



State Infrastructure Strategy  
2022–2042

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# Enhance long-term water security

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# 07

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## Strategic directions

- ▶ Increase water security through demand management, water and wastewater recycling, and rainfall-independent supply
- ▶ Improve management of water in regional communities in partnership with local authorities
- ▶ Embed integrated water cycle management approaches, including stormwater harvesting and recycled water projects, as standard practice in land use planning, precinct development and major projects

In both metropolitan and regional areas, the water sector is faced with the fundamental challenge of managing increasing demand for an essential resource that is becoming more variable due to a changing climate and that is constrained by existing infrastructure and policies.

The 2018 State Infrastructure Strategy (2018 SIS) recommended the NSW Government develop and adopt a NSW Water Statement – a transparent, strategic framework for the allocation, conservation, management and control of water resources across NSW. This would guide the development of catchment-by-catchment Regional Water Strategies that identify an integrated package of policy, planning, behavioural, regulatory, technology and infrastructure solutions for each catchment. This policy architecture is vital to setting NSW up to successfully respond to the challenges and opportunities facing the sector.

The NSW Government has progressed these actions, and other key water-related initiatives since the 2018 SIS, as outlined in Table 7.1.

**Table 7.1 – Key water initiatives from the NSW Government since 2018**

Strategy and Policy	Plans	Investment Programs / Funding	Other
NSW Water Strategy*	Water Reform Action Plan for the Murray-Darling Basin	Sustainable Diversion Limit Adjustment Mechanism	Establishment of Water Infrastructure NSW
Draft Metropolitan Water Strategies for Greater Sydney and the Lower Hunter	20 Water Resources Plans for the Murray-Darling Basin	Safe and Secure Water Program	Establishment of Natural Resources Access Regulator
Draft Regional Water Strategies (covering 12 NSW catchment regions)	Water Sharing Plans	Town Water Risk Reduction Program	

Note: \*The NSW Water Strategy is the NSW Water Statement referred to in the 2018 SIS

## 7.1 Current water resources and infrastructure are insufficient to meet future demand

Demand for water to support a growing population is increasing, as is demand from existing and new industries, and to support urban greening and cooling aspirations.

In just the past two decades, NSW has experienced profound and statewide droughts – most recently the 2017 to 2020 drought and the earlier Millennium drought in the 2000s. NSW has always had a variable climate, with cyclical periods of wet and dry periods. If, as projected by the NSW and ACT Regional Climate Modelling (NARClIM), extreme conditions happen more frequently, the availability of water to meet demand from NSW's growing population will be put to the test – unless investments and initiatives are delivered to mitigate the demand and supply gap.

The 2018 SIS acknowledged the significantly different challenges faced in each catchment east and west of the Great Dividing Range, as well as the specific challenges in major cities like Greater Sydney.

In 2020-21, DPE undertook new scientific analysis to better understand the impact of climate variability on long-term water availability, and to project future climate conditions at the local level across the State.<sup>255</sup> The analysis involved stochastic modelling using historically observed climate variability data and paleoclimate data, combined with the latest climate projections

from the NSW Government's NARClIM model. It concluded that NSW's dependency on rainfall alone for water supply is insufficient to meet demand across both metropolitan and regional areas with current approaches to policy, management and infrastructure.

## 7.2 Infrastructure alone will not address the State's water challenges

Infrastructure solutions cannot resolve all water supply issues. Existing assets such as dams, pipes, reservoirs, storage tanks and treatment facilities are essential assets, but the management, allocation and use of the State's water resources is equally important. Accordingly, the 2018 SIS and the subsequent NSW Water Strategy and forthcoming Regional Water Strategies recognise the need to develop bespoke packages of policy, regulatory, technology and infrastructure solutions for each catchment.

Compounding the challenge is the fact that infrastructure solutions, especially major projects such as desalination plants or dams, can take significant time and capital to plan and deliver. Drought conditions deplete water supply, and if they endure, infrastructure projects may not be complete in time to augment supply. Even if dams and pipelines can be built in time, they cannot store or transfer water that is not in the catchment in the first place.

