



Draft Regional Water Strategy

South Coast: Strategy

October 2020

Published by NSW Department of Planning, Industry and Environment

dpie.nsw.gov.au

Title: Draft Regional Water Strategy

Subtitle: South Coast: Strategy

First published: October 2020

Department reference number: PUB20/311

Cover image: Image courtesy of Destination NSW.

More information: www.dpie.nsw.gov.au/south-coast-regional-water-strategy

Acknowledgements: The input and collaboration of these NSW Government agencies is acknowledged: WaterNSW, NSW Health, Office of Local Government and Aboriginal Affairs NSW. We also acknowledge the feedback from the Aboriginal Water Coalition which includes the NSW Aboriginal Land Council, NTSCORP, Murray Lower Darling Rivers Indigenous Nations and Northern Basin Aboriginal Nations.

Acknowledging Aboriginal People: the NSW Government acknowledges Aboriginal people as Australia's first people practicing the oldest living culture on earth and as the Traditional Owners and Custodians of the lands and waters.

We acknowledge that the people of the Yuin Nation hold a significant connection to the lands and water covered by the South Coast Regional Water Strategy.

The South Coast Region holds areas of great spiritual, cultural and economic importance to Aboriginal people and the NSW Government recognises the connection of the water to the people of this nation.

We recognise the intrinsic connection of Traditional Owners to Country and acknowledge their contribution to the management of the South Coast Regional Water Strategy area landscape and natural resources.

NSW Department of Planning, Industry and Environment understands the need for consultation and inclusion of Traditional Owner knowledge, values and uses in water quality planning to ensure we are working towards equality in objectives and outcomes.

NSW Department of Planning, Industry and Environment is committed to building strong partnerships with Aboriginal people.

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Minister's foreword



The NSW Government made a commitment before the last election to undertake comprehensive modelling that would enhance the management of water to improve water security and better prepare our communities for future droughts.

Water is our most precious and valuable resource—for our towns and industries and maintaining our natural and cultural assets.

Our water management and understanding has improved considerably in recent times—if you can't measure it, you can't manage it.

The knowledge we have garnered in the development of these strategies will underpin future investments through a better understanding of optimum water management.

Engaging with our Aboriginal communities is vital, given water is an essential part of their connection to Country and culture, and their

cultural water holdings will be vital to creating local jobs into the future. While COVID-19 has impacted our ability to engage with Aboriginal communities in a culturally appropriate way, we are committed to including their voices in the South Coast Regional Water Strategy.

I appreciate the engagement by local government in the development of the draft strategies. Their continued partnership is very important to ensure the strategies respond to the needs of catchments that may extend across many local government boundaries.

Australia is no stranger to extremes; we have always had to manage our water resources through prolonged droughts and floods.

In preparing these strategies, we've engaged leading academics at a number of universities. The rainfall and evaporation modelling was largely undertaken by the University of Newcastle to help understand and mitigate risk in the most extreme circumstances.

The climate modelling in this draft strategy is based on a deliberately conservative scenario which is intended to 'pressure test' the effectiveness of these strategies in a worst-case scenario. They do not account for changes in how we operate the system moving forward, where in reality we will respond actively to ongoing drought conditions to prolong the availability of water for critical human needs.

These climate scenarios will not necessarily eventuate, but they give us an idea of the possible climate risks and allow us to begin planning to mitigate these risks if they arise.

The recent drought has taught us a great deal about managing our water resources and we need to put these lessons to good use in preparing for possible future extreme weather events.

In short, the better evidence and information we now have means we can better plan for the future to ensure this precious shared resource is managed to sustain regional lifestyles, create jobs, support industry and protect our precious natural environment.

There is no one size fits all policy to manage water in our regions, and I encourage all stakeholders to take part in giving us your views on how to improve these draft strategies to ensure our water management policies support the future of NSW.



Melinda Pavey
Minister for Water,
Property and Housing



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Snapshot

The South Coast region



120,000
population



11,950
km² area



Aboriginal Nations:
Yuin Nation



Regional centres include:
Vincentia, Milton-Ulladulla,
Batemans Bay
and Bega



Local centres include:
Moruya, Narooma,
Merimbula and Eden



Main river catchments:
Clyde, Deua, Tuross,
Murrah, Bega and Towamba



Main groundwater sources:
Lachlan Fold Belt Coast
Bega, Towamba and Tuross
river alluviums
Araluen Creek alluvium
South East Coastal Sands



Key water storage:
Brogo Dam (9 GL) regulates
the Brogo and lower
Bega rivers



Key environmental assets:
Native flora and fauna, state
and nationally significant
estuarine wetlands and
swamps, national parks
and nature reserves

Gross Regional Product:

\$6.1 billion



Key water sectors and engine industries:

Health care and social assistance, tourism, agriculture (dairy, beef, stone fruit),
aquaculture (oyster farming), forestry and food product manufacturing



Overview

Across NSW, our valuable and essential water resources are under pressure. Changing industry and employment patterns, and a more variable climate mean we face difficult decisions and choices about how to balance the different demands for this vital resource and manage our water efficiently and sustainably into the future.

The NSW Government is preparing comprehensive regional water strategies that will bring together the best and latest climate evidence with a wide range of tools and solutions to plan and manage each region's water needs over the next 20 to 40 years.

The South Coast Regional Water Strategy is one of 13 strategies (12 regional water strategies and a Greater Sydney Water strategy) the Department of Planning, Industry and Environment is developing in partnership with water service providers, local councils, Aboriginal peak bodies, communities and other stakeholders across NSW.

The South Coast region

The South Coast region (Figure 1) covers around 11,950 km² on the south coast of NSW, stretching from the Victorian border to the Clyde River catchment and Jervis Bay area. The area includes the six catchments of the Clyde, Deua (Moruya), Tuross, Murrah, Bega and Towamba rivers and 48 smaller coastal draining catchments. The area is located within the traditional lands of the Yuin Nation and comprises local government areas of Eurobodalla Shire Council and Bega Valley Shire Council and the southern part of Shoalhaven City Council. The village of Araluen and its surrounding area which falls within Queanbeyan-Palerang Regional Council's boundary is also covered by this regional strategy. The region stretches across the South East Tablelands and Illawarra-Shoalhaven planning regions.¹

The major catchments of the South Coast region all begin in the uplands of the Great Dividing Range and flow through to the sea via a series of estuaries and intermittently closed and open lakes and lagoons (ICOLLs), many of which are ecologically significant. The headwaters are primarily forested, with the lower coastal plains cleared for settlement and used for agricultural production.

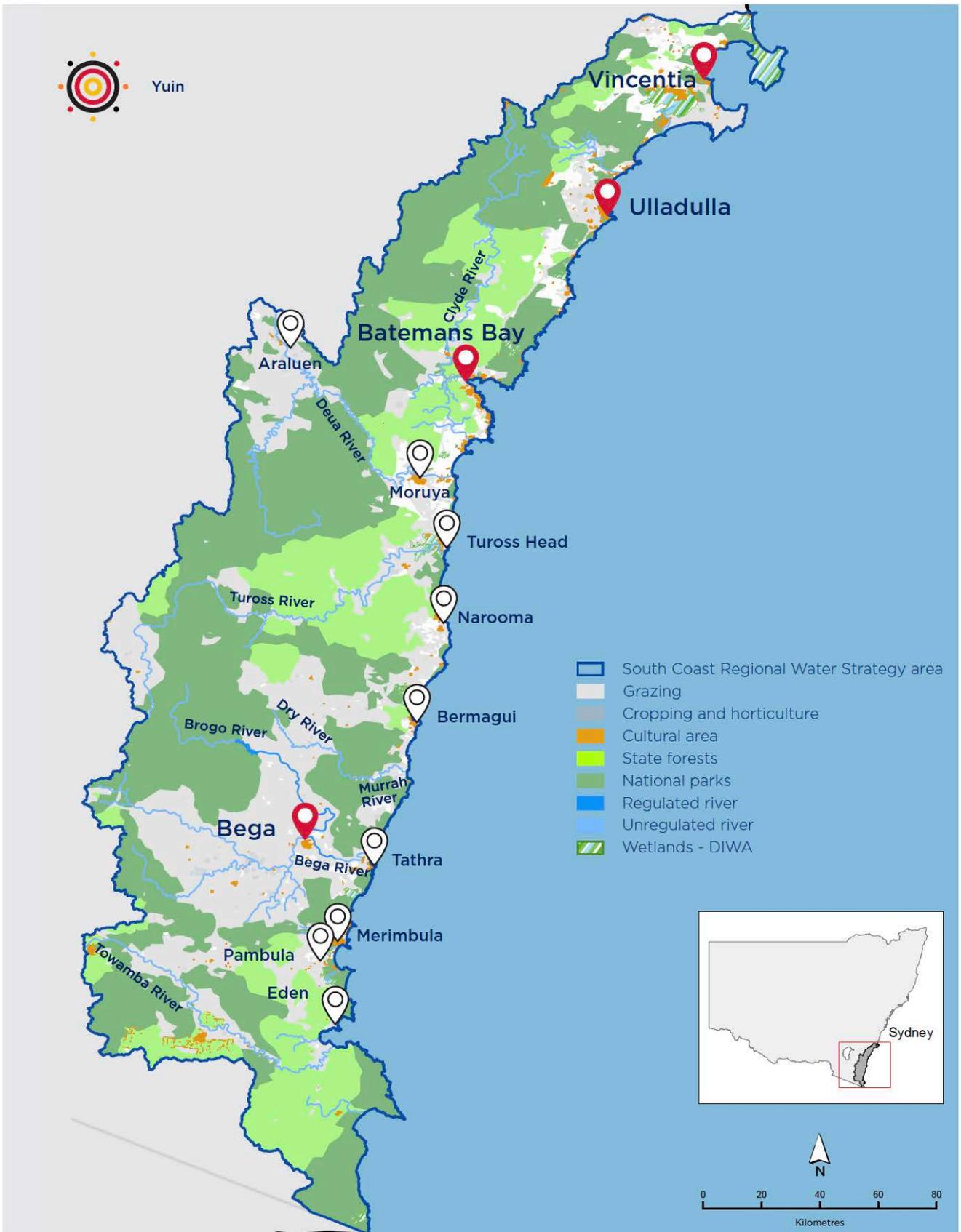
The South Coast region is home to about 120,000 people of whom 33,250 reside in the Bega Valley Shire, 37,230 reside in Eurobodalla Shire and about 50,000 live in the Shoalhaven City local government area. The population is concentrated in towns and villages along the coast. The region attracts hundreds of thousands of visitors annually.

The region's major regional centres are Milton-Ulladulla, Vincentia, Batemans Bay and Bega. Other important centres include Moruya, Narooma, Merimbula and Eden.

The South Coast region has a diverse economy, underpinned by connections to Canberra, Sydney and Melbourne, and varied agriculture and tourism opportunities. Its coastal plains support a range of profitable agricultural enterprises, particularly dairy, beef, oysters and fishing. The region is home to Bega Cheese, an industry leader in dairy product manufacturing, as well as several specialist cheesemakers and milk processors. Tourism is a large employing sector in the region with visitors attracted to the region's highly desirable coastline and marine environment, national parks, temperate climate and overall lifestyle amenity.

1. The NSW Government has divided the state into ten regions for the purpose of developing strategic land use plans. The South Coast, Murray and Murrumbidgee regional water strategy regions all fall within the South East and Tablelands strategic land use planning region. The South Coast and Greater Sydney regional water strategy regions fall within the Shoalhaven-Illawarra land use planning region.

Figure 1. Map of the South Coast region



Water in the South Coast region

Water is a significant feature of the South Coast region's environment, with its interconnected systems of rivers, creeks, groundwater aquifers, wetlands, estuaries and coastal lakes and lagoons. Water supports the region's population and its liveability, protects and conserves ecological assets and Aboriginal cultural heritage, and underpins key industries and local employment.

The South Coast region encompasses the catchments of the Clyde, Deua, Tuross, Murrumbidgee, Bega and Towamba rivers. The landscape is dominated by the Great Dividing Range to the west, which cascades to rounded foothills and undulating slopes before widening out to coastal floodplains. The coastal zone is generally characterised by estuaries, coastal lakes and lagoons, remote beaches and rocky headlands.

The South Coast region is home to many state and nationally significant wetlands and swamps supporting large areas of mangrove, saltmarsh and seagrasses. The Clyde River supports the largest area of estuarine wetlands of any estuary in the South Coast region, consisting of 54 discrete and protected wetlands. The region is also home to diverse native flora and fauna species including native fish and bird populations, some of which are listed as threatened, rare or endangered. National parks, state forests and public reserves, including several declared wilderness areas, cover a significant part of the region.

Some of the South Coast region's waterways—particularly in the Bega River catchment—have been classified as being under high or medium hydrological and environmental stress.² While there is enough water in the region to meet agricultural demands on an annual basis, most extraction takes place in the drier summer period when temperatures are high and flows are low. This puts high stress on the flora and fauna that rely on the rivers. Longer droughts and reduced flows due to climate variability and change will amplify these impacts.

Land use activities also have adverse impacts on some of the region's water sources. Agricultural practices, past clearing of riparian vegetation, forestry operations and urban development all contribute to water quality issues, especially after rain. Runoff from bushfire affected catchments can wash ash and eroded soil into waterways. More severe storm and erosion events under a changing climate will exacerbate the effects of land use activities and bushfires on water quality. Sea level rise will increase the salinity of surface water and groundwater sources in the region's coastal areas.

People and industries in the region's major towns receive water from supply systems operated by Shoalhaven Water, Eurobodalla Shire Council and Bega Valley Shire Council. WaterNSW supplies water users from the Bega-Brogo regulated river system.³

Most South Coast rivers are unregulated,⁴ meaning there are no major state-owned storages to capture and control flows for water supplies. These unregulated rivers and streams are the most important sources of water for the region's towns, rural landholders, industries and the environment. Groundwater from alluvial aquifers is also an important source of water.

2. Department of Land, Water and Conservation 1998, *Stressed Rivers Assessment Report: NSW State Summary*

3. A regulated river is one where the flow has been modified from its natural state through structures such as a major state-owned dam, weir or off-takes. Major dams usually control the flow of water down regulated rivers.

4. An unregulated river or stream is not controlled by releases from a major state-owned dam. Water users and the environment are reliant on climatic conditions and rainfall.

Groundwater provides important baseflows to rivers and creeks, and there can be a high degree of connection between surface water and groundwater in the lower river reaches, coastal riverbeds and estuaries, lakes and lagoons. This means that the depletion of surface water sources can impact groundwater recharge and groundwater levels. Similarly, a drop in groundwater levels, through over-extraction or drought, can lower surface water levels and reduce streamflows. Urbanisation in the region significantly changes surface water drainage and runoff in the region's major towns, which can impact groundwater recharge patterns and increase pollution risks.

The Bega-Brogo regulated river system is the only regulated system in the South Coast region. It is managed by WaterNSW and extends from Brogo Dam (8,980 ML) to the Bega River estuary. Brogo Dam is small and regularly fills and spills due to historically reliable rainfall. The dam's capacity is also far less than the volume of water access licences issued to the Bega-Brogo regulated river system. These factors mean it is underused during most years, rarely provides full allocations to general water security licences and only provides short-term water security for water users during droughts. This constrains economic growth and makes the catchment vulnerable to increased climate variability and change.

Cochrane Dam Pty Ltd owns and operates Cochrane Dam (2,700 ML) to generate hydroelectricity. Although water is not released from the dam to specifically meet irrigation demands, the dam does increase the reliability of water access to licence holders on the Bemboka River.

Private farm dams are scattered across the region to harvest and store water to meet the various water needs of rural landholders. These dams include small unlicensed 'harvestable rights dams' and larger licensed dams. While harvestable rights dams only make up a small proportion of regional water extractions, their impact on downstream river flows is magnified during droughts.

Porters Creek Dam (1,900 ML), Deep Creek Dam (4,900 ML) and Yellow Pinch Dam (3,000 ML) are the region's major town water storages, supplying water to the Shoalhaven Water, Eurobodalla Shire and Bega Valley Shire town water systems respectively. These local water utilities access multiple water sources across the region, including Brogo Dam, Tantawanglo Creek, the Tuross, Deua and Buckenbowra rivers and borefields at Bega, Eurobodalla and Kiah (Towamba River).

For most of the year, water from Porters Creek Dam is sufficient to meet the needs of customers in Shoalhaven Water's Southern System (Milton-Ulladulla and the villages around Jervis Bay and St. Georges Basin). During periods of high demand—such as summer and Easter school holiday period—water can be transferred from the Northern System which is located in the Greater Sydney region.

South Coast town water supplies are generally secure because the region has historically received regular and reliable rainfall. However, longer droughts and reduced flows due to climate variability and change, population growth and sea level rise will pose threats to several of the region's town water supply systems over the next 40 years.

South Coast local water utilities have been successful in helping reduce residential water consumption to well below the NSW regional median. However, poor raw water quality, climate change, ageing water and sewerage infrastructure, the remoteness of the region and low customer bases all increase the challenges of providing safe, secure and affordable water and sewerage services to local communities.

South Coast communities are less reliant on groundwater from the region's coastal sands and hard rock aquifers than they are on surface water and alluvial groundwater sources. Nearly all water accessed from hard rock aquifers is used for irrigation. The volume of recycled water use is low across the region. However, the proportion of wastewater recycled for reuse is relatively high compared to other NSW regions, particularly in the Bega Valley Shire and Shoalhaven City local

government areas. Recycled water is mostly used to irrigate local golf courses, parks and farmland and reduces the environmental and public health risks of wastewater discharges to the region's waterways.

Agriculture is the biggest water user in the South Coast region. Surface water and groundwater sources support dairy farming, beef grazing, small-scale horticulture (mainly stonefruit) and lucerne production. Most irrigation occurs in the Bega River and Tuross River valleys. Many of the region's agribusinesses rely on a combination of rainfall and irrigation water. South Coast estuaries, lakes and lagoons support a growing aquaculture industry, mostly oyster

farming, and underpin the region's tourism industry. Protecting the water quality of coastal lakes and estuaries from stormwater, sewage overflows, and runoff from agricultural and forestry land is of vital importance to aquaculture and tourism industries, and is a major challenge for the South Coast region.

Aboriginal people in the region also rely on water for their health, wellbeing and connection to Country. They value maintaining connectivity to land and water, and the region's rivers are considered 'classrooms' for maintaining the continuity of Aboriginal culture. Aboriginal people seek more opportunities to manage water using their cultural knowledge and to create improved economic opportunities.

Definitions

We are using the following definitions in the regional water strategies:

Water security in the context of regional water strategies refers to the acceptable chance of not having town water supplies fail. This requires community and government to have a shared understanding of what is a 'fail event' (for example, no drinking water or unacceptable water quality) and the level of acceptability they will pay for.

Water reliability refers to how often an outcome is achieved. It is often considered to be the likelihood, in percentage of years, of receiving full water allocations by the end of a water year for a licence category.

For example, a 60% reliability means that in 60% of years a licence holder can expect to receive 100% of their licensed entitlement by the end of the water year. Other measures of volumetric reliability could also be used: for example, the percentage allocation a licence holder could expect to receive at a particular time of the year as a long-term average. Reliability may also refer to how often an acceptable water quality is available. A reliable water supply gives some clarity to water users and helps them plan to meet their water needs.

Resilient water resources means water users are able to withstand extreme events, such as drought and flood, and/or adapt and respond to changes caused by extreme events.

Future climate risks

The NSW Government has invested in new climate datasets and improved modelling that provide a more sophisticated understanding of historic climate variability in the South Coast region, as well as likely future climate risks. This means that we have moved from making decisions that are based largely on single worst-case scenarios to a much more comprehensive understanding of natural variability and potential extreme events.⁵

We can now better predict and plan for plausible future climate scenarios (such as the likely frequency, duration and severity of extended droughts), better understand the climate risks faced by water users and the environment across NSW and better manage our water resources over the medium- and long-term to mitigate these risks.

This new information is the basis for preparing robust new water strategies for our regions and also offers fresh evidence for examining our existing water policies, operational rules and management plans.

The new climate data and updated hydrological modelling developed for this regional water strategy suggest that the South Coast region will continue to experience extended periods of wet and dry. The data shows that:

- under normal climate conditions, the South Coast region will continue to receive sufficient rainfall to provide for the region's current and future needs
- the region may experience longer droughts than we have seen in the historic record, with Brogo Dam being drawn down for periods longer than 18 months under current demand scenarios
- periods of low streamflow may become more frequent, including periods of cease-to-flow.

Sea levels are also predicted to rise, which will push high tides further upstream and increase river and groundwater salinity and inundation of low-lying land in the coastal areas. Over time, this may also have impacts on land availability for agriculture and other purposes.

These events could become more severe due to likely changes in climate across south eastern NSW in the near future and longer-term. These changes include higher temperatures, more frequent hot days, changes to the seasonality of rainfall and more days of severe bushfire weather. It also means that regular flows in rivers may reduce and some smaller creeks may stop flowing more often than they do now. Droughts that occur in closer succession and hotter, drier conditions may mean catchments require higher rainfall to generate runoff into rivers and creeks. Increased frequency and severity of bushfires will exacerbate erosion and poor water quality events. Strategic water planning and management will help us address these water quality challenges.

Making choices for the future

Like most regions across Australia, the South Coast region faces choices and challenges in balancing different water uses as climatic conditions change. However, the region's communities are used to variable annual rainfall and river flows and are in a good position to deal with greater climate variability and tackle future challenges, which include:

- supporting local water utilities to provide reliable, safe and affordable water and sewerage services supplies for the region's towns and Aboriginal communities
- maintaining domestic water availability during extended dry periods for the region's population who source their drinking and domestic water from unregulated rivers, groundwater aquifers, farm dams and rainwater tanks

5. More information about this modelling is provided in the *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about

- maintaining and improving flows for aquatic habitats and fish passage across the region's waterways, estuaries and coastal lakes and lagoons
- ensuring sustainable and reliable access to water to sustain and improve productivity in the region's agricultural industries
- mitigating the impacts of urban and rural land management activities on water quality, including the impacts of sewage
- improving the region's capacity to manage the impacts of sea level rise and higher-magnitude flooding.

To meet these challenges, we may need to rethink how the region's towns, industries and rural communities access water and which water resources they rely on. We may also need to find ways to use water more efficiently, improve how we manage groundwater and water quality, and make better use of recycled wastewater.

A new, comprehensive water strategy for the South Coast region

The South Coast Regional Water Strategy will guide how we address future water resource challenges, make the right policy and infrastructure choices and open up new opportunities for the region.

The strategy will bring together all the tools we have—policy, planning, regulatory, educational, technology and infrastructure solutions—in an integrated package that is based on the best evidence, responds to the region's water needs and delivers the right amount of water for the right purpose at the right times.

The strategy will aim to provide choices to better use, share, store and deliver water to avoid having to ride the highs and lows of water availability. It will cover the whole South Coast region and all water sources, and it will change how we manage water in the future.

In line with the objectives we have set for all regional water strategies, the South Coast strategy has a strong focus on working closely with communities to provide healthy, reliable and resilient water resources that:

- deliver and manage water for local communities
- enable economic prosperity
- recognise and protect Aboriginal water rights, interests and cultural values
- protect and enhance the environment
- are affordable.

The final strategy will set out clear and accountable actions for the NSW Government, local councils and industries to tackle the challenges facing the South Coast region. The strategy will aim to maximise opportunities arising from the region's growing tourism, agriculture, aquaculture and food production sectors. It will also seek to expand on opportunities presented by investment in the health of the marine estate⁶ and transport and community infrastructure, such as upgrades to the Port of Eden and Kings Highway.

The final strategy will also help to improve the sequencing and integration of water reforms and water planning actions across the South Coast region to ensure they are implemented effectively.

The Department of Planning, Industry and Environment will develop an implementation plan that identifies actions and timeframes.

6. The marine estate includes tidal rivers and estuaries, the shoreline, submerged lands, offshore islands, and the waters of the NSW coast from the Queensland border to the Victorian border and out to three nautical miles offshore.

Our vision for the strategy

Our vision for the South Coast Regional Water Strategy is to support the delivery of healthy, reliable and resilient water resources for a liveable and prosperous region. To achieve this, we need to position the region so there is the right amount of water of the right quality available for people, Aboriginal communities, towns, industries and the environment.

The options

A long list of potential options is presented as part of this draft strategy.

These options build on the NSW Government's current and planned investment in water infrastructure in the region, including the Eurobodalla Southern Storage, Brogo-Bermagui Water Treatment Plant and Merimbula Sewage Treatment Plant upgrade and deep ocean outfall. They also complement and build on state-wide reforms to introduce non-urban water metering, improve compliance with water sharing rules and review harvestable rights for all coastal draining catchments.

To identify and develop appropriate options for the draft strategy, we have drawn from a range of sources including previous studies, community engagement, experiences of recent droughts and existing government programs. We have aligned our approach with regional development and land use strategies to ensure that all options can be integrated and sequenced with state-wide and local plans.

Current options presented in the draft strategy cover actions, projects, reforms and investments that focus on:

- **maintaining and diversifying water supplies**, including new water storages and pipelines, augmenting and re-purposing existing water storages, new water treatment facilities and new sources of water such as groundwater, desalination, wastewater reuse and stormwater projects
- **protecting and enhancing natural systems**, including policy changes to ensure more sustainable water extraction, new and upgraded sewer services and wastewater schemes, improving fish passage and riparian, wetland and catchment management works
- **supporting water use and delivery efficiency and conservation**, including changes to bulk water supply operations, water efficiency measures, a review of the water market and increased allocations
- **strengthening community preparedness for climate extremes**, such as reviewing drought management rules and increasing on-farm storage.

Face-to-face engagement with Aboriginal communities on the South Coast region has been postponed due to the January and February 2020 bushfires and the COVID-19 pandemic. The department is committed to engaging with Aboriginal communities on the South Coast as soon as possible to ensure the Aboriginal rights, interests and concerns related to water are heard and included in the final strategy. Accordingly, in addition to the four focus areas identified above, the final long list of options in the draft strategy will include a key focus on **improving the recognition of Aboriginal people's water rights, interests and access to water**. This may include reviewing cultural water access licences and ensuring greater involvement of Aboriginal people in water management.

This strategy considers how government

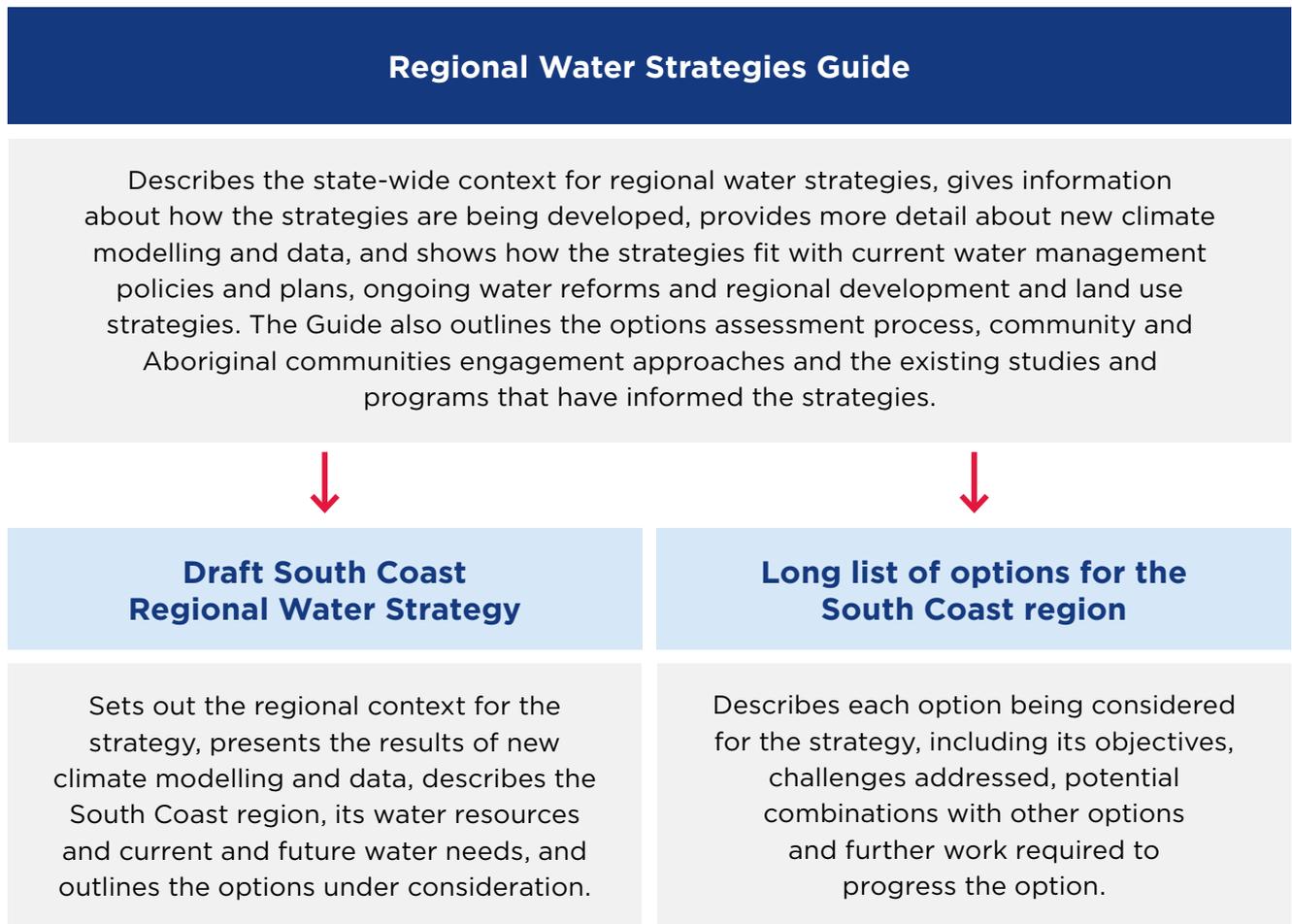
and local water utilities can adopt a more integrated approach to managing surface water, groundwater and their catchments. It also acknowledges that end of system flows are fundamental for a biologically diverse marine estate, which provides a range of social, economic and cultural opportunities for the South Coast’s communities, including its Aboriginal people, and visitors.

Many of the options are interrelated. This means that to get the most benefit out of these options—and make the best use of the region’s water resources—they may need to be combined into packages.

Not all options will be progressed, and many have not been costed. Following feedback on the draft strategy, we will conduct an evidence-based assessment to identify the best actions for the South Coast region. This will form the final, comprehensive South Coast Regional Water Strategy.

The Draft South Coast Regional Water Strategy is accompanied by a more detailed description of the long list of options and an overarching explanatory guide that outlines the broader context for the development of regional water strategies across NSW (Figure 2).

Figure 2. Draft South Coast Regional Water Strategy



Chapter 1

Context



Snapshot

We are preparing comprehensive regional water strategies across NSW, bringing together the best and latest climate evidence with a wide range of tools and solutions to plan and manage each region's water needs over the next 20 to 40 years.

- The strategies aim to understand how much water a region will need to meet future demand, identify the challenges and choices involved in meeting needs and set out the actions we can take to manage risks to water security and reliability.
- Through better strategic planning the NSW Government aims to support safe and secure water for towns and communities, support regional industries, boost economic prosperity and safeguard and enhance the environment. The strategies will also recognise and protect Aboriginal rights, interests and access to water.
- The South Coast Regional Water Strategy is one of 13 strategies (12 regional water strategies and a Greater Sydney Water Strategy) the Department of Planning, Industry and Environment is developing in partnership with water service providers, local councils and Aboriginal peak bodies. The final strategies will also be informed by communities and other stakeholders across NSW.

New climate data and modelling, plans, studies and investments have also influenced the direction of the Draft South Coast Regional Water Strategy.

- A significant amount of work since the Millennium Drought has improved our understanding of the risks affecting water resource management in the South Coast region. Community engagement across NSW over the last few years has also given insights into the best way to prepare for future droughts and floods in the region.
- The NSW Government has invested in new climate datasets and improved modelling to provide a more robust and sophisticated understanding of future risks to water availability in the South Coast region.
- The regional water strategies will build on existing NSW Government commitments to improve water security, resilience and reliability across regional NSW, including investment in water infrastructure, a range of state-wide water reforms and a new streamlined approval process for drought-related projects.
- The strategy also aligns with existing policies and plans that are improving the management of water resources across NSW, as well as being integrated with strategic and local land use planning.

1.1 Purpose of regional water strategies

Regional water strategies bring together the most up-to-date information and evidence with a wide range of tools and solutions to plan and manage a region’s medium and long-term water needs.

The strategies look out over the next 20 to 40 years and determine the challenges and choices involved in meeting the region’s future water needs and the actions we can take to manage risks to water availability and secure healthier, more resilient water sources.

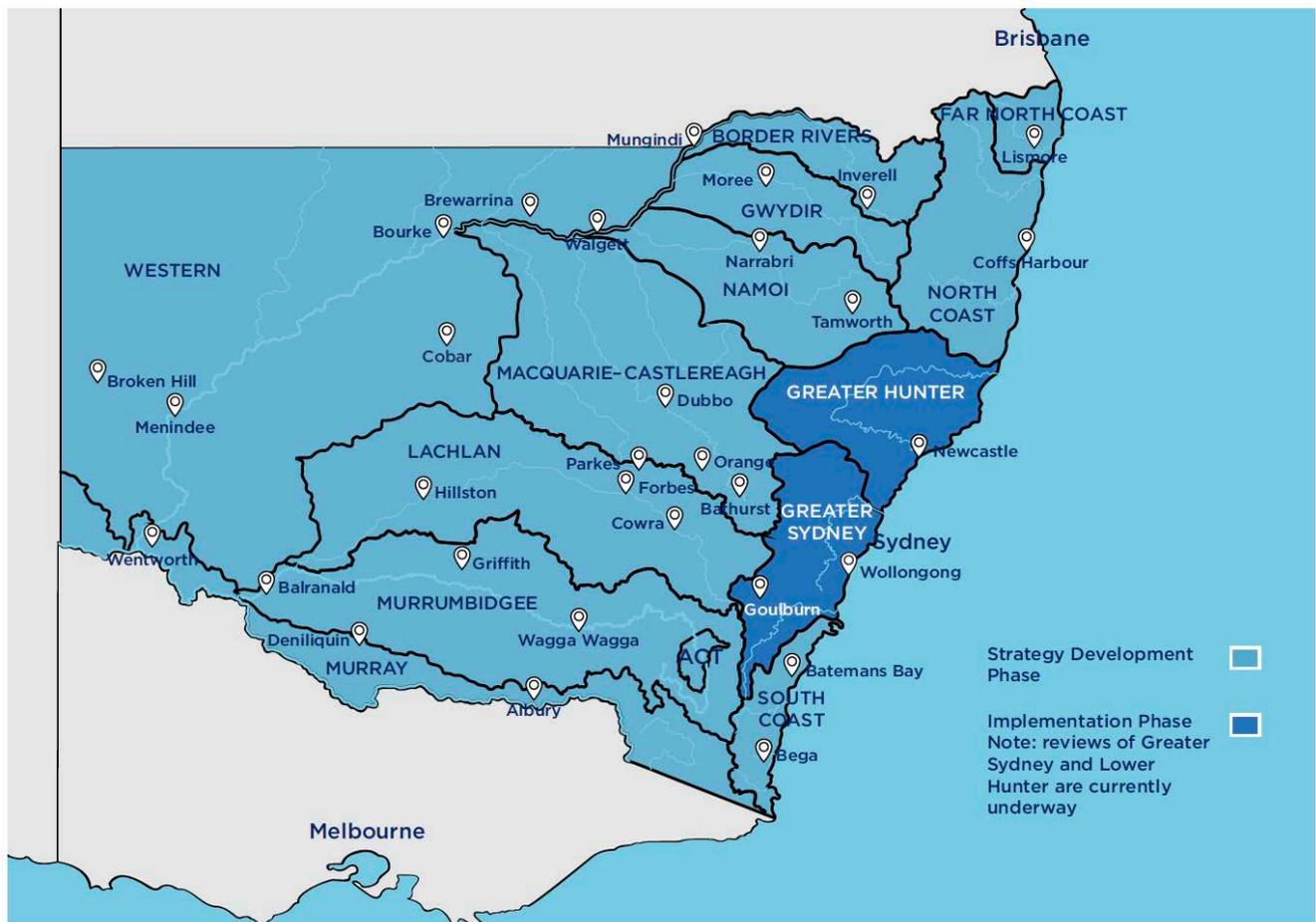
The strategies also explore new solutions to tackle these issues. The solutions have the potential to add value to the way we manage water, generate greater community-

wide benefits and create new economic opportunities for each region.

With improved strategic planning around water, the NSW Government aims to achieve more resilient water resources for towns, communities, industries, Aboriginal people and the environment.

The South Coast Regional Water Strategy is one of 13 strategies (12 regional water strategies and a Greater Sydney Water Strategy) the Department of Planning, Industry and Environment is developing in partnership with water service providers, local councils, Aboriginal peak bodies, communities and other stakeholders across NSW (Figure 3).

Figure 3. Map of NSW regional water strategy regions





1.2 Objectives of regional water strategies

Regional water strategies will set out a long-term ‘roadmap’ of actions to deliver five objectives (Figure 4). Options selected for inclusion in the final strategy for each region will need to address at least one of these objectives. Our aim is for each strategy to

have a comprehensive, balanced package of options that delivers on all of the objectives and the relevant goals set out in the *South East and Tablelands Regional Plan 2036*⁷ and *Illawarra-Shoalhaven Regional Plan 2036*.⁸

Figure 4. NSW regional water strategies: objectives



7. Department of Planning, Industry and Environment 2017, *South East and Tablelands Regional Plan 2036*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/South-East-and-Tablelands

8. Department of Planning, Industry and Environment 2015, *Illawarra-Shoalhaven Regional Plan*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Illawarra-Shoalhaven/Illawarra-Shoalhaven-Regional-Plan

During extreme events, such as the 2019 drought, our focus is on protecting basic landholder rights and essential town water supplies. Outside of these extreme events, we have greater flexibility to deliver across all the objectives, including providing water for the environment.

