the Australian, State and Territory Governments) abide by the Agreement through their decision-making processes for new infrastructure — a finding that reinforces the Commission’s 2017 conclusions (box 2).

As noted above, investment decisions made by water service providers are generally guided by planning frameworks and investments are scrutinised (in some cases) by independent economic regulators. These processes usually ensure compliance with the NWI principle for new infrastructure (*Assessment*: section 3.2).

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<sup>4</sup> 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; Lifeblood Alliance, sub. 70, pp. 27-28.

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## 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).

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.

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, requiring the capacity to finance the initial investment, and then adequate funding to maintain it over its operational life, as well as 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 under-subscribed infrastructure and, as the Commission noted in 2017 in the case of Paradise Dam, unsold water entitlements function as an implicit subsidy to water users (PC 2017a, p. 256).
  - Where user-pays is not in place, the burden 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 carries significant environmental costs — it can significantly alter flow regimes and connectivity along rivers and across landscapes, affecting seasonal wetting and drying cycles and impairing fish migration. 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 benefits from doing so.

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- 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 current 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 Dungowan Dam feasibility study (discussed below) explicitly excluded non-infrastructure options to address Tamworth’s water supply.
- Business cases are not long-term or comprehensive, and assumptions are not always rigorous or transparent (IWF, sub. 30, pp. 16–20, FNQROC, sub. 51, pp. 2-3; Engineers Australia, sub. 63, p. 19; Wentworth Group of Concerned Scientists, sub. 68, p. 5).
  - 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 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.
  - Some funding commitments (such as for Rookwood Weir) 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)
- 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

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large scale investments, for example roads. Cost Benefit Analysis of dam investment is more limited in its scope’.

Some participants viewed that current decision-making processes lacked transparency. For example, 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.

The IWF further pointed out that seven projects had received Australian Government funding commitments prior to business case development and environmental approvals (sub. 30, p. 17). This is a particular concern: business cases 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 development through a government subsidy, rather than user charges. Governments are unlikely to back down from funding a project they have already 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). This has since been revised to \$484 million following a feasibility study, and the costs may change again during business case development.

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### Box 3 Flawed decision making for Dungowan Dam

In 2016, the New South Wales and Australian Governments committed a total of \$150 million to the construction of Dungowan Dam on the Peel River (ANZIP 2020). The rationale for the project was that growth in Tamworth's urban water demand would affect reliability for general security irrigators in the Peel, 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 dam, albeit with a far higher project cost of \$484 million (GHD 2017, p. i). The study's preferred option was to construct a new 22.5 GL dam, increasing water availability by 6 GL a year on average. Most of the anticipated benefits derive from improving Tamworth's water security, with increased irrigated agricultural production representing less than 2 per cent of the project benefits (GHD 2017, p. 68).

In 2019, both governments agreed to provide half of the \$484 million construction cost. Early works were scheduled to commence in October 2020, with the final business case to be completed by June 2021 (WaterNSW 2020).

#### Discussion

The feasibility study underpinning this funding commitment has three key shortcomings.

- The benefit–cost ratio of 1.06 is marginal and contingent on optimistic assumptions (such as the willingness of Tamworth residents to pay for fewer water restrictions). Any further increases in construction cost would likely result in the project becoming unviable.
- Non-infrastructure options were excluded from the analysis (GHD 2017, p. 14). Some of these options may be considerably more cost-effective — for example, the cost of securing Tamworth's water supply by directly purchasing general security entitlements is estimated at just 2 per cent of the Dungowan Dam construction cost.<sup>a</sup>
- 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. As noted by the NSW Water Directorate (sub. 37, p. 7), the 2017–19 drought highlighted that the seasonal water allocation process under the catchment water plan was not as effective as it could be in protecting town water security, even with significant investment in water security infrastructure to date. 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).

In terms of these latter points, the proposed dam is a costly way to protect general security licences, relative to the value of the water. The dam is estimated to provide an additional 6 GL of water (annual average) which has a current market value of only \$11 million. By comparison, if the additional water was issued as entitlements to general security irrigators at full cost, it would be valued at more than \$60 000/ML, relative to current prices of about \$1341/ML.<sup>b</sup> Irrigators are unlikely to be willing to pay for the additional water, highlighting the poor viability of the project.