In the State's major urban centres, it will be essential to augment water supply with rainfall-independent sources such as desalination and, importantly, recycled water. These initiatives, especially purified recycled water for drinking, will require significant time and investment to achieve community support, an essential pre-condition to project development and delivery.

Completing strategic planning for each catchment across the State should remain an important priority of the NSW Government. The Government should also begin to plan in earnest for each new infrastructure project it identifies. It is essential that the Government progresses implementation of the State, metropolitan and regional water strategies to improve water security before the next drought occurs.

## 7.3 Strategies for Greater Sydney

### The need for rainfall-independent water supply

Greater Sydney relies predominantly on rainfall-dependent water supply. Only 23% of Sydney's drinking water demand is currently met by rainfall-independent sources.<sup>256</sup> If the 2017-2020 drought had lasted another two years, Greater Sydney would have exhausted its available water supplies, which would have had severe social and economic implications.<sup>257</sup>

With a minimum lead time of 4 to 6 years to deliver new rainfall-independent water infrastructure, such as desalination or water recycling plants, there is no infrastructure solution that could be built in time to address such severe water supply issues should a similarly prolonged drought occur in coming years.

Existing desalination plants can provide only 15% of Greater Sydney's current water needs. In contrast, Melbourne – which has the next lowest level of rainfall-independence in Australia – can meet 34% of its current water supply through desalination.<sup>258</sup>

Proactively planning for and investing in rainfall-independent supply augmentation, in addition to water conservation and demand management practices, is vital to secure Greater Sydney's future water supply. This includes investigating projects to increase desalination capacity and interconnections to enhance supply and resilience. The Greater Sydney Water Strategy sets out a range of rainfall-independent water supply options to safeguard water supply.<sup>259</sup>

The increasing need for rainfall-independent supply is also being highlighted by other Australian jurisdictions. Infrastructure Australia acknowledges that a reliance on rainfall-dependant water no longer 'makes sense', given climate change is likely to shift rainfall patterns, and calls for the adoption of all water supply options.<sup>260</sup> Similarly, Victoria's Infrastructure Strategy 2021-2051 seeks to progress toward an

integrated model of water cycle management, with a key priority to progress the better use of stormwater and recycled water to augment existing water supply.<sup>261</sup>

### Water recycling and re-use

Water recycling and reuse is a proven, cost-effective technology and meets stringent safety standards. It should continue to be explored and developed as an option. There is significant opportunity for NSW to pursue purified recycled water for drinking and non-drinking purposes, as a wastewater management tool and water supply solution.<sup>262</sup> This need has been acknowledged in recent years by Infrastructure Australia,<sup>263</sup> the Productivity Commission,<sup>264</sup> the State, regional and metropolitan water strategies and industry bodies.<sup>265</sup>

Adopting purified recycled water for drinking can involve 'direct' or 'indirect' augmentation of supply. Direct augmentation involves discharging purified wastewater directly into the reticulated water supply. Indirect augmentation involves the release of purified wastewater into an 'environmental buffer', such as a river. This water is then re-extracted and treated for drinking.<sup>266</sup> Several NSW communities already indirectly reuse water. For example, wastewater from the Southern Highlands is purified, discharged back into the Wingecarribee River which then flows into the Warragamba Dam and is used in Sydney's water supply.<sup>267</sup>

Purified recycled water for drinking is a common approach globally and is already adopted in Perth, Singapore, London and Los Angeles.<sup>268</sup> Perth residents have been using purified recycled water for drinking since 2017 through the city's Groundwater Replenishment Scheme, accounting for 4% of the city's water supply.<sup>269</sup> In Singapore, 30% of the nation's water needs is sourced from recycled water,<sup>270</sup> including as drinking water in dry periods.<sup>271</sup>