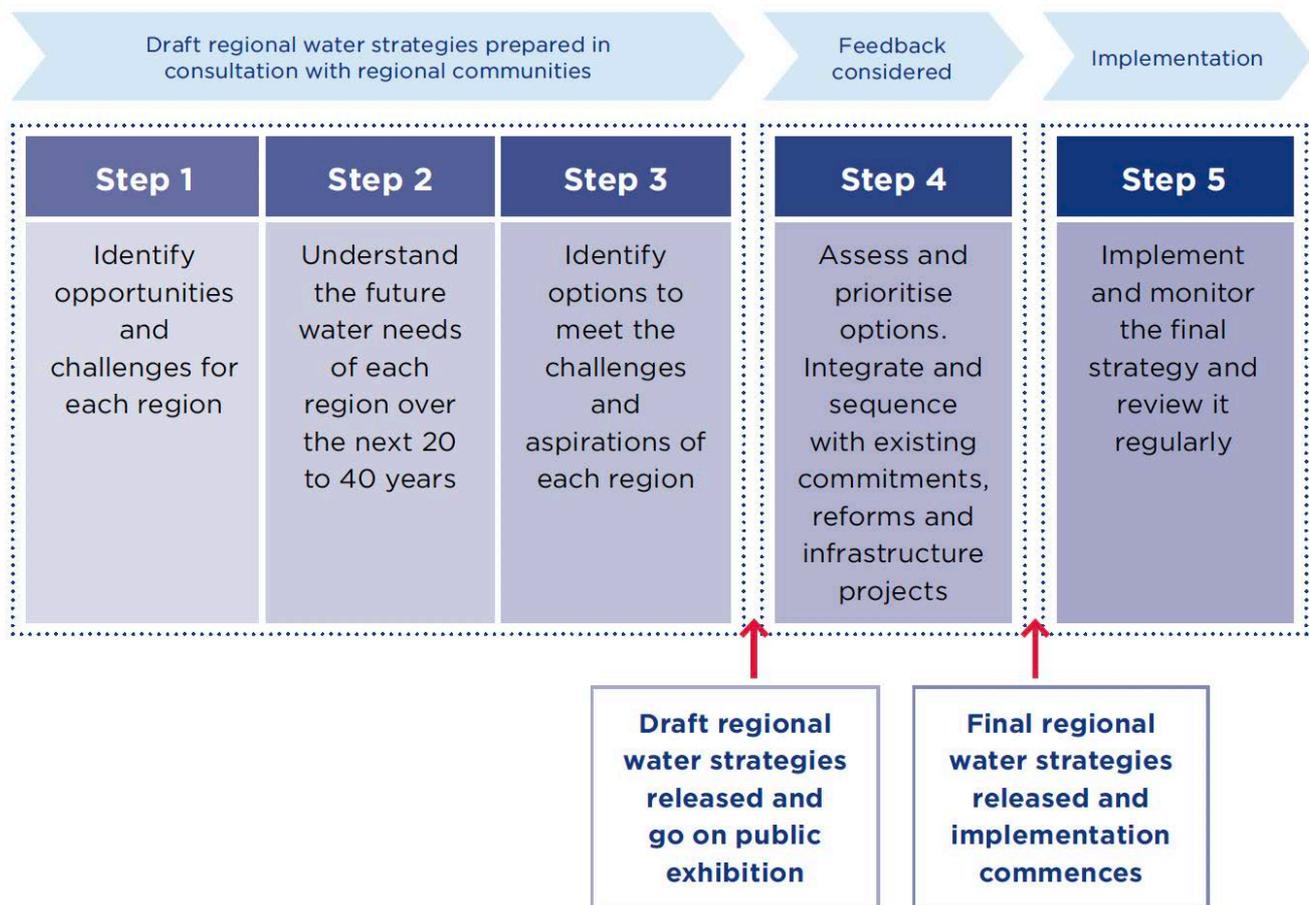
It is also important to note that when formulating water sharing plans, the NSW Government must take all reasonable steps to prioritise

the protection of the water sources and their dependent ecosystems.⁹

Through the regional water strategies, we aim to better manage these extreme events for all water users in the future.

The NSW Government is taking a five-step approach to preparing and implementing regional water strategies, as shown in Figure 5 below.

Figure 5. Five step approach to NSW regional water strategies



9. Subsections 9(1)(b), 5(3)(a) and 5(3)(b) of the NSW *Water Management Act 2000*

1.3 What has informed the draft regional water strategies?

To ensure we are using the best evidence and most recent data, and fully consider ideas and options from each region, we have used a wide range of sources to inform each strategy.

1.3.1 Improved climate modelling and data

Until now, water management in NSW has been based on historical data and observations going back to the 1890s. This has provided a limited understanding of extreme events. The NSW Government has invested in new climate datasets and modelling to develop a more sophisticated depiction of past and future climatic conditions. For the South Coast region, these improved datasets have used the statistical characteristics of the recorded data to generate more than 13,000 years of synthetic climate data. We have then combined this information with other sources of climate data such as climate change projections and plausible changes to the frequency of east coast lows. This new data has helped us to better understand the region's natural climate variability, including the probability of wet and dry periods, and estimate risks to future water availability.

This improved modelling means that we can move from making decisions based heavily on single worst-case scenarios drawn from a short climatic record to plausible climate scenarios drawn from a much more comprehensive understanding of the length and frequency of wet and dry periods.

We can now better understand the probability of future climate characteristics—such as the

frequency, length and distribution of droughts and wet periods in the region—and better understand how to mitigate these risks and assess the possible benefits of medium and long-term solutions.

This new method is an important advance on previous climate datasets and models. Through this work, we can now assess the impact of changes in flows and water security over a much wider range of climatic conditions than if we had only considered the observed historical records.

This updated climate information has been used to help develop the Draft South Coast Regional Water Strategy and will help to assess and compare the effectiveness of the draft options. It will also support all water users in making more informed decisions and better planning and preparing for climate risks.¹⁰

Chapter 2 sets out the results from analysis of the new climate data for the South Coast region. We will continue to use the best and latest evidence about the future climate to develop solutions to address the challenges associated with protecting and enhancing environmental assets, including rivers and waterways, regional towns and industries in a more variable climate and during extreme events.

Ongoing analysis will yield more specific and robust results, giving an updated understanding of risks to town water supply, irrigation and environmental water security in the South Coast region. The final South Coast Regional Water Strategy will use this new data to identify the best ways to share, manage and use water to manage these risks.

10. More information about these new climate datasets and how they are being used in our river system models is provided in the *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about

1.3.2 Existing studies

A significant amount of work has been undertaken to understand the risks affecting water resource management in regional NSW. Development of the Draft South Coast Regional Water Strategy and the long list of options identified for the region has been informed by catchment and water security studies, water sharing and drought planning, and regional development, infrastructure and environmental strategies prepared by a range of NSW Government departments and agencies.¹¹

The strategy has also been informed by Infrastructure NSW's *State Infrastructure Strategy* (2014¹² and 2018¹³), WaterNSW's *20 Year Infrastructure Options Study*¹⁴, and the NSW Government's *NSW Marine Estate Management Strategy 2018–2028*.¹⁵

The *State Infrastructure Strategy* identified the Bega River catchment as having low water security and low opportunity for improved irrigation, and recommended further analysis of groundwater and networking opportunities. It also recommended the NSW Government develop a regional water strategy for the Bega catchment. WaterNSW's *20 Year Infrastructure Options Study* provides a strategic assessment of management options to meet long-term targets in regulated rivers across the state, including the Bega-Brogo regulated river system.

The *Marine Estate Management Strategy* sets out actions to tackle priority threats to the NSW marine estate. Many of these also threaten the health of upstream waterways and our objective of delivering resilient water resources for the South Coast region. Priority threats were identified in the *Marine Estate Community Survey Final Report*¹⁶ and the *NSW Marine Estate Threat and Risk Assessment Final Report*.¹⁷

Several important local studies have also informed the strategy:

- *Bega Valley Shire Council's Water Supply and Sewerage Strategic Business Plan*¹⁸
- *Bega River Catchment Water Storage Project* (SMEC 2008)¹⁹
- *Brogo Dam Augmentation Preliminary Study* (State Water 2004)²⁰
- Eurobodalla Shire Council and Shoalhaven Water have prepared integrated water cycle management strategies. Integrated water cycle management strategies are strategic plans that guide and prioritise actions for management of the urban water supply, sewerage and stormwater systems.

These studies will be important sources of information in assessing options for the final South Coast Regional Water Strategy.

11. More information about this work is provided in the *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about

12. Infrastructure NSW 2014, *State Infrastructure Strategy Update 2014*

13. Infrastructure NSW 2018, *Building Momentum—State Infrastructure Strategy 2018-2038*

14. WaterNSW 2018, *20 Year Infrastructure Options Study, Rural Valleys: Summary Report*, www.watnsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study

15. NSW Marine Estate Management Authority 2018, *NSW Marine Estate Management Strategy 2018-2028*, NSW Government

16. NSW Marine Estate Management Authority 2018, *Marine Estate Community Survey—Final Report*, NSW Government

17. NSW Marine Estate Management Authority 2017, *NSW Marine Estate Threat and Risk Assessment*, Sydney, www.marine.nsw.gov.au

18. Bega Valley Shire Council 2014, *Water Supply and Sewerage Strategic Business Plan*

19. SMEC 2008, *Bega Valley Water Storage Options Project*, Bega Valley Water Storages Committee

20. State Water 2004, *Brogo Dam Augmentation Preliminary Study*

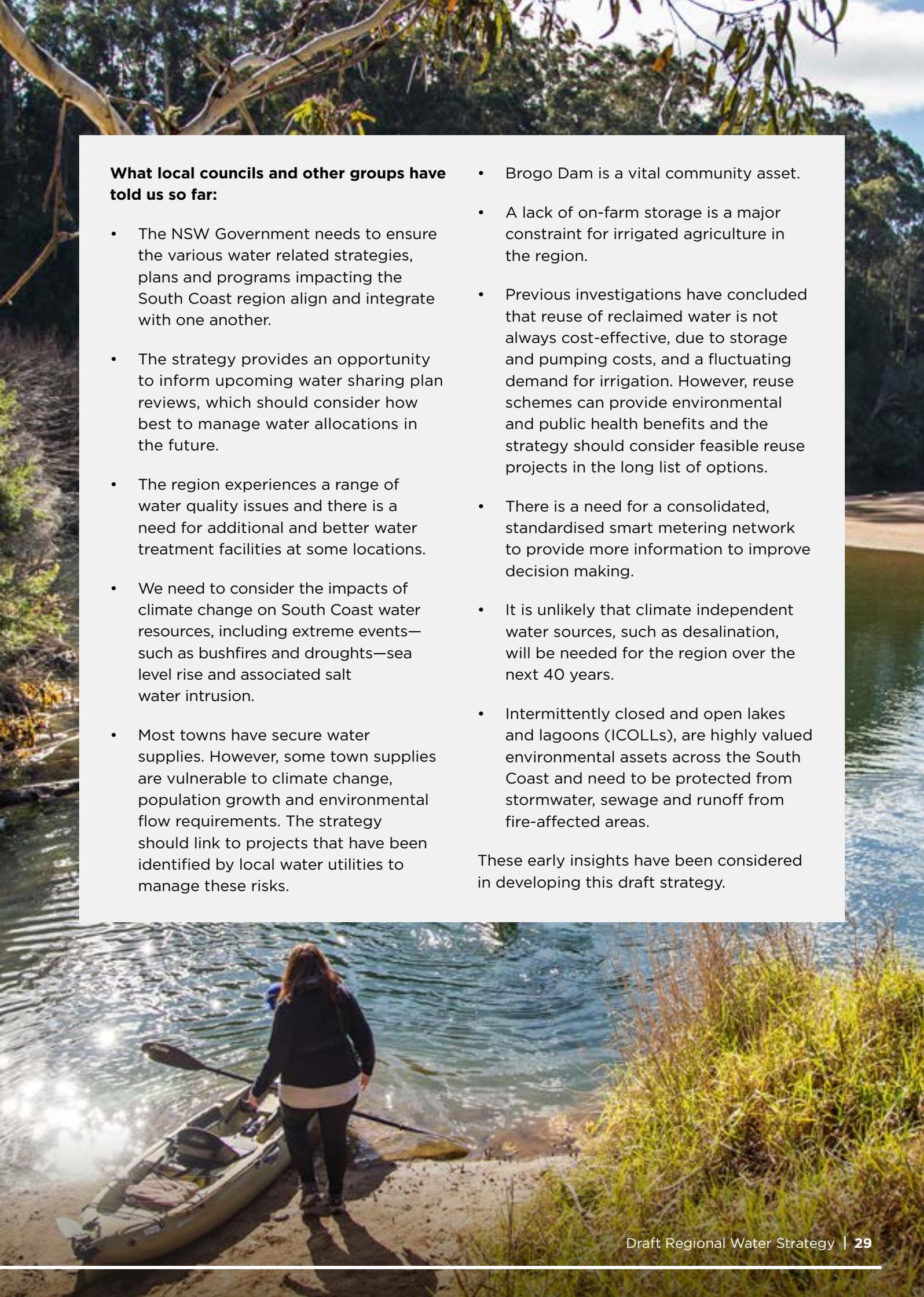
1.3.3 Community engagement

NSW Government has been consulting on—and is continuing widely—and is continuing to consult—on water sharing, metering reforms, environmental water management and drought. Through these processes, we have heard many ideas about how to be better prepared for future droughts and floods and a more variable climate.

Due to the COVID-19 pandemic and recent bushfires, we have had to redesign our engagement program, replacing some face-to-face consultation with virtual, online and other contactless methods. We have continued to talk with local councils, key stakeholders and water users about their thoughts on what the South Coast Regional Water Strategy could cover. We have been unable to undertake face-to-face engagement with Aboriginal communities on the South Coast. Engagement with the Aboriginal communities will take place as we progress through the options assessment process and final report preparation, and as we develop the NSW State Water Strategy.

Further information about the outcomes of initial meetings and discussions with local councils, key stakeholders and water users—and our proposed engagement approach with Aboriginal communities during the COVID-19 pandemic—is in Attachment 1.





What local councils and other groups have told us so far:

- The NSW Government needs to ensure the various water related strategies, plans and programs impacting the South Coast region align and integrate with one another.
 - The strategy provides an opportunity to inform upcoming water sharing plan reviews, which should consider how best to manage water allocations in the future.
 - The region experiences a range of water quality issues and there is a need for additional and better water treatment facilities at some locations.
 - We need to consider the impacts of climate change on South Coast water resources, including extreme events—such as bushfires and droughts—sea level rise and associated salt water intrusion.
 - Most towns have secure water supplies. However, some town supplies are vulnerable to climate change, population growth and environmental flow requirements. The strategy should link to projects that have been identified by local water utilities to manage these risks.
 - Brogo Dam is a vital community asset.
 - A lack of on-farm storage is a major constraint for irrigated agriculture in the region.
 - Previous investigations have concluded that reuse of reclaimed water is not always cost-effective, due to storage and pumping costs, and a fluctuating demand for irrigation. However, reuse schemes can provide environmental and public health benefits and the strategy should consider feasible reuse projects in the long list of options.
 - There is a need for a consolidated, standardised smart metering network to provide more information to improve decision making.
 - It is unlikely that climate independent water sources, such as desalination, will be needed for the region over the next 40 years.
 - Intermittently closed and open lakes and lagoons (ICOLLs), are highly valued environmental assets across the South Coast and need to be protected from stormwater, sewage and runoff from fire-affected areas.
- These early insights have been considered in developing this draft strategy.

1.4 Building on existing commitments and reforms

The NSW Government has made significant commitments to improve water resilience and reliability across the state. Much of our current work focuses on addressing the risks facing regional NSW and setting our regions up for the future. For the South Coast region, this includes investing in new off-stream storages, such as the Eurobodalla Southern Storage, new reticulated water supply and sewerage schemes, and upgrades to water treatment and sewage treatment plants.

We are implementing a range of state-wide water reforms, including improving water and sewage services for Aboriginal communities, improving compliance and transparency around water use and access. We are also introducing robust new metering laws to make sure that most water taken in NSW is accurately measured and monitored.

We are implementing the NSW Government's coastal management framework to manage the risk of coastal hazards on communities and the health of our estuaries. This is being done through the preparation and implementation of coastal management programs by councils with

their local communities. Coastal management programs will also be able to integrate actions from the *Marine Estate Management Strategy*²¹ to protect and enhance NSW's marine estate over the next ten years, including the South Coast region's highly valued tidal rivers and estuaries. The South Coast Regional Water Strategy will integrate and build on key *Marine Estate Management Strategy* initiatives and outcomes of coastal management programs such as improving water quality, planning for climate change and rehabilitation of degraded coastal waterways.

We continue to work towards a state-wide Aboriginal water policy to better represent the interests of Aboriginal cultural values and rights in water management.

More information about these reforms is in the *Regional Water Strategies Guide*.

The South Coast Regional Water Strategy will build on these commitments and reforms, seek to enhance and leverage them where possible and address any outstanding gaps.

Providing for community water supplies

The Safe and Secure Water Program is a \$1 billion regional infrastructure co-funding program established in 2017. The NSW Government has committed over \$67 million in the past three years from Safe and Secure Water Program and Restart NSW to co-fund eligible water and sewerage projects across the South Coast region. This delivers improvements to public health, water security, environmental outcomes and social benefits.

When regional town and village supplies are threatened by a major event such as an extreme dry period or extreme water quality event, the NSW Government also provides technical and financial assistance to ensure critical human water needs are met. During the recent drought the Emergency Relief for Regional Town Water Supplies program provided over \$217,000 to local water utilities in the South Coast.

21. NSW Marine Estate Management Authority 2018, *NSW Marine Estate Management Strategy 2018-2028*, NSW Government



1.5 Policy and planning context

Each regional water strategy sits within a broader policy and planning context. This includes policies and plans that guide the management of regional water resources in coastal NSW (Figure 6).

The NSW Government is also developing a 20-year State Water Strategy. This will establish overarching directions for managing water resources and services to ensure future water security, reliability and resilience, and address long-term challenges such as greater climate variability and population changes. The State Water Strategy will set high-level outcomes and actions to achieve these across public and environmental health, service delivery, liveability, economic development and technology, and for Aboriginal people.

Regional water strategies are an opportunity to explore how we can bring together existing commitments and better integrate and shape these plans, policies and investments for improved water outcomes. In particular, the strategies will play a key role in the ordering, sequencing and integration of water reforms in each region.

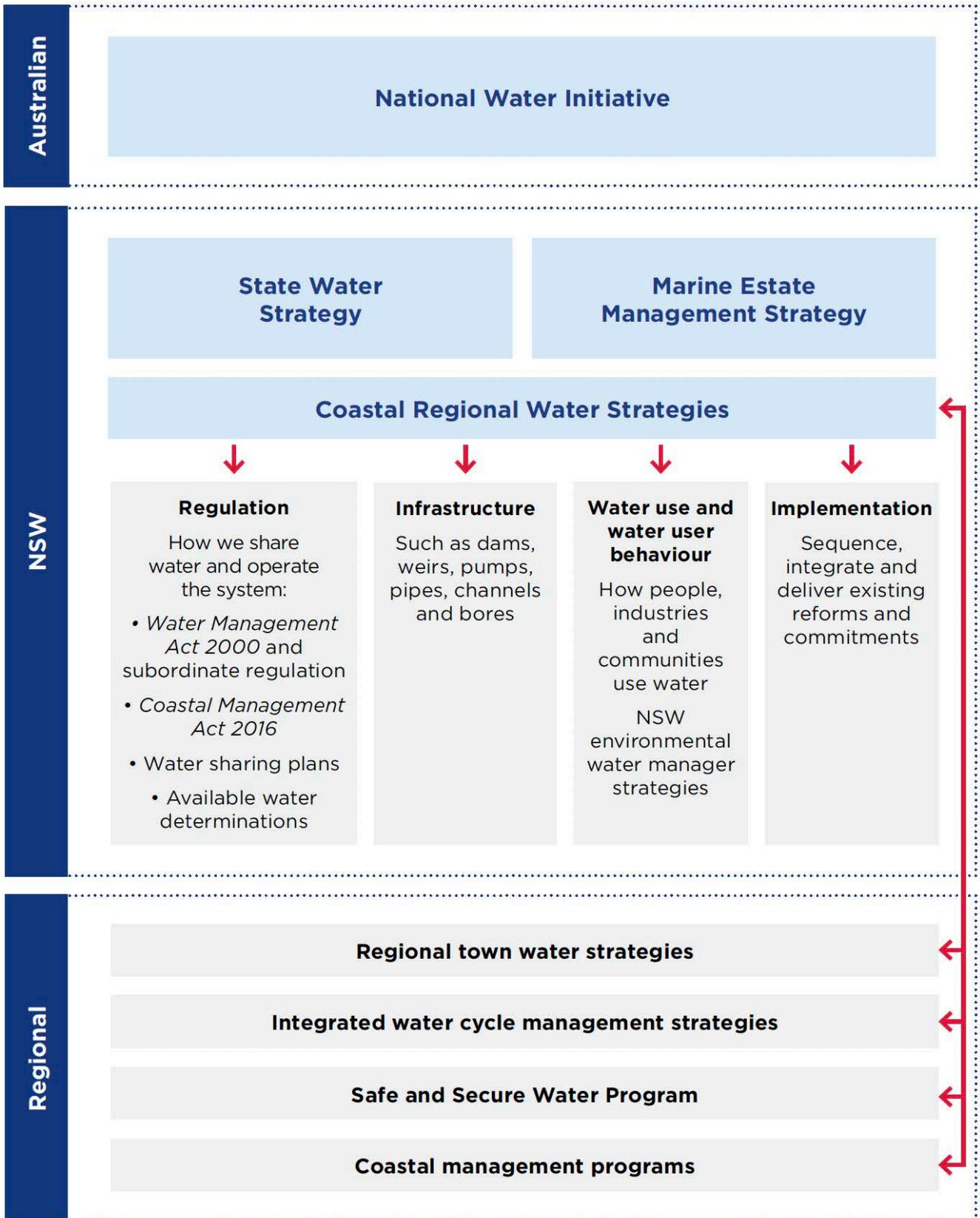
The strategies also align with the NSW Government's strategic planning hierarchy and will be integrated with current land use and regional plans.²² This includes the *South East and Tablelands Regional Plan 2036*²³ and *Illawarra-Shoalhaven Regional Plan 2036*.²⁴

22. More information about how the strategies relate to strategic, regional and water planning is in the *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about

23. Department of Planning, Industry and Environment 2017, *South East and Tablelands Regional Plan 2036*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/South-East-and-Tablelands

24. Department of Planning, Industry and Environment 2015, *Illawarra-Shoalhaven Regional Plan 2036*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Illawarra-Shoalhaven/Illawarra-Shoalhaven-Regional-Plan

Figure 6. Regional NSW water policy and planning context for coastal catchments



Chapter 2

The South Coast region, its opportunities and challenges

Snapshot

The South Coast's water resources are already under pressure. Changing climate conditions will increase this pressure and the water management challenges facing the region.

- Securing water for towns is already a challenge for some parts of the region during extended droughts. Uncertainty around future changes in rainfall, evaporation and sea level rise means future flows and supply are also uncertain. New climate modelling will help South Coast communities plan to meet these challenges and ensure future investment is directed wisely.
- The South Coast region has a naturally variable climate that includes periods dominated by either wet or dry conditions. Hydrological models updated with more sophisticated climate data for this strategy found that:
 - under normal climate conditions, the South Coast region will continue to receive sufficient rainfall to provide for its water needs
 - the region can move between wet and dry periods more frequently than previously understood, and periods of drought may occur more frequently and for longer in the future. The future climate could be more variable, with shifts in rainfall patterns, higher rates of evaporation, more hot days and more days of severe bushfire weather
 - while inflows to Brogo Dam could decrease, the dam will continue to be a reliable supply of water, remaining above 50% for 98% of the time under current levels of water demand and dam operation. However, if we experience longer droughts than we have seen in the historic record, Brogo Dam may be drawn down for periods longer than 18 months
 - water extraction is likely to increase as demand for water by towns and irrigators grows. At the same time, there is an increased likelihood of prolonged and more frequent low flow periods in the region's unregulated river systems. Based on annual averages, there is sufficient water in the region's rivers and streams to accommodate rising demand, but more frequent low flow and cease-to-pump events could reduce water access reliability for all users and adversely impact water-dependent ecosystems and fauna
 - sea levels are projected to rise in the region by between 0.09 m and 0.19 m by 2030 and between 0.24 m and 0.59 m by 2070. As sea levels rise and flood-producing rainfall events increase in severity, communities in low-lying areas along the coast could be more exposed to flooding. Saltwater will intrude further into estuaries, lakes and groundwater sources. The effects of sea level rise on salinity may be magnified as freshwater inflows reduce.

- Although large impacts are not expected in the short term, and the likelihood of the worst-case scenario eventuating is small, our new projections show that just relying on observed historical records to make water management decisions is no longer the best course of action. We need to have plans in place to be prepared for plausible future climate risks.
- Increases in the frequency and severity of droughts and floods will exacerbate challenges caused by erosion and poor water quality, further limiting water security for all water users.

Towns, communities and industries in the South Coast are vulnerable to increased water security risks.

- On the South Coast, town water supplies, agricultural industries, food manufacturing, stock and domestic needs, fishing, tourism and the environment all rely on water from unregulated river sources. Protecting water for these users of unregulated rivers will become increasingly difficult in a future with even greater climate variability.
- The South Coast is not set up to manage the extreme dry periods that we now know are part of the natural variability of the region's climate. Producers in the region are highly dependent on regular rainfall and are highly susceptible to drought. Some town water supplies are not set up to manage extended dry periods. A lack of water storage is also a major constraint to balancing water demands. These factors mean that more frequent and severe droughts

in the future may leave some towns and rural landholders vulnerable to water shortages.

- The volume of entitlement held in Brogo Dam (16,429 ML) is considerably more than the dam's capacity (8,920 ML). Consequently, available water determinations for general security water access licences in the Bega-Brogo regulated river system are never greater than 40% at the start of the water year and have not exceeded 80% over the last 10 years. Anecdotally, this low level of allocations contributes to irrigators' reluctance to invest more heavily in their enterprises.
- Relatively large releases from Brogo Dam are required to service customers in the Bega River tidal pool. Consequently, water levels in the dam can drop quickly, raising concerns about the security of town and irrigation supplies reliant on the Bega-Brogo regulated river system.
- Currently, Brogo Dam is operating at a loss and represents a financial liability to the state. The draft regional water strategy will assess policy, operational and infrastructure options with the potential to improve the use of this important asset and reduce its financial burden.

There are challenges in protecting the South Coast's water-dependent environmental assets.

- Healthy water sources are needed to support the region's important environmental assets, which in turn support liveable communities and successful regional industries.

However, providing water for a healthy environment is challenging. Water for the environment is not actively managed in the South Coast and is largely dependent on rainfall-generated stream flows.

- Some of the region's rivers and creeks are already under high-to-medium hydrologic stress. New climate modelling suggests that climate change will reduce the total volume of water flowing each year on average in the rivers of the Bega and Tuross catchments, a decrease in the magnitude of medium to high flow events in the regulated Brogo River and reductions in the scale of high flow events in streams that flow directly into estuaries. This will also have negative impacts on the region's highly valued coastal lakes.

We need to better manage groundwater resources.

- Groundwater sources in the region include alluvial, coastal sand and hard rock aquifers. Groundwater is used for town water supplies, dairying, irrigation, stock and domestic and limited industrial use—particularly in the lower reaches of the Bega, Towamba and Tuross rivers.
- Alluvial groundwater aquifers are expected to come under threat from sea level rise-induced saline intrusion over the next 30 to 80 years and beyond, particularly for low-lying areas with significant volumes of extraction. A range of local fit-for-purpose responses will be required to respond to this challenge.

- Groundwater, from hard rock aquifers in particular, represents a largely untapped resource and may offer options for addressing regional water challenges. Increased monitoring, metering and modelling of groundwater will be required to develop these resources in an ecologically sustainable manner.

There are significant opportunities to improve how we manage and use water in the South Coast.

- New climate information offers an opportunity to review and update water sharing and access rules to better reflect sustainable levels of extraction that consider the regions social, economic, ecological and cultural water needs.
- Opportunities also exist to make better use of existing water supply infrastructure and develop region-scale solutions, improve water quality throughout the region and identify a range of options to support the region's industries to mitigate water security risks and build resilience to climate variability and climate change.
- There are opportunities to involve Aboriginal communities more directly in water decision-making and to incorporate traditional knowledge into water management in the region. There are also opportunities to support Aboriginal people to better understand and access water rights they may have under Native Title or other mechanisms.

2.1 What we know about the South Coast region's climate

2.1.1 Today's climate

The topography of the South Coast region results in a large range of climates. The region is wetter close to the coast and drier inland. Although the climate is generally mild, the region can experience periods of hot days during summer and periods of cold in winter in inland areas. The coastal influence moderates the temperature, with cooler temperatures in summer and warmer temperatures in winter than those experienced further inland.

In summer, average temperatures across the region range from 18–24°C. In winter, average temperatures range from 8–12°C. Temperatures have been increasing since about 1960, with higher temperatures experienced in recent decades.²⁵

On average, much of the region sees fewer than 10 hot days each year. Coastal areas experience fewer than 10 cold nights per year. The number of cold nights increases with distance from the coast, increasing to over 90 nights per year in inland parts of the region.

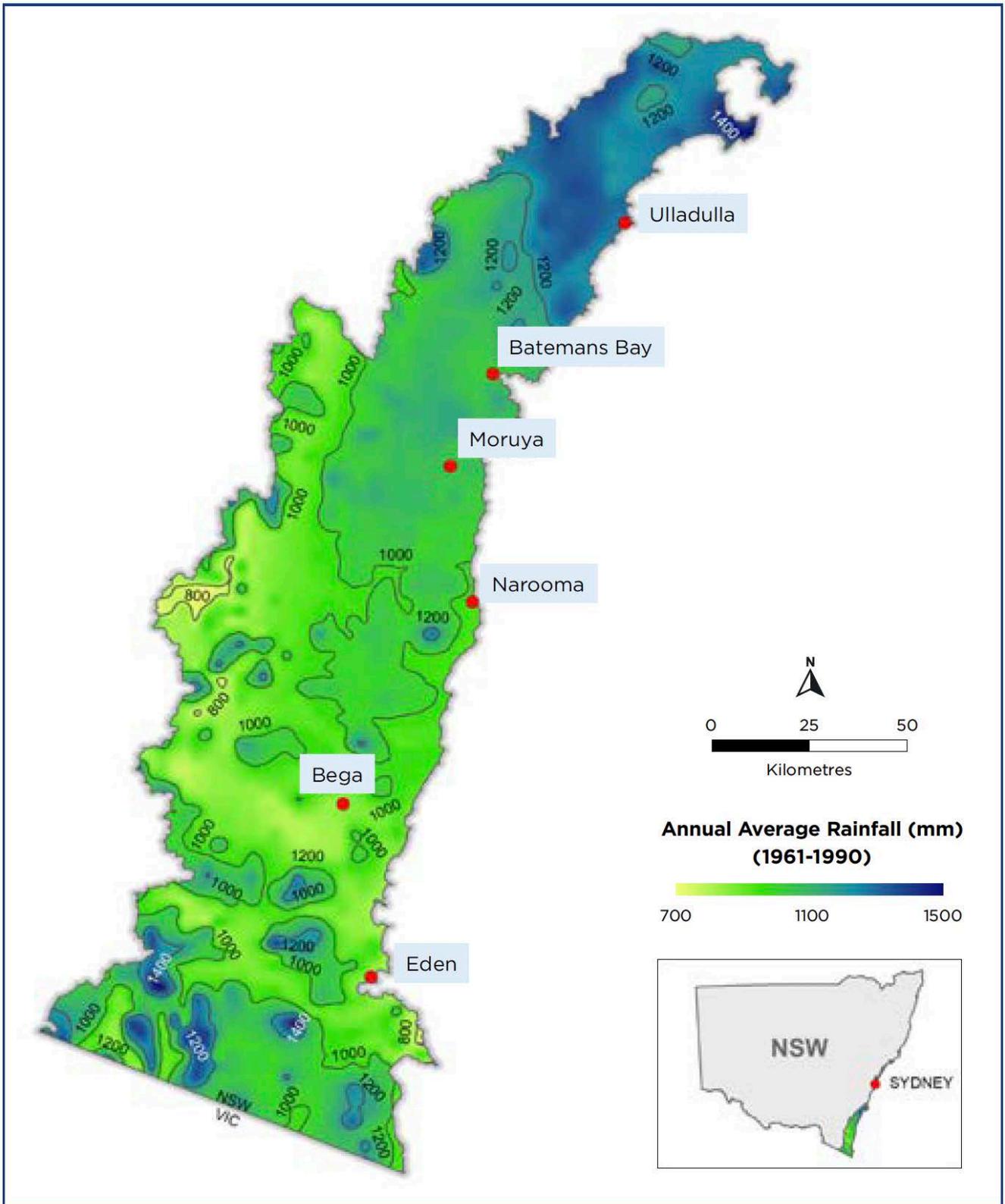
Average annual rainfall is higher in the northern part of the region, north of the Kings Highway, where it ranges between 1,200 and 1,400 mm (Figure 7). Further south, average annual rainfall is between 1,000 and 1,200 mm, except across much of the Bega and Tuross river valleys where the range is between 800 and 1,000 mm. Annual rainfall in the South Coast region is highly variable, with 10% of years receiving more than 1,200 mm and the driest 10% of years getting less than 580 mm. While significant rainfall can occur at any time throughout the year, the late summer and early autumn months tend to be wetter than other times.

The key driver of flood-producing rainfall events along the South Coast is the occurrence of east coast lows, which can occur in any season. These low-pressure systems are often small, may form quickly and direct moist ocean air over the coastal areas, producing intense rainfall events.

25. Department of Planning, Industry and Environment 2014, *South East and Tablelands Climate Change Downloads*, climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/South-East-and-Tablelands-Climate-Change-Downloads



Figure 7. Observed average annual rainfall in the South Coast region



Source: Map prepared by Department of Planning, Industry and Environment using data from the Bureau of Meteorology

2.1.2 A better understanding of current climate variability and future climate change

As outlined in section 1.3.1, new climate datasets and improved modelling are providing a better understanding and more realistic picture of the natural variability of the South Coast's climate beyond the observed historical records.

As east coast lows are a key climate driver for the region, we have also generated potential future climate datasets that change the number of these lows the region experiences over the long term (see box to right). This means we have three new datasets to assess current and future climate variability and risk for the region:

- 13,000-year 'current climate' dataset (see section 1.3.1)
- 13,000-year NARcliM-informed future climate change scenario (based on a dry scenario for 2060 to 2079)
- 13,000-year climate change scenario assuming a decrease in the occurrence of east coast lows by one event per year (east coast low-1 scenario).

Together, these datasets give us a much-improved understanding of the potential impacts of a worst-case climate scenario on the South Coast's water resources.

This new data suggests that it is plausible that we could see droughts of longer duration and greater severity than those seen in the recorded data.²⁶ It is also likely that there could be floods of greater intensity than those seen in the historical record. This is to be expected, as we know that 130 years is not long enough to have reliable information on the risks of these extreme events.

26. Further information about the development of new climate datasets is provided in Attachment 2 of the *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about. Specific analysis related to the South Coast region has been prepared for the Department of Planning, Industry and Environment by the University of Newcastle.

Using climate change projections in water modelling

The NSW Government's NARcliM (climate change) datasets include a range of different future climate scenarios. We have used the most conservative result from NARcliM (version 1.0) in our modelling—the scenario which represents the greatest reduction in average monthly rainfall. While the results of the other scenarios in the current version of NARcliM are arguably equally appropriate and probable, we intend to stress-test the water system and understand the worst-case climate scenario for strategic water planning. This will test the resilience of options proposed in the regional water strategies, particularly options that go towards securing water for critical human needs.

In the South Coast, we have also tested potential scenarios with reduced numbers of east coast lows. We have chosen to present the scenario where one east coast low has been removed in a year, as this is the closest outcome to the most conservative result from NARcliM.



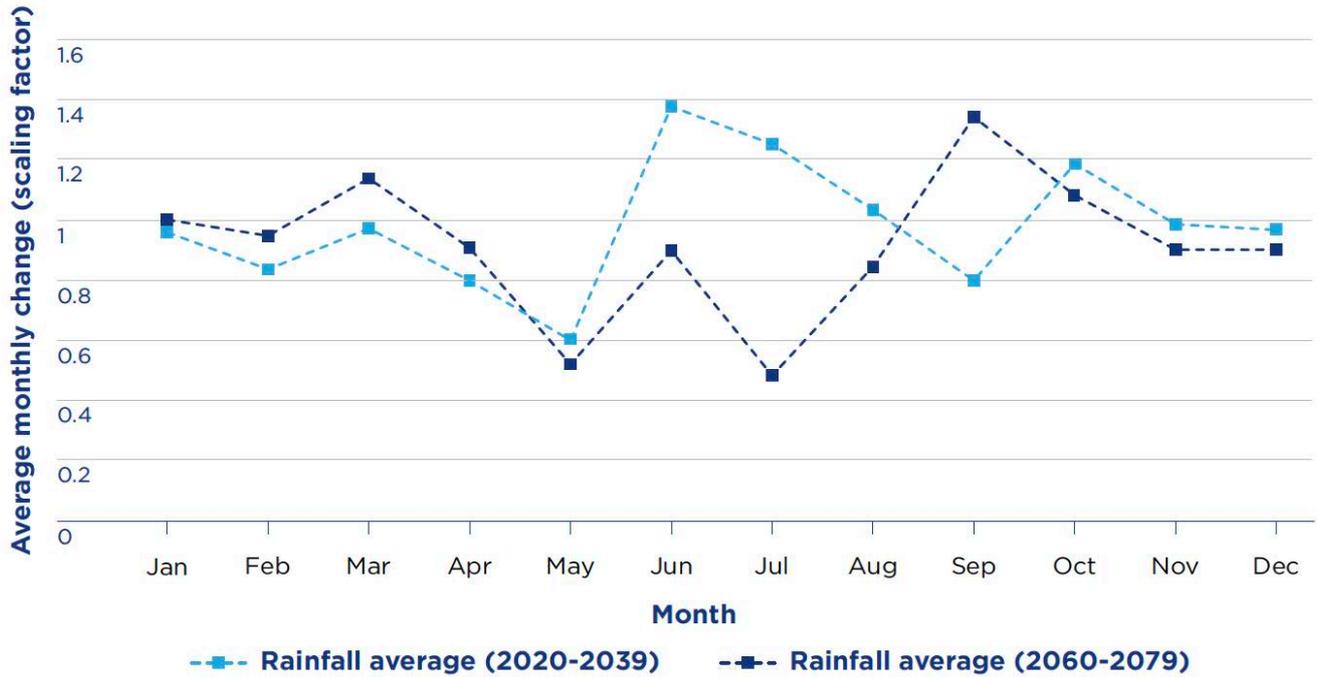
Image courtesy of Destination NSW.