Moreover, the prospect of 'new' water is illusory. Because 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 on the Peel would lead to the water sharing plan cap becoming binding, reducing supplementary access (water extractions during infrequent high-flow events) for Namoi River irrigators (GHD 2017, p. 19).

<sup>a</sup> Based on 75 per cent reliability and a Peel General Security entitlement price of \$1341/ML, and a maximum potential shortfall of 5.5 GL by 2065 (GHD 2017, p. 6). <sup>b</sup> Weighted average 2018-19 Peel General Security entitlement price (Aither 2019).

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The creation of a dedicated Australian Government body to assess water infrastructure projects suggests that future decisions will face greater scrutiny to avoid similar shortcomings. Future Australian Government water infrastructure funding commitments are expected to be subject to the NWGA's *Investment Policy Framework*, published in October 2020 (box 4). Many aspects of this framework represent improvements in project assessment and selection processes that, if implemented, will address some of these shortcomings for future government funding commitments.

#### **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 (2020b, p. 4).

However, of the \$3.5 billion made available by the Australian Government under the NWIDF, more than \$1.5 billion has (as of 11 November 2020) already been committed, with about \$470 million reflecting completed projects or projects under contract, and a further \$1 billion committed to projects in the planning stage (NWGA 2020c). The Commission's assessment found that many of these projects have unviable or marginal benefit–cost ratios, and some do not have completed business cases.

## **2.2 The case for rural water infrastructure subsidies is not clear**

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

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to the private sector (PC 2014, p. 110). Similarly, in cases of high-cost regional urban water supply, a degree of government funding may be justified on equity grounds to ensure access to a basic essential service (SP G *Regional*).

In those cases, a government subsidy for a share of infrastructure costs can be warranted.

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), there is an emphasis on investments that support regional development. The NWGA (2020b, 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).

Generally, funding major infrastructure for the benefit of irrigated agriculture amounts to subsidising a commercial operation and undermines the NWI user-pays principle. This is the case for both new developments, and for projects 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)

The NWGA framework excludes projects that supply water for the exclusive use of a private business or individual (NWGA 2020b, p. 1), and it does prioritise 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). While selecting the option with the highest net benefit is good practice, the framework does not require a *positive* net benefit. Moreover, it excludes 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 facilitate funding for projects that would not pass a strict economic viability test (based on delivering positive net benefits), because the framework's broad 'national interest' test recognises some objectives, such as promoting regional prosperity (box 4: principle 1), that would not be considered as part of that economic assessment. These impacts are not included in a net benefit test as all public investment creates some flow-on economic impacts, but these often represent a transfer of resources and jobs between regions.

With governments looking to increase infrastructure spending, a ‘just add water’ approach assumes that increased access to water through new or expanded infrastructure, in itself, is a cost-effective way to deliver the government’s objective to promote regional development. The availability of Australian Government funding through the NWIDF and its broad public interest test risks biasing State and Territory priorities towards infrastructure solutions — ignoring other, more cost-effective means (outside of water infrastructure) to enable regional economic growth or improve water security.

This approach also assumes that additional water will be put to productive use and generate employment — an assumption that is not always borne out.<sup>5</sup> The Commission’s 2017 analysis suggested that major irrigation infrastructure developments tended to create few jobs, and often at a high cost (table 1).

**Table 1 Sample of irrigation infrastructure project outcomes**

	Ord Stage 2	Duck	Swan Valley
Jurisdiction	WA	Tas	Tas
Cost to government (\$m)	334 <sup>a</sup>	32	18
Project completion	2014	2018	2018
Number of irrigators holding entitlements	150 <sup>b</sup>	26	15
Ongoing jobs created	61 <sup>c</sup>	50 <sup>d</sup>	16 <sup>e</sup>
Cost per job created <sup>f</sup> (\$m per full-time equivalent)	5.5 <sup>c</sup>	0.6	1.1

<sup>a</sup> 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.

<sup>b</sup> 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. <sup>c</sup> Excludes 10–15 seasonal workers. Cost per job excludes Australian Government funding. <sup>d</sup> Approximate. <sup>e</sup> Estimate; actual data not available. <sup>f</sup> 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).