To increase adoption in NSW, barriers will need to be overcome, including negative public perceptions,<sup>272</sup> fragmented governance responsibilities and wastewater pricing policies.<sup>273</sup> In particular, it will be important for the community to be informed candidly about the compelling need for greater water security, and to demonstrate the effectiveness of purification technology to increase community acceptance of purified recycled water in the medium to long term.<sup>274</sup> Building on lessons from other jurisdictions, it can take significant time to build community support and trust. Therefore, a roadmap for the adoption of purified recycled drinking water should be developed, building on work already undertaken by water utilities.<sup>275</sup> This roadmap should include measures to build community support, in addition to progressing a demonstration plant for purified recycled water.<sup>276</sup>

## Box 7.1

### Lessons on adopting purified recycled water for drinking from other jurisdictions

The Water Services Association of Australia, the peak industry body representing the urban water industry, prepared a report in 2019 which highlighted 10 lessons from other jurisdictions to inform the adoption of purified recycled water in Australia:

Jurisdictions that have successfully implemented purified recycled water for drinking have built trust and buy-in from communities. Key to building and maintaining trust is ensuring transparent and open information sharing and early, grassroots education and engagement with the community. Given that other jurisdictions have taken nearly a decade to deliver purified recycled water, it is important to start planning and engagement early.

In addition, investment in a demonstration plant with educational facilities, such as a public tour program and visitor program, can significantly build community awareness and support.

Finally, another key to success is collaborative and transparent engagement between government and regulators. This will ensure an effective regulatory framework.

Recycled water for non-drinking purposes also presents a significant opportunity to reduce the need for new supply, provide water for public green spaces, return water to river ecosystems and reduce major capital investment needed for conventional sewerage expansion.<sup>277</sup> Work underway to develop the Upper South Creek Advanced Water Recycling Centre in the Western Parkland City demonstrates this approach.

Rainfall-independent sources will also be needed to contribute to meeting water demand from the increased green space and tree canopy cover needed to offset the effects of urban heat (see Chapter 5, Box 5.3 on urban cooling in South Creek). Demand for water to service green space and tree canopy is projected to increase from around 20 GL per year in 2020-21 (around 4% of Sydney's total annual demand) to around 68 GL per year by 2035.<sup>278,279</sup>

Aside from investment in new infrastructure, improved water security over the long term will also require ongoing initiatives to conserve water, manage demand and leverage technological solutions to better monitor water use and the water system's efficiency.

## 7.4 Opportunities and challenges in regional NSW

### Regional water challenges

Many towns and cities in regional NSW face even greater and more severe risks to water security than Sydney. In late 2019, more than 50 regional NSW towns including Dubbo, Cobar and Narromine, experienced significant stress as a result of the recent drought. Numerous towns and communities resorted to carting water, among them Euchareena and Guyra. Many others had 6 to 12 months of supply, such as Tamworth. In some towns, water quality was declared unsafe, resulting in boil water alerts.<sup>280</sup>

These severe conditions threaten the economic viability of some regional towns, as key industries in these locations, such as agriculture, are heavily reliant on water availability.

Regional water challenges are further exacerbated by limited operational scale. Water provision in regional NSW is provided by 93 local water utilities (LWUs), predominantly council-owned, which service 1.8 million people. There is significant variability in the geographic coverage and population of each LWU's area of operation. For example, areas serviced can range from 285 to over 50,000 square km, while populations can range from only 1000 to over 300,000. Remoteness can contribute to skills shortages, including in specialist water engineers and operators needed to maintain town water infrastructure. There is also

an insufficient rate base in many communities. These limitations mean that LWUs can struggle to independently fund services, as capital and operating costs can exceed revenue from user and service charges.