Our improved modelling also incorporates plausible climate change projections for the region, which suggest that in the South Coast region there will likely be:

- **changing rainfall patterns**—median annual rainfall in the region could decline by up to 5% and heavy rainfall events are likely to be more intense over the long term (2060 to 2079). In the short term (2020 to 2039), shifts in seasonal patterns are expected to cause a decrease in rainfall during late summer and autumn, with an increase in winter rainfall. However, the modelling suggests that by 2060 there could be a 30% decrease in winter rainfall, with an increase in rainfall during spring and late autumn (Figure 8)
 - **higher evapotranspiration**—potential evapotranspiration is expected to increase by between 3% and 6% by 2070 compared to levels between 1990 and 2009, with the largest increases in late autumn and winter (Figure 9).
- Other changes the South Coast region is likely to experience include:²⁷
- **higher temperatures**—this includes a rise in maximum temperatures by between 0.5–1.0 degrees by 2030 and by 1.8–2.5 degrees by 2070. Minimum temperatures are expected to increase by 0.4–0.7 degrees by 2030 and 2.3 degrees by 2070
 - **more hot days (> 35°C) and warm spells**—the region is expected to experience an extra three hot days over spring and summer by 2030 and an extra eight hot days by 2070
 - **fewer cold nights (< 2°C)**—the region is expected to experience 12 fewer cold nights by 2030, and 35 fewer cold nights by 2070
 - **rising mean sea level**—sea level is projected to rise in the region between 0.09 m and 0.19 m by 2030, and between 0.24 m and 0.59 m by 2070. Flooding and inundation will become more common in low-lying areas along the coast. The height of extreme sea-level events will also increase
 - **harsher fire-weather climate**—average fire weather is projected to increase during spring and summer, with the number of days of severe fire weather increasing by up to two more days every five years.

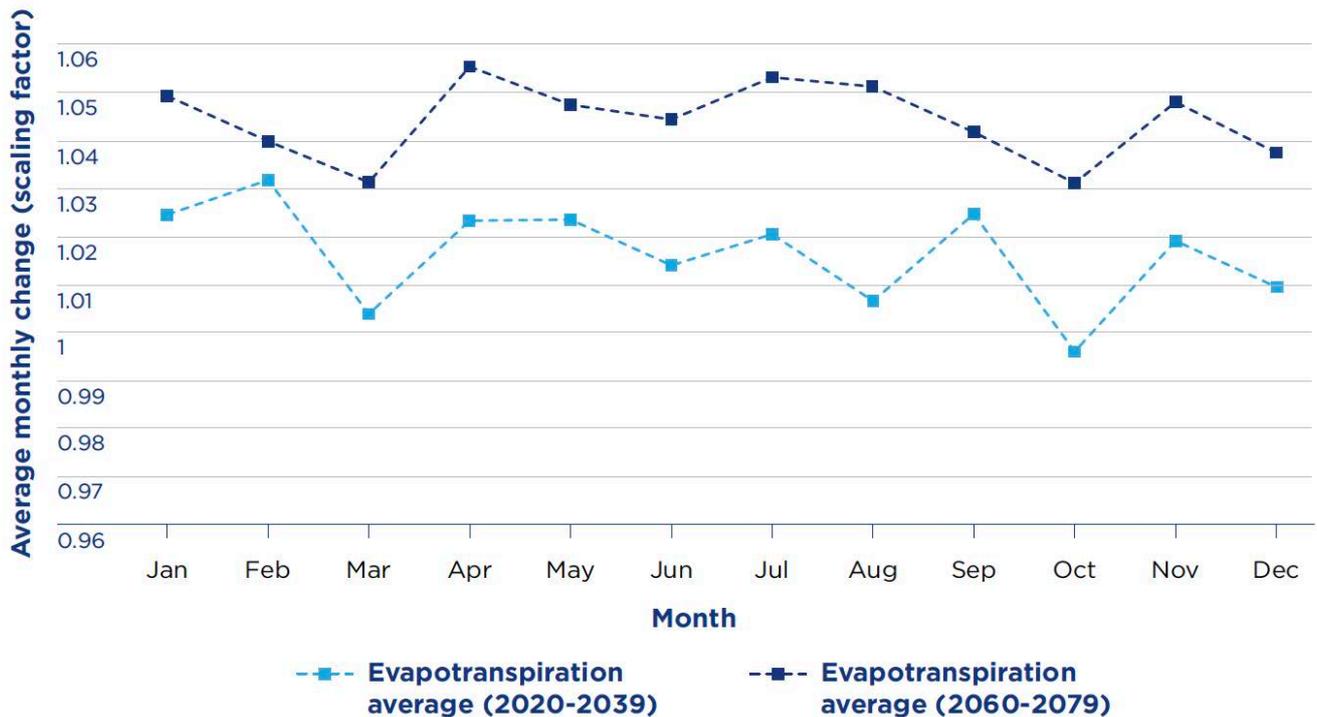
27. The modelling uses forecasts for the South East and Tablelands drawn from the NSW and ACT Regional Climate Modelling (NARClIM) project: climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/South-East-and-Tablelands-Climate-Change-Downloads Further information about how these forecasts have been used in combination with the new climate datasets is provided in Attachment 2 of the *Regional Water Strategies Guide*.

Figure 8. Average monthly changes in rainfall for the Bega and Tuross catchments for the periods 2020 to 2039 and 2060 to 2079 compared to the period 1990 to 2009 from NARClIM projections



Source: Department of Planning, Industry and Environment—Water 2020, region climate data

Figure 9. Average monthly changes in evapotranspiration for the Bega and Tuross catchments for the periods 2020 to 2039 and 2060 to 2079 compared to the period 1990 to 2009 from NARClIM projections



Source: Department of Planning, Industry and Environment—Water 2020, region climate data

The region has experienced persistent droughts, as well as intense shorter droughts

The region generally receives sufficient rainfall but has experienced extreme droughts²⁸ over the past 130 years of observed records. The most well-known are:

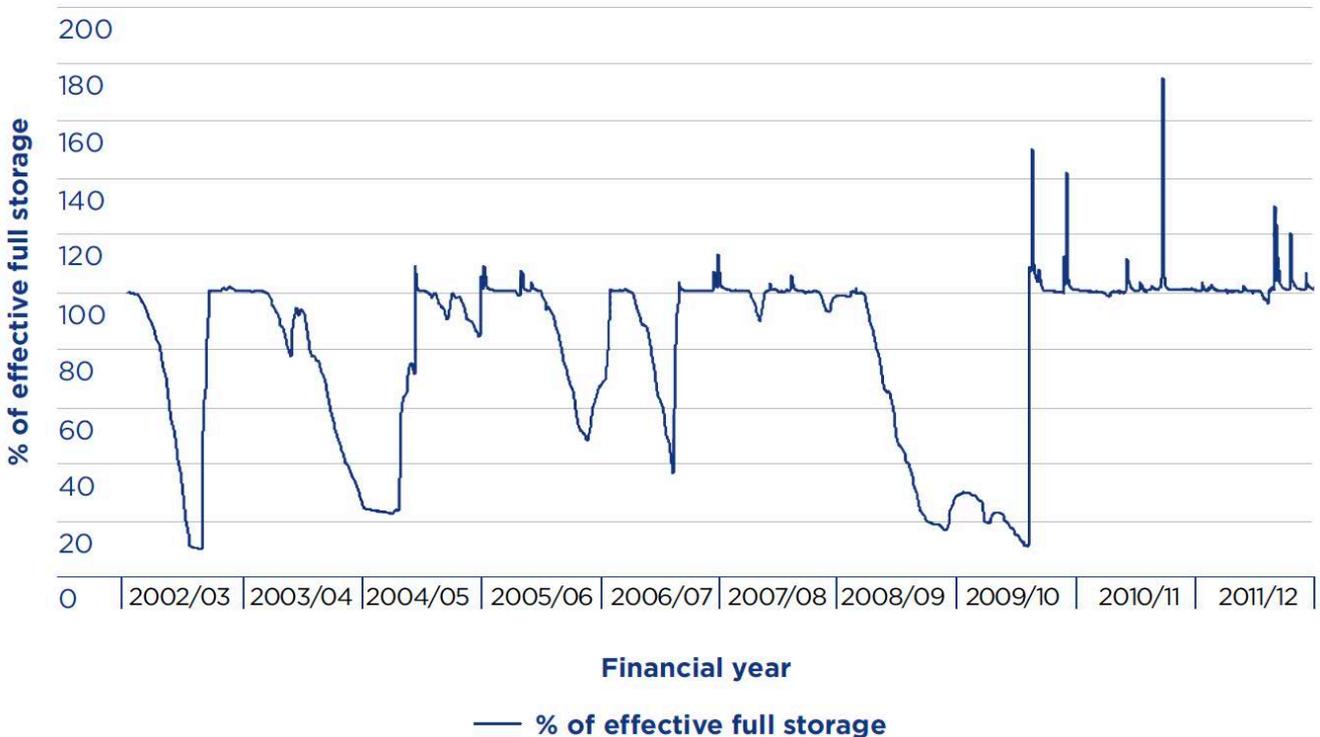
- the Federation Drought (1895 to 1903)
- the World War II Drought (1939 to 1945)
- the Millennium Drought (1997 to 2009).

Rainfall totals in 2018 and 2019 were also extremely low, combining to record the second lowest two-year total of the last 130 years. The region’s lowest two-year rainfall total on record (1940/1941) occurred during the World War II Drought. Our new modelling suggests that this protracted drought is not unique, nor is it the worst the region is likely to have experienced

in the longer term past. Our new extended datasets suggest that we could experience more severe drought in future.

The Brogo River is the only regulated river in the South Coast region. Flows in the Brogo River are regulated by Brogo Dam, a state-owned storage with a capacity of 8,980 ML. Due to the region’s relatively small catchments, its location on a coastal escarpment and generally reliable rainfall, storages in the region (including Brogo Dam) have been sized to maintain availability of water for relatively short periods of drought, unlike storages in inland areas of NSW. Critical droughts for South Coast water storages are those that extend for more than 18 months. This is illustrated in Figure 10, which shows Brogo Dam being drawn to below 40% on four occasions during the Millennium Drought, before quickly recovering to full capacity following South Coast rain events.

Figure 10. Percentage of effective full storage during the Millennium Drought, Brogo Dam



Source: WaterNSW

28. Drought is defined in terms of periods of rainfall deficit (meteorological drought), low catchment streamflow (hydrological drought) and soil moisture depletion (agricultural drought). This strategy discusses meteorological and hydrological drought.

Our new datasets and modelling suggest that droughts of this duration and severity may not be unique. For example, hydrologic modelling of our long-term (stochastic) climate and climate change datasets shows that the driest 12-month period produced close to zero inflows to Brogo Dam. By comparison, our observed historic record shows that our worst 12-month period produced around 1,800 ML of inflows (Figure 11). Further, the observed historical record shows a 24-month minimum inflow sequence of 15,000 ML and included a wet period that would almost have certainly refilled the dam. Our modelling showed that 24-month minimum inflows could be much lower and could drop to around 2,000 ML under climate change (Figure 12). This indicates that droughts exceeding 24 months should be considered when assessing risks to water supplies across the region.

While there are periods when Brogo Dam may be drawn down, impacting water availability for users relying on this storage, it is generally very reliable. Using the recorded information, the storage is full or spilling for 54% of the time and is greater than 50% full for 99% of the time. Even under severe future climate change scenarios, the storage is expected to be full or spilling 49% of the time and greater than 50% full for 97% of the time.

Cochrane Dam, on the Bemboka River, is a small capacity dam (2,700 ML) with a primary purpose of electricity generation. It serves a secondary purpose of providing some increased reliability to irrigators downstream. The operation of this dam for electricity generation means that it is drawn down

significantly for longer periods than Brogo Dam. Climate change modelling suggests that the number and duration of drawdown events will increase, but not significantly—under current conditions, Cochrane Dam is less than 50% full for 80% of the time, increasing to 83% of the time under the NARClIM climate change scenario and up to 87% of the time under the east coast low-1 climate change scenario. Further work is required to understand the impact of climate change on electricity generation capacity and the relationship between electricity generation and irrigation requirements.

In the South Coast region's unregulated rivers, the overall impact of a more variable climate and climate change on the availability of water for town water supplies and irrigation is small. In both the Tuross and the Bega systems, our modelling suggests that extraction will increase. This is because decreases in rainfall and increases in evaporation will lead to increased demands for water by towns and irrigation. In most years there will be sufficient water in the streams to provide for this increase in demand, with climate change modelling showing only a small increase in the number of cease-to-pump events at both the Bega River at Kanoona and the Tuross River at Eurobodalla. However, depending on the distribution of these cease-to-pump events, a small increase could significantly increase the risk of water supply shortfalls and impact water-dependent aquatic ecosystems and fauna. These risks are discussed further in Sections 2.2.2 and 2.3.2.

Figure 11. Worst minimum inflow into Brogo Dam over 12 months under observed historical climate records, long-term climate (stochastic) and climate change scenarios (stochastic + NARClIM, east coast low - 1)

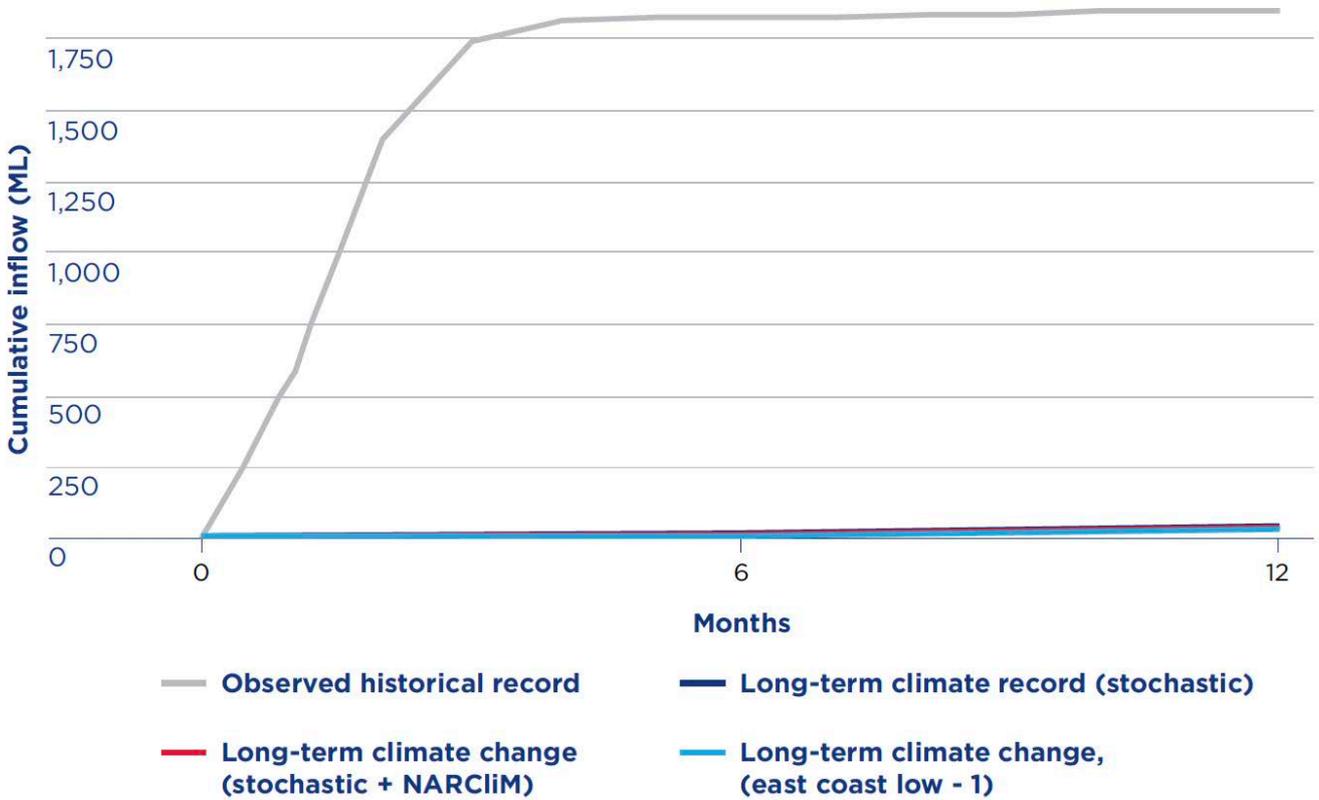
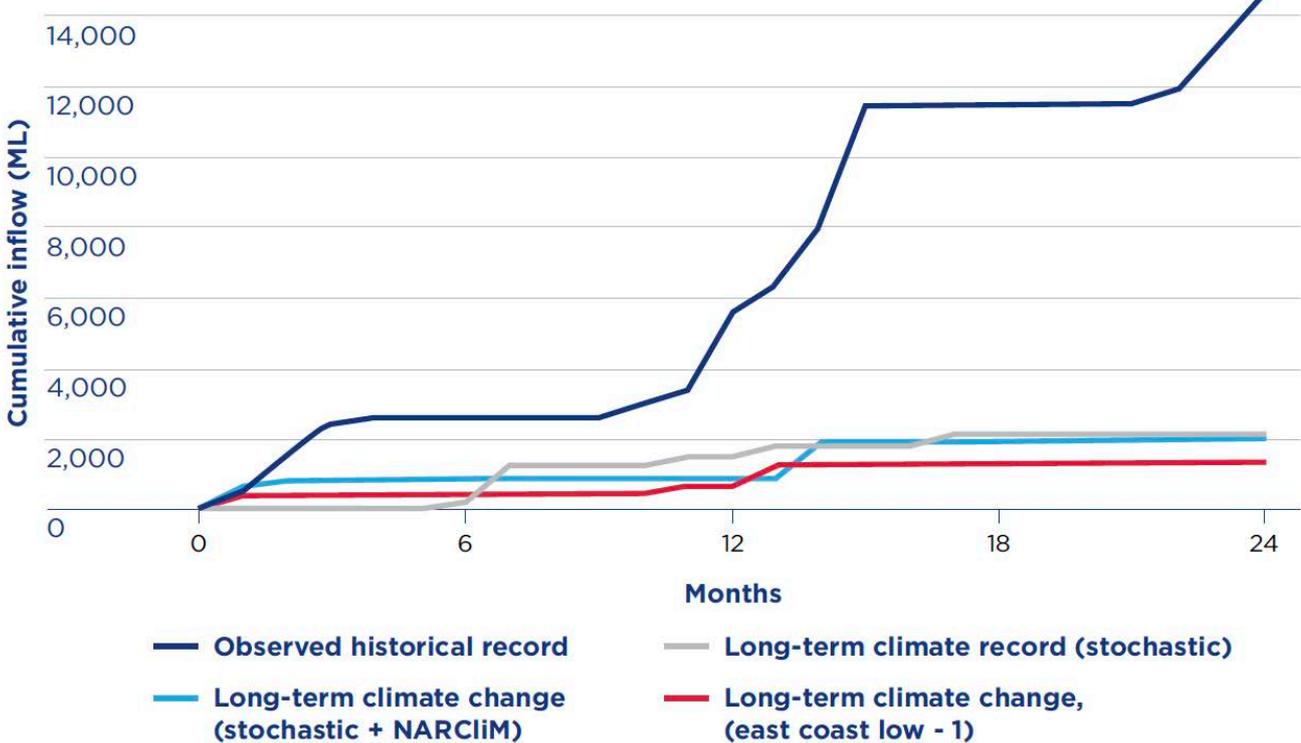


Figure 12. Worst minimum inflow into Brogo Dam over 24 months under observed historical climate records, long-term climate (stochastic) and climate change scenarios (stochastic + NARClIM, east coast low - 1)



In summary, our new climate change modelling shows that:

- under median conditions, 24-month inflows to Brogo Dam could decrease by 9%, from 161 GL to 146 GL. These flows are large enough that Brogo Dam would not be drawn down to critically low levels
- there is a slightly increased chance of Brogo Dam being drawn down to critically low levels, but the likelihood of this happening is small
- droughts of longer duration than those seen in the historic record are possible both under the longer term 'current climate' modelling and our climate change scenarios
- overall, Brogo Dam remains a reliable supply of water, remaining above 50% for 97% of the time

- Cochrane Dam will continue to provide some supply to irrigation during dry periods but does not provide a reliable supply of water for users downstream during dry periods
- there is generally sufficient water for towns and unregulated irrigation in both the Tuross and Bega unregulated systems. However, the increased chance of flows falling below cease-to-pump flow levels may have significant implications for town water supplies, irrigators and the environment, depending on the location.

The probability of worst-case climate change outcomes occurring is very low. These estimates are based on the driest, or 'worse-case', climate projection scenarios, looking 40 years into the future. These scenarios will not necessarily eventuate, but they give us an idea of the plausible future climate risks.

A note of caution: the climate change scenarios in these models will not necessarily eventuate. They are potential scenarios and there is always a level of uncertainty with this type of modelling, which needs to be taken into account as part of any water decision-making and planning. In some instances, this may mean managing risks to our water security by being prepared and resilient, rather than relying on firm predictions and hard numbers.

As the science develops further, we will be able to reduce or quantify some of these uncertainties.



Floods are a feature of the past, and the future

Floods are an important feature of the South Coast hydrologic cycle. They are a vital, natural process that supports the South Coast region's diverse ecosystems. They form part of the environmental flows required to connect wetlands and floodplains with rivers, estuaries and intermittently closed and open lakes and lagoons (ICOLLs). They are also responsible for the highly productive soils that are found on the region's floodplains.

Floods and small freshwater flow events following rainfall are important to the health of coastal waterways and provide reproductive cues for many fish and invertebrates. However, due to development on floodplains, floods can also have significant detrimental impacts on people and businesses—damaging infrastructure, creating safety risks and causing financial and economic loss. For example, the average annual flood damages for the Bega and Brogo Rivers floodplain, including the Candelo township, was estimated to be approximately \$875,000 (as at 2018).²⁹

Flooding in the region can occur at any time but shows strong seasonality. Most floods in the historical record have occurred in the first half of the year, with the peak period between February and April, resulting predominantly from east coast lows.

The South Coast region has experienced significant flood events over the past 130 years. The March 2011 storm was believed to be the largest flood experienced in the Bega township since 1971, with flows at Kanoona peaking at 230,000 ML/day. The damage caused to bridges meant residents of some local areas were isolated for a number of days. The storm event was a declared natural disaster³⁰ and was estimated to have caused approximately \$10 million in damages.³¹

Climate change is expected to increase the severity of flood-producing rainfall events (including more severe east coast lows), as well as impacts due to rising sea levels (see the next section). These aspects could increase the risk of flooding in the South Coast region particularly in low lying floodplains where ocean influences can also significantly impact flood behaviour. As sea levels rise and flood producing rainfall events increase in magnitude, this will increase the exposure of communities to flooding.

The modelling methods we are using for the regional water strategies have been developed to understand long-term inflows into rivers and extraction from rivers and have not been designed for flood analysis. However, they can give some indication about the trends of flood behaviour with climate change. For example, our stochastic modelling indicates it is plausible that the region could experience more severe flood-producing rainfall events than what has occurred in the past 130 years of observed records. It is also plausible that climate variability and climate change could combine to generate maximum flows larger than what has occurred over this same period.

Flood risk management developed with the technical and financial support of the Department of Planning, Industry and Environment—Environment, Energy and Science under the Floodplain Management Program uses models, that are calibrated and validated against historical events, to examine the full range of flood behaviour up to and including extreme events. A fit-for-purpose approach is used to investigate the impacts of climate change on flood behaviour for specific locations. Many urban areas in the South Coast region have in place a floodplain risk management plan and these are frequently updated with new information,

29. Cardno 2018, *Floodplain Risk Management Study—Bega & Brogo Rivers FRMSP*, Bega Valley Shire Council, begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-MIX-43-27-08

30. Commonwealth of Australia 2016, *Flood levy information for individuals*, accessed 17 June 2020, www.ato.gov.au/General/Dealing-with-disasters/Previous-years/Flood-levy/Flood-levy-information-for-individuals/#listofdeclarednaturaldisaster

31. SMEC 2014, *Bega and Brogo Rivers Flood Study at Bega*, Bega Valley Shire Council, begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-ERC-20-04-75

particularly following significant flood events (approximately every 5-10 years). Councils work closely with the Department of Planning, Industry and Environment—Environment, Energy and Science and the State Emergency Service to ensure that land-use planning and emergency management processes are in place to protect the community from the impact of flooding, including the potential impacts of climate change on flood risk.

Sea levels are rising

Global sea levels are rising, predominantly as a result of increasing greenhouse gas concentrations in the atmosphere and associated glacial and ice sheet melt.³² As a coastal region, the South Coast is particularly susceptible to the impacts of rising sea levels. Low-lying areas may become inundated and sandy shorelines will recede landwards. Sea level rise is likely to exacerbate flood impacts in the region as it will increase tidal inundation and may impact flood behaviour in low lying coastal floodplains. Rising sea levels may also change the opening and closing of ICOLLs and push estuary tidal limits further upstream and cause greater intrusion of saltwater into groundwater sources. This potentially poses a threat to

regional water security in some areas because increases in salinity may restrict the potential uses of these water sources.

Local geomorphological factors, ocean currents and local thermal expansion or contraction of oceans all affect sea level rise projections in different locations. The extent to which sea levels will rise is also highly dependent on how significantly greenhouse gas emissions are reduced in the coming years (Table 1). Sea levels in the South Coast region are projected to increase between 0.09 m and 0.19 m by 2030 and between 0.24 m and 0.59 m by 2070 (relative to 1986-2005 levels), depending on the greenhouse gas emissions scenario used.

The figures presented in Table 1 are based on global estimates of sea level rise published by the International Panel on Climate Change in 2013.³³ The International Panel on Climate Change published more recent figures in 2019, however, these have not yet been downscaled to the South Coast region and further analysis is required to take account of these revised figures.

Table 1. Sea level rise projections for the South Coast region (relative to an average calculated between 1986 and 2005)

Year	Low emissions scenario (RCP4.5) [m]	Very high emissions scenario (RCP8.5) [m]
2030	0.14 (0.09-0.18)	0.14 (0.10-0.19)
2050	0.24 (0.16-0.32)	0.27 (0.19-0.36)
2070	0.36 (0.24-0.48)	0.45 (0.32-0.59)
2090	0.48 (0.31-0.65)	0.66 (0.46-0.88)

Note: Values are average values with likely range provided in brackets

Source: coastadapt.com.au/sea-level-rise-information-all-australian-coastal-councils#NSW_BEGA_VALLEY

32. Oppenheimer, M., et al. 2019, *Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities*. In H.-O. Pörtner, et al. (Eds.), *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, Intergovernmental Panel on Climate Change

33. Church, J. A., et al. 2013, Sea Level Change. In T. F. Stocker, et al. (Eds.), *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press

Larger rises are possible beyond these median scenarios. The Intergovernmental Panel on Climate Change suggests that it should be understood that larger rises are possible and highlights that a global mean sea level rise of 2 m in 2100 cannot be ruled out.³⁴ This is supported by other research, which suggests that the upper estimate of global mean sea level rise could be as high as 2 m to 2.7 m.³⁵

Only a small number of surface water users in the South Coast region take water from within the tidal limits—14 water access entitlements across the estuaries of the Bega, Tuross, Clyde and Moruya rivers totalling around 396 ML/year. However, groundwater use in low lying areas is more significant, with:

- 389 ML of entitlement³⁶ in the South East Coastal Sands Groundwater Source plus a significant number of bores and spear pumps accessing water for basic landholder rights. These water sources are low lying and close to the sea, and bore water levels are often close to or below 0 m Australian Height Datum (AHD)³⁷
- 8,300 ML of entitlement accessing alluvial groundwater, with many of the bores accessing water from close to or below 0 m AHD. In addition, a large portion (around 1,000 ML) of Bega town water supply is extracted each year from the Bega Sands Alluvium, again from low levels.

These water users are particularly at risk from rising sea levels and saltwater intrusion. Water from these sources may become significantly saltier over the coming years, making them harder to use without costly treatment.

Salinity problems due to climate have already been experienced in the region. During times of low stream flow, water in the lower reaches of the Tuross River can become so saline, due to the tidal estuarine influence, that it is unsuitable for stock and domestic water use or irrigation.³⁸ In the Bega and Tuross rivers, water users have previously constructed temporary tidal barrages to restrict the movement of saline water upstream from those points. As sea levels keep rising, water users may need to find alternative sources of water, which can be more expensive and may impact their ability to conduct operations.

Sea level rise will also threaten the management, operation and maintenance of low-lying gravity agricultural drainage and stormwater and sewerage infrastructure.

34. Intergovernmental Panel on Climate Change 2019, *Special Report on the Ocean and Cryosphere in a Changing Climate*, www.ipcc.ch/srocc/

35. Research conducted by the National Oceanic and Atmospheric Administration in the United States.

36. This assumes an allocation of 1 ML per entitlement share

37. AHD or Australian Height Datum is the national vertical datum for Australia and the basis for measuring all physical heights in Australia. For practical purposes, zero AHD can be considered as an elevation of 0 metres or mean sea level.

38. Dedden, C. 2010, *Sustainable water management in the lower Tuross River*, New South Wales (A research report submitted in partial fulfilment of the requirements for the award of the degree of Honours Bachelor of Environmental Science.), University of Wollongong





Image courtesy of Scott Nicholas, Department of Primary Industries—Fisheries.

2.2 The landscape and its water

The South Coast region is a collection of coastal catchments: six major catchments (Clyde, Deua, Tuross, Murrah, Bega and Towamba) and 48 smaller catchments.

The major catchments of the South Coast all begin in the uplands of the Great Dividing Range and flow through to the sea via a series of estuaries and intermittently closed and open lakes and lagoons (ICOLLs), many of which are ecologically significant. Compared to other systems in the state, streams are relatively short. The headwaters are primarily forested and the lower-reach, small-scale floodplains are cleared and used for settlement and production.

2.2.1 Water resources in the region

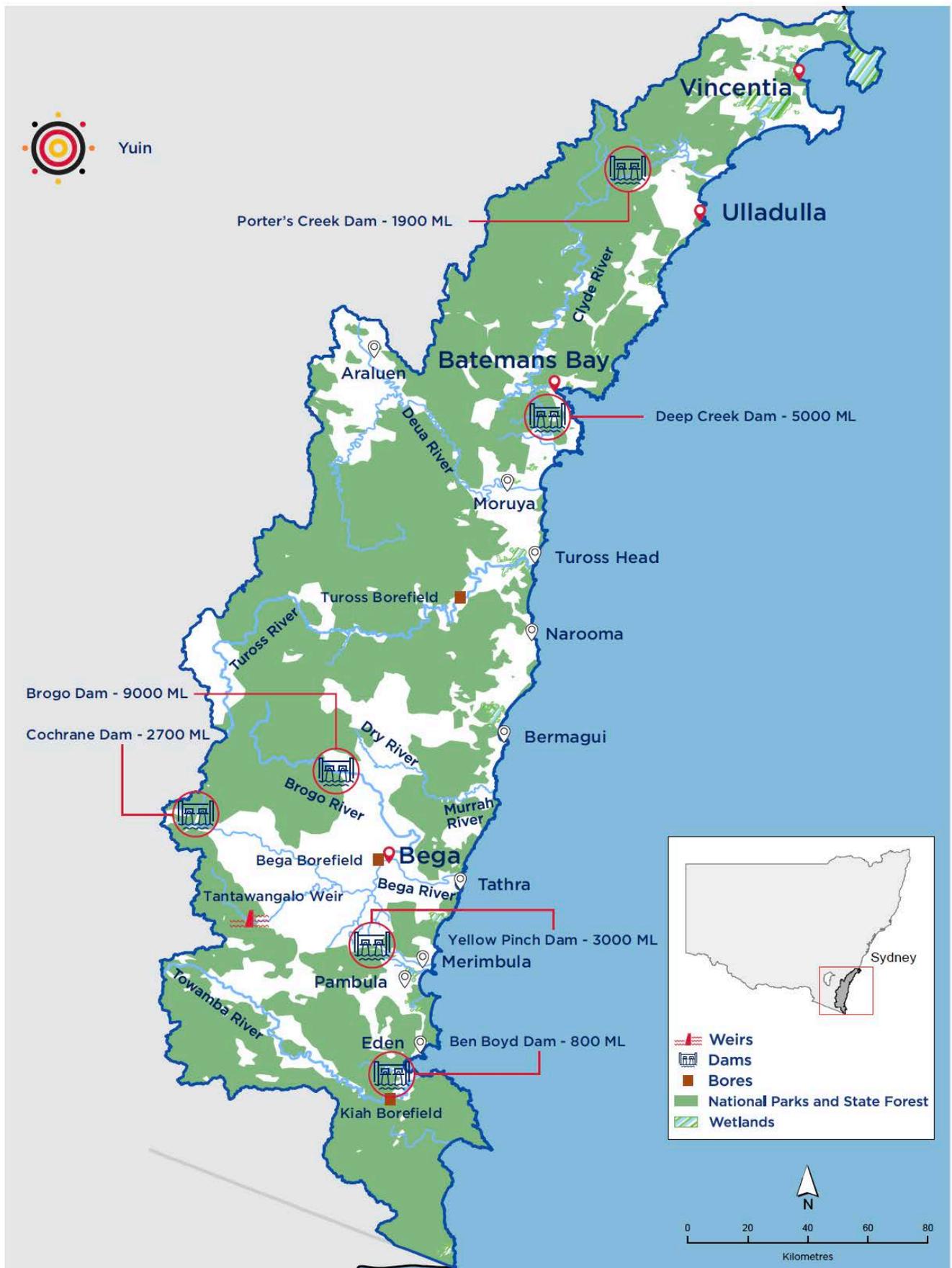
Water is critical to the health of the environment, the social fabric and liveability of the South Coast region and its economic prosperity.

The region's towns, communities and industries use water from multiple sources (shown in Figure 13 and Figure 14):

- **unregulated rivers and creeks**, including the Clyde, Deua, Tuross, Murrah, Bega and Towamba rivers
- **the regulated Bega and Brogo river system**, supplied from Brogo Dam
- **groundwater sources**
- **recycled water** from local water utilities
- **local catchment runoff** captured in farm dams.

The only state-owned dam in the region is Brogo Dam (8,980 ML) on the Brogo River. All other rivers in the region are unregulated and do not have any state-owned dams. The only other significant instream dam in the region is Cochrane Dam (2,700 ML), a privately-owned dam operated to generate hydroelectricity, in the upper reaches of the Bega-Bemboka river system.

Figure 13. The South Coast region: key water resources and infrastructure



Unregulated rivers and creeks

Most South Coast rivers are unregulated, meaning there are no major storages to capture and control flows for water supplies. These rivers rely on rainfall to generate stream flows.

Unregulated water access entitlement represents 64% of all entitlement in the South Coast region. Significantly, the greatest challenge to water management on the South Coast is presented by the climate, local topography and the highly variable stream flows in unregulated streams. Flows in most South Coast rivers are highly variable due to the high variability of rainfall, the infrequent larger rainfall events caused by east coast lows and the relatively short lengths of the rivers. There are very few dams or weirs providing storage of water in these systems.

On the South Coast, town water supplies, agricultural industries, food manufacturing, stock and domestic needs, fishing, tourism and the environment all rely on water from unregulated sources. Securing water for users of unregulated rivers will become increasingly difficult in a future with even greater climate variability.

Clyde-Jervis Bay area

The Clyde River-Jervis Bay area comprises the Clyde River catchment and adjoining coastal catchments between Broulee and Jervis Bay. It covers around 3,300 km². The Clyde River flows into the sea at Batemans Bay. The Clyde River estuary covers an area of approximately 17.5 km², reaching upstream to the confluence with Cyne Mallowes Creek. The area also includes many coastal streams between Batemans Bay and Jervis Bay that terminate in ICOLLs or wave dominated barrier estuaries, such as Burrill Lake, Conjola Lake and St Georges Basin.

Larger instream structures include a weir on Croobyar Creek near Milton and a weir on Millards Creek, Ulladulla, which is used as a tidal barrage. The catchment also includes

several town water supply dams including Porters Creek Dam (1,900 ML), which is owned and operated by Shoalhaven Water, and Deep Creek Dam (4,900 ML), which is owned and operated by Eurobodalla Shire Council.

Deua-Moruya River area

The Deua River area comprises the Deua-Moruya River catchment and the small coastal catchments of Congo Creek and Meringo Creek. It covers an area of around 1,700 km². The Deua River becomes the Moruya River at the tidal pool near the confluence with Wamban Creek, approximately 20 km upstream from the river mouth. The Moruya River flows through a trained entrance into the sea at Moruya Heads. Five major tributaries flow into the Deua River, including Araluen Creek. The small coastal streams terminate in ICOLLs.