In part, this situation reflects a lack of specificity in the NWI as to when government subsidies are permitted. As highlighted by the IWF (sub. 30, p. 14):

The NWI allows for the provision of community service obligations (CSOs) for water storage and delivery in both urban and rural systems (NWI para 66 v c) but offers no guidance on when

<sup>5</sup> 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).



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and how they should be implemented. Further, the NWI does not provide a framework to guide CSO development and application.

Overall, this approach perpetuates the risk of public investment in projects that are unlikely to achieve their anticipated ends (in terms of regional development), as well as ongoing public subsidies for costs that should be paid for by water users.

### **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.

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This situation, in part, reflects shortcomings of the NWI and its minimalist requirements for new developments. The principle concerning new infrastructure is sound and, if complied with, would ensure that government investment only occurs rarely and where clearly justified. But on its own, it is 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 of these shortcomings appear to have been addressed recently through other 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 economic merits of some prior Australian government commitments, alongside the NWGA's broad public benefit test, are not consistent with NWI principles. Further improvements are required.

Including a comprehensive decision-making framework in the NWI would ensure principles that represent an agreed position with all State and Territory Governments are embedded as part of longer-term water reform, ensuring government decisions can be held to account in implementing a sound investment framework.

### **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 is sound in principle: proposals should be demonstrated as both ecologically sustainable and economically viable prior to investment (although neither term is defined), and in accordance with the pricing requirements, users should ultimately bear the costs of infrastructure. This principle should continue to guide all investments in major water infrastructure — including by governments.<sup>6</sup> (The Commission is also considering whether this principle should be expanded to incorporate Aboriginal and Torres Strait Islander people's aspirations in the planning of new developments. This is discussed below).

Yet the Commission's assessment has highlighted project selection that is inconsistent with the NWI — and with public infrastructure funding principles more generally. The issue is not one of principle, but of implementation.

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<sup>6</sup> The 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.

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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 the NWI infrastructure principle in project assessment
- principles for cost-sharing (including government subsidies) and allocating water from new 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 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.

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## 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 better adherence to this decision-making process would help avoid uneconomic investments. 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
- select the most worthwhile option based on that business case.

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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.

Importantly, government funding or financing for a project should only be committed to following an assessment of all sources of funding (consistent with box 5: principle 6), which occurs after the business case is prepared. (The conditions for where government investment may be warranted is 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 water demand, job creation or social benefits) by better refining the assumptions used to underpin those estimates.

## 3.2 Criteria for 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 NWI principle — irrespective of who funds it and how. 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 to construction.

### Environmental sustainability

Environmental 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 processes.

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In keeping with current practice, environmental 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 (which is determined 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 environmentally 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 environmental sustainability of a new development, 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.

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 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.

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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 to 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. That said, 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 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).

However, some participants highlighted the need to recognise commercially sensitive information from project partners (for example, BHP, sub. 26, p. 5). 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. But in cases of material commercial sensitivity, a qualified independent body should assess the business

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cases for major projects in-house and publish a review prior to governments committing funding, as Infrastructure Australia currently does for some 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 private sector 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 simply 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’ public investment 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 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 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 such distributional impacts (for example, favouring economic activity in one region over another in order to encourage regional development). Where governments do so, a high standard of rigour and transparency must be applied to the analysis to justify the public expenditure —



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prior examples have shown that, similar to estimates of water uptake, estimates of job creation can undershoot expectations (at times, spectacularly).

### Culturally responsive infrastructure development processes that incorporate Aboriginal and Torres Strait Islander people's values

In addition to the existing NWI principle for new developments, proponents should specifically account for impacts on Aboriginal and Torres Strait Islander people's heritage and other cultural values associated with water.

Currently, this is usually done through compliance with any 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. (The existing approval requirements are outlined in SP D *Cultural access*: section 4.)

However, to better support the aspirations of Traditional Owners — including pursuit of the inland water target under the National Agreement on Closing the Gap — a renewed NWI should ensure that any new developments are culturally responsive. That is, the aspirations and concerns of Traditional Owners should be understood, discussed and considered in developing plans for major infrastructure. And project proponents should specifically identify and account for impacts on Aboriginal and Torres Strait Islander people's heritage and other cultural values associated with water.

In undeveloped systems, 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. The provision of those entitlements should be seriously considered by governments.