It is critical that water resources are shared equitably and responsibly to ensure economic growth in regions without compromising the health and resilience of natural water systems. Water infrastructure projects and future industries must still work within the sustainable diversion limit requirements in relation to the protection of planned environmental water and the Australian Government's obligations on extraction.<sup>281</sup>

### **Work underway and opportunities for regional communities**

Several initiatives are underway to address these issues. Twelve regional water strategies are being prepared by DPE, delivering on the commitment made by the NSW Government in its response to the 2018 SIS. These strategies will set out long-term, tailored water management solutions for regional communities – including region and catchment-specific infrastructure investment and policy interventions – using an evidence-based options assessment process.<sup>282 283</sup>

To be successful, each strategy will require strong government support, close collaboration with stakeholders and a commitment to sustaining the delivery of solutions over a long time period.

From an infrastructure perspective, following investigation, analysis and community consultation, the strategies will incorporate a range of infrastructure solutions that could include inter-regional connections, dams and dam raisings, weir upgrades, regional desalination plants, water treatment facilities and two-way water transfer.<sup>284</sup>

The NSW Government has already identified dams and dam wall raisings, and it is likely the emerging regional water strategies will canvass additional dams for consideration. It is crucial that appraisal of these projects maintain the strong discipline in strategic options assessment and economic assessment that is a hallmark of other sectors. This is particularly important given the complexity and costs of delivering dam infrastructure, their long build times, as well as the potential for significant environmental, social and cultural impacts.

The importance of maintaining this discipline has been highlighted by the Productivity Commission. The Commission's 2021 White Paper noted that options proposed in NSW's emerging water strategies should be evaluated through rigorous cost benefit analysis. All available options should be considered, including infrastructure, non-infrastructure and centralised and decentralised sources of supply as well as changes to water sharing arrangements. In addition to options analysis, due diligence is needed to ensure individual investment decisions are based on high-quality business cases.<sup>285</sup>

In 2019, NSW Government announced development of major dam projects in the Peel, Lachlan, and Border Rivers catchments - new Dungowan dam, Wyangala Dam wall raising and Mole River dam. Those announcements were subject to further analysis and the dam proposals should be re-evaluated alongside alternatives. Alternative options, including rainfall-independent water supply options, should be exhaustively pursued given the likelihood of their cost and delivery times increasing beyond reasonable expectations and potential for environmental, social and cultural impacts. Options analysis should include baskets of options as well as single source solutions.

The regional water strategies will support and are complemented by actions being taken by the Department of Regional NSW, through Future Ready Regions, to diversify regional economies. In addition, the Aboriginal Communities Water and Sewerage Program works with local water utilities to raise the standard of service to improve water supply and sewerage services in eligible Aboriginal communities.<sup>286</sup>

The NSW Government has also implemented the Safe and Secure Water Program which is investing in upgrades to infrastructure (such as bores, pipelines and treatment plants) that will assist LWUs with the provision of safe and reliable water for regional communities. In certain cases, this work is supported by the Public Works Advisory to ensure community needs and public health are protected.<sup>287</sup> Following a review of the program and completion of a business case, provision of

further funding may be critical to ensure LWUs can plan and deliver infrastructure and services that will reduce public health risks and ensure the viability of regional towns and economies.

Through the Town Water Risk Reduction Program (see Chapter 11, Box 11.7 for more), the Government is working with local councils and LWUs to improve management of town water risks. This includes investigating alternative funding arrangements for local water utilities, including customer service obligations (CSOs).

Aside from these steps to help achieve minimum service level standards in regional communities, a review of LWUs should examine:

- ▶ DPE's regulatory framework in partnership with the local water utility sector
- ▶ continuation and extension of the Safe and Secure Water Program to reduce public health and water security risks to an acceptable level
- ▶ working with local water utilities to improve asset management
- ▶ investigation of a needs-based community service obligation (CSO) funding model
- ▶ establishing a sustainable market for training in water operations to build capability and skills.