There are no major on-stream dams in the area. Eurobodalla Shire Council pumps water directly to its reticulated water supply system from the Deua River at Wamban.

Tuross River area

The Tuross River area comprises the Tuross River catchment and adjoining coastal catchments. It covers an area of around 6,900 km². The Tuross River is over 140 km in length and has a catchment of 2,180 km². It has six major tributaries. The Tuross River terminates in an estuarine lake and wetland system that opens to the sea at Tuross Head. The tidal limit in the Tuross River is located 19 km from the ocean entrance. The Tuross River and estuary are highly prized for their recreational fishing. The estuary supports oyster aquaculture and is a nursery ground for commercially important native fish species. The river supports a population of Australian Grayling, listed as endangered under the *Fisheries Management Act 1994*.

Bega Valley Shire Council owns and maintains Illawambra Weir, situated on Wandella Creek, which can supply town water to the village of Cobargo.



Image courtesy of Destination NSW.

Historically, local farmers have built a temporary sand barrage across the Tuross River at the tidal limit when salinity levels rise. The sand barrage allows limited access to water for health and hygiene purposes and stock water for the region's dairy herds. The barrage washes away under medium flow conditions. More recently, concerns have been raised regarding the effect of the barrage on the river and its ecosystem.

Murrah-Wallaga area

The Murrah-Wallaga area comprises the Murrah and the Wallaga Lake catchments and covers an approximate area of 784 km². There are nine ecologically significant ICOLLs (including Wallaga Lake, Wapengo Lagoon and Nelson Lagoon) and one ecologically significant estuary (Bermagui). The entrance of Bermagui River has breakwaters making it open to the sea permanently.

There is no major water supply infrastructure. However, Bega Valley Shire Council has a weir on Couria Creek, which is used to divert water to supplement the Brogo-Bermagui water supply system.

Bega-Brogo River

The Bega River has a catchment of 1,940 km². The Brogo River is a major tributary of the Bega River, joining the Bega River a few kilometres upstream of the Bega Estuary, and then flows southeast into Mogareeka Inlet, an ICOLL 4 km north of the town of Tathra.

The state-owned Brogo Dam and privately-owned Cochrane Dam are the only significant instream dams in the region. Bega Valley Shire owns Tantawanglo Weir from which it diverts and transfers water from Tantawanglo Creek in the Bega River catchment, to Yellow Pinch Dam in the Towamba River catchment.

For several decades, local irrigators have erected a temporary sand barrage across the Bega River at Jellat Jellat to prevent saltwater intrusion into the freshwater reaches of the lower Bega and Brogo rivers during periods of low stream flow. The barrage is managed in accordance with guidelines negotiated with the Healthy Rivers Commission.

Towamba River area

The Towamba River basin comprises the Towamba River catchment and several coastal catchments between Wallagoot Lake and the Victorian border that terminate in estuaries or ICOLLs. Several of these are ecologically significant. The area covers around 2,345 km². The main catchments are the Towamba River, Wonboyn River and Pambula Lake.

Bega Valley Shire's Yellow Pinch Dam—a 3,000 ML off-stream storage—is located in the upper reaches of Merimbula Creek but receives most of its water from Tantawanglo Creek in the Bega River catchment. Bega Valley Shire also operates the Kiah Borefield located alongside the Lower Towamba River. Water from the borefield is used to fill Ben Boyd Dam, an 800 ML off-stream storage for the system, as well as to supply Eden and southern areas directly.



Image courtesy of John Spencer, Department of Planning, Industry and Environment.

Regulated Bega and Brogo river system

The Brogo River is a major tributary of the Bega River, joining the Bega River a few kilometres upstream of the Bega Estuary, and drains about one third of the Bega Valley catchment. Brogo Dam is in the upper reaches with a catchment area of 400 km², 70% of which falls within National Park land. There are no licensed water extractions upstream of the dam.

As noted in section 2.1.2, Brogo Dam has been sized to maintain water availability for relatively short periods of drought. The outflow capacity of the dam is 750 ML/day but normal releases are approximately 70 to 80 ML/day during peak irrigation in summer. The minimum outflow from the dam is 4 ML/day. Downstream tributaries (Double Creek and House Creek) provide an average of 1,400 ML/year of inflows to the Brogo system.

The Bega-Brogo regulated river system supplies water to high security, general security and supplementary water access licence holders—mostly for dairy farms—and water for town water supplies. Bega Valley Shire Council extracts between 1 and 3 ML/day for its Brogo-Bermagui water supply system, depending on the time of year, from an offtake that is 4 km downstream of the dam. Under normal conditions, about 1 ML/day is currently required to supply the Brogo-Bermagui system. The management of water from Brogo Dam is discussed further in section 2.2.3.

Harvestable rights farm dams

Many landholders across the South Coast regions source water from harvestable rights dams. A harvestable right allows landholders to collect 10% of the average annual regional runoff from their properties and store it in one or more farm dams. Due to the nature of harvestable rights—which do not require metering, an approval for dam construction or a licence for water take—there is no data available on how much water is collected or used from harvestable rights sources across the South Coast.

Groundwater

Groundwater sources in the region include alluvial, coastal sand and hard rock aquifers as shown in Figure 14.

Alluvial aquifers are located within the narrow bands of alluvial sediments adjacent to, and hydraulically connected with, rivers, creeks and ICOLLS. They are managed in conjunction with surface water resources through the various surface water sharing plans in the South Coast region. Bores accessing alluvial aquifers can be located above and below the tidal limit and there is 8.3 GL of entitlement in these sources across the region. Many of the alluvial aquifers in the region are highly hydrologically connected with the adjacent surface water bodies. In the Bega Valley, it is common practice for water users to dig shallow sumps in the Bega Sands Alluvium and extract groundwater, which is quickly replenished by river water transmitted through the sands.

Coastal sand aquifers are mostly shallow aquifers located within paleo-channels, dunes or lowland coastal sand deposits. They are recharged from local rainfall and are not usually hydrologically connected to a river or creek. Through the water sharing plan for the South Coast Groundwater Sources, these aquifers are managed within the South East Coastal Sands Groundwater Source and there is 389 ML of entitlement in the region from these sources.

Groundwater from alluvial and coastal sand aquifers in the South Coast is used for town water supplies, dairying, irrigation, stock and domestic and industry—particularly in the lower reaches of the Bega, Towamba and Tuross rivers. Bega Valley Shire’s town water supply is heavily reliant on the alluvial aquifer alongside the Bega River, where the council extracts around 1 GL/year of town water for Bega and Tathra. Town water for Eden and Ben Boyd is supplied from a borefield exploiting alluvial deposits associated with the Towamba River at Kiah.

Outcrops of hard rock aquifers are more prominent in the higher elevations of the catchments. Both porous and fractured rock aquifers in the region have generally low to moderate connectivity with surface water and mostly only provide limited amounts of water. However, they are a relatively more important resource in the upper catchments where alluvial sediments are scarce. There is around 4.7 GL of entitlement from these sources in the region.

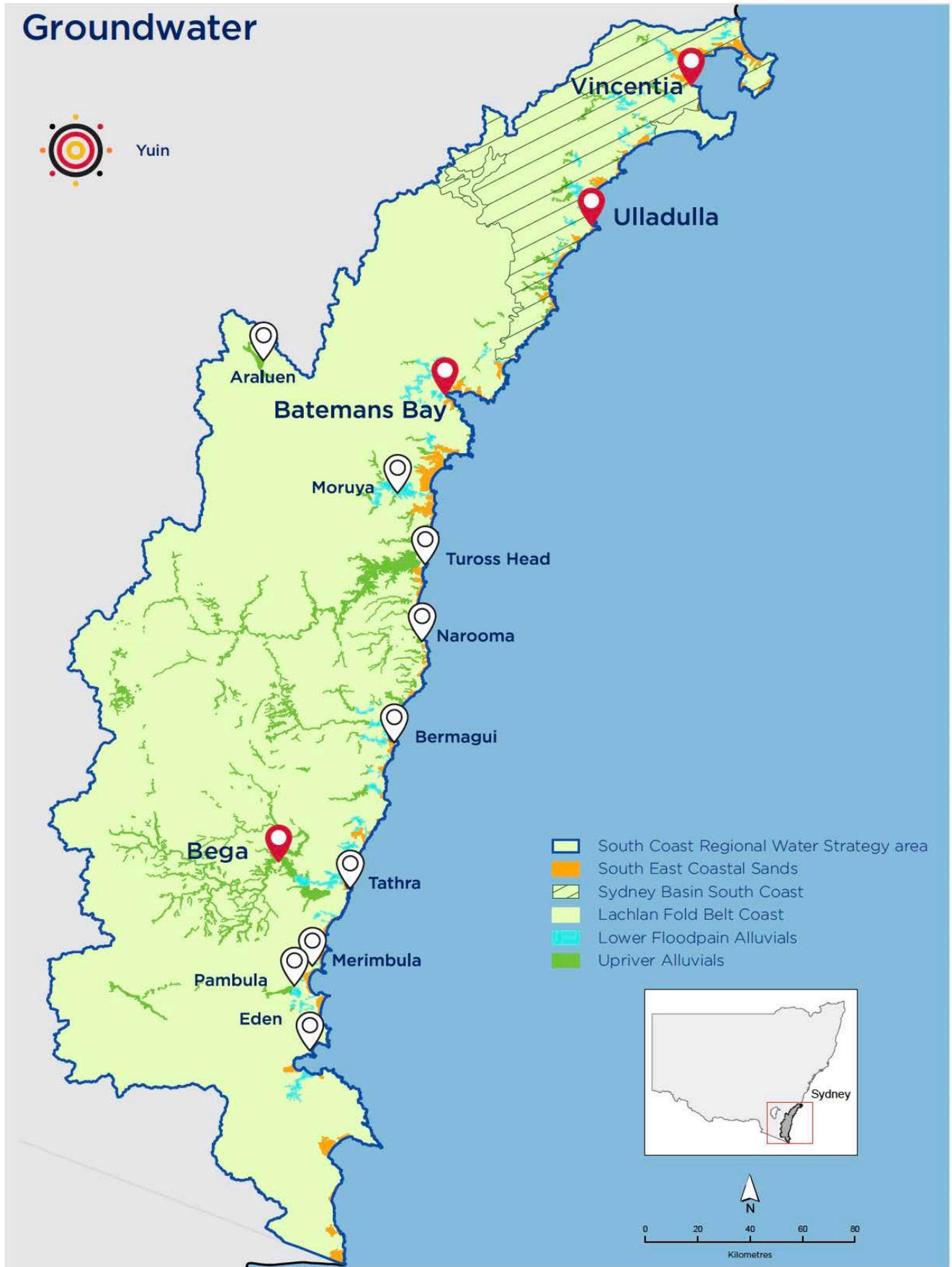
Groundwater use is expected to come under threat from sea level rise-induced saline intrusion over the next 30 to 80 years and beyond, particularly for low-lying areas with significant volumes of extraction.

Saline intrusion into previously non-saline groundwater sources can render water unusable for consumptive purposes such as town water supply, irrigation and stock, depending on the salt concentration. As low-lying groundwater development is spread across the region in the various segregated sands and alluvium, a range of local fit-for-purpose responses will be required to respond to this national/global challenge.

Groundwater, from hard rock aquifers in particular, represents a largely untapped resource and may offer pragmatic and realistic management options for addressing regional water challenges. Continuing to improve our understanding of groundwater will enable better informed decisions about its management and use. Gaining knowledge about groundwater availability across the entire South Coast region, not just in areas where it is usually accessible, and providing this information to towns and industries could significantly improve planning for drought. It could also help communities to make informed decisions about which water sources to access at different times and consider how land use planning decisions may impact these sources.

NSW has a strong groundwater management framework that has undergone significant reform. However, opportunities still exist to continue to improve how we manage groundwater resources. Several groundwater-related options are proposed in the Draft South Coast Regional Water Strategy, focused on using groundwater more efficiently, innovatively and sustainably, making sure groundwater of suitable quality is available for critical needs, improving our knowledge and understanding of groundwater processes and better managing risks to this important resource.

Figure 14. Groundwater sources in the South Coast region



Recycled water

All three local water utilities in the South Coast region produce recycled water for reuse. Treated wastewater from the Merimbula Sewage Treatment Plant operated by Bega Valley Shire is used as much as possible for irrigation at Pambula Merimbula Golf Course and farmland at Oaklands. The remainder is disposed via the beach-face outfall or dunal exfiltration ponds. The golf club uses between 13% and 30% of the total volume of treated wastewater each year (approximately 680 ML/year³⁹). More is used in dry years, less in wet. Median use is around 21% per year. Oaklands Farm uses between 5% and 11% of the total volume, with the median use around 8% per year. Treated wastewater is pumped through a 4 km pipeline to a 2,020 ML storage dam on the Oaklands property.

Eurobodalla Shire Council uses recycled water to irrigate the Moruya Golf Club, Riverside Park in Moruya and the Catalina and Tuross Golf Clubs. Recycled water is also used at the sewage treatment plant to wash down equipment.

Shoalhaven Water operates an extensive reclaimed water system on the floodplains of the Shoalhaven River, which falls within the Greater Sydney region (refer to break out box).

The main driver for supplying recycled water in the South Coast is to manage wastewater impacts on receiving environment and public health. Several studies have been conducted to assess the economic feasibility of reuse but these studies have found that large-scale reuse is difficult to justify on economic grounds alone. The regional water strategy provides an opportunity to explore how recycled water can be better utilised as a largely climate independent water supply source.

Shoalhaven Water's Reclaimed Water Management Scheme

Shoalhaven Water's Reclaimed Water Management Scheme (REMS) is one of the largest and more complex water recycling schemes undertaken by a regional water utility. The objectives of the REMS are to maximise the use of reclaimed water for beneficial purposes rather than disposing of it into the environment, supply high quality irrigation water to the region's farmers and irrigate local sporting facilities and golf courses.

Interest in the REMS' ability to provide a reliable, climate independent source of irrigation water for the local Nowra and Bomaderry regions helped build the case to expand the scheme in 2019 to meet additional demands. Shoalhaven Water's upgrade of the REMS in 2019 almost doubled the allocated irrigation area to more than 600 ha, including dairy farms, golf courses, sporting fields and other recreation areas.⁴⁰

39. Bega Valley Shire Council 2019, *Effluent management*, begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-DRU-10-03-65

40. Shoalhaven Water 2020, *Reclaimed Water Management Scheme*, shoalwater.nsw.gov.au/About-Us/Major-Projects/REMS

2.2.2 Water and the regional environment

The South Coast region is home to several important water dependent environmental assets:

- **Native flora and fauna species** including diverse native fish and bird populations. Some of these are listed as threatened or endangered. Many of these are essential for river health and water quality. Some of these species provide recreational fishing and have cultural value to the Yuin people.
- **State and nationally significant wetlands and swamps** supporting large areas of mangrove, saltmarsh and seagrasses. The Clyde River supports the largest area of estuarine wetlands of any estuary in the South Coast region, consisting of 54 discrete wetlands protected under *State Environmental Planning Policy (Coastal Management) 2018*. The Deua River catchment consists of 32 discrete protected wetland areas and the Tuross River catchment consists of 53 discrete protected wetland areas.
- **National parks and nature reserves** covering approximately 42% of the region, including two declared wilderness areas.

Healthy, connected water sources are essential to protecting these environmental assets and species, and to achieving the NSW Government's land use planning goals for the South Coast region's environment. A healthy environment also improves the liveability of the region, contributes to the health and wellbeing of communities and sustains the tourism, resources and agricultural industries.

Fresh groundwater flow also supports environmental assets and associated bio-chemical and physical processes, including estuaries, ICOLLs, fringing swamps, limestone (karst) formations and surface baseflows of unregulated rivers and creeks.

Many of these features exist within the marine estate and collectively form some of the region's greatest natural assets that are highly valued by locals and tourists alike. They provide recreation and enjoyment, contribute to residents' quality of life and are of social, cultural, economic and environmental importance to the people of NSW. These significant benefits reinforce the importance of healthy groundwater systems to the social and economic wellbeing of the region's communities.

All third order and higher streams and rivers of the South Coast region are classified 'key' fish habitat. Australian Grayling is listed as endangered under the *Fisheries Management Act 1994*. Short-finned eels have commercial fishing value, while bass and mullet are fished recreationally. A number of native fish species also move between fresh and estuarine environments during their life cycles.

Many factors have contributed to the deterioration of river health and native fish populations in South Coast rivers. These include stream-bed aggradation, changes to streamflows, degradation of instream habitat and riparian vegetation, poor land management, barriers to fish passage and introduced fish species.

The construction of Brogo Dam has altered the natural stream flows along the Brogo and lower Bega rivers. Although relatively small, the dam has redistributed flows between seasons, reduced the frequency of mid-range flows and lowered downstream water quality when storage levels are low.⁴¹ While the remaining streams in the South Coast region are classified as unregulated, flows in several South Coast streams have been modified historically by small weirs that create pools to extract water for agriculture and domestic purposes. These weirs can affect waterway connectivity, the health of riparian and aquatic environments and the movement, spawning and feeding of native fish. Under the *NSW Weirs Policy*,⁴² several of these weirs have been removed or modified to improve fish passage.

41. NSW Government 2011, *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources—Background*, www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/south-coast-region

42. NSW Government 1997, *NSW Weirs Policy*, NSW Government

Water for the environment

The region's water sharing plans aim to protect water for environmental outcomes. Environmental water in the plans is provided by setting limits on the volumes and timing for water extraction. Three mechanisms aim to protect water for environmental purposes:

- Long-term average annual extraction limits set the upper limit of water that can be extracted from water sources in the region.
- Cease-to-pump rules prohibit extraction when flow rates drop below specified levels.
- Minimum releases from on-stream dams and weirs, and environmental water reserves, maintain downstream flows.

In the South Coast, WaterNSW releases a minimum flow of 4 ML/day from Brogo Dam. An environmental contingency allowance is also available to help manage critical water quality events, such as algal blooms and blackwater events, and maintain aquatic ecosystem health. Cochrane Dam Pty Ltd—in agreement with downstream water users—releases water from Cochrane Dam to the Bemboka River to achieve a minimum flow of 2 ML/day at Kanoona.

Providing water for a healthy environment can be difficult at times because water for the environment is not actively managed in the South Coast. Water for the region's environment assets and ecosystem functions is largely dependent on rainfall-generated streamflows and how much water is extracted for consumption.

Currently, water extraction rules are constraining ability to meet the region's environmental water requirements in two ways:

- Annual extraction limits set out in the water sharing plans largely reflect the total licenced volumes at the time the plans were made. This means that there is some uncertainty as to whether these limits are sustainable over the long term.
- Although the cease-to-pump rules were informed by risk assessments and the management objective of protecting low flows, the rules in some locations are based on visible flow rather than an established flow rate. This means that at some locations, cease-to-pump rules only come into effect once a water source has stopped flowing. This protects pools from drawdown, providing drought refuge, but does not retain connectivity within the system.

Future impacts on water for the environment

Higher temperatures, increased evaporation, increased fire risk, changes to rainfall patterns and associated flows, and potentially more intense dry and wet periods have the potential to significantly impact water-dependent ecosystems that have evolved over millennia to thrive in natural cycles that are now changing.

Modelling the effects of long-term climate change on hydrology in the South Coast region indicates the potential for significant changes to river flows in the next 40 years, with associated impacts on riverine and estuarine ecosystems. We have analysed these changes for the regulated Brogo River,⁴³ unregulated rivers across the Bega⁴⁴ and Tuross⁴⁵ river catchments and inflows to the Bega⁴⁶ and Tuross⁴⁷ river estuaries. We have also analysed flows at the Kanoona unregulated river streamflow gauge,⁴⁸ given its importance in the water management of the Bega River catchment.

In general, our modelling shows the total volume of water flowing each year on average in the rivers of the Bega and Tuross catchments reducing by 12% to 16%, with these impacts happening across all components of the flow regime (Figure 15).

The magnitude of medium to high flow events (flows that occur every 2.5 years on average) in the regulated Brogo River may decrease by 8%. The impacts are likely to be more pronounced in the unregulated rivers, where medium to high flow events may decrease in size by more than 20% (Figure 15). The modelling also shows that high flows will occur less frequently in the future. This will limit the number of events that may trigger fish movement and spawning and reduce the

larger tributary flows that stimulate riverine productivity by transporting dissolved carbon and organic detritus, micro-organisms, plankton and small animals into the system.

Similarly, high flow events in streams directly flowing into estuaries are predicted to reduce in magnitude by 15% for the Bega River estuary and 18% for the Tuross estuary. Reductions in the size of events flowing to estuaries will have similar impacts to freshwater systems in terms of the availability of organic carbon and other food for organisms low in the food web, but may also impact salinity gradients and circulation patterns, detrimentally impacting the estuarine ecology, particularly in the tidal pool at the upper limit of the estuary.

Lower magnitude flows are also predicted to be affected significantly. For rivers in the Bega valley, it is possible that the 95th percentile flow (flow that is exceeded 95% of the time) will decrease in magnitude by around 29% to 35% across the regulated and unregulated rivers. This will reduce the ability for rivers to prolong the availability of the higher velocity riffle habitats relied upon by many aquatic organisms to breathe, feed and reproduce.

The number of cease-to-flow events is predicted to increase across all regulated, unregulated and estuary inflow systems, with the percentage of years with a cease-to-flow event increasing from 6% (six out of every 100 years) to 14% in the Brogo regulated river system, from 23% to 31% in the unregulated rivers in the Bega River catchment and from 18% to 25% in the unregulated rivers in the Tuross River catchment (Figure 16).

The average duration of each cease-to-flow event ranges from 1 to 13 days and is not expected to change significantly. Cessation of flow in rivers and streams will result in

43. Modelled at 219025 Brogo River at Angledale

44. Median of the following unregulated modelled locations/gauges: Bega (Tantawangalo Weir inflow, 220004, 220001, 220004, 219034, 219020, 219017, 219008, 219006, 219001, 219032, 219022, 219021, 219003, Cochrane Dam inflow and Brogo Dam inflow)

45. Median of the following unregulated modelled gauges: Tuross (218001, 218005, 21800, 218008)

46. Modelled at Bega catchment end of system node (reach 2)

47. Modelled at Tuross catchment end of system node

48. Modelled at 219032 Bega River at Kanoona

drying of flowing water habitats, increased sedimentation, water quality deterioration (elevated water temperatures and low dissolved oxygen levels) and the loss of connectivity throughout the river system, all of which will have damaging effects on the region's aquatic ecosystems.

The lack of freshwater flows entering the estuaries during the cease-to-flow events will change the salinity gradient and decrease the size of the tidal pool where freshwater is found below the more saline water above,

generally resulting in saline water moving further upstream. These impacts will be in addition to any impacts from sea level rise, which has not been modelled in this analysis. Importantly, these climatic changes will not occur in isolation, but will coincide with other factors such as further development of water resources, market shifts, land use and agriculture changes. If not managed properly, these factors present a risk to the long-term health of rivers, floodplains, estuaries and wetlands.

Figure 15. Impacts of long-term climate risks on the flow regime—NARCIIM climate model

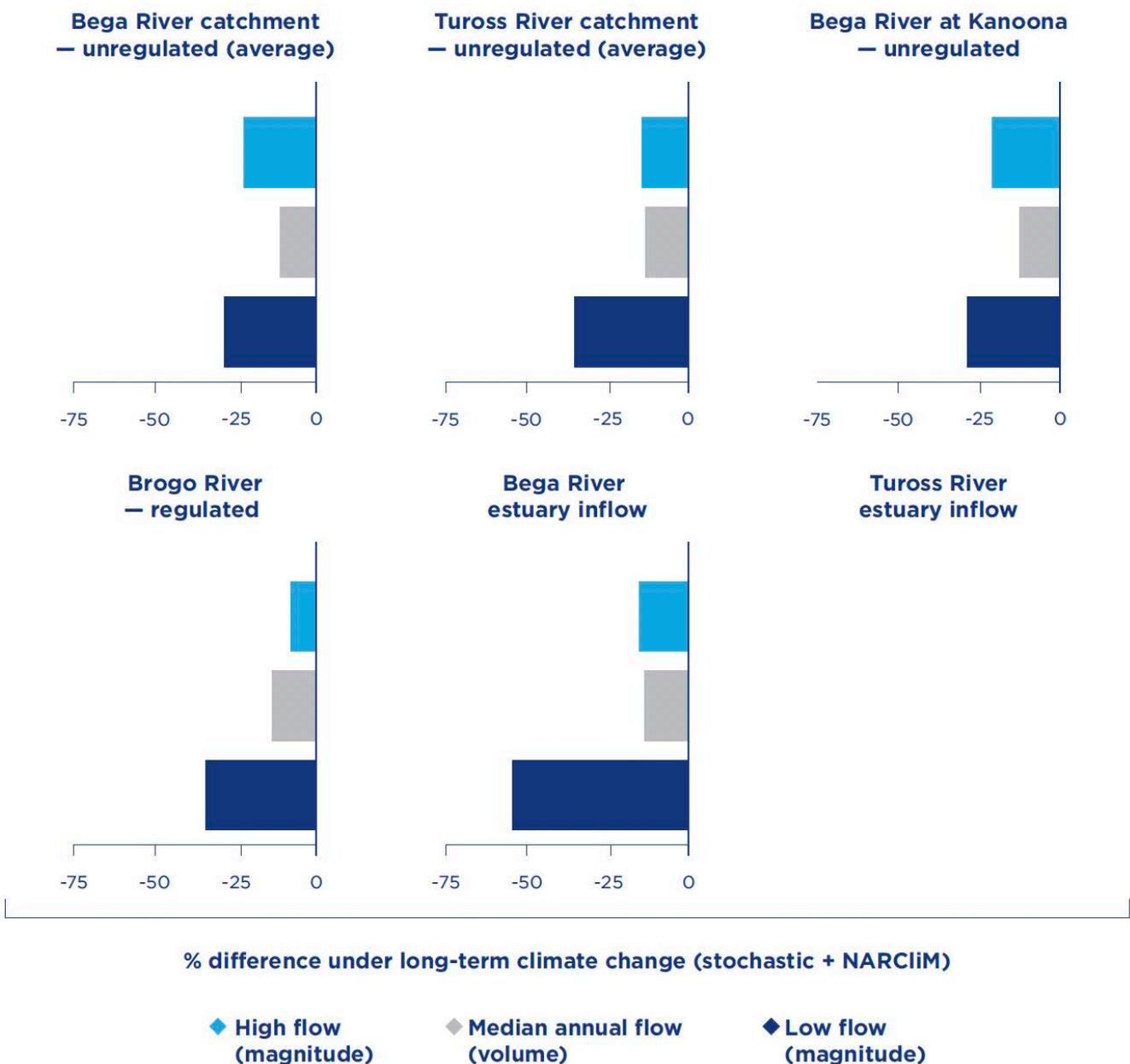
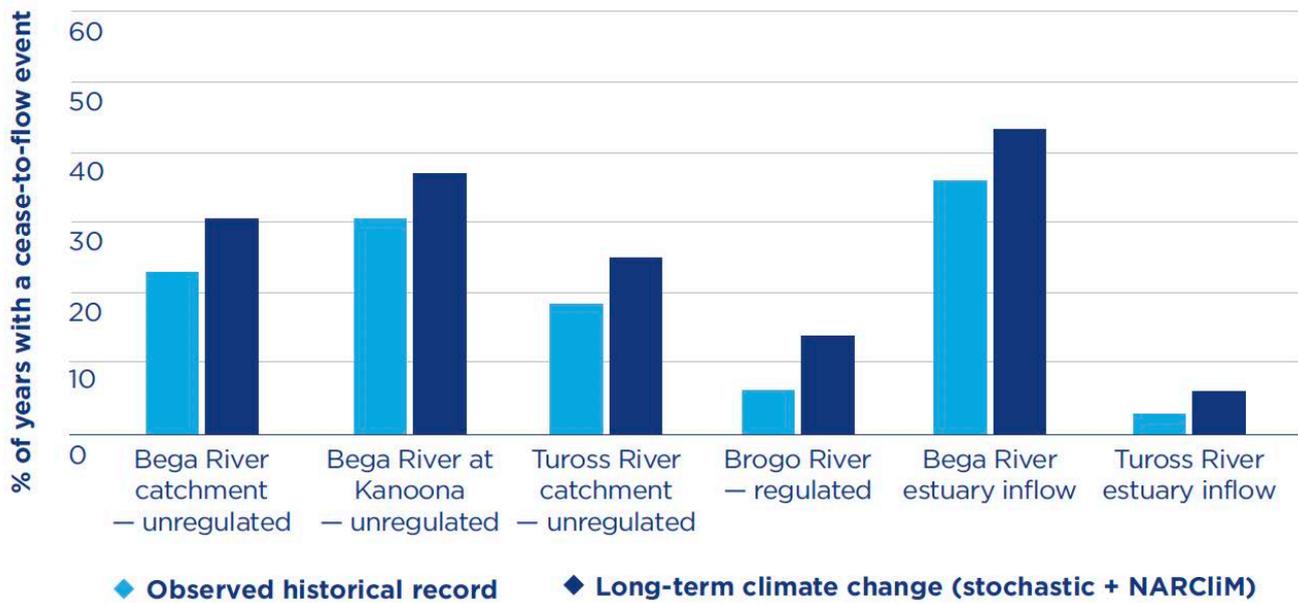


Figure 16. Impacts of long-term climate risks on the flow regime (cease-to-flow events)



A more variable climate means that concerted and coordinated efforts will be required to protect and enhance the region’s vital environmental, economic, social and cultural assets into the future. To this end, opportunities exist to embed and build on water metering reforms to better understand the impacts of water extraction on waterway and aquifer health and improve water users’ compliance with the rules. With access to better information, there is also an opportunity to consider the long-term sustainability of existing extraction limits through upcoming water sharing plan reviews.

This Draft South Coast Regional Water Strategy also considers a range of options to protect and improve the health and resilience of the region’s natural systems and aquatic species. This includes actions to protect environmental water, support and increase native fish populations, protect ecosystems that are dependent on coastal groundwater resources and initiatives to restore riverine habitats.

Water quality

The quality of water across the South Coast region’s rivers, estuaries, wetlands and aquifers varies with time and location. Water quality is affected by natural processes and by human practices. Natural factors include the local geology, which influences salt and nutrient inputs

as well as climate, riparian vegetation and stream flow. Human practices affecting water quality include water extraction, river flow regulation and land management, all of which can lead to unnatural levels of nutrients, suspended solids (which increase turbidity), pathogens and toxicants, dissolved oxygen, pH and temperature.

Poor water quality impacts the health of fish and other aquatic organisms, seafood quality and aquatic habitat and can cause harmful, potentially toxic algal blooms. It can also cause odour problems, reduce the effectiveness of water treatment and have negative impacts on amenity, tourism, recreation and commercial opportunities and Aboriginal cultural heritage.

Floods and high flows naturally clean and flush rivers. Human practices reducing freshwater flows across the South Coast include water extraction for agriculture, towns and domestic and stock purposes, river flow regulation by instream dams and weirs such as Brogo Dam and Cochrane Dam, and water interception by farm dams and plantation forestry. Climate change is forecast to drive further reductions in freshwater flows.

Human practices impacting the quality of catchment runoff include land clearing for agriculture, forestry and urban development, gravel road construction and cattle grazing along riparian zones. These practices increase erosion and the turbidity and sedimentation of streams,

wetlands and estuaries particularly following heavy rainfall. Clearing of riparian vegetation and the reduction of large woody debris in waterways leads to an ongoing loss of riffles, channel bed erosion and reduction of in-channel water storage. Loss of riparian shading also exposes streams to heatwaves, especially during droughts, exacerbating extremes in water quality and changing the trophic dynamics of streams (algal dominated instead of organic matter driven). Such changes seriously threaten the maintenance of aquatic ecosystems. Sediment also acts as a potential mode of transport for nutrients to enter waterways. Cattle accessing waterways to drink can increase erosion and can be a common source of pathogen (bacteria and virus) contamination. More frequent and severe storm and erosion events under climate change will exacerbate the effects of land use activities on water quality.

As an example, archival photos indicate the in the second half of the 19th century the

Bega River immediately upstream of Bega widened from 40 m to 140 m due to European settlement.⁴⁹ River pools and the lower floodplains were then progressively smothered by 2 m of sand eroded from the upper catchment during subsequent floods.

Runoff from agricultural land and sewage effluent and septic runoff from village and rural residential town areas cause elevated nutrient, toxicant (heavy metals, chemicals and pesticides) and pathogen levels in both surface water and alluvial ground water sources. Stormwater and sewage overflows from town areas discharge a range of pollutants into waterways and can impact adjacent and downstream estuaries and wetlands. The *NSW Marine Estate Threat and Risk Assessment Final Report*⁵⁰ identified urban stormwater discharge as the third-highest ranked threat to environmental assets in the south region. The risk of groundwater contamination is also higher in urban areas.

Improving water quality through the Marine Estate Management Strategy

The *NSW Marine Estate Threat and Risk Assessment Final Report*⁵¹ identified water pollution as the number one threat to both the environmental assets and the social, cultural and economic benefits derived from the marine estate. Initiative 1 of the *NSW Marine Estate Management Strategy 2018–2028*⁵² targets improving water quality through management actions aimed at improving habitat, addressing litter, and reducing land-based runoff, including:

- clean coastal catchments
- fish friendly workshops for local government
- oyster reef restoration
- riverbank vegetation rehabilitation
- coastal wetland rehabilitation
- reducing erosion from roads and tracks
- biodiversity offsets
- marine litter campaign
- risk-based framework for waterway health
- estuarine water quality monitoring
- coastal floodplain study
- coastal drainage management
- construction sediment management
- review of the NSW Water Quality Objectives⁵³
- review of the NSW Diffuse Source Water Pollution Strategy.

49. Brooks, A. P., & Brierley, G. J. 1997, *Geomorphic response of lower Bega River to catchment disturbance, 1851–1926. Geomorphology*, 18(3–4), 13.

50. NSW Marine Estate Management Authority 2017, *NSW Marine Estate Threat and Risk Assessment Final Report*, Sydney, www.marine.nsw.gov.au

51. NSW Marine Estate Management Authority 2017, *NSW Marine Estate Threat and Risk Assessment Final Report*, Sydney, www.marine.nsw.gov.au

52. NSW Marine Estate Management Authority 2018, *NSW Marine Estate Management Strategy 2018–2028*, NSW Government
 53. Department of Planning, Industry and Environment—Environment, Climate Change and Water, *NSW Water Quality and River Flow Objectives*, accessed 24 August 2020, www.environment.nsw.gov.au/ieo/



Image courtesy of Scott Nicholas, Department of Primary Industries—Fisheries.

Bushfires pose an increasing and ongoing threat to water quality across the South Coast because of the high proportion of forested areas and expected increases in severe fire weather days under climate change. Heavy rain over bushfire affected catchments can wash ash and eroded soil into waterways, increasing suspended solids and turbidity, sedimentation and nutrient and heavy metal concentrations. Loss of riparian vegetation can increase water temperature, affecting algal growth and dissolved oxygen levels, leading to a negative impact on aquatic life.

Generally, water sources across the region are naturally low in dissolved salts (salinity). However, as discussed in section 2.1.2, sea level rise, combined with a reduction in freshwater flows, will cause tidal limits to move further upstream and saltwater to intrude into groundwater sources. Increased salinity will combine with higher water levels to alter existing freshwater dependent habitats for numerous South Coast water sources. This is expected to change the condition and characteristics of the estuaries, ICOLLs and fringing swamps of the South Coast region.

The impacts will vary according to local conditions, such as substrate and geomorphology, but it is broadly anticipated that marine conditions will move landwards. The NSW Government is taking action to identify estuary and marine environments and species at threat from climate change through the

Marine Estate Management Strategy and the preparation of coastal management plans. Saltwater intrusion will also impact water security for local water utilities and water users who currently access freshwater water sources located close to, or within, current tidal limits. Forming a clearer regional picture of this issue is critical to developing appropriate local responses.

Unlike other coastal NSW regions, the disturbance of acid sulfate soils is not considered a major threat to South Coast water quality. While acid sulfate soils are present in the region, including the lower Tuross and Clyde river catchments, relatively low levels of agricultural development and a coordinated management program have reduced the risk of acidic water with toxic levels of metals draining into the region's waterways.

The potential for cold water pollution is also low across the South Coast. Cold water pollution can occur downstream of large dams due to releasing water from deep within storage to the downstream river channel. Numerous studies have indicated that cold water pollution can adversely impact aquatic organisms and aquatic ecological processes and is a key determinant of river health. Cochrane Dam on Georges Creek in the Bega River catchment is the only dam in the region estimated to cause moderate cold-water pollution effects.⁵⁴ It is one of 18 dams identified by the NSW Government for investigation and possible action over the next 15 years.

54. Department of Trade and Investment, Regional Infrastructure and Services 2012, *NSW Cold Water Pollution Strategy*, NSW Government

2.2.3 Managing water in the South Coast region

Water in NSW is managed and shared under the *Water Management Act 2000*, with specific water sharing rules set out in water sharing plans.

Managing water extraction

Water sharing plans set the limits on the amount of water that can be extracted from surface water and groundwater sources in the South Coast region. The annual sharing of water is managed through long-term average annual extraction limits (LTAAELs). Daily sharing is managed through cease-to-pump rules in unregulated river systems, which can vary for different categories of licence. In regulated systems, water extraction is managed through available water determinations. Water extraction rules aim to balance reliable access to water with protecting the environment.

LTAAELs are set for extraction management units, which may consist of a complete river catchment, part of a catchment or, as is often the case along the coast, a collection of small coastal catchments. LTAAELs represent the average long-term (over five years) volume of water that can be extracted from an extraction management units.