Further, some Traditional Owners have raised concerns about consultation processes for new developments (SP D *Cultural access*). The Commission considers that jurisdictions should ensure new developments are undertaken with high-quality engagement with Aboriginal and Torres Strait Islander people.

The Commission welcomes views on how these values could be promoted in the NWI water infrastructure element — noting that this should not pre-empt the co-design process for a new element on Aboriginal and Torres Strait Islander people's water access (as discussed in SP D *Cultural access*).

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INFORMATION REQUEST 13.1

*How could a refreshed National Water Initiative ensure that major water infrastructure investments most effectively promote the aspirations of Traditional Owners and protect Aboriginal and Torres Strait Islander people's heritage and cultural values? Should the principle guiding new infrastructure be amended to ensure that planning processes for developments are culturally responsive (in addition to those developments being environmentally sustainable and economically viable)?*

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### 3.3 Cost sharing between users and governments

The funding and financing arrangements for a project, including any government subsidies, should only be determined after the project has met all other criteria under the framework 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.<sup>7</sup> 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.
  - Public benefits can include 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.)
- 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*.)

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<sup>7</sup> 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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- 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 a 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, undermining the user pays principle and distorting 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 the 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 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.

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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 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 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 key shortcoming is the propensity of governments 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 projects is often weak (PC 2017b, pp. 275–277). Job creation is often job diversion, and people have many job opportunities so that 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

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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 they consider facilitating arrangements. 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 development 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. 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).

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.

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## 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).

### *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 planning) that the investment 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 is currently experiencing), policies that stimulate demand and increase employment rates can provide economic benefits. Such circumstances usually suggest general macroeconomic policies (like reductions in interest

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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.

Considering the long timeframe and large scale of major water infrastructure developments, these 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 current 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.<sup>8</sup> This remains sound as an approach: market-based approaches encourage movement of water to its highest-value 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 grant some entitlements to particular sectors, including urban providers or Traditional Owners. Although not a

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<sup>8</sup> NWI paragraphs 70–72.

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market-based approach, this is not inconsistent with allocating water to its highest-value use. 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, and aim to allocate water to its highest value use where practicable.

### **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 should have primary responsibility for proposing (and overseeing) major water infrastructure developments in their jurisdictions, and for undertaking many of project selection and assessment processes discussed above. This corresponds with their current 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).<sup>9</sup>

#### **The Australian Government's role should be limited**

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*).

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<sup>9</sup> The Australian Government has some responsibilities for major developments under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).



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There are some in-principle arguments for Australian Government funding of 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.

DRAFT RECOMMENDATION 13.1

Australian Government investment in major water infrastructure 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.

### 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 for CBA. An alternative model to ensure the quality of proposals is to require a qualified institution to review the business cases for major water projects and confirm that the analyses are rigorous (or otherwise). (However this should not replace the requirement to publish feasibility studies and business cases for major projects.)

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,<sup>10</sup> 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 independent National Water Grid Advisory Body would be established to provide expert advice to the NWGA on water

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<sup>10</sup> 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).

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infrastructure (McCormack 2020a). It is not yet clear what form their advice will take, nor how transparent its processes will be. Transparency will be essential to provide public assurance that the Body’s advice is genuinely independent of the NWGA and placing 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.

## 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 principle covering investment in new or refurbished infrastructure is sound and should be retained as guidance for all investment. Jurisdictions should agree to criteria that demonstrate how adherence to the principle is to be fulfilled (regardless of who the proponent is).

The element should also establish an agreed framework to guide government investment in major developments. This framework is not intended to replace the NWGA’s *Investment Policy Framework*, but instead to refine it, and to ensure consistent principles are agreed to in a renewed NWI.

As raised in section 3, the high-level principle for investment proposals could be broadened to more explicitly encompass Aboriginal and Torres Strait Islander people’s heritage and cultural values associated with water to support the aspirations of Traditional Owners and accord with the inland water target being developed under the National Agreement on Closing the Gap.

The Commission welcomes views on how these values could be incorporated in the NWI water infrastructure element — noting that this should not pre-empt the co-design process for a new element on Aboriginal and Torres Strait Islander people’s water access (SP D *Cultural access*).