Finally, the NSW Government supports ecological outcomes for the Murray-Darling Basin through the Sustainable Diversion Limit Adjustment Mechanism (SDLAM) projects. These projects aim to deliver strong ecological outcomes while improving availability of water for households,

industry and agriculture. NSW is involved in 21 of the 36 SDLAM projects that aim to recover 605GL per year of water, more than the entire capacity of Sydney Harbour.<sup>288</sup> Twelve of these projects are in place and delivering outcomes. Delivery of the remaining SDLAM projects is critical to ensure NSW achieves its Basin Plan outcomes while supporting regional economies, in particular the Murray, Murrumbidgee and Darling River catchments where these projects are located.<sup>289</sup>

## 7.5 Capitalising on the value of wastewater in NSW

Increasing demand for water ultimately generates more wastewater. This typically requires treatment and disposal, putting pressure on the health and quality of receiving waterways. In Greater Sydney, this is anticipated to create a need to upgrade and renew aging wastewater assets.<sup>290</sup> The 2018 SIS recommended Sydney Water develop a 20-year Strategic Capital Investment Plan for Sydney's water and wastewater systems. This plan has now been finalised and outlines metropolitan wastewater infrastructure needs.<sup>291</sup>

Despite this good work, the fact remains that treatment and disposal of wastewater is fundamentally an inefficient use of a valuable resource. With 80% of Sydney's wastewater being treated and discharged into the ocean, there is the opportunity to invest instead in wastewater recycling for multiple water uses.<sup>292</sup>

This is consistent with principles outlined in the NSW Water Strategy. The Strategy contains an action to foster the circular economy in cities and towns, and to promote and improve integrated water cycle management. Integrated water cycle management takes a whole-of-system, multidisciplinary approach to the provision of water, wastewater and stormwater services and can improve water quality in receiving waterways.

Regional and metropolitan water strategies are expected to adopt a more integrated water cycle management approach, but there is the opportunity to further embed these principles within all future developments in NSW. The Wianamatta South Creek project (see Chapter 5 for more) outlines a leading approach on a sub-regional scale, but applications are also feasible on a precinct and individual site scale.



## 7.6 Recommendations

No	Recommendations	Implementation timeframe	Lead agency
28	<b>Increase the resilience of Greater Sydney’s water supply through a full range of options, including better conservation and more diverse sources</b>		
	a. Increase investment in water conservation programs in partnership with public and private sectors.	Immediate Priority	Planning and Environment
	b. Progress planning and development for rainfall-independent water supply projects, including desalination, recycled water and interconnections.	Immediate Priority	Planning and Environment
	c. Adopt integrated water cycle management approaches across the development of all NSW Government-led precincts and major projects.	Immediate Priority	Planning and Environment
	d. Incorporate stormwater harvesting and recycled water projects as standard practice of land use planning.	Immediate Priority	Planning and Environment
29	<b>Develop a roadmap for the adoption of purified recycled drinking water, including measures to build community support and demonstrate the efficacy of the technology</b>	Immediate Priority	Planning and Environment
30	<b>Improve water security and quality in regional NSW</b> Complete the suite of Regional Water Strategies and progress investigations and planning for new water infrastructure identified within each catchment.	Immediate Priority	Planning and Environment
31	<b>Investigate and propose alternatives to the delivery of major dam projects in the Peel, Lachlan and Border Rivers catchments</b>	Immediate Priority	Planning and Environment & Regional NSW

No	Recommendations	Implementation timeframe	Lead agency
32	<b>Bolster long-term funding and capability to support financial sustainability of Local Water Utilities and ensure minimum service levels are achieved</b>		
	a. Review DPE's regulatory framework in partnership with the local water utility sector.	Immediate Priority	Planning and Environment
	b. Establish a specific and ongoing program to improve asset management methods, routines and skills in local water utilities.	Immediate Priority	Planning and Environment
	c. Investigate extension of the Safe and Secure Water Program to reduce public health and water security risks to an acceptable level.	Immediate Priority	Planning and Environment & Regional NSW
	d. Investigate alternative funding arrangements, including a needs-based community service obligation (CSO) funding model, to ensure all communities have access to water that meets quality standards.	Immediate Priority	Planning and Environment
	e. Establish a sustainable market for training in water operations to build capability and skills.	Immediate Priority	Planning and Environment & Education