LTAAELs for South Coast water sources are implemented through the following water sharing plans:

- *Clyde River Unregulated and Alluvial Water Sources (2016)*
- *Deua River Unregulated and Alluvial Water Sources (2016)*
- *Tuross River Unregulated and Alluvial Water Sources (2016)*

- *Murrumbidgee Area Unregulated and Alluvial Water Sources (2010)*
- *Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources (2011)*
- *Towamba River Unregulated and Alluvial Water Sources (2010)*
- *South Coast Groundwater Sources (2016)*.

The Towamba River, Bega and Brogo rivers and Murrumbidgee area water sharing plans are scheduled to be replaced or amended in 2021. The Clyde, Deua and Tuross plans are due to be remade in 2026.

Dealing with extraction limits

The region's surface water LTAAELs reflect the sum of licenced volumes and estimated basic landholder rights at the time the water sharing plan was made. While the LTAAELs across all six major catchments are considerably less than their total annual flows, competition for water between water users and the environment is highest when streamflows are low. Of all the South Coast catchments, the Bega catchment is under the greatest hydrologic stress.⁵⁵ Cease-to-pump rules in water sharing plans are in place to manage competition for water during these periods.

Recent investment in new climate and environmental datasets and modelling provide an opportunity to review and update the LTAAELs and water access rules to reflect sustainable levels of extraction. Sustainable extraction limits would consider the ecological, economic, social and cultural water needs of the region and may result in higher or lower LTAAELs. Higher LTAAELs would support economic growth because more water access licences could be issued for productive use. Lower LTAAELs would identify where the NSW Government should prioritise reducing the impact of water extraction on the environment.

55. Department of Land, Water and Conservation 1998, *Stressed Rivers Assessment Report: NSW State Summary*



Image courtesy of Scott Nicholas, Department of Primary Industries—Fisheries.

The region's groundwater long-term average annual extraction limits (LTAAELs) vary by aquifer and are based on the calculation of several key components, including groundwater recharge, risk assessments, planned environmental water and current and future water requirements.

The LTAAELs have been set at 20,000 ML for the Lachlan Fold Belt Coast Groundwater Source, 5,600 ML for the South East Coastal Sands and 21,500 ML for the Sydney Basin-South Coast. Unassigned water exists in these groundwater water sources because the LTAAELs still exceed the total of water access licence volumes plus the volumes estimated for basic landholder rights. Acknowledging this, the NSW Government has made shares available in these groundwater sources through a controlled allocation process each year since 2017. In 2020 a total of 1,852 shares was made available in these three groundwater sources.

Future controlled allocations will be made in accordance with the *Strategy for the controlled*

allocation of groundwater.⁵⁶ Investment in better understanding groundwater processes and availability would help identify opportunities to increase LTAAELs to support economic growth or prioritise locations where levels of water extraction are unsustainable over the long term.

The current rules for allocating surface water from the Bega-Brogo regulated river system are based on observed rainfall records prior to the development of the water sharing plan. The rules do not anticipate a scenario where the region's climate is likely to be more variable in the future, with more severe droughts occurring more often.

Preparation of the South Coast Regional Water Strategy offers an opportunity to consider whether our resource assessment and allocation settings are at the right levels, particularly in relation to new climate data, regional trends and other contemporary information.

56. Department of Primary Industries—Water 2017, *Strategy for the controlled allocation of groundwater*, NSW Government, www.industry.nsw.gov.au/

Water take in the South Coast region

A total of 82,965 ML⁵⁷ of surface water and groundwater is licensed for use across the South Coast region (Table 2). About 64% of this entitlement (53,031 ML) is for extraction from unregulated rivers, of which 26,836 ML is in the Bega River catchment and 8,044 ML is in the Tuross River catchment.

Water entitlement in the Bega-Brogo regulated river system represents 20% of total surface water and groundwater entitlement across the South Coast region. About 85% of this entitlement is general security entitlement, (Table 3) used predominantly for irrigating dairy pastures. Brogo Dam also holds a small, but important entitlement of 700 ML for high security town water supply.

Table 2. Entitlement (share component) volume for water resources across the South Coast region

Water source	Entitlement (ML)	% of total
Unregulated	53,031	64
Regulated (Brogo—Lower Bega)	16,429	20
Alluvial groundwater	8,384	10
Groundwater—Hard rock aquifers	4,732	6
Groundwater—Coastal sands	389	< 1
Total	82,965	

*Note: This volume includes 902 ML of water extracted by Eurobodalla Shire Council through several bores located near the Tuross River. Although the water is extracted from a borefield, it is considered surface water because of its close proximity to the river.

Table 3. Entitlement (share component) volume for the Bega-Brogo regulated river system

Water access licence type	Entitlement (ML)
Regulated high security	421
Regulated general security	13,954
Town water regulated	700
Supplementary	1,300
Domestic and stock regulated	54
Total	16,429

57. Licensed access to water is managed through 'share components'. For ease of reporting in this document we have used 'ML' rather than 'share components'. This assumes that 1 ML is issued for each unit share.

Alluvial groundwater entitlement constitutes 10% of the total entitlement across the region. The greatest proportion of alluvial groundwater entitlement is in the Bega River catchment (3,643 ML), followed by the Lower Towamba River alluvium (1,918 ML), the Tuross River alluvium (1,045 ML) and the Pambula Lake alluvium (907 ML). A total of 4,732 ML of entitlement is issued in the region's hard rock groundwater sources, while just 389 ML has been issued to South Coast coastal sands groundwater sources.

About 80% of surface water and groundwater entitlement is used for agriculture, predominantly irrigation. Entitlement for local water utilities and stock & domestic purposes is about 17% and 3%, respectively.

There are no environmental water entitlements in the South Coast region. As discussed in section 2.2.2, water for the environment is, by definition, water not taken for other purposes, under the rules set out in the water sharing plans. Due to the high level of competition for water in some streams, the volume of water left for the environment can be minimal. For example, the peak daily demand of all unregulated licences in the Bega catchment upstream of Kanoona is 147 ML/day, more than double the 80th percentile flow (flow that is exceeded 80 % of the time). Reductions in flows and water quality due to climate variability and change will amplify the issue of insufficient water for the environment.

As discussed in section 2.1.1, harvestable rights allow landholders in coastal draining catchments to collect and store 10% of the average annual rainfall runoff from their properties, without a water access licence, water supply work approval or water use approval. Harvestable rights dams can only be constructed on non-permanent mapped minor streams or unmapped streams. 'Minor streams' are first and second order streams, as defined using the Strahler stream order system.⁵⁸ The water captured in a harvestable rights dam can be used for any purpose but it cannot be supplied to any other property or traded. Coastal water users have requested that the NSW Government explore options that would allow them to take more water under their harvestable rights to support agricultural production.

Plantation forestry covers an estimated 22% of the South Coast region and up to 50% the Clyde, Tuross and Towamba river catchments. Plantation forestry can intercept surface runoff and throughflow. Water planners are considering how such interception should be included in catchment hydrology calculations and incorporated into catchment extraction limits. Water sharing plans across NSW do not currently require plantation managers to hold water access licences. However, the department is currently considering an amendment clause to include in future coastal water sharing plans which may require that any significant expansion of plantation forestry must be licensed.

58. Department of Industry 2018, *Determining stream order—Fact sheet*, www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data



Water usage

As most pumps on unregulated systems are not metered, we do not have accurate figures about water take from these systems. Anecdotal information for water use in the Bega River and Tuross River catchments suggests that the water take averages around 50% of the existing entitlement, with annual use varying with climatic conditions.

Water take from the regulated system is controlled by water allocations. Due to the size of Brogo Dam relative to entitlement, the maximum commencing allocation for general security users on 1 July in any year is set at 40%, even if the dam is full. Due to the large proportion of sleeper entitlement, the dam is often not drawn down sufficiently during the year to allow it to refill and allow for general security allocations to reach 100%. The allocation for general security water access licences from the Bega-Brogo regulated river system has not exceeded 80% over the last 10 years (Figure 17).

Since the commencement of the *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011*, the total volume of water made available each year has been around 9,800 ML on average (Figure 18). Of this volume, only about 30% has been used. As mentioned above, this low rate of utilisation contributes to suppressed levels of allocation.

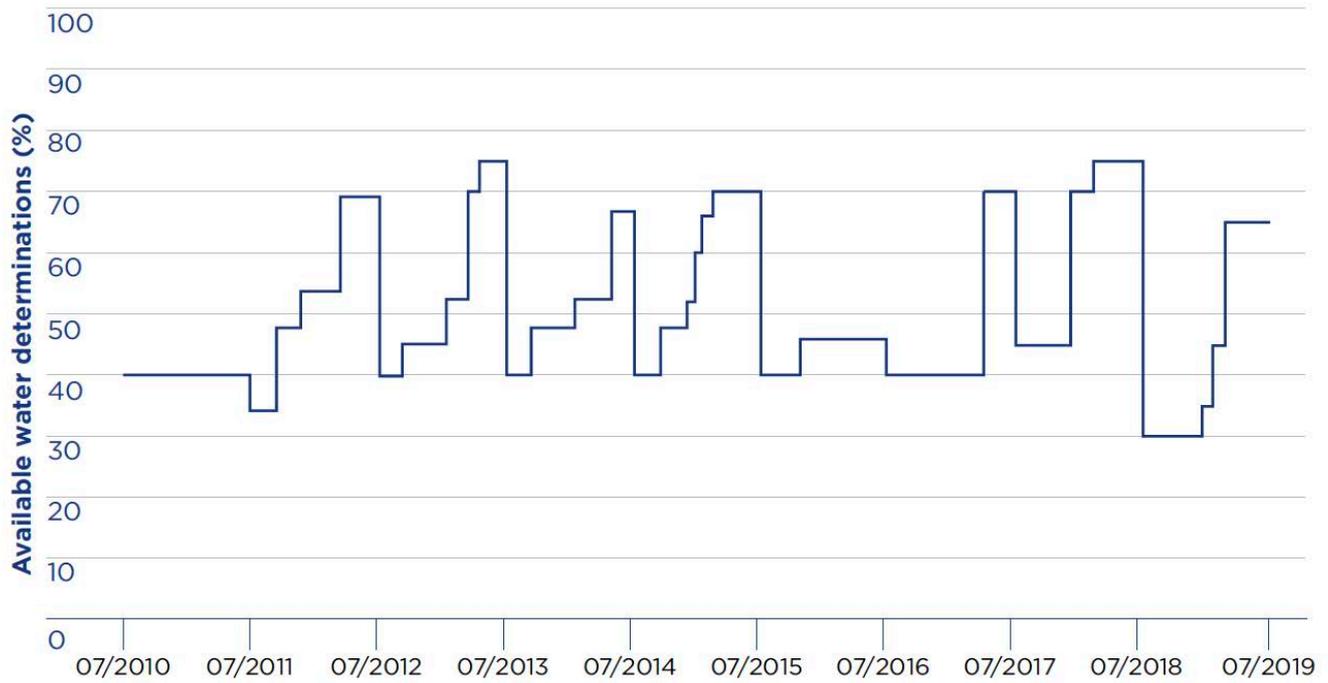
Water storage

Given the region's reliance on unregulated streams, options that increase the volume of water stored throughout the catchment may provide benefits in overcoming shortfalls in dry periods. Water storage has the potential to increase water security for extractive users whilst improving the duration of low stream flows.

Furthermore, as highlighted by the *Final Report of the NSW Bushfire Inquiry*,⁵⁹ increased water storage is critical for fighting bushfires, and is needed at a local level for sprinkler systems to protect homes and buildings; and at a community level to provide sufficient and effective filling points for firefighting tankers.

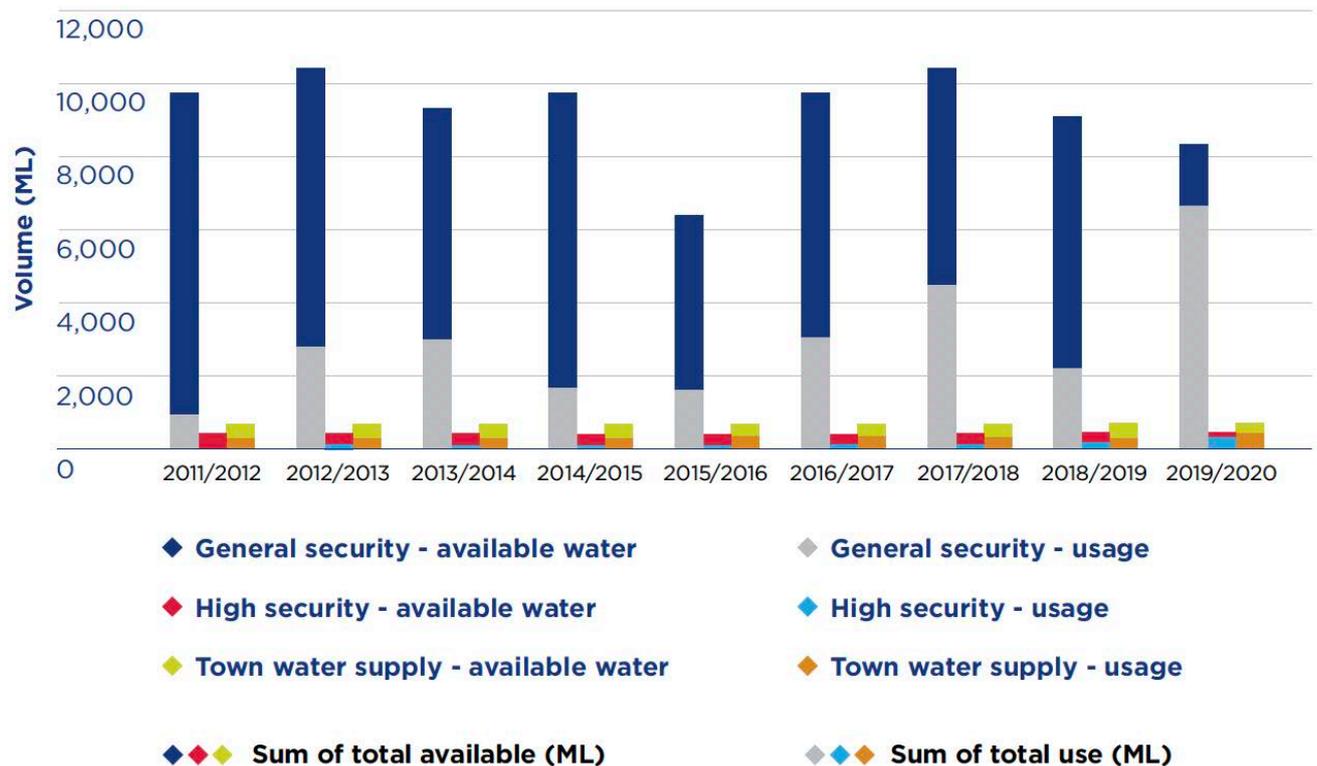
59. Department of Premier and Cabinet 2020, Final Report of the NSW Bushfire Inquiry, NSW Government, www.dpc.nsw.gov.au/publications/categories/nsw-bushfire-inquiry/

Figure 17. Available water determinations for general security water access licences in the Bega-Brogo regulated river system



Source: Department of Planning, Industry and Environment—Water Information Reporting & Extraction

Figure 18. Available water determinations compared with water usage in the Bega-Brogo regulated river system



Setting priorities for water sharing

The *Water Management Act 2000* sets out how we prioritise water sharing during normal operations, with the highest priority being for the environment, followed by basic landholder rights⁶⁰ (Table 4).

There is currently no instrument to modify these priorities in coastal catchments in response to extreme events to safeguard available water for critical needs. Preparation of the South Coast Regional Water Strategy provides an opportunity to consider if such an instrument is needed.

For example, in some other parts of the state, water sharing priorities change during extreme events such as prolonged droughts. Basic landholder rights and essential town water services (authorised by an access licence) become the highest priority, followed by the environment. This change in priorities is triggered when a water sharing plan (or part of a plan) is suspended. The aim is to operate within the plan rules for as long as possible, as they provide clarity for all users of these water sources.

Table 4. Priorities for water sharing under normal circumstances and an example of extreme events rules applied elsewhere in the state⁶¹

Priority	Extreme events	Normal circumstances
Highest	<ul style="list-style-type: none"> Critical human water needs 	<ul style="list-style-type: none"> Needs of the environment
	<ul style="list-style-type: none"> Needs of the environment 	<ul style="list-style-type: none"> Basic landholder rights
	<ul style="list-style-type: none"> Stock High security licences Commercial and industrial activities authorised by local water utility Water for electricity generation on a major utility licence Conveyance in supplying water for any priority 3 take 	<ul style="list-style-type: none"> Local water utility access licences Major utility access licences Stock and domestic access licences
	<ul style="list-style-type: none"> General security licences 	<ul style="list-style-type: none"> Regulated river (high security) access licences
	<ul style="list-style-type: none"> Supplementary licences 	<ul style="list-style-type: none"> All other forms of access licences Supplementary access licences

60. Landholders can take water under basic landholder rights without a water licence or approval in certain circumstances. There are three types of basic landholder rights in NSW under the *Water Management Act 2000*: domestic and stock rights, harvestable rights and native title rights. More information on basic landholder rights is provided at www.industry.nsw.gov.au/water/licensing-trade/landholder-rights

61. This table describes priorities for water sharing under normal circumstances across the state. It also describes extreme events rules applied elsewhere in the state. There are currently no extreme event rules in place in the South Coast.

Managing floods

The *NSW Flood Prone Land Policy*⁶² outlines the government partnership for flood risk management in NSW. It identifies that local councils are primarily responsible for managing flood risk in their communities. The *Floodplain Development Manual*⁶³ outlines the roles and responsibilities of local councils, which include:

- developing and implementing floodplain risk management plans to better understand and manage flood risk to the community
- providing information to, and improving the awareness of flooding in, the community
- operating and maintaining their floodplain risk management assets
- considering flooding in land use planning, development and infrastructure decisions
- supporting NSW State Emergency Service in emergency management and planning.

The NSW Government plays an important role in managing flood risk before, during and after floods. This is done primarily through the Environment, Energy and Science Division

of the Department of Planning, Industry and Environment, who leads the implementation of the *NSW Flood Prone Land Policy*, and provide support to local councils through the Floodplain Development Manual and associated floodplain risk management guidelines and tools. The Department of Planning, Industry and Environment is currently reviewing the manual and its associated guidance.

Councils also receive specialist technical support from the Department of Planning, Industry and Environment flood risk management experts and financial assistance through the NSW Floodplain Management Program. This program supports the development and implementation of floodplain risk management plans consistent with the manual. Funding provided through the program to local government authorities to manage flood risk is generally at a rate of \$2 for every \$1 provided by the council.⁶⁴

The NSW State Emergency Service (SES) leads flood emergency management planning and response. The Floodplain Management Program supports the NSW SES to fulfil its role as the state's flood combat agency.

NSW Government flood risk management investment in the South Coast

The NSW Government, sometimes in partnership with the Australian Government, has been active in supporting flood risk management by local councils since the 1950s. This led to the establishment of the NSW Floodplain Management Program, which along with the Floodplain Development Manual, supports the implementation of the *NSW Flood Prone Land Policy* (first issued in 1984).

The NSW Government has provided substantial ongoing investment to South Coast regional councils to manage flooding risk. From 2012/2013 to 2019/2020, the NSW Government awarded grants to the value of approximately \$3 million under the Floodplain Management Program to local councils in the region to help them better understand and manage the flood risk in their communities.⁶⁵

62. The *NSW Flood Prone Land Policy* is published in the Floodplain Development Manual.

63. Department of Infrastructure, Planning and Natural Resources 2005, *Floodplain Development Manual: the management of flood liable land*, NSW Government, www.environment.nsw.gov.au/research-and-publications/publications-search/floodplain-development-manual

64. Department of Planning, Industry and Environment 2018, *Floodplain Management Program*, accessed 26 August 2020, www.environment.nsw.gov.au/topics/water/floodplains/floodplain-management-program

65. Funding estimates include Bega Valley Shire Council, Eurobodalla Shire Council and Shoalhaven City Council (noting that not all of the Shoalhaven City local government area is included in the South Coast Regional Water Strategy).

Managing the coast and estuaries

The NSW Coastal Management Framework aims to promote thriving and resilient coastal communities living and working on a healthy coast. The framework provides technical, statutory and financial support to councils to prepare, review and implement coastal management programs to manage coastal hazards, water quality and estuary health including the impacts of climate change and includes:

- *Coastal Management Act, 2016*
- *State Environmental Planning Policy (Coastal Management) 2018*
- NSW Coastal Management Manual
- NSW Coastal Council
- Coastal and Estuary Grant Program.

The framework provides the means by which councils can manage coastal hazards including coastal erosion and shoreline recession, coastal watercourse entrance instability, coastal inundation, coastal cliff stability, tidal inundation and erosion caused by tidal waters.

Councils in the South Coast region have been working for many years on coastal planning and are at varying stages of completing their coastal management programs for the open coast and key estuaries in close consultation with local communities and relevant agencies. Information such as tidal inundation developed by councils through coastal and floodplain risk management planning processes can also be used to support decision making regarding the management of coastal waterways.

Managing water quality

Water quality is managed through several legislative and regulatory instruments and agencies, and through a number of non-regulatory initiatives.

The NSW Government has adopted the *National Water Quality Management Strategy*⁶⁶ as its policy to manage the quality of waterways in NSW and protect water resources. The strategy provides guidance for maintaining and improving water quality according to local community environmental values and uses.

In NSW, goals for meeting these values and uses are captured in the NSW Water Quality and River Flow Objectives.⁶⁷ Objectives have been developed for all major fresh and estuarine surface water catchments across the state, including the South Coast.

Water sharing plans are a key mechanism to meeting water quality goals. The plans use flow management measures (including extraction limits and cease-to-pump rules) to help ensure enough flow is available to meet water quality objectives and targets. For the Bega-Brogo regulated river system, an environmental contingency allowance is also available to help manage critical water quality events, such as algal blooms and blackwater events, and maintain aquatic ecosystem health. Additional mechanisms are available through the approvals and licensing framework. This includes ensuring bore extraction limits, setback distances and construction standards for new water supply works are enforced to limit groundwater drawdown and minimise the likelihood of increased salinity.

66. Australian Government 2018, *Charter: National Water Quality Management Strategy*, Department of Agriculture and Water Resources, www.waterquality.gov.au/

67. Department of Environment, Climate Change and Water 2006, *NSW Water Quality and River Flow Objectives*, Department of Environment, Climate Change and Water, accessed 24 August 2020, www.environment.nsw.gov.au/ieo/

Our new climate and environmental datasets and modelling will help inform our understanding of local water quality risks arising from changed flow regimes and water extraction patterns. Risk assessments are used to inform reviews of water sharing plans, which are scheduled to begin across the South Coast catchments from 2021. Improved water quality monitoring would further strengthen these assessments.

Water quality objectives review

The Department of Planning, Industry and Environment is reviewing the NSW Water Quality and River Flow Objectives for each catchment in coastal NSW to reflect contemporary values and expectations and, where appropriate, update these objectives in consultation with the community. The department is also reviewing the Diffuse Source Water Pollution Strategy to improve the way land managers deal with diffuse sources of water pollution, mainly stormwater pollution. These are key actions under Initiative 1 of the *NSW Marine Estate Management Strategy 2018–2028*.⁶⁸

As discussed in section 2.2.2, the quality of South Coast water sources is also affected by land use activities, many of which are outside the influence of the *Water Management Act 2000* and therefore cannot be addressed through water policy and planning alone. The process used to assess and manage the impacts of land use activities and water extraction on water quality is outlined in the *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions*.⁶⁹

This framework helps to support healthy waterways through regional and local planning instruments, environmental regulation, integrated water cycle management plans, coastal management programs or other catchment management plans for restoring and protecting the health of waterways.

Managing catchment water quality also helps local water utilities meet drinking water quality standards set out in the *Australian Drinking Water Guidelines*⁷⁰ (ADWG). The ADWG details a preventative management approach that manages and monitors water quality from the catchment to the consumer. The ADWG is used by NSW Health, the Department of Planning, Industry and Environment and local water utilities to assure safe, good quality drinking water for NSW communities.

Water supplies in regional NSW are monitored for microbiological and chemical quality through the NSW Health Drinking Water Monitoring Program. NSW Health also publicly reports water quality incidents. The Department of Planning, Industry and Environment's Water division monitors the performance of local water utilities in providing drinking water.

The risk of human exposure to potentially toxic blue-green algal blooms is managed through a coordinated regional approach with the Regional Algal Coordination Committees. State-wide and regional contingency plans and guidelines have been developed to manage algal blooms. The guidelines aim to minimise the impact of algal blooms by providing adequate warning to the public ensuring their health and safety in recreational situations and for stock and domestic use.

The South Coast Regional Water Strategy is an opportunity to consider if additional actions are needed to better manage water quality in the region.

68. NSW Marine Estate Management Authority 2018, *NSW Marine Estate Management Strategy 2018-2028*, NSW Government

69. Dela-Cruz, J., et al. 2017, *Risk-based framework for considering waterway health outcomes in strategic land-use planning decisions*, Office of Environment and Heritage and Environment Protection Authority

70. National Health and Medical Research Council and Natural Resource Management Ministerial Council 2011, *Australian Drinking Water Guidelines*, www.nhmrc.gov.au

Gathering more and better information

Improving the information we have about water use and water needs will help us to manage the South Coast region's water more efficiently and ensure we can plan to have enough water available at the right time. Improving the collection of data will give us a better understanding of the water risks in the region for the environment and all water users. More data and knowledge will support future decisions about water sharing and investments in secure water supplies and water quality management. It will also help water users and regulators manage compliance with water access and sharing rules.

Improved information can also help water users, future investors and regions make more informed decisions about the industries that are most suited to each region.

The South Coast region largely consists of unregulated water courses where streamflow gauges are not installed, and water extraction is not measured. This means there is limited data on water extraction and flow patterns from these rivers and streams, making it difficult to manage equitable sharing during dry conditions.

This lack of data is being addressed through the implementation of the new non-urban metering framework announced by the NSW Government as part of its 2017 *Water Reform Action Plan*.⁷¹ Under the framework, all surface and groundwater works covered by the rules will need to be fitted with compliant metering equipment by 1 December 2023. An estimated 893 water supply works in the South Coast region will be subject to the metering rules: 138 in the unregulated rivers, 379 in the Bega-Brogo regulated river system and 376 in the groundwater bores.

Technology can help

The NSW Government and WaterNSW are developing a new data platform⁷² to increase the availability and accessibility of critical non-urban water information. The platform will provide information on:

- water sharing plan rules
- entitlements and works approvals
- transactions (such as water trades)
- water take from water sources
- flows in rivers and streams.

The initiative is being developed progressively and will be fully operational

by 2025. Information on NSW's regulated water systems, including the Bega-Brogo regulated river system, is already available.

In addition, under the new metering laws, large surface water users will need to install telemetry and remotely transmit water information to government. This will enable better decisions on the active management of water instream and for townships and will give the Natural Resources Access Regulator a reliable source of data about water take to inform its compliance and enforcement functions. It will also support WaterNSW in their billing activities.

Water users will also be able to access their information via a private online dashboard.

71. Department of Planning, Industry and Environment 2017, *NSW Government water reform action plan*, NSW Government, www.industry.nsw.gov.au/water/what-we-do/water-reform-action-plan

72. WaterNSW, *WaterInsights portal*, accessed 10 September 2020, www.waternsw.com.au/waterinsights/water-insights



Image courtesy of Destination NSW.

The 2019 drought has pointed to the important role groundwater sources can play in providing supplementary and backup supplies for towns, domestic and stock and other commercial uses. Given the expected continuing demands on groundwater, we need to improve our understanding of the interaction between surface water and groundwater resources in the South Coast to enable us to make decisions to improve the resilience of our water sources. We need to understand where a change in groundwater use can influence flows to rivers and vice versa. We also need to understand how a changing climate is impacting the replenishment of groundwater resources. More broadly, we need to ensure ongoing investment in the groundwater monitoring network so we have the water quantity and quality information we need to manage the resource into the future.

Our current understanding of groundwater resources has data gaps that are limiting the way we manage them. These gaps include information about the resources themselves and how they are being accessed by water users. A more comprehensive groundwater monitoring network in the region that includes both level and water quality information is needed to improve our understanding of existing groundwater processes and to make projections of longer-term effects linked to climate change. It will also help us to understand the spatial variability of saltwater intrusion in coastal aquifers.

There are also opportunities to improve our groundwater modelling in areas of high groundwater use on the coast. For example, new numerical models in areas of high use or risk are needed to address town water supply needs and to assess the impacts of sea level rise and saltwater intrusion, new bore license submissions and groundwater dealings. There are also opportunities to incorporate climate change projections into our long-term planning and development of groundwater resources.

The coastal regions of NSW also suffer from a lack of water quality data. The current NSW surface water quality monitoring program was established and designed in 2007 to meet the objectives and data requirements at that time. However, there are data gaps we need to fill to help us make decisions and monitor our progress into the future.

The Department of Primary Industries is undertaking a three-year program to identify and map important agricultural lands.⁷³ Knowing where this land is situated and understanding its location, value and contribution will assist in making decisions to align current and future agricultural land uses and their water needs. A comprehensive and consistent approach to collecting water statistics and information will greatly help this process.

73. Department of Primary Industries 2020, *Important Agricultural Land Mapping in NSW*, accessed June 2020, www.dpi.nsw.gov.au/agriculture/lup/agriculture-industry-mapping/important

Collecting better data

Across the South Coast region, there are opportunities to gather more information about:

- the water requirements (when and how much) of communities, the environment, urban-based commercial businesses and industries and what a reduction in water availability will mean for these users
- what the water is being used for, including crop types and yield values
- the interaction between groundwater and surface water in the South Coast region
- quantity of water use and patterns of water use in the unregulated system and some groundwater systems
- water quality.

Gathering and analysing this data will improve our understanding of the water risks in the region for the environment and all water users and support future decisions about water sharing.







Image courtesy of John Spencer, Department of Planning, Industry and Environment.

2.3 People, industries and water use

2.3.1 Aboriginal people

The South Coast region lies within the lands of the Yuin Nation, which extends along the coastal plains from the Shoalhaven River in the north to the Victorian border in the south.

Water is the lifeblood of Aboriginal people. It allows kinship, connection, stories, songlines and healing through medicine and food. Healthy waterways and groundwater systems are critical to Aboriginal people for health, wellbeing and culture.

Aboriginal people have managed the land and water of the region for over 22,000 years.⁷⁴ European settlement interrupted Aboriginal peoples' connection with Country along with the accompanying responsibilities for land and water management.

Several significant water-dependent Aboriginal cultural sites are recognised throughout the South Coast region. In 1975, Merriman Island in the middle of Wallaga Lake was the first Aboriginal Place to be gazetted in NSW. Merriman Island is shaped like *Umbarra* the black duck and is highly valued for its link to the origin of the Black Duck Totem of the Yuin people. It is also associated with a story about King Merriman, a Yuin Elder who died in 1904.⁷⁵

74. Donaldson, M. et al. 2015, *A history of Aboriginal Illawarra Volume 1: Before colonisation*, University of Wollongong

75. Susan Dale Donaldson Environmental and Cultural Services 2012, *Exploring ways of knowing, protecting and acknowledging Aboriginal totems across the Eurobodalla shire, Far South Coast, NSW*, Eurobodalla Shire Council, 2012

Water used by Aboriginal people

Face-to-face engagement with Aboriginal communities on the South Coast has been put on hold due to the bushfires in the region in January and February 2020 and the COVID-19 pandemic (see section 1.3.3 and Attachment 1). The department is committed to engaging with the Aboriginal communities on the South Coast as soon as possible to ensure that Aboriginal rights, interests and concerns related to water are heard and included in the final strategy.

In our state-wide community consultations, we heard that Aboriginal communities do not have adequate access to water or access to Country to fulfil their cultural rights and to protect cultural sites. While there are some ways of accessing water for cultural purposes, we heard from Aboriginal people that current provisions in the *Water Management Act 2000* do not meet their spiritual, cultural, social and economic needs. We also heard that healthy waterways are critical to Aboriginal communities for culture and health and wellbeing.

Aboriginal people's legal rights as they apply to water management have been recognised in international human rights treaties and conventions, in Australian and NSW Native Title and land rights laws, and in national and state-based water plans. These instruments recognise the right to self-determination and the right to access traditionally owned lands and water. They also recognise the importance of maintaining the environmental knowledge and practices of Aboriginal people, promoting their full participation in decisions about water resources and acknowledging Aboriginal cultural values and uses in water planning.

In addition, the 2007 Echuca Declaration defines cultural flows as 'water entitlements that are legally and beneficially owned by the Nations of a sufficient and adequate quantity and quality to improve the spiritual, cultural,

natural, environmental, social and economic conditions of those Nations'.⁷⁶

Australia's Native Title laws recognise the traditional rights and interests to land and water of Aboriginal people. Anyone who holds Native Title with respect to water can take and use water for personal, domestic and non-commercial communal purposes. Native Title holders often have water related aspirations, such as the protection of water, water allocations and advising on water management practices in a determinations area. South Coast Aboriginal communities are currently in the process of applying for a Native Title determination, which covers most of the South Coast region.⁷⁷

Aboriginal people can apply for Aboriginal cultural water access licences. If granted, this licence can provide up to 10 ML/year for drinking, food preparation, washing and watering domestic gardens, as well as for Aboriginal cultural uses.⁷⁸

The final South Coast Regional Water Strategy will reflect the results of our ongoing consultation with Aboriginal people in the region and consider options on how to recognise and deliver their water rights.⁷⁹

It will also consider how options will help deliver on commitments under the *National Agreement on Closing the Gap*⁸⁰, including the four reform areas of:

- formal partnerships and shared decision making
- building the community controlled sector
- transforming government organisations
- shared access to data and information at a regional level.

76. Murray Lower Darling Rivers Indigenous Nations 2007, *Echuca Declaration*

77. Commonwealth of Australia 2017, *Search Register of Native Title Claims*, Commonwealth of Australia, accessed 19 December 2019, www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/Search-Register-of-Native-Title-Claims.aspx

78. NSW Government 2011, *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources*, Office of Water, legislation.nsw.gov.au/#/view/regulation/2011/110/whole

79. More information about our Aboriginal engagement approach is in the *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about

80. *National Agreement on Closing the Gap 2020*, www.closingthegap.gov.au

2.3.2 People and towns

The South Coast region is home to about 120,000 people of whom 33,250 reside in the Bega Valley Shire, 37,230 reside in Eurobodalla Shire and about 50,000 live in the Shoalhaven City local government area. The population is concentrated in towns and villages along the coast.

The region's major regional centres are Bega, Batemans Bay, Milton-Ulladulla and Vincentia. Other local centres include Eden, Merimbula, Narooma and Moruya. These centres are important employment, services and cultural hubs for the broader region. The region is connected economically to the more densely populated hubs of Canberra, the Illawarra region and Western Sydney.

Economic growth in the region will be driven by health care and social assistance, tourism, agriculture, aquaculture and food product manufacturing. The South Coast attracts significant numbers of tourists from Canberra, Sydney and Melbourne, especially during the Christmas and Easter holiday periods. For example, in 2017/2018, Eurobodalla Shire had 1.4 million visitors to the area. Recent population growth in the region has been moderate: the populations of both Eurobodalla Shire and Bega Valley Shire grew around 0.5% per annum between 2006 and 2016. This trend is expected to continue over the next 20 years⁸¹. However, population growth in the region is not uniform—most growth is

expected to be along the northern coastal fringe in the Shoalhaven City and Eurobodalla Shire local government areas.

The NSW Government's strategic planning framework for regional NSW—including *A 20-Year Economic Vision for Regional NSW*⁸² and regional economic development strategies—capitalises on the South Coast as a region of employment and services. In addition, the *South East and Tablelands Regional Plan 2036*⁸³ and *Illawarra-Shoalhaven Regional Plan*⁸⁴ set out planning directions for state government, councils and other organisations to realise the potential for growth in the region.

Economic development in the region is guided by the strategic planning framework. The *Far South Coast Regional Economic Development Strategy*⁸⁵ has been designed to leverage the key specialisations of the region, which include:

- aquaculture, forestry and logging
- timber and hardware goods
- dairy and baked goods manufacturing.

The NSW Government is also committed to improving employment opportunities for Aboriginal people in the South Coast region. The *Aboriginal Participation in Construction Policy*⁸⁶ supports a minimum of 1.5% Aboriginal participation in construction projects undertaken by government agencies.

81. Public Works Advisory, Department of Regional NSW 2020, *Population and Water Cycle Projections*, Report Number: ISR20076 (July 2020)

82. NSW Government 2020, *A 20-Year Economic Vision for Regional NSW*, NSW Government, www.nsw.gov.au/a-20-year-economic-vision-for-regional-nsw

83. Department of Planning, Industry and Environment 2017, *South East and Tablelands Regional Plan 2036*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/South-East-and-Tablelands

84. Department of Planning, Industry and Environment 2015, *Illawarra-Shoalhaven Regional Plan*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Illawarra-Shoalhaven/Illawarra-Shoalhaven-Regional-Plan

85. NSW Government 2018, *Far South Coast Regional Economic Development Strategy 2018-2022*, www.dpc.nsw.gov.au/programs-and-services/centre-for-economic-and-regional-development/projects/regional-economic-development-strategies/

86. NSW Government 2018, *Aboriginal Participation in Construction Policy*, buy.nsw.gov.au/policy-library/policies/aboriginal-participation-construction

As the region grows, so will the need for services such as healthcare, education, construction and retail. The NSW Government is investing heavily in transport and community infrastructure to cater for the future population and increased tourism. This includes investment in:

- South Coast marine tourism, including \$44 million to extend the Port of Eden wharf
- upgrades to the Princes, Snowy Mountain and Kings Highways, which are major freight and passenger corridors that connect the region to Melbourne, Sydney and Canberra
- improvements to Bay Link Road, a major arterial road for Batemans Bay
- an expansion of services and facilities at Merimbula and Moruya Airports to improve the region's connections to major cities and to facilitate growth in population and tourism.