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DRAFT NWI RENEWAL ADVICE 13.1: 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 principle that all infrastructure is to be assessed as economically viable and environmentally sustainable prior to the commitment of funding, with cost recovery from users as the norm. Jurisdictions should agree to criteria on how adherence with the principle can be demonstrated.

The new element should also include an agreed framework to guide government investment in major water infrastructure.

Jurisdictions should agree to more specific criteria for *how* adherence to the NWI principle should be demonstrated, including:

- conditions for ensuring environmental sustainability and economic viability
- principles for cost sharing, including any government funding, and water allocation.

Further, the framework should clarify the conditions concerning where governments subsidise major water infrastructure in pursuit of a strategic objective (such as regional 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.

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## DRAFT NWI RENEWAL ADVICE 13.2: ASSESSMENT CRITERIA FOR WATER INFRASTRUCTURE

As part of the new infrastructure element, jurisdictions should agree to criteria on how projects can demonstrate adherence with the National Water Initiative (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.

Environmental sustainability should be demonstrated through environmental, social, and Aboriginal and Torres Strait Islander people’s cultural heritage 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.

Costs should be recovered from users as the norm, except where government funding is 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 to support access to an essential service (for example, 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, unless they demonstrate 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. However, they should consider allocating entitlements in undeveloped systems to Traditional Owners, and ensure that project assessment processes are culturally responsive.

In renegotiating the NWI, jurisdictions should agree to clear institutional roles and responsibilities to coordinate any government investment.

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DRAFT NWI RENEWAL ADVICE 13.3: INSTITUTIONAL ARRANGEMENTS

A new water infrastructure element should clarify relevant institutional roles and responsibilities underpinning the framework for government investment.

- State and Territory Governments should have primary responsibility for proposing (and overseeing) major water infrastructure developments in their jurisdictions.
- 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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## References

- Aither 2019, Water Markets Report: 2018-19 Review and 2019-20 Outlook, Melbourne.
- ANZIP (Australia & New Zealand Infrastructure Pipeline) 2020, Dungowan Dam Replacement, <https://infrastructurepipeline.org/project/dungowan-dam-replacement/> (accessed 18 December 2020).
- BOM (Bureau of Meteorology) 2018, Ord: Water access and use, [www.bom.gov.au/water/nwa/2018/ord/supportinginformation/wateraccessanduse.shtml#:~:text=Groundwater%20rights&text=There%20are%20approximately%2050%20groundwater,sourced%20from%20combined%20fractured%20rock.](http://www.bom.gov.au/water/nwa/2018/ord/supportinginformation/wateraccessanduse.shtml#:~:text=Groundwater%20rights&text=There%20are%20approximately%2050%20groundwater,sourced%20from%20combined%20fractured%20rock.) (accessed 15 December 2020).
- COAG (Council of Australian Governments) 1994, Water Reform Framework, Canberra.
- 2004, Intergovernmental Agreement on a National Water Initiative, Canberra.
- Courtney, S. (Minister for Primary Industries and Water (Tas)) 2018, Duck Irrigation Scheme to deliver greater water security, [www.premier.tas.gov.au/releases/duck\\_irrigation\\_scheme\\_to\\_deliver\\_greater\\_water\\_security](http://www.premier.tas.gov.au/releases/duck_irrigation_scheme_to_deliver_greater_water_security) (accessed 15 December 2020).
- DNRME (Qld) (Department of Natural Resources, Mines and Energy (Qld)) 2019, Queensland bulk water opportunities statement - strategic framework, Brisbane.
- 2020, Assessing demand for water: Guidance for project proponents, Brisbane.
- GHD 2017, Dungowan Dam and Peel Valley Feasibility Study Feasibility Assessment Report, Report to WaterNSW.
- IA (Infrastructure Australia) 2015, Assessment Brief - Tasmanian Irrigation Tranche 2, Sydney.
- 2017, Project Evaluation Summary - Myalup-Wellington Water Project, Sydney.
- 2018a, Assessment Framework, March, Sydney.
- 2018b, Infrastructure Decision-making Principles, Sydney.
- 2018c, Project Evaluation Summary - Lower Fitzroy River Infrastructure Project, Sydney.
- 2020a, Infrastructure Priority List, Project and Initiative Summaries, February, Sydney.
- 2020b, Stage 2 Haughton Pipeline Project: Project business case evaluation summary, Sydney.
- Joyce, B., Rockliff, J. and Hutchinson, E. (Minister for Agriculture and Water Resources, Minister for Primary Industries and Water (Tas) and Federal Member for Lyons) 2016, Coalition Invests in the Future of Irrigated Agriculture in Tasmania, Media Release.
- Littleproud, D. and Martin, S. (Minister for Agriculture and Water Resources and Senator for Tasmania) 2019, Joint Media Release: Duck Irrigation Scheme improving Tasmania's water security, Media Release.
- McCormack, M. 2019, National Water Grid Authority for the future, Media Release, <https://minister.infrastructure.gov.au/mccormack/media-release/national-water-grid-authority-future> (accessed 19 January 2021).