The NSW Government is also investing in job stimulus and economic growth in the region including:

- the Bushfire Industry Recovery Package, which provides grants between \$50,000 and \$10 million to support agricultural and aquaculture businesses to recover from the 2019/2020 bushfires
- \$274 million for the Batemans Bay Bridge replacement project, which will employ more than 150 people
- over \$23.5 million in road upgrades and improvements
- several education centres and TAFEs at Bega, Batemans Bay and Moruya that provide training and upskilling to the local workforce.



Water for people and towns

Providing secure and resilient water services to regional centres, towns and outlying areas is vital for the long-term sustainability of the region, particularly in the context of a changing climate. It is also vital for supporting regional land use planning goals of a connected and prosperous region, healthy and connected communities and environmentally sustainable housing and lifestyle choices.

Safe, secure and sustainable water supply and sewerage services are necessary to support a growing economy and contribute to the amenity, liveability and wellbeing of residents and visitors. Water in regional towns and communities also provides broader social benefits. Rivers, coastal lakes and wetlands, town swimming pools and infrastructure such as Brogo Dam and Deep Creek Dam offer social and recreational opportunities. Open spaces and parks connected to water are also important community and recreational assets.

Local water utilities provide water and sewerage services to about 80% of people in the South Coast region. Shoalhaven Water provides water and wastewater services to towns in the region's north—Milton-Ulladulla, Mollymook and the towns and villages around Jervis Bay and St Georges Basin. The primary water source for these towns is Porters Creek Dam (1,900 ML) in the upper reaches of the Clyde River catchment. During peak holiday demand periods, water can be supplied by Shoalhaven Water's Northern System, which accesses water from Bamarang Dam (3,800 ML), an off-stream storage filled by diversions from the Shoalhaven River. Flows

in the Shoalhaven River are regulated through Tallowa Dam. Danjera Dam, another off-stream storage (7,660 ML), provides a back-up water supply when there is a water shortage.

Eurobodalla Shire Council sources raw water from the Buckenbowra (Clyde catchment), Deua and Tuross rivers and distributes it throughout the local government area via an extensive regional network of pipelines. Deep Creek Dam (4,500 ML), located 5 km south of Batemans Bay, is the major storage for the town water supply system.

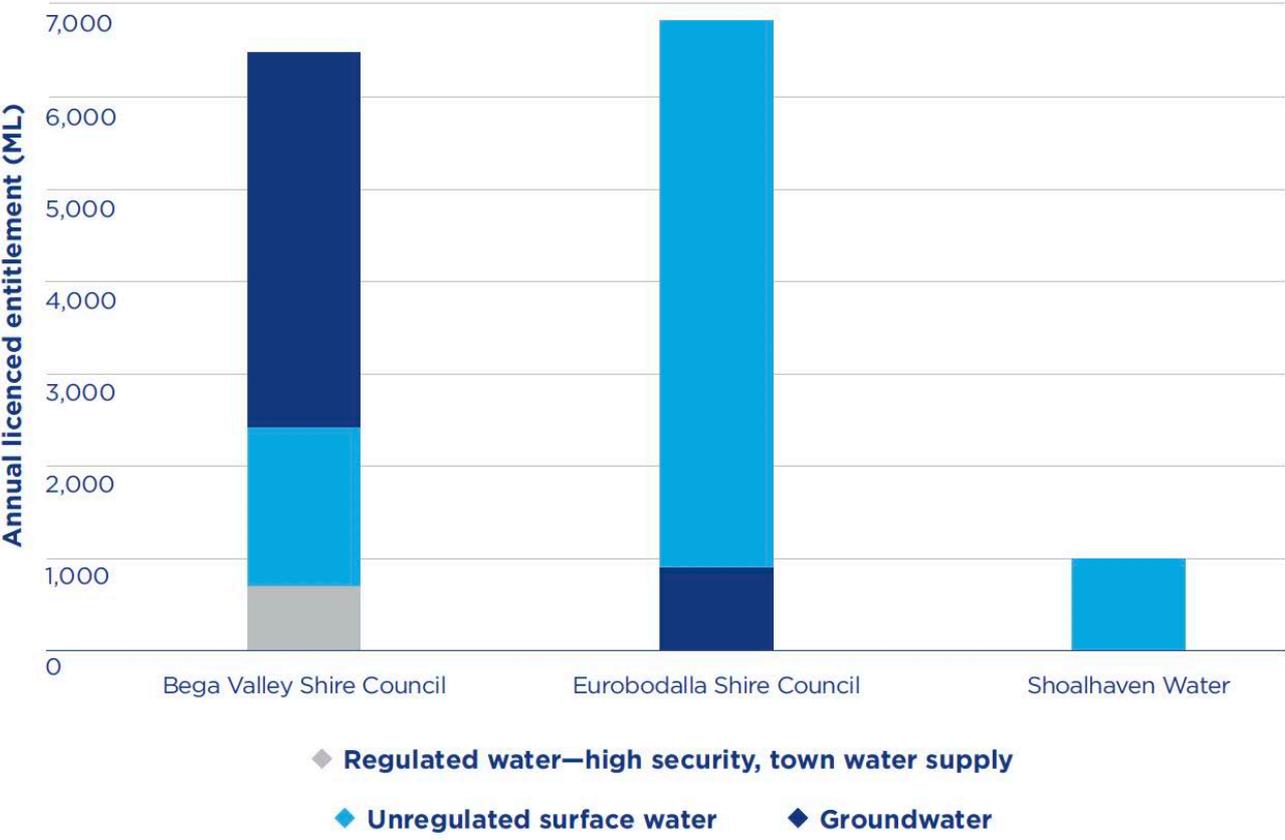
Bega Valley Shire Council's town water supply includes four largely independent water supply systems—Tantawanglo-Kiah, Bega-Tathra, Brogo-Bermagui and Bemboka. The Tantawanglo-Kiah system is the largest system in the Bega Valley, servicing towns such as Merimbula, Tura Beach, Pambula and Eden. The system sources water from Tantawanglo Creek and Towamba River and Bega River alluvial aquifers. Yellow Pinch Dam (3,000 ML) and Ben Boyd Dam (800 ML) are the major water storages for the town water supply system. The Bega-Tathra system also sources water from the Bega River alluvial aquifer, while Brogo Dam is the main source of water for the Brogo-Bermagui system.

The region's local water utilities hold water access licences to extract up to a total of 14,306 ML each year from South Coast water sources to supply their connected towns and villages (Figure 19). This equates to around 17% of all licensed water entitlement in the region.



Image courtesy of Destination NSW.

Figure 19. Annual town water entitlement volumes and supply sources in the South Coast region



Source: Department of Planning, Industry and Environment—Water 2019, water licensing. Note that these figures do not include Shoalhaven Water’s Northern Scheme.

In regional NSW, town water supply systems are planned and sized in consultation with the community, considering historical and future consumptive needs and climate projections. Local water utilities are responsible for providing water and sewerage services to their respective communities in a way that balances costs and community expectations about levels of service. This responsibility extends to planning for, and delivering, secure water supplies.

All town water supplies have some level of inherent water security risk and are designed to accommodate moderate levels of restricted service. With the support of the Department of Planning, Industry and Environment—Water,

local water utilities undertake water security access risk analyses as part of their integrated water cycle management planning. These analyses take into account:

- headworks (water storage and treatment) arrangement and capacities
- physical water delivery system and operational rules under water sharing plans
- operating protocols and past experiences in delivering water in drought conditions.

The water security access risk for the major town water supply systems across the regions are presented in Table 5.

Table 5. Water security risk for centres and towns in the South Coast region

Water utility	Drinking water supply system	Population served in 2014 (approx)	Water security risk
Shoalhaven City Council	Shoalhaven District	111,998	Very low
Eurobodalla Shire Council	Batemans Bay to Central Tilba	35,741	Medium
Bega Valley Shire Council	Brogo-Bermagui	3,166	Medium
	Tantawanglo-Kiah	12,652	Very low
	Bega-Tathra	6,629	Very low

Note: The table only covers drinking water supply systems for a population greater than 500 people. These risks represent the preliminary water security risks as assessed by the Safe and Secure Water Program as of April 2020 and are subject to change over time based on further investigation, new information from councils and/or delivery of projects/solutions addressing these risks. The population serviced by Shoalhaven Water spans the South Coast region and extends into the Greater Sydney region.

Source: NSW Government's Safe and Secure Water Program

Water security risk for the Shoalhaven District water supply system is considered very low due to the reliability of surface water sources in the Clyde and Shoalhaven river catchments. However, Shoalhaven Water has identified a need to increase the capacity of its water supply network to be able to meet peak holiday demands in the future, which are forecast to increase.

In contrast, forecast reductions in surface water yields and population growth are contributing to medium water security risk for the Eurobodalla system. In 2016, Eurobodalla Shire Council's *Integrated Water Cycle Management Strategy* identified a potential supply shortfall of around 1,850 ML/year by 2046.⁸⁷ The introduction of the Tuross River and Deua River water sharing plans in 2016 placed new

87. Hydrosphere Consulting 2016, *Integrated Water Cycle Management Strategy and Strategic Business Plan*, Eurobodalla Shire Council, www.esc.nsw.gov.au/inside-council/community-and-future-planning/strategies/integrated-water-cycle-management

restrictions on council's ability to extract water, increasing the risk of shortfalls. To manage these challenges, Eurobodalla Shire Council is constructing a 3,000 ML off-stream storage in the Tuross River basin to secure the region's town water supply needs. The Southern Water Supply Storage will be located about 30 km south of Moruya on an unnamed tributary of the lower Tuross River and give the council greater operational flexibility and the additional water needed to supply an increasing population.

The water security risks for Bega Valley Shire's water supply systems are also considered medium to very low due to the reliability of its surface water and groundwater sources. Our modelling of the Bega River catchment gives insights into future water availability at some of Bega Valley Shire's key extraction locations:

- As an indicator, the likelihood of 20 consecutive days of supply shortfall at the Tantawanglo extraction point will increase from about 9% to 15% of all years (Figure 20).
- As an indicator, the likelihood of 20 consecutive days of supply shortfall at the Bega Sands extraction point will increase from about 7.5% to 11% of all years (Figure 21).
- Climate variability and climate change may have a similar impact on water access reliability for the Brogo-Bermagui town water supply system.

Figure 20. Number of consecutive supply shortfall days per water year at Tantawanglo town water supply extraction point

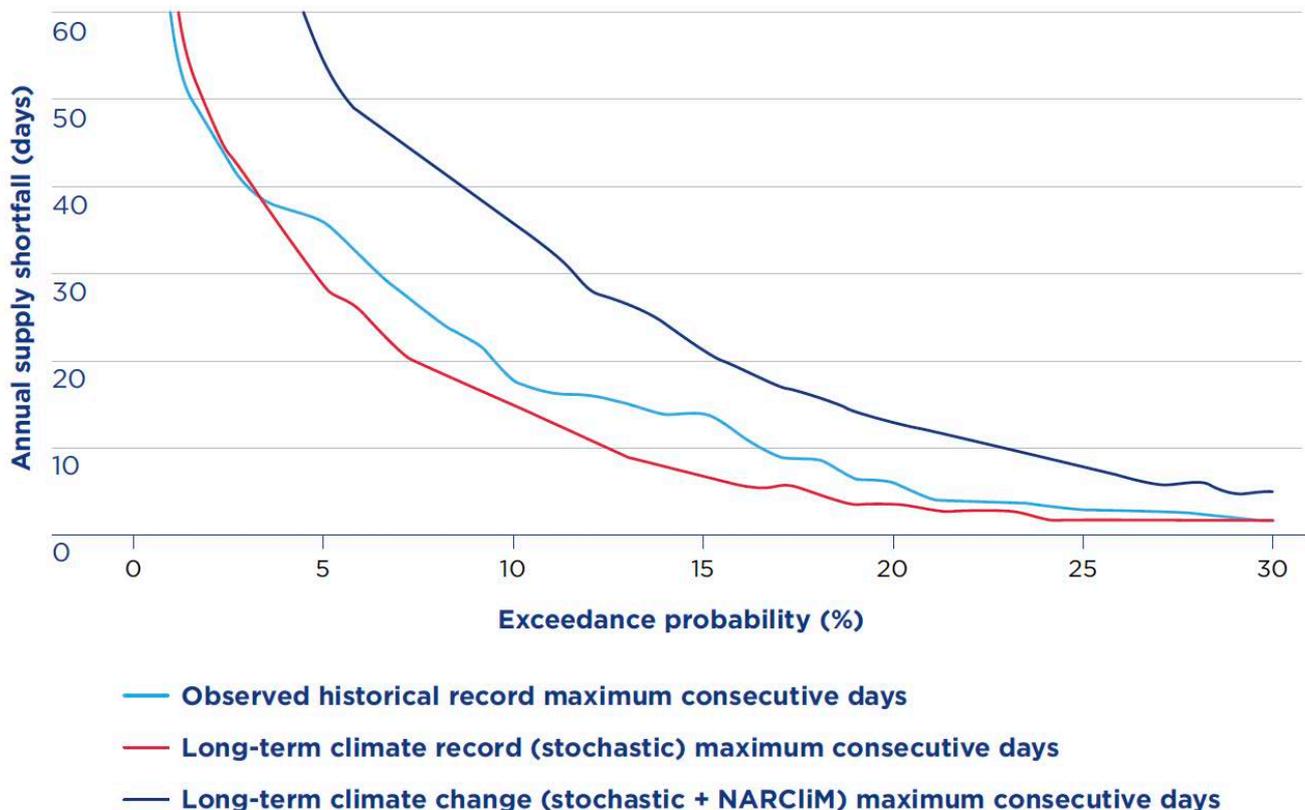
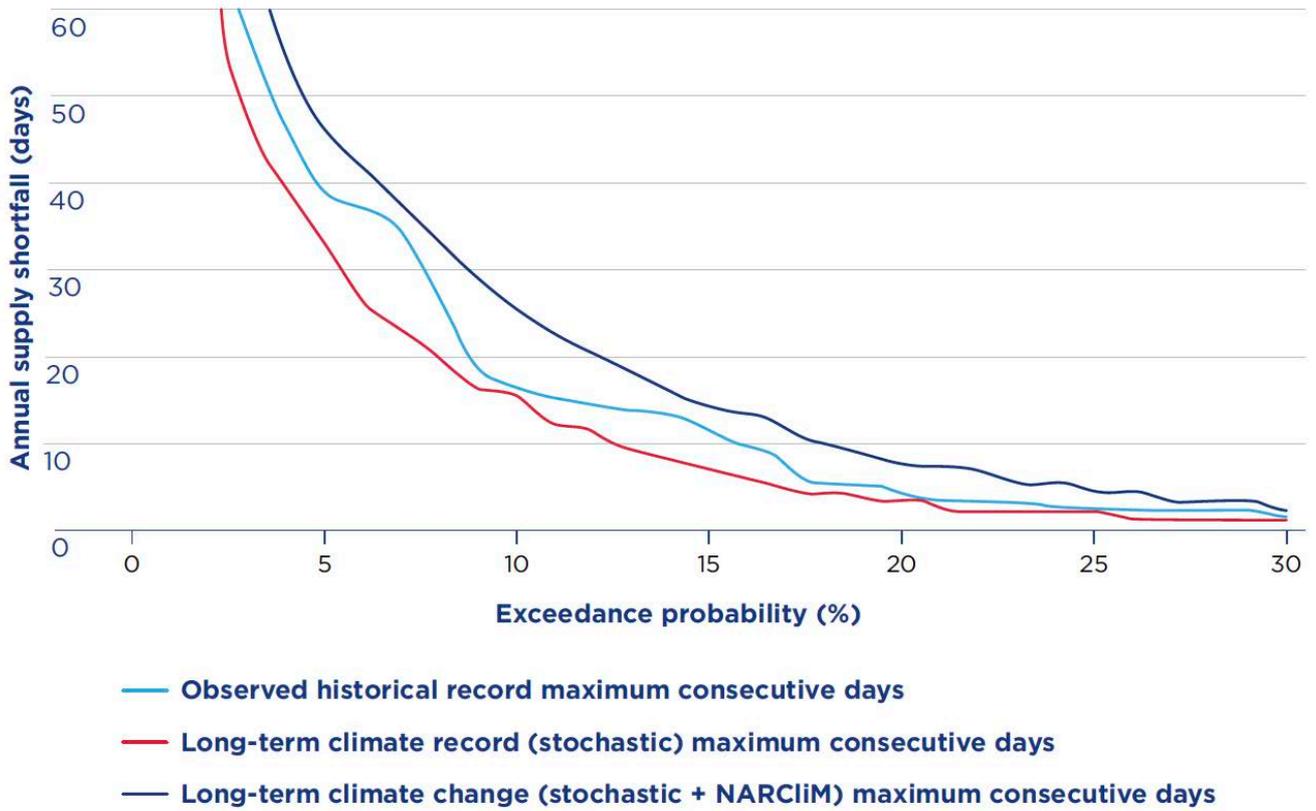


Figure 21. Number of consecutive supply shortfall days per water year at Bega Sands town water supply extraction point



The Bega Sands alluvial groundwater source, which is the primary source of water for the Bega-Tathra town water supply system, may become less secure due to several challenges:

- decreased flows from climate variability and change
- sea level rise
- increased extractive pressures due to more frequent and longer dry periods
- possible changes to the operation of Brogo Dam.

These threats could contribute towards saltwater ingress into the Bega Sands, significantly impacting its resource potential for Bega Valley Shire and other groundwater users in the local area, such as Bega Cheese. The regional water strategy provides an opportunity to better assess and quantify the risk of saltwater intrusion on this water source and other vulnerable freshwater sources across the region.

We also know that the water systems in the South Coast region mostly rely on surface water and groundwater sources that are fed by regular and predictable rainfall. Consequently, they are vulnerable to the types of extreme dry periods we now know may have occurred in the past and that our modelling suggests can occur in the future. Recent experience has also shown that—during extended dry periods—town water supply systems face increases in demands from private water tankers delivering water to rural users.

About 20% of people in the region source their drinking and domestic use water from roof water harvesting in rainwater tanks, harvesting runoff from their properties into farm dams or accessing unregulated rivers and groundwater aquifers. These individual private systems have higher inherent water security risks that are exacerbated during extended dry periods. Better coordination between local

water utilities and government agencies during droughts would provide greater support to rural landholders and help local water utilities manage the impact of increased demands on their water supply systems.

These challenges highlight the importance of acting now to ensure adequate water security in the future. This draft strategy considers a wide-ranging suite of options to maintain and diversify town water supply systems, including augmentations of state-owned infrastructure and system interconnections, recycle and reuse initiatives and alternative sources such as desalination. NSW Government investment in better understanding the resource potential of the region's hard rock aquifers and the risks of sea level rise would also support future investigations into the most suitable options for local town water supply augmentation and drought contingency management.

A continuing focus on using water more wisely will help to mitigate the impacts of lower water availability and increasing demand. It will also contribute to meeting water security objectives and may delay the need for system augmentations. The regional water strategies provide an opportunity to review and improve existing demand management initiatives. These initiatives can contribute to further reducing residential water consumption, which is already generally low across the South Coast region—between 120 to 146 kL per year compared to the NSW regional median of 159.6 kL per year. There is also an opportunity to complement these demand management initiatives with investment in water supply system efficiencies. System efficiency projects would aim to reduce the proportion of non-revenue water (water that has been produced but is 'lost' before it reaches the customer), which is higher across the South Coast than the NSW median, particularly in the more remote and sparsely populated Eurobodalla Shire and Bega Valley Shire local government areas.

The poor quality of some of the region's water sources is also impacting the ability of local water utilities to provide safe drinking water in accordance with the *Australian Drinking Water Guidelines*.⁸⁸ More intense storms and increased likelihood of bushfires will heighten water quality risks in the future. In response to water quality threats, Shoalhaven Water and Eurobodalla Shire Council have progressively upgraded their water treatment facilities to provide additional treatment capacity—often at great cost. Bega Valley Shire is following suit, having been most impacted by poor raw water quality in recent years due to the minimal level of treatment in place. This is reflected by the relatively high number of water quality complaints reported across the municipality compared to the NSW regional median. 'Boil water' notices have been issued on several occasions over the last decade—the latest following the significant rainfall events in March 2017 and August 2020. Bega Valley Shire is responding to these water quality risks by investing in upgrades to its Brogo-Bermagui, Bega-Tathra and Yellow Pinch Dam water treatment plants. The NSW Government has provided more than \$10 million funding support for these projects.⁸⁹ Additional region-scale support could be provided by coordinating catchment management improvement activities and region-wide water quality monitoring. Further support could come from ensuring that existing government water quality improvement programs—such as those committed to in the *Marine Estate Management Strategy* (refer to section 2.2.2)—consider town water supply management objectives when prioritising delivery.

Increasing the use of recycled water and improving stormwater management could help to reduce the environmental impact of discharges from the region's wastewater and stormwater systems. There are also opportunities to reduce the frequency of sewer overflows in several of the region's sewerage systems, which are high in the northern part of the region compared to the NSW median. For example, between 2013 and 2019, Shoalhaven Water and Eurobodalla Shire reported an average of between 20 and 30 sewer overflow events per year.⁹⁰ This compares to the NSW regional median of four events per year over this same period. Shoalhaven Water and Eurobodalla Shire Council have identified a program of sewerage system upgrades to manage these risks. Extending local water utility sewerage systems to unsewered villages would also reduce the environmental and health impacts of on-site sewage systems in high risk areas (areas where poor water quality threatens public health or surface water or groundwater sources with high ecological values).

Sea level rise, coastal inundation and flooding also threaten the performance of local water utility assets. Many of the region's water supplies, sewage treatment plants and stormwater drainage networks are located in estuaries and low-lying floodplains. Improving our understanding of the risks of sea level rise across the region will help local water utilities adapt to these challenges.

88. National Health and Medical Research Council and Natural Resource Management Ministerial Council 2011, *Australian Drinking Water Guidelines*, www.nhmrc.gov.au

89. Department of Planning, Industry and Environment 2020, *Approved projects*, NSW Government, www.industry.nsw.gov.au/water/plans-programs/infrastructure-programs/safe-and-secure-water-program

90. Department of Planning, Industry and Environment 2020, local water utility performance monitoring data and reports, NSW Government, www.industry.nsw.gov.au/water/water-utilities/lwu-performance-monitoring-data



Image courtesy of Destination NSW.

Ageing water and sewerage infrastructure requires additional and ongoing capital investment to maintain service levels. This presents a challenge to local councils in the region as the costs of refurbishing or replacing aging assets add to the costs of augmenting and operating the water and sewerage systems. Local water utility operating costs and typical residential bills across the Eurobodalla Shire and Bega Valley Shire local government areas exceed the NSW regional median, reflecting the high costs of providing water and sewer services in large remote areas with low populations.

Smaller councils and local water utilities can also often find it difficult to attract and retain skilled staff and keep pace with the advances

in regulation and technology that could save money and improve services. Collaboration between South Coast councils, the joint organisations for the Canberra and Illawarra-Shoalhaven regions, WaterNSW and the NSW Government will be important to meeting these challenges. This could be through finding economies of scale, unlocking efficiencies through knowledge sharing and driving continued performance improvements across the region. Shoalhaven Water's proximity to Sydney also provides an opportunity for it to improve relationships with metro water authorities, including Sydney Water. Improving the overall performance of the region's local water utilities would have positive health and economic impacts for the broader region.

2.3.3 Jobs and industries

The South Coast region is the tenth largest in the state in terms of economic output, population and employment.⁹¹ Economic output for the region was \$4.10 billion in 2018/2019 which comprised of \$2.07 billion and \$2.03 billion from the Bega Valley Shire and Eurobodalla Shire local government areas respectively. In 2016 there were 12,571 jobs in the Bega Valley Shire local government area and 12,661 jobs in the Eurobodalla Shire local government area.⁹²

The primary employer in the South Coast region is the health care and social assistance sector (Figure 22), which has grown significantly over the past 15 years. While not as prominent as in the past, dairying, milk production and cheese production still play critical roles in the regional economy. Tourism is a major employing sector with approximately 2,700 workers employed in 2016 across the accommodation and food services and retail

trade sectors.⁹³ Oyster-farming is a developing industry on the South Coast, as is forestry, reflected in an annual average growth rate for the agriculture, forestry and fishing sector of almost 9% between 2011 and 2018.⁹⁴

The total regional export estimate for the Bega Valley Shire Council was \$1.32 billion in 2016, of which food product manufacturing (including dairy products) accounted for approximately 52%. Agriculture, forestry and fishing, as well as construction, were the two largest regional export contributors in the Eurobodalla Shire local government area, accounting for approximately \$115 million each.

The region's water resources are a critical input for many of these industries—either indirectly by providing the town water and sewerage services necessary for service industries and communities to operate or by the direct provision of water to industries such as agriculture and aquaculture.

91. REMPLAN Economy: Custom data 2019, www.remplan.com.au/economy/

92. Economic figures presented for the South Coast region do not include the Shoalhaven City local government area. The regional centre of Nowra is located within the Shoalhaven City local government area but is not located within the extent of the South Coast Regional Water Strategy area boundary.

93. REMPLAN Economy: Custom data 2019, www.remplan.com.au/economy/

94. REMPLAN Economy: Custom data 2019, www.remplan.com.au/economy/

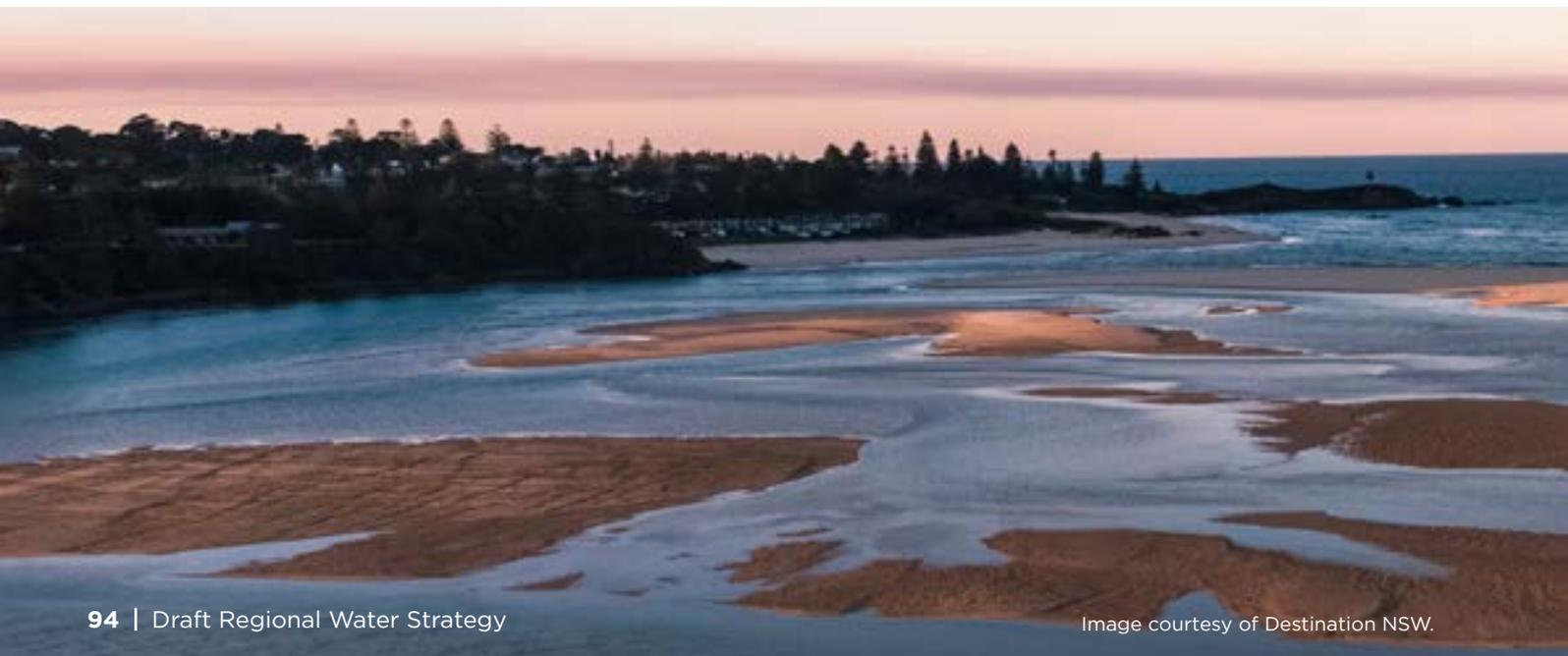
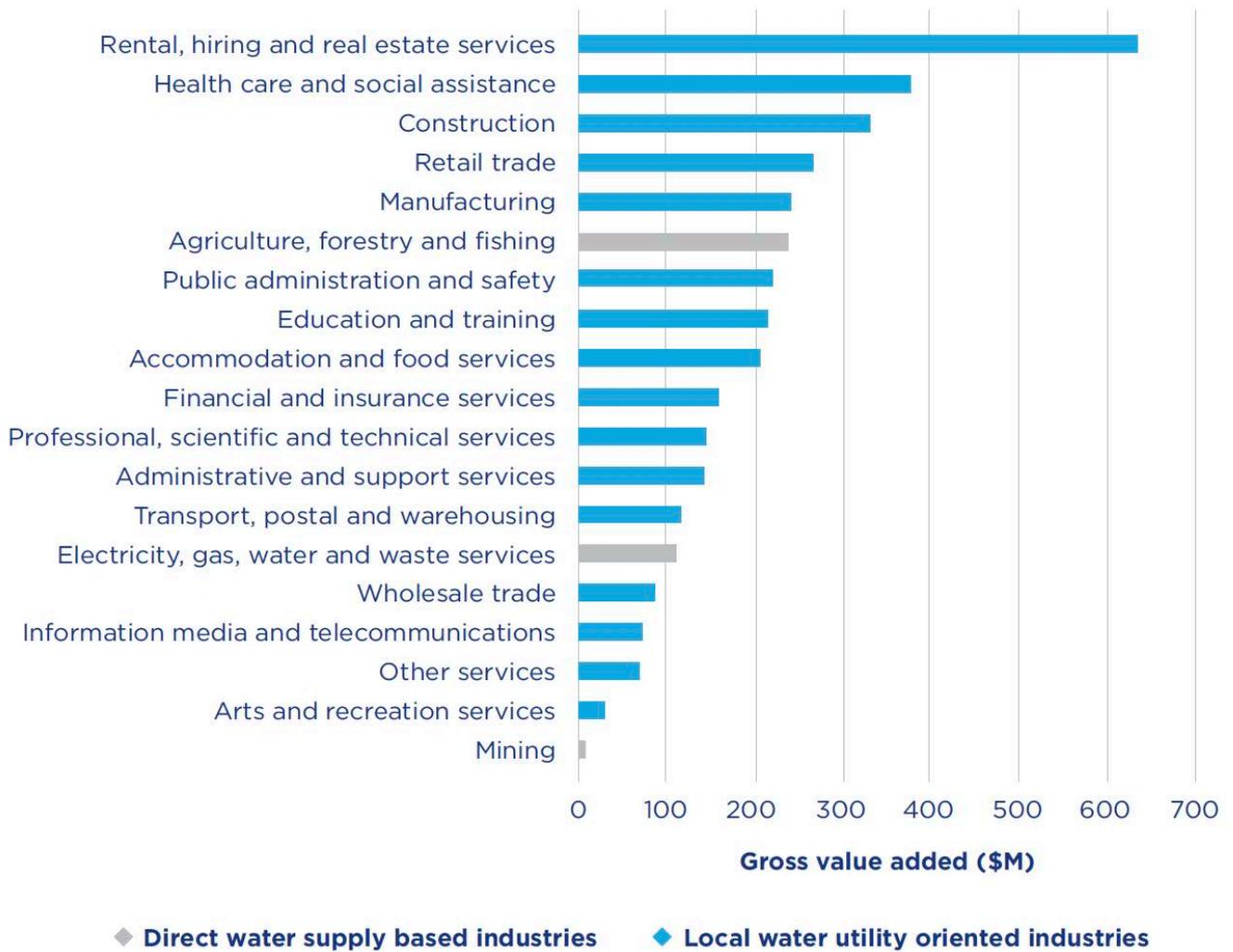


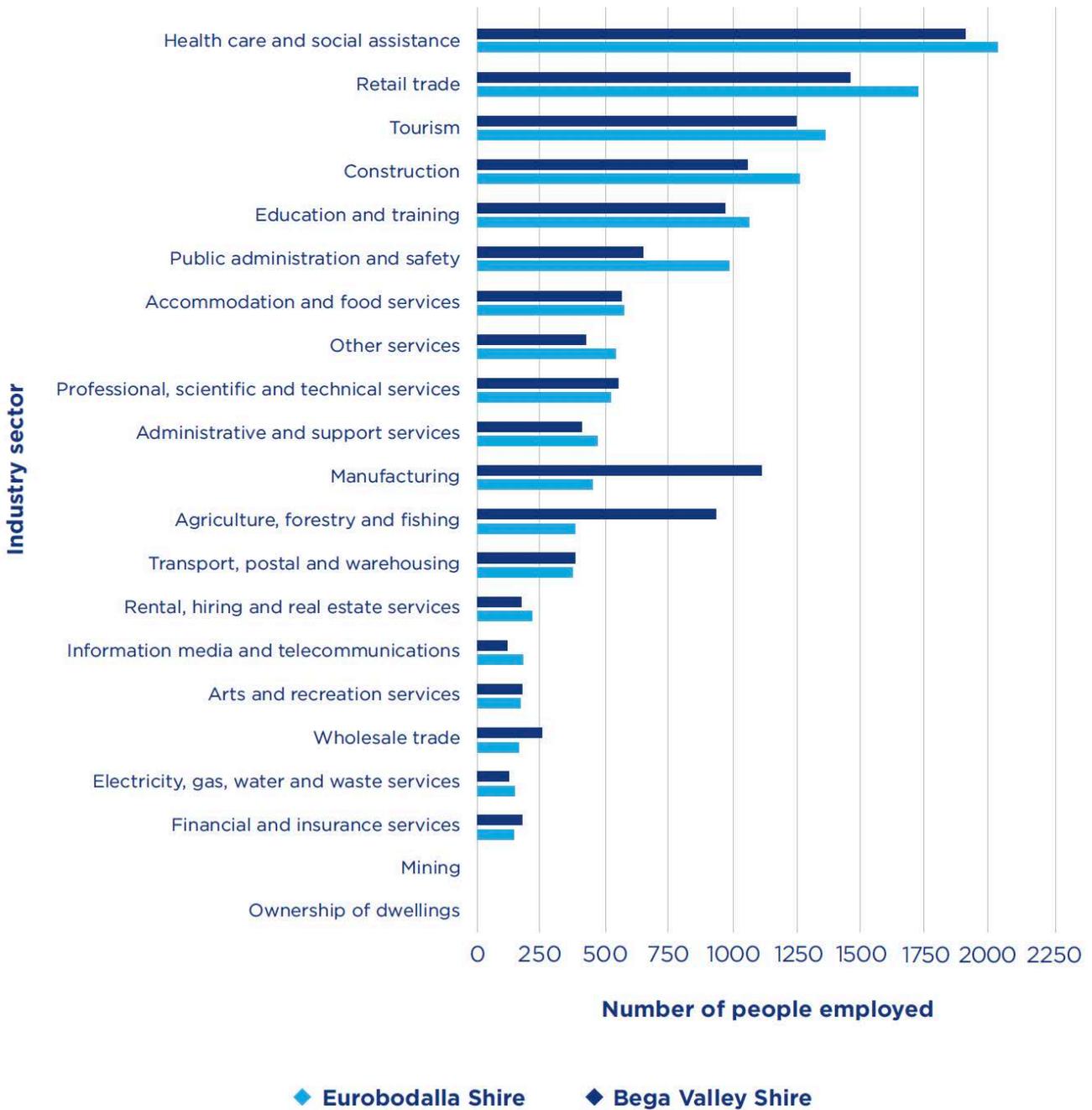
Figure 22. Economic outputs of key industries in the South Coast region



Source: REMPLAN 2019, Economic analysis for Department of Planning, Industry and Environment



Figure 23. Employment in key industries in the South Coast region



Source: REMPLAN 2019, Economic analysis for Department of Planning, Industry and Environment



A note about the COVID-19 pandemic: While the COVID-19 pandemic will have an impact on regional communities and economies in the short term, we expect government investments in transport, community, water and other infrastructure to sustain and catalyse the economic contribution of the South Coast region in the longer term.

Agriculture

Agriculture is the largest industry on the South Coast with a direct demand for water. Together with forestry and fishing, agriculture contributes on average more than \$200 million per year to the regional economy (Figure 22) and directly employs around 1,300 workers (Figure 23).

Dairying is the major agricultural enterprise in the South Coast region. Most dairy farms are located in the Tuross, Murrah and Bega catchments, with some dairying also in the Milton area. Over the last few decades, as a consequence of deregulation of the dairy industry, high capital and operating costs, and market uncertainties, the area of land under dairy production has decreased. In most instances, the farms that have ceased dairying have become lifestyle or beef enterprises. As a consequence, the area of land under beef farming has increased over the last few decades. Most beef-farming properties do not have significant irrigation demands.

The main agricultural use in the Deua catchment is grazing, which covers approximately 13% of the catchment, mostly on the coastal floodplain and in the Araluen Valley. The Araluen Valley used to support a substantial stonefruit industry, but due to several pressures the area of land under stonefruit has decreased significantly, with some farmers turning to lucerne production instead. A few stonefruit orchards still operate in the region along the lower Deua Valley, in the coastal catchments of the Clyde area and in the upper Towamba catchment.

The main agricultural land use in the Tuross River area is livestock grazing, which occupies almost 11% of the catchment. Irrigation covers just 1.3% of the catchment. Irrigated dairy farms are found along the Tuross River near Eurobodalla and Bodalla at Corunna Lake and Tilba Tilba Lake.

The greatest agricultural demand for water in the Towamba area is stock water and small-scale irrigation of lucerne. A small number of horticultural properties require irrigation water for fruit and vegetable production and for orchard maintenance. Although conducted at a small scale, agriculture is the main industry in the Towamba Valley and is economically important to the rural communities of Wyndham and Towamba.

A significant area of land west of Pambula and Eden is grazed for beef cattle production. It is relatively less significant to the economies of these areas because of the importance of the tourism industry.

Several plant nurseries are located throughout the region. Although they have a relatively small demand for water, these nurseries are significant contributors to the regional economy.

Agricultural water use

Secure water supplies are vital for supporting and growing agribusiness across the South Coast region. Water entitlements for agriculture represent about 80% of available licensed water in the region.

Most of the water use in the South Coast region is for dairying (irrigation and stock drinking water). The majority of irrigated pasture is

irrigated from unregulated water sources. Although irrigation provides benefits to pasture growth, many farmers prefer to not irrigate if rainfall is sufficient. As a consequence, the average irrigation rate for pastures in the South Coast region is relatively low—around 2 to 4 ML/ha/year. With the projection of a generally drier climate and the likelihood of more extreme dry periods, irrigation is likely to become more of a necessity for some agricultural industries.

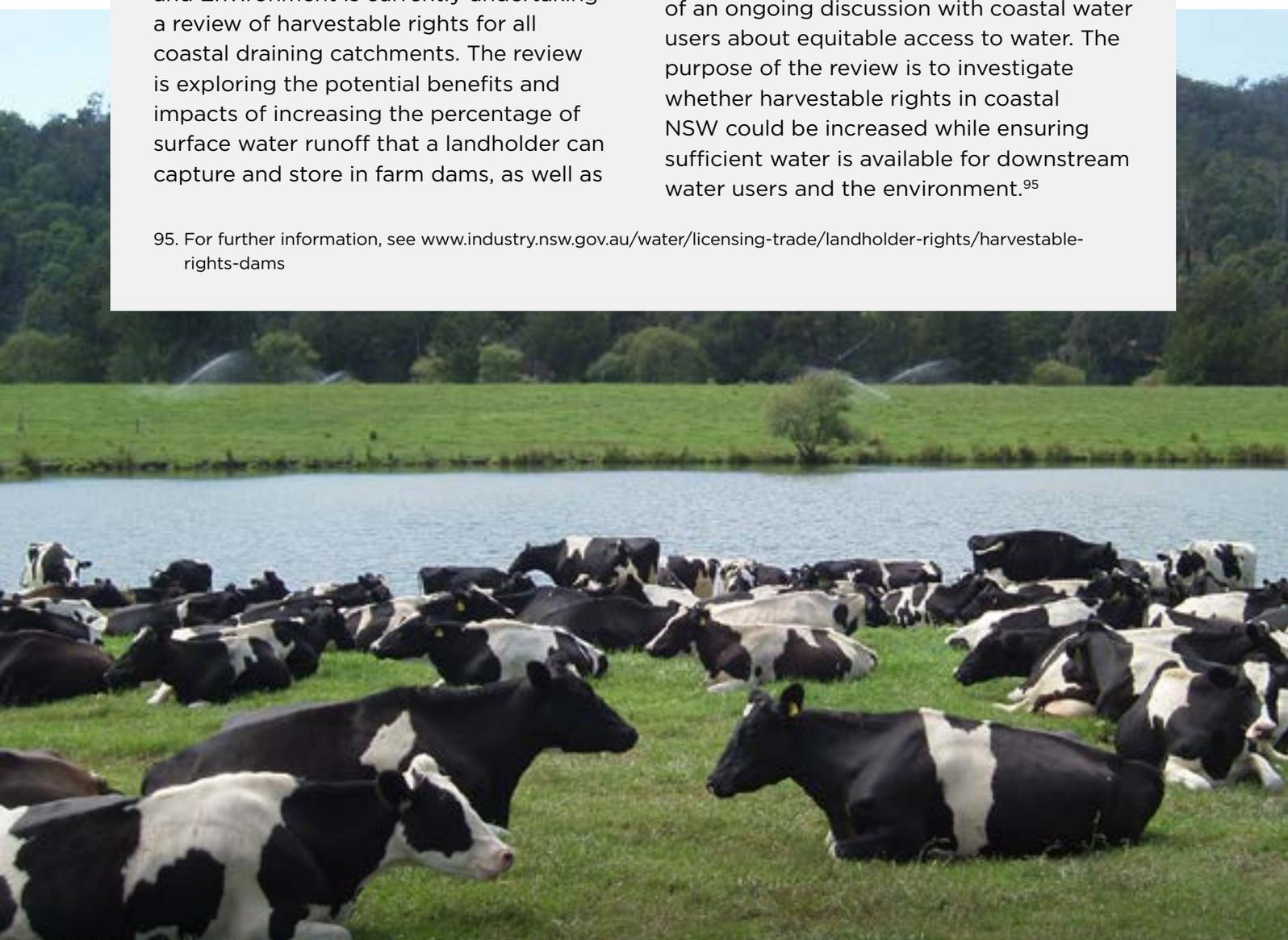
Landowners are also entitled to capture up to 10% of the rainfall runoff from their land, under harvestable rights provisions. This water can be captured and stored in hillside gullies and small (first or second order) streams. As noted in section 2.2.3, coastal water users have requested the exploration of options that would allow them to take more water under their harvestable rights to support agricultural production.

Review of harvestable rights in coastal draining catchments

The Department of Planning, Industry and Environment is currently undertaking a review of harvestable rights for all coastal draining catchments. The review is exploring the potential benefits and impacts of increasing the percentage of surface water runoff that a landholder can capture and store in farm dams, as well as

allowing harvestable rights dams on third order streams and non-permanent first and second order streams without an approval or water access licence. The review is part of an ongoing discussion with coastal water users about equitable access to water. The purpose of the review is to investigate whether harvestable rights in coastal NSW could be increased while ensuring sufficient water is available for downstream water users and the environment.⁹⁵

95. For further information, see www.industry.nsw.gov.au/water/licensing-trade/landholder-rights/harvestable-rights-dams



Oyster-farming/aquaculture

Aquaculture, in particular oyster-farming, is a developing industry on the South Coast. There are several commercial oyster leases from the Shoalhaven River to the Victorian Border, with leases operating in most of the estuaries and lakes of the region. Pacific and Sydney rock oyster farming in the Clyde River, Tuross Lake, Wagonga Inlet, Wapengo Lake, Merimbula Lake, Pambula River and Wonboyn River is estimated to contribute approximately \$18.7 million to the region. Commercial oyster leases also exist in Burrill Lake, Lake Conjola, Deua (Moruya) River, Tomago River, Wallaga Lake, and the Bega River.⁹⁶ Aquaculture in the South Coast has a multiplier effect on the region's economy: the sector is estimated to produce \$87.17 million in outputs to the local economy, generates nearly \$7 million in household income and employs around 182 people.⁹⁷

Batemans Bay and the Clyde River estuary support oyster leases covering around 249 ha of estuary. The Clyde River is the fifth largest producer of the Sydney Rock oyster in NSW and the largest on the South Coast. The Clyde River also supports a commercial fishing industry and is the eight largest finfish producer on the South Coast.

There are approximately 80 oyster leases in the Tuross estuary, although commercial fishing has not been permitted in the estuary since 2002.

Coila Lake supports an active commercial fishing industry focused on the Eastern King Prawn. The lake is one of the most intensively fished lakes on the South Coast for commercial crustacean and finfish catches. Wagonga Inlet supports around 80 oyster leases.

The challenges of maintaining good water quality in estuaries, rivers and lakes through catchment management and mitigating the impacts of climate change and sea-level rise are of particular relevance to the region's oyster industry.

Forestry

The forestry sector is a significant contributor to the economic output of the South Coast region. In the Bega Valley Shire local government area in 2016, approximately 200 people were employed in the forest and wood products industry, predominantly in native forest resources. This equated to approximately 5% of the fully engaged workforce in the local government area. Similarly, in the Eurobodalla Shire local government area in 2016 more than 100 people were employed in the forest and wood products industry, also predominantly in native forest resources. This equated to approximately 2.5% of the fully engaged workforce in the local government area.⁹⁸

Direct employment in wood product manufacturing declined over the 10-year period between 2006 and 2016 in the region. Across the Bega Valley Shire and Eurobodalla Shire local government areas, approximately 450 people were employed in wood product manufacturing in 2016, down from approximately 800 people employed in 2006. This trend is indicative of the sector across the state.⁹⁹

96. Department of Primary Industries 2017, *Aquaculture in New South Wales*, Facts and Figures

97. Barclay, K., McIlgorm, A., Mazur, N., Voyer, M., Shierer, S Payne, A.M. 2016, *Social and Economic Evaluation of NSW Coastal Aquaculture*, Fisheries Research and Development Corporation (FRDC 2015/302) and University of Technology Sydney, Sydney, December

98. NSW Government 2018, *Assessment of matters pertaining to renewal of Regional Forest Agreements*, www.dpi.nsw.gov.au/forestry/regional-framework

99. NSW Government 2018, *Assessment of matters pertaining to renewal of Regional Forest Agreements*, www.dpi.nsw.gov.au/forestry/regional-framework

Tourism and recreation

The Eurobodalla region has experienced a steady increase in tourism, with 539 tourism businesses operating in 2018.¹⁰⁰ In the 2017/2018 financial year, 818,000 domestic overnight visitors for 2.8 million nights, domestic day trips with an estimated 532,000 and an estimated 38,000 international visitors for approximately 151,000 nights. Key market sources for visitors are Canberra and Sydney for overnight stays. Day trips are mainly from people residing within the region. Most of the visitors are families or retired persons. Key activities include social and outdoor/nature activities. Most international visitors are from the United Kingdom, Germany and the United States of America, with backpackers making up 19% of the market.¹⁰¹

In the Bega Valley region in the 2017/2018 financial year, there were 522 tourism businesses in operation. There were 490,000 domestic overnight visitors for 1.98 million nights and domestic day trips with an estimated 370,000 visitors. The international market accounted for an estimated 30,000 visitors for 181,000 nights. Like the Eurobodalla region, most international visitors to the Bega Valley are from the UK, the USA and Germany.

Tourism spending within the region was approximately \$540 million for the 2017/2018 financial year, with 48% being spent in the Bega Valley and 52% spent in the Eurobodalla area. The tourism spend in this period equates to approximately 1.3% of the regional share of NSW tourism. Tourism was responsible for employing 2,722 people in 2016, with 48% attributed to the Bega Valley and 52% attributed to the Eurobodalla areas.

The Port of Eden's recent extension of the main wharf will allow vessels as large as 260 to 325 m to berth alongside for easier and safer passenger disembarkation. There is potential for Eden to host up to 30 ships per year within the next few years.¹⁰² The wharf extension, which was funded jointly by the NSW, Australian and local governments, provided 240 jobs during construction and has created 86 ongoing positions in Eden.¹⁰³

As a consequence of its extensive coastline, numerous coastal lakes and several major rivers and estuaries, tourism in the South Coast region is highly dependent on the ongoing ecological health of its waterways and water resources. Furthermore, retail trade, accommodation and food services are strongly affected by tourism. Tourism is an industry that is sensitive to perceptions, with the potential to be impacted negatively by perceived amenity or poor water quality issues in the region such as water restrictions. Quantifying the water use directly attributable to the tourism industry is difficult given the complexity of determining direct and indirect use. However, any future high-level water restrictions in the South Coast region could have a significant economic impact through decreased visitation, cancellations of hotel bookings or a reduction in booked holidays. Anecdotally, previous 'boil water' notices issued by Bega Valley Shire Council during poor water quality events have resulted in cancellations.

Tourism in the region has been affected heavily by the recent bushfires and the COVID-19 pandemic. Despite these setbacks, tourism is expected to continue to be a very important part of the South Coast region's economy.

100. Tourism Research Australia 2019, *Local Government Area Profiles 2018*, www.tra.gov.au/Regional/Local-Government-Area-Profiles/local-government-area-profiles

101. Eurobodalla Shire Council 2018, *Eurobodalla Tourism Monitor—Financial Year 2017/18*, www.esc.nsw.gov.au/living-in/about/tourism/facts-and-figures

102. Chenhall, S. 2013. *Eden economy on cruise control*. Eden Magnet. www.edenmagnet.com.au/story/1923117/eden-economy-on-cruise-control/

103. Region Group Pty Ltd 2019, *Pacific Explorer—Eden's first cruise ship to tie up at new wharf*, aboutregional.com.au/pacific-explorer-edens-first-cruise-ship-to-tie-up-at-new-wharf/

Hydro-electric power

Brown Mountain Power Station is located on the eastern escarpment of the Great Dividing Range inland from Bega on the Bemboka River, downstream from the Cochrane Dam wall. It is privately owned by Cochrane Dam Pty Ltd, having been sold by the NSW Government in 2016.

The power station commenced generating electricity in 1943 and was commissioned initially with five high pressure turbo generators with a generating capacity of 4.5 MW (6,000 hp) of electricity, generated from the run-of-the-river of Bemboka River. Today, the power station operates with a total capacity of 4.95 MW (6,640 hp) generated from water released from Rutherford Creek and Cochrane Dam.

Brown Mountain Power Station is connected to the 66 kV transmission line running between Cooma and Bega.

Industry water use and climate risks

As a consequence of the region's relatively reliable rainfall, many agricultural industries (dairying, beef, stonefruit and lucerne) have developed without the construction of significant water storages, relying heavily on unregulated water sources. These industries are therefore particularly susceptible to more extreme dry periods and reductions in flows caused by future climate variability and climate change (see section 2.2.2).

Water security is essential for ongoing, prosperous agricultural enterprises across the region. A lack of stock drinking water and poor pasture growth significantly impacts livestock industries, such as dairying and beef production, on both dryland and irrigated properties. During severe water shortages, farmers must reduce stock numbers, buy in feed, or both. This is costly and can threaten farm viability. Reducing stock numbers can impact the viability of farming enterprises for a long time as it may

take many years to re-stock the farm. Feed is usually only available outside the region during drought and consequently is very expensive.

Permanent plantings such as fruit trees are also very susceptible to dry periods. Moderate water shortages will impact fruit production and the profitability of the current crop and possibly the following year's crop. Severe water shortages will result in the death of trees.

Our modelling shows that on average, extractions from unregulated water sources will increase in response to climate change (Figure 24). With changing rainfall patterns and increased evaporation, irrigation demand will increase, and on average, unregulated water sources will be able to meet this increased demand. However, although average annual extractions from unregulated streams are projected to increase, analysis of daily flow data indicates that we are likely to experience an increase in the frequency of cease-to-pump events. When this occurs, water users are prevented from accessing water under their water licences.

Table 6 shows how water access may be impacted in the future under climate variability and climate change. For example, our modelling indicates that the number of cease-to-pump events that extend for 30 days or more in small unregulated catchments—such as Tantawangalo Creek—could increase from 50 events every 130 years to 88 under the east coast low-1 climate change scenario. While, the relative increase in 30-day cease-to-pump events is greater for larger rivers—such as the Tuross River at Eurobodalla—the number of events will remain low (up to 14 events every 130 years) due to the larger catchment area. This suggests future climate change impacts on water access across the region is likely to be greater on the smaller unregulated streams and rivers.

Sharing water among extractive and non-extractive users during dry times is already a considerable challenge for the unregulated catchments of the South Coast. Increased frequency of cease-to-pump events because of climate variability and climate change will heighten this challenge.

For the Bega—Brogo regulated river system, our modelling suggests that climate variability and climate change will slightly reduce the reliability of water allocations for general security licences (Figure 25). The biggest impacts are likely to occur in dry years when allocations are below 40%. These events are predicted to occur more frequently.

Figure 24: Modelled impacts of climate variability and climate change on average annual extraction from unregulated and regulated water sources

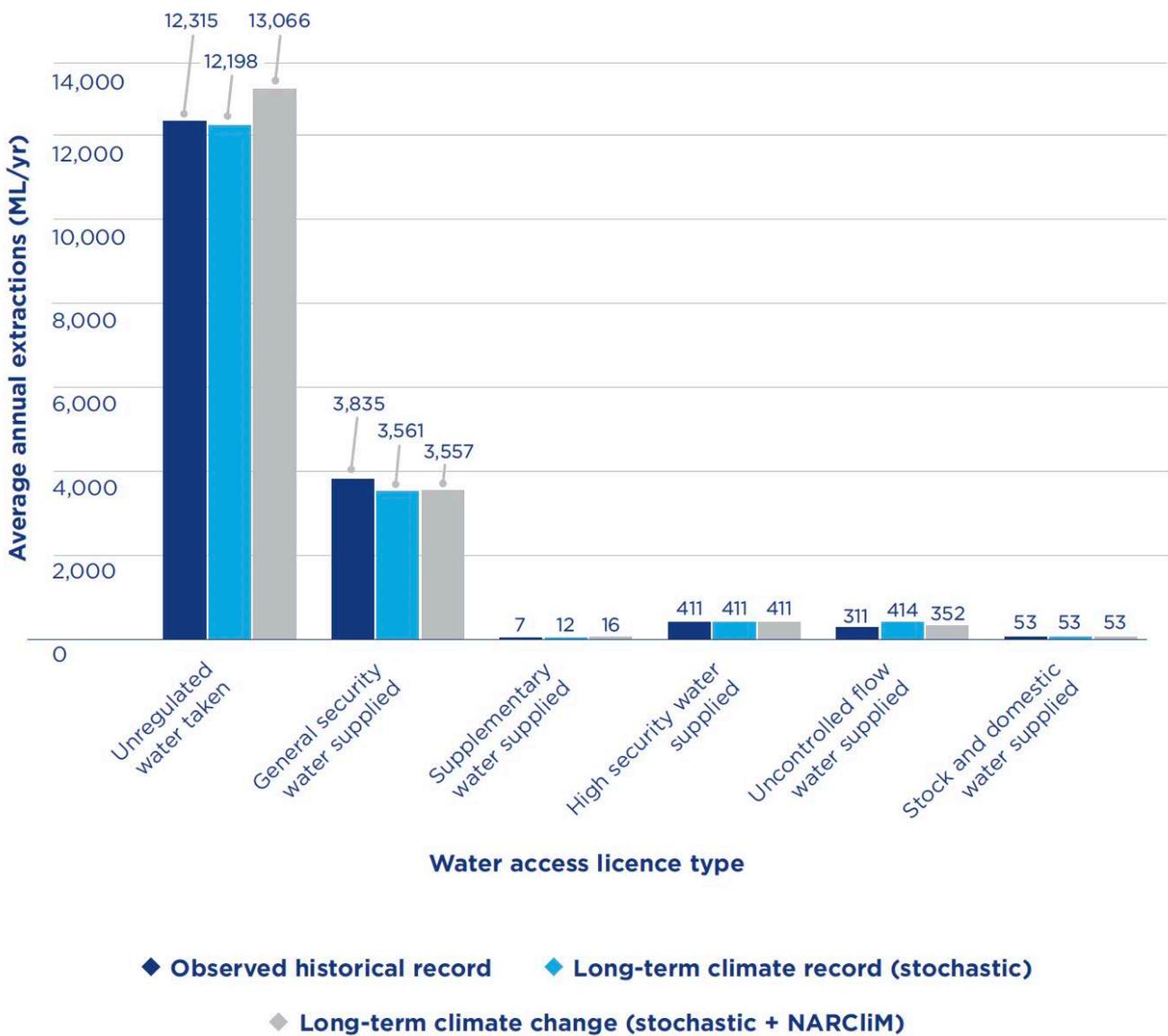
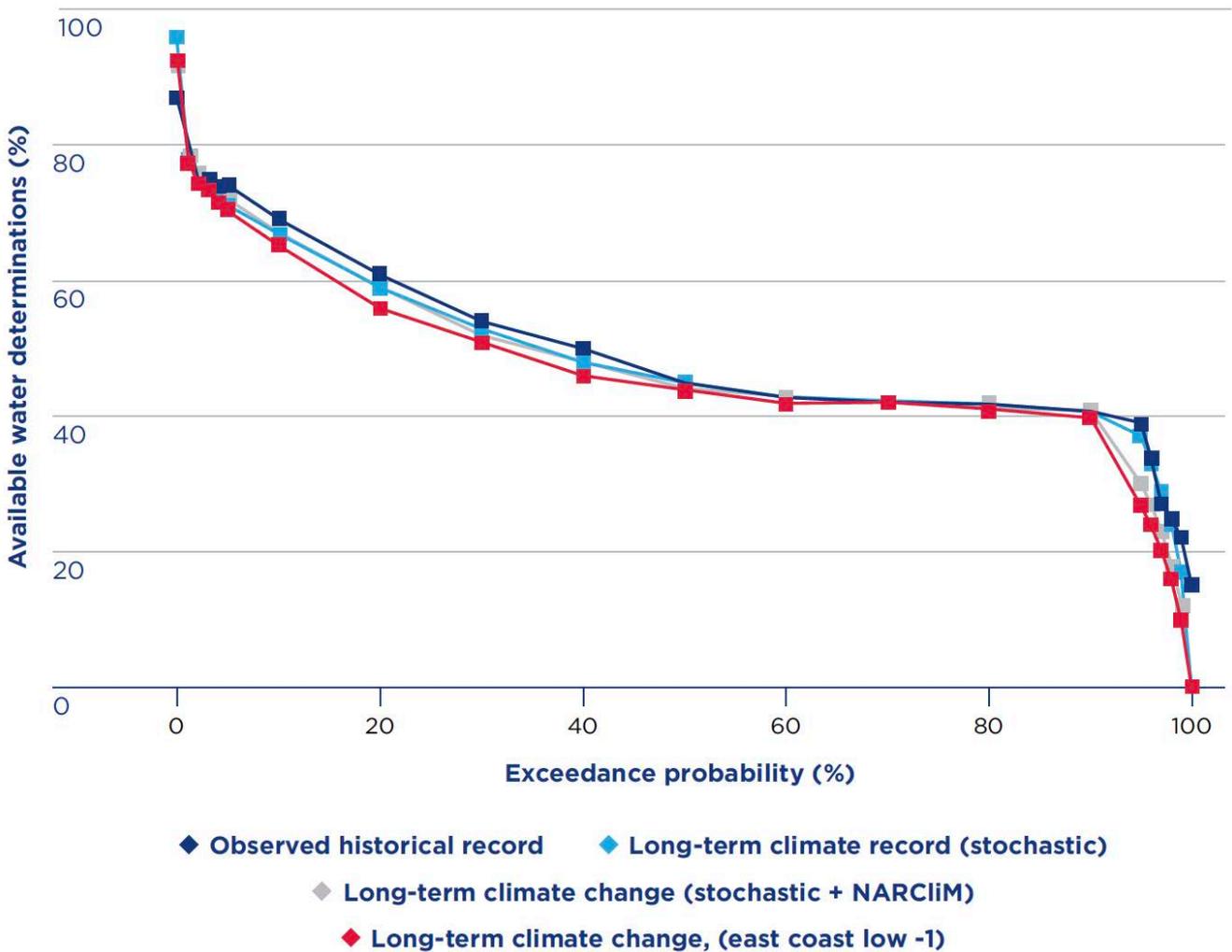


Table 6: Number of cease-to-pump (CTP) events under various climatic scenarios across the Bega River and Tuross River catchments

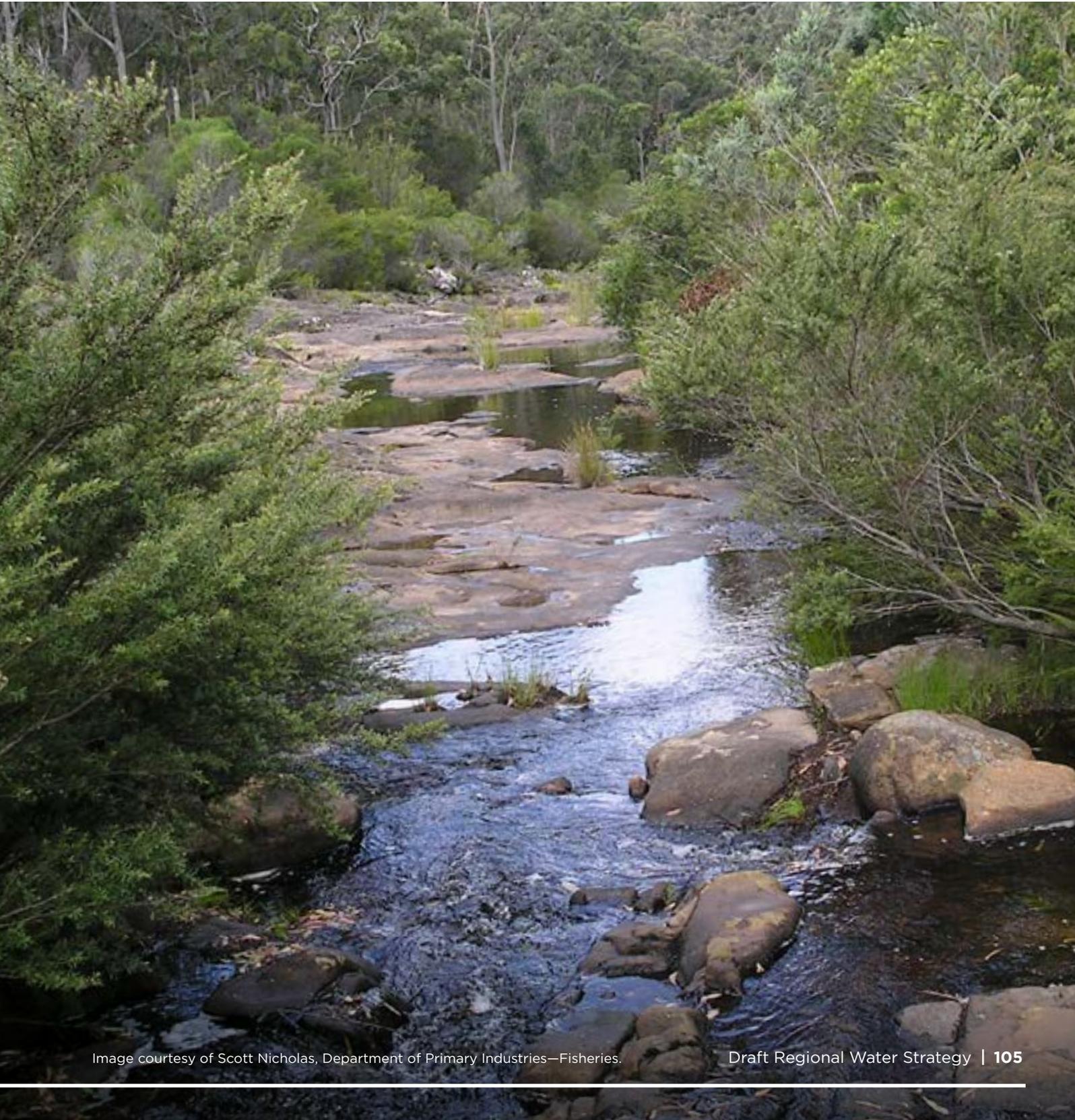
	Long-term climate (stochastic)	Long-term climate change (stochastic + NARClIM)	Long-term climate change (east coast low -1)
Gauging Station 219022 Tantawangalo Creek			
Number of 30-day CTP events per 130 years	50	69	88
Number of 7-day CTP events per 130 years	172	215	278
Gauging Station 218008 Tuross River at Eurobodalla			
Number of 30-day CTP events per 130 years	7	12	14
Number of 7-day CTP events per 130 years	31	48	59

Figure 25. Exceedance probability for general security available water determinations for the Bega-Brogo regulated river system



The regional water strategy provides an opportunity to look at a range of options that would support the region's industries to build resilience and mitigate risks in the face of climate variability and climate change.

In addition, to better understand the effects of climate variability on agriculture, the Department of Primary Industries—Agriculture is undertaking a vulnerability assessment to consider potential changes to yield and crop substitution and identify adaptation opportunities. These findings will be available in mid-2022 and will inform future water policy and actions.



Chapter 3

Options for the South Coast Regional Water Strategy

Snapshot

We have developed a long list of options that could be included in the final South Coast Regional Water Strategy.

- To identify these options, we have drawn ideas from previous studies, experience with the 2019 and Millennium droughts, community consultation, government reforms and programs, and council water plans and strategies.
- Each option is expected to address at least one of the objectives set for the regional water strategies.
- They also aim to achieve the NSW Government's focused planning goals for the region.
- The options aim to contribute to achieving our vision of having healthy and resilient water resources for a liveable and prosperous South Coast region.
- The options have not been prioritised and not all options have been costed.

The options we are considering aim to tackle the challenges facing the South Coast region and maximise opportunities arising from regional change.

Options in the current long list focus on:

- **maintaining and diversifying water supplies**, including new water storages and pipelines, augmenting and re-purposing existing water storages, new water treatment facilities and new sources of water such as groundwater, desalination, wastewater reuse and stormwater projects

- **protecting and enhancing natural systems**, including policy changes to ensure more sustainable water extraction, new and upgraded sewer services and wastewater schemes, improving fish passage and riparian, wetland and catchment management works
- **supporting water use and delivery efficiency and conservation**, including changes to bulk water supply operations, water efficiency measures, a review of the water market and increased allocations
- **strengthening community preparedness for climate extremes**, such as reviewing drought management rules and increasing on-farm storage.

In addition to the four key focus areas identified above, the final long list of options will also include a key focus on **improving the recognition of Aboriginal people's water rights, interests and access to water**. These options will be developed following face-to-face engagement with Aboriginal communities in the region (which has been postponed due to the bushfires of January and February 2020 and the COVID-19 pandemic).

In each of these areas, we are open to exploring fresh ideas and innovative solutions that will add value to regional industries, leverage new investments and support new economic, employment and environmental opportunities.

Not all options will be progressed.

- Inevitably, these options will involve trade-offs and choices. To fully understand these impacts and trade-offs, we will first seek feedback on these options before undertaking a formal assessment process.
- The assessment process will look at the positive and negative effects of the option, its cost efficiency, how widely its benefits are likely to be distributed and its feasibility. Not all the regional water strategies objectives

can be quantified. When the outcome is difficult to assess in a financial context, options will be assessed on how effective they are in terms of achieving objectives, rather than on a cost basis.

- Preferred options, and packages of options delivered together, will be informed by a range of evidence including modelling, expert judgement and Aboriginal and community input. These will form the final, comprehensive South Coast Regional Water Strategy.

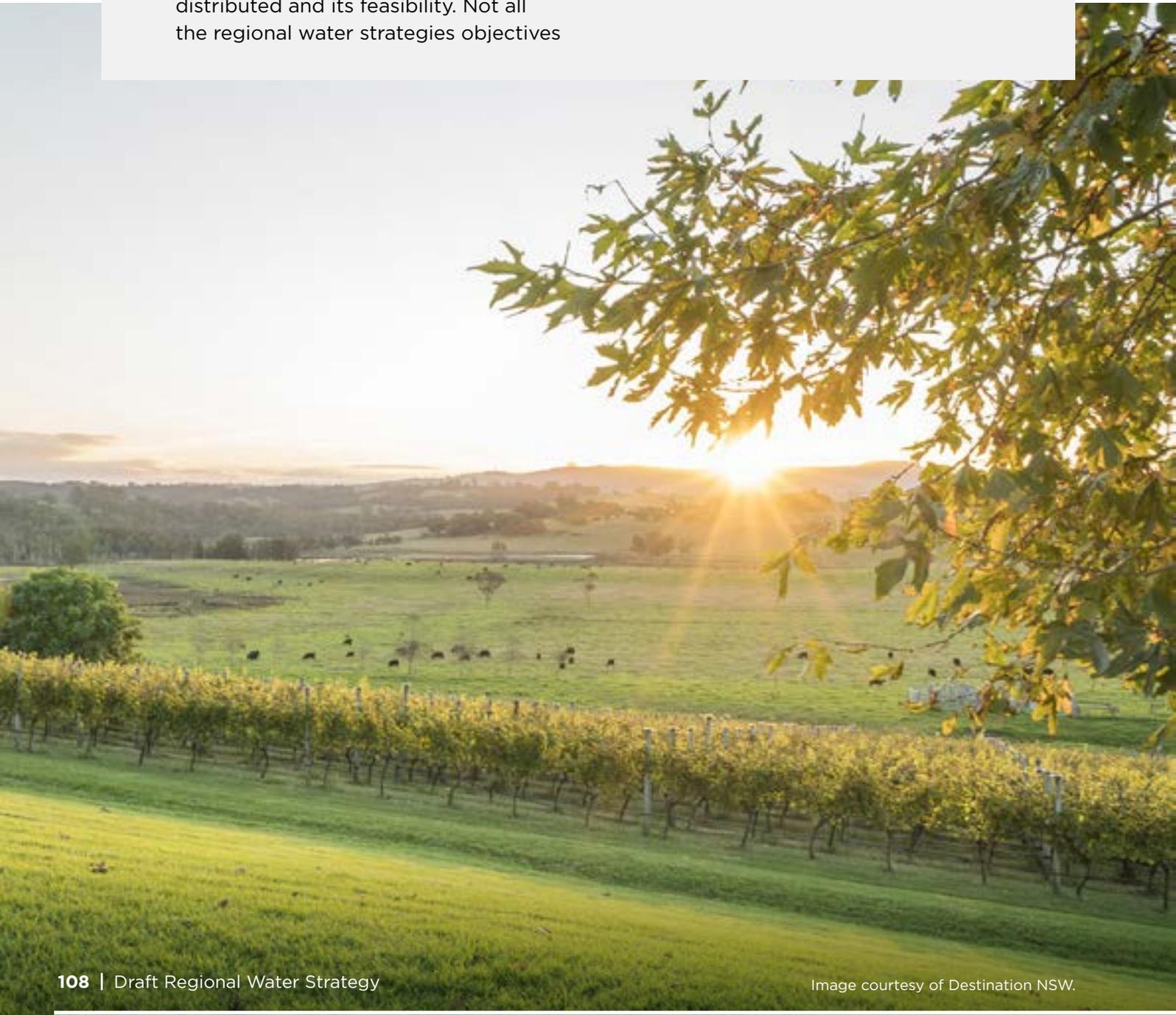




Image courtesy of Destination NSW.

3.1 Our vision for the South Coast Regional Water Strategy

The challenges in the South Coast region stem from predictions for more severe events, sea level rise, more variable and increasing water demands and the impacts of land use practices. We can't change today's climate or the basic hydrology of our river and groundwater systems. However, we can deliver better outcomes for the region by changing:

- infrastructure in the region, such as dams, weirs, pumps, pipes and channels
- how we manage and operate our water systems, such as water sharing arrangements, allocations, dam operations and environmental flow requirements
- how water is used and water user behaviour, including demand management measures
- how we manage our catchments
- any combination of the above four options.

We have identified policy, planning, regulatory, educational, technology and infrastructure options that address the challenges the region may face and maximise opportunities arising from emerging and expanding industries and new investments in transport and community infrastructure.

Our vision for the strategy

Our vision for the strategy is to support the delivery of healthy, reliable and resilient water resources for a liveable and prosperous South Coast region. To achieve this, we need to position the region so there is the right amount of water of the right quality delivered in the right way for people, Aboriginal communities, towns, industries and the environment.

3.2 Identifying and developing the options

We have developed a long list of options that could be included in the final South Coast Regional Water Strategy. In preparing this list, we recognise that a great deal of work has been done over the last few years to identify initiatives that could improve water management and water security in the region. We have collated these initiatives and supplemented them with further actions based on feedback from local councils, joint organisations, and government agencies. The public consultation process and ongoing engagement with Aboriginal people will provide another opportunity to identify options and seek feedback on the long list of options. Bringing all of these options together, will help us to align and better sequence the various water reform processes as we develop the strategy.

In developing the long list of options for the South Coast region, we have specifically considered the following:

- Each option is expected to address at least one of the regional water strategy objectives (see Figure 4 in Chapter 1) and deliver on the regionally focussed goals outlined in the *South East and Tablelands Regional Plan 2036*¹⁰⁴ and *Illawarra-Shoalhaven Regional Plan 2036*.¹⁰⁵ Some options will support multiple objectives. Other options may have positive benefits for one objective while having negative impacts for another objective. We do not have all of the information at the moment to understand these impacts. We will do further work to understand these impacts and seek your views on how each option may impact you and your values.
- While considering a range of options to maintain and improve the resilience of the region's water resources in the face of a variable and changing climate, we have also included options that take the next step in identifying innovative water solutions that will add value to existing industries, create opportunities for new industries and generate greater benefits that extend across the community.
- As discussed in section 1.3.1, the NSW Government has invested in new climate datasets and improved modelling to gain a more accurate understanding of future climatic conditions in the South Coast region. A number of options in the long list propose reviews of existing policy settings, operational rules and management plans considering this new data.
- As discussed in section 1.3.2, we have drawn on a range of sources to develop the options, including existing studies, past experience (such as water management during the Millennium Drought), community engagement and current NSW Government initiatives and programs. This process acknowledges the significant amount of thought and work already directed towards addressing the region's water-related challenges. More information about these sources is in the *Regional Water Strategies Guide*.¹⁰⁶

104. Department of Planning, Industry and Environment 2017, *South East and Tablelands Regional Plan 2036*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/South-East-and-Tablelands

105. Department of Planning, Industry and Environment 2015, *Illawarra-Shoalhaven Regional Plan 2036*, NSW Government, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Illawarra-Shoalhaven/Illawarra-Shoalhaven-Regional-Plan

106. *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about

- We have had conversations with local councils and local water utilities to understand their views on what options could be considered in the South Coast Regional Water Strategy to improve water security and quality for towns and communities (see section 1.3.3).
- We have sought expert advice from government agencies.
- As discussed in section 1.3.3, face-to-face engagement with Aboriginal communities on the South Coast region has been postponed due to bushfires in January and February 2020 and the COVID-19 pandemic. Rather than including potential options in the draft long list before this consultation has taken place, we are committed to ensuring that options with a primary focus on Aboriginal people's water rights, interests and access to water are developed through face-to-face engagement with Aboriginal communities. This will also ensure that we include the extensive knowledge of Traditional Owners in water management decisions. Example options developed as a result of our state-wide consultations include reviewing cultural water access licences and ensuring greater involvement of Aboriginal people in water management.