- 
- 2020a, National Water Grid Advisory Body appointed, <https://minister.infrastructure.gov.au/mccormack/media-release/national-water-grid-advisory-body-appointed> (accessed 20 November 2020).
- 2020b, Statement of Expectations - Infrastructure Australia, Canberra.
- NAIF (Northern Australia Infrastructure Facility) 2021, Investment Guidelines, <https://naif.gov.au/about-naif-finance/investment-guidelines/> (accessed 19 January 2021).
- NQWIA (North Queensland Water Infrastructure Authority) 2020, North Queensland Water Infrastructure Authority, [www.nqwia.gov.au/home](http://www.nqwia.gov.au/home) (accessed 3 August 2020).
- NRMMC (Natural Resource Management Ministerial Council) 2010, National Water Initiative Pricing Principles.
- NWGA (National Water Grid Authority) 2020a, National Water Grid Advisory Body, [www.nationalwatergrid.gov.au/about/advisory-body](http://www.nationalwatergrid.gov.au/about/advisory-body) (accessed 19 January 2021).
- 2020b, National Water Infrastructure Investment Policy Framework, Canberra.
- 2020c, Status of the 22 National Water Infrastructure Development Fund (NWIDF) capital projects (as at 11 November 2020), Canberra.
- 2020d, The National Water Grid: Investing in Australia’s water future, Canberra.
- PAC (Public Accounts Committee) 2019, Where to from here? The status of the Ord-East Kimberley Development Plan, Report 9, Legislative Assembly Western Australia, Perth.
- PC (Productivity Commission) 2014, Public Infrastructure, Report no. 71, Canberra.
- 2017a, National Water Reform, Report no. 87, Canberra.
- 2017b, Transitioning Regional Economies, Study Report, Canberra.
- QPC (Queensland Productivity Commission) 2020, Building economic resilience in Queensland, Research paper.
- SunWater 2020, Fact Sheet: Bundaberg Water Supply Scheme, Brisbane.
- TI (Tasmanian Irrigation Pty Limited) 2018a, Duck Irrigation Scheme, [www.tasmanianirrigation.com.au/schemes/duck-irrigation-scheme](http://www.tasmanianirrigation.com.au/schemes/duck-irrigation-scheme) (accessed 19 January 2021).
- 2018b, Swan Valley Irrigation Scheme, [www.tasmanianirrigation.com.au/schemes/swan-valley](http://www.tasmanianirrigation.com.au/schemes/swan-valley) (accessed 19 January 2021).
- 2020, Irrigation Rights: entitlement to an annual volume in an irrigations scheme, <https://app.powerbi.com/view?r=eyJrIjoiNWVkOWM1ZTYtNTJhZC00ZDkxLTliZTYtMzliYmEwNGVhZjRhIiwidCI6IjBlNWRiMWFmLTExYWUtNDE2Yy1hNzMxLTlmYmNhOTJjMTZkNiJ9> (accessed 16 October 2020).
- WaterNSW 2018, 20 Year Infrastructure Options Study - Rural Valleys, Summary Report, Parramatta.
- 2019, Water Balance Report: Peel Valley 2018-2019, Parramatta.
- 2020, Dungowan Dam, [www.watarnsw.com.au/projects/new-dams-for-nsw/dungowan-dam](http://www.watarnsw.com.au/projects/new-dams-for-nsw/dungowan-dam) (accessed 18 November 2020).
- Western Australian Auditor General 2016, Ord-East Kimberley Development, 20, Perth.