We have not ordered or prioritised the options identified for the South Coast long list of options and many options on the list have not been costed.

A number of preliminary options did not make it onto the long list. We carefully considered these options before determining they should not proceed further. These options and the reasons they are not included in the draft strategy are set out in *South Coast: Long list of options*.

Image courtesy of John Spencer,
Department of Planning, Industry and Environment.

3.3 Which options will be progressed?

Not all options in the long list will be progressed. Only feasible options will be progressed following an assessment process.

Inevitably, these options—and their priority in the South Coast Regional Water Strategy—will involve trade-offs and choices. To understand the impacts and trade-offs we will first seek your feedback on these options and then use a formal options assessment process which will look at:

- **Effect**
To what extent are the options expected to contribute to or otherwise impact on the NSW Government’s objectives over the planning horizon and/or during extreme events?
- **Impacts and magnitudes of impacts**
A risk assessment of the positive or negative impact of the option on the objectives, and the magnitude and frequency of these impacts.
- **Cost efficiency**
To what extent are the options likely to deliver cost-effective outcomes?
- **Distribution of benefit**
Is there likely to be a broader public or regional benefit from the option, or is the benefit concentrated to a small number of users?
- **Feasibility**
To what extent is the option likely to be feasible, including regulatory/policy change, stakeholder acceptance, time to implement, cost, alignment with government policy, both national and international, as well as technical feasibility?

Further information on this process is in the *Regional Water Strategies Guide*.¹⁰⁷

It is unlikely that a single option will be capable of addressing the identified risks across the objectives we have set for the strategy. The greatest benefits are likely to be realised by combining (or packaging them together) so that they complement each other to improve the efficiency of the system, offset impacts or unlock greater benefits by using the different levers that are available—such as policy and infrastructure levers.

For example, infrastructure options may improve water reliability for industries and water security for towns but could have negative environmental impacts. To mitigate these impacts, and increase the benefit of the projects, infrastructure projects could be combined with:

- environmental options that mitigate the impacts of the infrastructure on native fish species and environmental assets, such as wetlands and estuaries
- demand management measures to make sure industries are operating as efficiently as possible
- policy and regulatory options that review whether existing water sharing arrangements under altered conditions are appropriate.

However, combining some of the options might mean that other options cannot be pursued. At present, we do not have enough information to understand the trade-offs between options or combinations of options that are described in Table 7.

107. Regional Water Strategies Guide, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about

As development of the strategy progresses, preferred options and combinations of options—and their trade-offs—will be informed by a range of evidence including modelling, expert judgement and community input. In particular, as discussed in section 1.3.1, the NSW Government has invested in new modelling to gain a more accurate understanding of future climatic conditions in the South Coast region. This new data, along with economic analysis, will be used to understand the pros and cons of each option and the impact of various combinations of options in addressing the key challenges facing the region.

It is important to remember that the way we progress options will need to take account of the *Water Management Act 2000*.

Other important considerations when we arrive at short-listed options will be who owns and maintains infrastructure options, who benefits, what the impacts are and how to pay for them—for example, should the cost be recovered from water users and what will the Commonwealth Government pay for and what will the NSW Government pay for?



3.4 South Coast: Long list of options

Table 7 summarises the long list of options we have identified for the Draft South Coast Regional Water Strategy. Detailed information about each option, the challenges it will address, its potential combination with other options and further work required to progress the option is set out in *South Coast: Long list of options*.

The current long list of options focuses on:

- 1. maintaining and diversifying water supplies**
- 2. protecting and enhancing natural systems**
- 3. supporting water use and delivery efficiency and conservation**
- 4. strengthening community preparedness for climate extremes.**

A number of options included in the current long list will also contribute towards our fifth focus area of **recognising Aboriginal people's water rights, interests and access to water**.

Concentrating on these five objectives will enable us to address the challenges facing the South Coast region, while maximising opportunities for regional communities and industries, and supporting their aspirations.

We have heard from communities that the regional water strategies should not just focus on the risks and challenges of today. This is why our current long list of options not only focuses on the issues identified in Chapter 2, but also includes a number of options that may become important in future decades.

These options need to be supported by comprehensive and robust data and information and the right tools and infrastructure to implement change in the future.

However, this means that some of our draft long list options are still in a conceptual state. We need to continuously work with local councils, communities, environmental managers, Aboriginal peak bodies, Aboriginal people and industries to develop and refine these ideas further.

As noted previously, the options included in Table 7 are not ordered or prioritised and many have not been costed.

Regional water strategy: objectives



Deliver and manage water for local communities

Improve water security, water quality and flood management for regional towns and communities.



Enable economic prosperity

Improve water access reliability for regional industries.



Recognise and protect Aboriginal water rights, interests and access to water

Including Aboriginal heritage assets.



Protect and enhance the environment

Improve the health and integrity of environmental systems and assets, including by improving water quality.



Affordability

Identify least cost policy and infrastructure options.

Table 7. Long list of options: summary

Option	Description	Objective
<p>Maintaining and diversifying water supplies—<i>Opportunities to improve town water security, maintain suitable water quality and support growth and jobs in the region</i></p>		
<p>1. Pipeline from Brogo Dam to Bega-Tathra town water supply system</p>	<p>Construct a pipeline from Brogo Dam into the Bega-Tathra town water supply system to provide an additional supply of water should the risk of saltwater ingress into the current groundwater source (the Bega Sands aquifer) become too great.</p>	
<p>2. A reserve volume for the Brogo-Bermagui town water supply system</p>	<p>Investigate changing access to the reserve volume in Brogo Dam to improve the dam’s ability to deliver water to the Brogo-Bermagui town water supply system during extreme events.</p>	
<p>3. Water treatment plant for Brogo-Bermagui town water supply system</p>	<p>The NSW Government, under the Safe and Secure Water Program, has committed \$10 million to the design and construction of a water treatment plant for the Brogo-Bermagui town water supply. The concept design for the proposed 3.5 ML/day water treatment plant was completed in August 2020 with tenders for the detailed design and construction closing on 1 October. Commissioning of the new water treatment plant is anticipated in mid 2022.</p> <p>This is an existing NSW Government commitment.</p>	
<p>4. Water treatment plant for Yellow Pinch Dam</p>	<p>Yellow Pinch Dam (3,000 ML) is Bega Valley Shire Council’s major water storage supplying water to Merimbula, Tura Beach, Pambula Beach and Pambula. Water supplied by this town water supply system currently receives minimal treatment.</p> <p>Bega Valley Shire Council has secured \$75,000 (25% of total costs) under the Safe and Secure Water Program towards a scoping study into a new water treatment plant at Yellow Pinch.</p>	
<p>5. Upgrade water main between Bewong and Milton</p>	<p>Construct approximately 20 km of 600 mm diameter water main between Bewong and Milton to allow peak demands from the southern Shoalhaven region to be serviced from Shoalhaven Water’s Northern System. Plans to extend the 600 mm main have been deferred due to a decrease in water demand (in response to the release of the Best-Practice Management of Water Supply and Sewerage Guidelines and pay-for-use charges). However, the existing connection between Shoalhaven Water’s northern and southern water supply systems may create a bottleneck to water supply in the future.</p>	
<p>6. Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council town water supply systems</p>	<p>Connect the Bega-Tathra and Southern Eurobodalla Shire Council town water supply systems to reduce the risk of water shortages from less frequent east coast lows. This option would increase and diversify the water supplies available in both the Bega and Eurobodalla regions. It could also potentially improve the feasibility of a major augmentation, such as increasing Brogo Dam’s capacity.</p>	

Option	Description	Objective
7. Vulnerability of surface water supplies to sea level rise	Identify and quantify the risks to the region’s surface water supplies due to sea level rise. This option would build on hydrodynamic modelling completed under the <i>Marine Estate Management Strategy</i> to assess the risks of sea level rise on tidal pool and estuarine water users and local water utility water and sewerage infrastructure.	
8. Reuse of reclaimed water	Indirect potable reuse involves discharging purified recycled water into an aquifer or into rivers upstream of potential water users or existing assets. This option will identify and investigate potential locations across the region to develop reuse of reclaimed water, including purified recycled water for drinking.	
9. Managed aquifer recharge investigations and policy	Investigation of possible sites for temporary storage of treated wastewater, stormwater and river flows in aquifers to improve storage efficiencies—referred to as managed aquifer recharge. This option would involve developing a regulatory framework and supporting policy to regulate the storage and recovery of this water. Stored water could be reused by towns, water users or provided to groundwater-dependent ecosystems.	
10. Desalination for supply augmentation	Desalination can be an attractive option for coastal regions as it offers a virtually unlimited, climate-independent source of water. Desalination plants can be constructed as small-scale units servicing specific local water demands or can supply regional demands. Plants can also be scaled up as the water demand grows. The success of this option would depend largely on finding suitable sites and using suitable technologies with small footprints.	
11. Instream dam at Reedy Creek	Construct an instream dam (1.1 GL or 4 GL) on Reedy Creek, a tributary of Candelo Creek. Previous hydrologic modelling done for this project indicated that a 1.1 GL dam on Reedy Creek would provide 80% reliability to downstream irrigators, and a 4 GL dam would provide 90% reliability. A dam on Reedy Creek would offer the option of providing town water supply via a pipeline from the dam to Bega Valley Shire Council’s existing Tantawanglo pipeline.	
12. Eurobodalla Southern Storage	Construct an off-stream storage in the Tuross Valley—the Eurobodalla Southern Storage. The project will involve construction of an off-river storage on an unnamed tributary of the Tuross River. Works include 3,000 ML of water storage capacity and a new river intake pump station. This is an existing NSW Government commitment.	
13. Increased harvestable rights for coastal draining catchments	Increase the proportion of rainfall that can be captured as a harvestable right. A review of harvestable rights is currently underway and is considering the effects of increased harvestable rights and of allowing dams to be built on larger tributaries within NSW catchments that drain to the coast. The review aims to determine if greater access to water for agricultural production could be allowed while ensuring enough water is available for downstream water users and the environment. Undertaking this review is an existing NSW Government commitment.	

Option	Description	Objective
14. Improve releases from Cochrane Dam to better match water demands of irrigators	Investigate opportunities to improve water release (and water take) arrangements from Cochrane Dam that better balance the often-conflicting needs of downstream water users and power generation. This option does not propose to prescribe any new water reservation and release arrangements between Cochrane Dam Pty Ltd and water users into the region's water sharing plan.	
15. Increased industry access to high flows	Provide industry with increased access to high flows, including supplementary flows in the regulated Bega-Brogo regulated river system and high flows in unregulated catchments. This would increase water security for industries in the region, supporting their ongoing viability and expansion.	
16. Increased on-farm water storage	Lack of water storage is a major constraint to balancing water supply and demands in South Coast catchments. This option would assess the current levels of farm dam implementation and usage, the hurdles to constructing on-farm storages, the value of on-farm storages to industry, the regional water security consequences of low on-farm storage uptake, and the benefits and disadvantages of this option compared with other water storage options.	
17. A grid of off-stream storages in the Bega Valley	In 2008, the Bega River Catchment Water Storages Project (Stage 1) found that 12 off-stream storages with a total storage of 2,000 ML would increase irrigation supply security in the Bega Valley to greater than 90%. The project proposed that the off-stream dams be filled by pumping flows from the nearest watercourse into the storages where flows would be stored until required by water users downstream. Flows would be extracted from the streams in accordance with the water sharing plan rules, assuming no limitations in pump transfer capacities. Once required, flows would be released back into the streams from the off-stream storages and be available for water users to extract from the river.	
18. Tuross River barrage	Assess the costs and benefits (environmental, economic and social) of options to manage the risk of saltwater ingress in the lower Tuross River. This would involve assessing several options, such as the continuing use of a temporary sand barrage across the river, the installation of a permanent weir or options that reduce landholders' demands on water from the lower Tuross.	
19. Increase capacity of Brogo Dam	Increase the capacity of Brogo Dam to improve the reliability of general security water access licences in the Bega-Brogo regulated river system. In most years, allocations from Brogo Dam are relatively low, which restricts the level of investment in regional enterprises. The low level of allocations is due in part to the high level of entitlement (15,000 ML) relative to the dam capacity (9,000 ML).	
20. Increase capacity of Cochrane Dam	Increase the capacity of Cochrane Dam by raising the height of the current dam wall. As this option would inundate areas of the South East Forests National Park, stringent environmental assessments would be required.	

Option	Description	Objective
21. Brown Mountain Water Project (pumped hydro scheme)	Increase water storage for the Bega Valley by pumping water during high stream flows from a pondage below the existing Brown Mountain Power Station to a new storage (nominally 40 GL) at Steeple Flat in the headwaters of the Bemboka River. The option would also generate additional electricity through pumped hydro on a run-of river basis between the dam and the Steeple Flat storage.	
22. Instream dam at Crystalbrook	Construct an instream dam (5 GL or 24 GL) at Crystalbrook on Brown Mountain Creek. Previous hydrologic modelling done for this project indicated that a 5 GL dam at Crystalbrook would provide 80% reliability to irrigators on the Bega-Bemboka River, while a 24 GL dam would provide 90% reliability.	
Protecting and enhancing natural systems—Opportunities to protect and enhance environmental outcomes and realise broader community benefits through a healthy environment		
23. Establish sustainable extraction limits for South Coast surface water and groundwater sources	Investigate methods for defining sustainable levels of extraction based on ecological, economic, social and cultural water needs. This would include quantifying the sustainable extraction volumes for water sources in the South Coast. The option would also need to include consideration of amendments to water sharing plans to legally establish new limits on surface water and groundwater extraction that reflect sustainable levels. Should the review indicate that the sustainable extraction limit for a water source is greater than the current limit, a strategy would be developed for the controlled allocation of new water access licences.	
24. Shift extractions from low streamflows to high streamflows	Some of the region's rivers and creeks are under hydrologic stress during low flow periods. Water sharing plans in the South Coast region allow for the conversion of unregulated licences to 'high flow access only' licences. However, conversions are not being taken up by licence holders. This option would examine if more effective incentives are available to encourage high flow conversions, with the aim of shifting extractive pressures from low streamflows to high streamflows.	
25. Extend water and sewer services to southern villages (Shoalhaven Water)	Connect the villages south of Lake Tabourie (Kioloa, Merry Beach, Bawley Point and North Durras) to town water supplies and sewer services. This option would investigate whether the lack of sewerage systems for these villages is having an unacceptable impact on the local waterways.	
26. Southern Reclaimed Water Management Scheme	Establish a reclaimed water re-use scheme for the Milton-Ulladulla area (a 'Southern Reclaimed Water Management Scheme'). A 2008 study by GHD for Shoalhaven Water found that a re-use scheme is technically feasible and could provide a reliable supply for around 85 ha of land or up to 220 ha if a 237 ML seasonal balancing storage was included in the scheme. The existing reclaimed water management scheme on the Shoalhaven floodplain has shown significant and growing demand for reclaimed water.	

Option	Description	Objective
27. Merimbula Effluent Management Scheme	<p>Upgrade the Merimbula sewage treatment plant and construct an ocean outfall to dispose of excess treated wastewater during high rainfall periods. Upgrades to the plant will also improve the quality of its treated wastewater. The Merimbula Sewage Treatment Plant and Ocean Outfall Project, which has been thoroughly investigated over the past 10 years, aims to protect the area's unspoilt aquatic and land environment and ensure public health standards are met.</p> <p>The NSW Government has committed \$8.81 million funding to this project under the Safe and Secure Water Program. The total cost of the project is \$40 million.</p>	
28. Fish-friendly water extraction	<p>Install screens on pumps to reduce the amount of fish being extracted at pump sites. Native fish can be inadvertently extracted by pumps. From there the fish are unable to return to the river system. The 'Screens for Streams' program will partner extractive water users with scientists and engineers to collaboratively reduce native fish mortality. This option will target high priority reaches or installations in the South Coast region.</p>	
29. Improved fish passage in South Coast rivers	<p>Remediate high-priority barriers to fish passage in the Clyde, Deua and Turross River catchments, including Buckenbowra Dam, Currowan Creek-Western Distributor, Shallow Crossing, Clyde Ridge Road, Burra Creek Weir and Wadbilliga Road.</p> <p>Remediating these structures in accordance with the <i>NSW Fish Passage Strategy</i> will improve recruitment, distribution, growth and survivorship of native and threatened fish species. The outcomes of fish passage remediation will be enhanced by work to secure adequate environmental flows.</p>	
30. Improve stormwater management	<p>This option will identify and investigate potential locations for precinct-scale schemes to harvest and reuse stormwater in urban developments. This involves harvesting, storing, treating and delivering stormwater for non-potable use such as the irrigation of local parks or fields.</p>	
31. Bringing back riverine and estuarine habitats and threatened species	<p>A 'Bringing Back Threatened Species' program to restore riparian and wetland habitats by protecting and enhancing priority areas using best practice management. This program would improve the condition, connectivity and resilience of habitat and landscape that has suffered a serious decline in quality and quantity due to land use activities since European settlement. The program would also build skills and share the knowledge of local landholders, community groups and Aboriginal people.</p>	
32. Characterising coastal groundwater resources	<p>Improve knowledge and understanding of the region's groundwater resources through an extensive program of field investigations, literature reviews, expansion of existing monitoring networks, metering of all forms of groundwater take, development of conceptual and numerical groundwater flow and transport models, and publishing of annual resource updates. This work would support government and the community to make informed decisions about managing groundwater sustainably.</p>	

Option	Description	Objective
33. Protecting ecosystems that depend on coastal groundwater resources	<p>A range of projects to advance our knowledge and management of groundwater dependent ecosystems. A critical, but often overlooked element of the water cycle is groundwater and groundwater dependent ecosystems. These ecosystems are critical because they provide valuable goods and services and support a variety of fauna and flora communities. They also have inherent environmental value. During droughts when groundwater is needed to support communities, it is critical that groundwater dependent vegetation is also maintained.</p>	
<p>Supporting water use and delivery efficiency and water conservation—<i>Opportunities to improve the efficiency of existing water delivery systems, increase productivity and address water security challenges through demand management options</i></p>		
34. Active and effective water markets	<p>Review the effectiveness of water markets (unregulated, regulated and groundwater) in the South Coast, including their ability to contribute to improved water security outcomes in the region.</p>	
35. Improved data collection and information sharing	<p>Improve data collection on the environment (particularly streamflows, water quality and groundwater levels), industrial water use and town water use in the South Coast region. This would improve information and knowledge to inform future water planning and management decisions in the region.</p>	
36. Weir at Brogo-Bermagui town water supply off-take	<p>Construct a weir at the off-take site that would allow water to be delivered more efficiently to the Brogo-Bermagui water supply system. This would increase water security for all Brogo-Brogo regulated river system water users.</p>	
37. Shorten the Bega-Brogo regulated river system	<p>Reduce the need for large water releases from Brogo Dam when flows in the Bega River are low by shortening the length of the regulated river system. This could be achieved by various means, including a pipeline to transfer water from the Brogo River to tidal pool users, incentives for water users in the lower reaches to trade or retire entitlements or a government buy-back of licences.</p>	
38. Increase general security allocations in the Bega-Brogo regulated river system	<p>A high proportion of entitlement in the Bega-Brogo regulated river system is not used. This option would consider various means to increase the reliability of allocations to the Bega-Brogo regulated river system, including:</p> <ul style="list-style-type: none"> • increasing the capacity of Brogo Dam • activating sleeper entitlement • licence holders being encouraged to retire licences • government buying back licences. 	
39. Regional network efficiency audit	<p>Region-wide audit of water supply network infrastructure leakage. The audit will identify opportunities to reduce water losses through network leaks and minimise annual volumes of non-revenue water.</p>	

Option	Description	Objective
<p>Strengthening community preparedness for climate extremes—<i>Opportunities to develop fit-for-purpose policies and regulation to protect town water security, strengthen community health and wellbeing and better manage risks</i></p>		
<p>40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control</p>	<p>Consider the potential hydrologic and water quality benefits of providing landholders with financial and technical assistance to implement river rehabilitation works. This region-wide program could include instream works (such as log jams, rock chutes, log weirs and rock revetment), establishing/rehabilitating riparian vegetation to slow the movement of water through the landscape, reducing erosion and decreasing sediment loads in streams.</p>	
<p>41. Apply the NSW Extreme Events Policy to the South Coast region</p>	<p>Extend the <i>NSW Extreme Events Policy</i> from the Murray-Darling Basin to coastal regions to give WaterNSW, local water utilities and other water users clarity and direction during periods of drought. The option would include establishing a critical water advisory panel for the South Coast region and developing an incident response guide for the region.</p>	
<p>42. Quantify the resource potential of South Coast hard rock aquifers</p>	<p>Undertake a joint exploration (with the Geological Survey of NSW) of fractured rock and alluvial aquifers to detect groundwater sources and underground storage potential in key locations throughout the South Coast region.</p>	
<p>43. Planning for climate change impacts on coastal groundwater resources</p>	<p>The shallow nature of coastal groundwater resources provides advantages for water access. However, it also means they are vulnerable to impacts from climate change and sea level rise. Possible impacts include reduced water availability for consumptive use and the environment due to reduced groundwater recharge, salination of aquifers by seawater intrusion and inundation, waterlogging, contamination and flooding. In this option, Department of Planning, Industry and Environment—Water would collaborate with Local Land Services, councils and universities to co-design and implement local-scale projects to better understand and manage these impacts.</p>	
<p>44. Planning for land use pressures on coastal groundwater resources</p>	<p>Coastal aquifers provide reliable water sources during droughts and produce good quality, high yielding groundwater. However, these aquifers are vulnerable to contamination and are under increasing pressure from growing coastal populations. This option would review the challenges facing coastal groundwater resources and set out a framework for integration of land and groundwater management on the coast.</p>	

Cultural options developed for inland regions

A number of options have been developed for the Gwydir, Lachlan and Macquarie regional water strategies to recognise and protect Aboriginal water rights, interests and access to water. These options are:

- River Ranger Program
- Securing flows for culturally significant and water-dependent sites
- Culturally-appropriate water knowledge program
- Water-dependent cultural practices and site identification project
- Shared benefit project (environment and cultural outcomes)
- Aboriginal cultural water access licence review

- Water portfolio project for Aboriginal communities
- Regional Aboriginal Water Advisory Committee
- Co-management investigation of Travelling Stock Reserves
- Regional Cultural Water Officer Employment Program

Full descriptions of these options can be found in the Gwydir, Lachlan and Macquarie regional water strategies.¹⁰⁸ As the development of the regional water strategy for the South Coast continues, these options will be discussed with Aboriginal communities to assess their appropriateness for the region. Other region-specific cultural options will also be developed in partnership with local Aboriginal communities.

108. www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies



Chapter 4

Where to from here?

We have developed this draft strategy based on the new evidence we have, the latest policies and programs for the region, and feedback from government agencies and local councils.

The outcomes, challenges, opportunities and options we have identified in this strategy will be tested, evaluated and refined based on your input.

4.1 Finalising the strategy

Our next steps are to use the feedback you provide to analyse, screen and assess the long list of options, put together a portfolio of options to be progressed and develop a final strategy for release by the end of 2021. We will also be prioritising face-to-face engagement with Aboriginal communities to develop additional options for the final strategy.

We recognise that in getting to the final strategy there will be hard trade-offs, but the only way we can make the best decision possible is to deal with issues proactively and realistically. This will give us the most likely chance of long-term success.

The final South Coast Regional Water Strategy will have review processes to ensure the region has an effective strategy in place that remains relevant for future water management.

Following completion, each regional water strategy will be reviewed when the equivalent water sharing plans are reviewed.

4.2 Implementing the strategy

Community engagement does not end with consultation; it is a vital part of implementing the regional water strategies. The final South Coast Regional Water Strategy will map out our approach to implementation and include an implementation plan. This plan will set out how NSW Government agencies and other organisations with a role in water management and planning will deliver key actions and strategies for maximising water security and availability for all users and the environment. This implementation plan will be clear about timeframes and responsibilities for delivery.

We want to be clear about how we work with communities and regions to ensure:

- We are accountable for what we promise our regions.
- We have the right partnerships in place to drive forward action.
- We are transparent in how we go about those actions.
- We can check with those with on the ground and lived experience that the directions and actions we pursue continue to be the right ones for each region.



Your voice is important

We have prepared this draft strategy to continue our discussions with you about the future management of water in your community. It has been prepared in consultation with local councils. We will consult with Aboriginal communities during the public exhibition of the draft strategy.

We would like to hear your views on the draft strategy and whether you have any further information that could help us to assess the benefits or disadvantages of any of the options. This may include:

- how your household, business, industry or community currently manages the impacts of a highly variable climate
- the current and future challenges you see in the South Coast region and how you think these should be addressed
- how the management of water resources can be improved or leveraged to create and take up new opportunities in the region
- the options presented in this draft strategy
- how we can achieve our aims for accountability and transparency
- the best ways of partnering with communities and regions to implement the strategy.

Your views on the strategy's vision and objectives are also important.

This Draft South Coast Regional Water Strategy is on public exhibition from 30 October 2020 to 13 December 2020. A range of supporting information is available at www.dpie.nsw.gov.au/south-coast-regional-water-strategy

You can also have your say on the draft strategy by providing written feedback to the Department of Planning, Industry and Environment by midnight 6 December 2020 via:

Web: www.dpie.nsw.gov.au/south-coast-regional-water-strategy

Email: regionalwater.strategies@dpie.nsw.gov.au

Please note that all submissions will be published on the department's website unless you let us know in your submission that you do not wish the content to be released.

We will be holding online sessions on the draft strategy during the public exhibition period to help shape the final strategy. These sessions will give participants an understanding of the context for the strategy, what the latest modelling is telling us and what the options for better managing water in the South Coast region could mean. Times and locations for these sessions can be found at www.dpie.nsw.gov.au/south-coast-regional-water-strategy.

We will also continue to meet with local councils, local water utilities, Aboriginal communities and other stakeholders. Talking with these groups is critical for designing a strategy that builds on their knowledge and capacity, is feasible in terms of implementation and links to their relevant initiatives, plans and strategies.

Attachments



Attachment 1

Targeted stakeholder engagement

Overview

A thorough engagement program supports the development of the regional water strategies. The purpose of engagement is to inform, gain information and feedback, collaborate with key stakeholders on strategy development and build support for the regional water strategy.

Development of the South Coast Regional Water Strategy is supported by four engagement phases:

1. Targeted engagement with councils, local water utilities, joint organisations, Aboriginal people and peak bodies
2. Public exhibition of the draft regional water strategy and targeted engagement with State and regional peak bodies
3. Further targeted engagement with councils, local water utilities and joint organisations in each region, as well as Aboriginal people and peak bodies
4. Public release of final regional water strategy.

An interagency panel was formed to assist in the development of the South Coast Regional Water Strategy. This panel, chaired by Department of Planning, Industry and Environment—Water, included representatives from across the Department of Planning, Industry and Environment cluster including Environment, Energy and Science, Office of Local Government, Planning and Strategy and Reform.

Members of the panel also included representatives from Regional NSW, including Local Land Services, and the Fisheries and Agriculture sections of the Department of Primary Industries. WaterNSW was also represented.

The department held two workshops with key regional stakeholders on 7 November 2018 to discuss risks and opportunities around water security for the region.

This report documents targeted stakeholder feedback during engagement phase 1 of the development of the South Coast Regional Water Strategy.

Engagement

Discussions were held with councils, local water utilities and other stakeholders between June 2020 and September 2020. Due to the bushfires and COVID-19, face-to-face engagement with Aboriginal communities has been put on hold. The following organisations or communities have participated in discussions so far.

Local council/local water utilities/other organisations
Bega Shire Council
Eurobodalla Shire Council
Shoalhaven Water
Queanbeyan-Palerang Regional Council
Bega Cheese Pty Ltd
Bega and Brogo water users
Cochrane Dam Pty Ltd
South East Region Conservation Alliance
Tuross water user representative
Araluen water user representative

The purpose of discussions was to establish a collaborative relationship with local councils, local water utilities and other organisations, as well as to gain an understanding of key water challenges and risks in the South Coast region. Discussions also focused on gaining feedback on a draft long list of options for the South Coast Regional Water Strategy.

Discussions with Aboriginal communities will include a focus on cultural challenges, the development of cultural options and learning from Aboriginal people's knowledge of water in the region.

Summary

Quick stats and hot topics

A total of seven meetings were held, with 20 people attending and participating in discussions during the targeted engagement phase. Information about participants and a summary of recurring themes and hot topics are outlined below.

Targeted council/local water utilities/other organisations	
Quick stats	Four targeted council meetings including one meeting with joint councils and two stakeholder reference group meetings
	20 people participated in discussions
	Meetings held by video conference and in person
	Over 200 ideas, opportunities and challenges and suggestions identified
Recurring themes	Collaboration and an ongoing partnership approach between the South Coast Regional Water Strategy and councils
	The range of water quality issues and their impact on secure water supply
	Water supply security for certain areas of the region
	Impacts of re-occurring extreme events and climate change on water supply and quality
	Eurobodalla Southern Storage Project
	Various future water security options relating to Brogo Dam
Hot topics	Concern of inclusion of Shoalhaven challenges and options
	Water quality concerns impacting water supply
	Impacts of re-occurring extreme events and climate change on water supply and quality
	Suitability of current water sharing plan rules

Detailed feedback

The following table summarises the feedback from the targeted engagement phase.

Topic	Comment
Collaboration and engagement	Attendees value ongoing consultation. They were appreciative of ongoing engagement and are keen to be involved through the development of the regional water strategy. Attendees are also keen to see the Draft South Coast Regional Water Strategy when it is released for comment.
Regional Water Strategy development	<p>Attendees expressed support for the Regional Water Strategy Program but raised concerns about alignment between the program and other plans and timelines.</p> <ul style="list-style-type: none"> Concern was raised regarding the split between the South Coast Regional Water Strategy and the Greater Sydney Water Strategy. Attendees noted that Shoalhaven City challenges and options could potentially be missed. Additionally, there was concern that there had been no consultation as yet on the Greater Sydney Water Strategy. Attendees mentioned that there might be only limited connection between the South Coast's three local government areas due to the nature of the catchments and the existence of interconnected water supply systems. Councils would like to have input into any regional (cross-catchments) options raised by the Draft South Coast Regional Water Strategy. One of the exceptions to this is the sewerage scheme for the village of Akolele. Councils stressed the importance of alignment between the strategy and integrated water cycle management modelling. Questions were raised about upcoming water sharing plan reviews and the importance of better sequencing between the regional water strategy, integrated water cycle management plans and water sharing plans. Questions were raised around the approach to ensure inclusion of rural (agricultural) water supply and recreational use of water storages (e.g. Brogo Dam, Deep Creek Dam and Yellow Pinch Dam). It was noted that options might be missed in a long list. It needs to be acknowledged that the regional water strategy might not pick up everything at first and that it needs to allow for refinement.
Water sharing plan issues and potential changes	<p>Various concerns regarding the current water sharing plans were raised and suggestions for changes to the plans were made.</p> <ul style="list-style-type: none"> It was stressed that a commencing available water determination of 40% if Brogo Dam is full at the beginning of the water year (<i>Water Sharing plan for the Bega and Brogo Regulated Rivers Water Source</i>) is not enough to get a bank loan to invest in a larger crop or update/improve irrigation equipment. It was suggested that the same issue applies to the unregulated system. Concerns were expressed with the current water sharing plan rules (<i>Water Sharing Plan for the Tuross River Unregulated and Alluvial Water Sources 2016</i>) regarding daily and annual extraction limits where water take is limited for both the environment and town water supply during low flows as well as high flows. This can result in allowing the remaining water during high flows to run off into the ocean, instead of being used to fill storages. It was suggested that the regional water strategy should address this issue. Self-imposed limitations on surface water were proposed to the <i>Water Sharing Plan for the Tuross River Unregulated and Alluvial Water Sources 2016</i> so take doesn't influence other water users. The proposed changes to the water sharing plan would allow access for council to the alluvial aquifer during low flow periods and access to the river during high flow periods. Support was expressed to review and revise water sharing rules to better protect environmental water in forecasted more extreme dry periods.

Topic	Comment
Water quality concerns	<p>Multiple water quality concerns were raised including:</p> <ul style="list-style-type: none"> • water extractions increasing the concentration of nutrients (in pools) thus increasing the possibility of blue-green algae blooms • quality of rainwater during bat plagues/flying fox faeces • issues at South/North Durras: <ul style="list-style-type: none"> - sandy soils—on-site sewerage systems soak into the water table - multiple caravan parks providing point source pollution - with the sandy soils, there are many water supply bores there is a risk that residents may top up their rainwater tanks with sewage contaminated groundwater during dry years • the need for increased investment in multi-barrier treatment on water treatment plants • water quality challenges during bushfires • the need for additional and better water treatment plants.
Impacts of re-occurring extreme events and climate change on water supply and quality	<p>Attendees stressed the importance of the impacts of re-occurring extreme events and climate change on water supply and quality.</p> <p>Bushfires</p> <ul style="list-style-type: none"> • It was stressed that lack of town water supply was a problem during bushfires when the power was cut and there wasn't enough supply to defend properties around Durras. • Concern was expressed regarding infrastructure resilience during extreme events, such as power supply and telecommunications. • Support was expressed for the need for better bushfire response, increasing all assets (pumps, generators) and peak capacity. • The need for a more resilient water supply for central Tilba during extreme events to ensure its safety. • It was mentioned that a major risk to Bermagui's water supply (and potential impact on the pump station) is bushfires. • A suggestion was made to shore up the emergency supply provisions in the bulk water agreement with WaterNSW for Tallowa Dam to manage extreme events such as bushfires. <p>Saltwater intrusion due to climate change</p> <ul style="list-style-type: none"> • Attendees mentioned that there is a risk of increased occurrence of saltwater moving up the lower reaches of the Tuross due to sea level rise. The risk is highest during low river flows. • It was suggested that Eurobodalla Shire Council's pump station could be moved further up the river. Additionally, it was mentioned that council stops pumping during these low flows anyway and would still have use of its bores. The problem would become urgent if sea water intrusion impacts aquifers. • It was also stated that there are currently regulatory constraints associated with managing this issue adaptively: for example, through constructing a temporary sand barrage.

Topic	Comment
Water security and sewerage	<p>Concern was expressed around water security and sewerage systems in some areas in the region.</p> <ul style="list-style-type: none"> It was mentioned that there is a lack of town water supply to the south of Lake Tabourie. Some of the villages are also unsewered (Kioloa, Merry Beach, Bawley Point and North Durras). Transferring water further south could create water quality issues by overloading the capacity of on-site sewerage systems. It was stated that the vulnerability of water supply in the southern Shoalhaven system has not been significantly investigated and might create a supply bottleneck in the future. Attendees also identified a lack of water storage in the Eurobodalla Shire Council area. Combined with the costs associated with investing in on-farm storage, these are major constraints for town water supply and irrigated agriculture in the lower Tuross.
Southern Storage Scheme	<p>The Southern Storage Scheme was explained to ensure sufficient water storage in the Eurobodalla system and linked to current draft options in the South Coast Regional Water Strategy.</p> <ul style="list-style-type: none"> Council explained there is current project approval to construct a 26 ML river pumping station on the Tuross River and a 3,000 ML off-river storage (upgradable to 8,000 ML in the future). The main concern is securing sufficient funding. It was requested this project be included as an option in the regional water strategy as council have already invested substantially in it. An explanation was given that this storage project aims to secure enough town water supply to overcome the current water sharing plan challenges (being restricted to high flow take only). The storage is not meant for irrigation. Attendees stated that the storage project addresses four issues: population growth, climate change impacts on water access, water sharing plan compliance regarding environmental and agricultural water and resilience/risk management during natural disasters. <p>Biodiversity offsets</p> <ul style="list-style-type: none"> Concern was raised around the high costs for biodiversity offsets (buying forestry land) as part of the project.

Topic	Comment
Options around Brogo Dam	<p>The range of draft options concerning Brogo Dam were discussed.</p> <p>Augment Brogo Dam</p> <ul style="list-style-type: none"> It was stressed that Bega Councillors see this as a key outcome to be achieved. Attendees said there is community support for this project as it is a long-term investment for water security. The Mayor has sent a letter to the NSW and Australian governments advocating for this option and federal funding. Attendees noted that an augmented Brogo Dam may also open up opportunities for the installation of a hydropower plant. Hydropower introduces its own problems in terms of a competing water use agenda between water being used for power and community consumption demand. This option was still supported as it will help the community move towards a low-carbon economy. Support was shown for the development of a business case for this option. <p>Decommission Brogo Dam</p> <ul style="list-style-type: none"> This option was not supported by attendees. <p>Brogo pipeline Eurobodalla</p> <ul style="list-style-type: none"> Attendees mentioned that the Bermagui system has sufficient entitlement and pipeline capacity (with the recent increase in system storage). It was stated that with the new southern water storage under construction, this option would not be required for 20 years or more. If this option was to be considered for future generations, it would have to be modelled to ensure sufficient pipeline sizes. There is also some uncertainty around security of supply as Brogo Dam is not owned and operated by a local water utility. <p>Construction of pipeline from Brogo to Bega-Tathra</p> <ul style="list-style-type: none"> It was mentioned that this option has been considered for a while by the council. Attendees noted the potential topographic constraint going through the Brogo Pass and mentioned that a north route might have to be considered. Questions were raised about whether the option is necessary as there is considerable storage in the Bega sands and Yellow Pinch Dam. <p>Brogo Dam is reclassified as a town water supply dam</p> <ul style="list-style-type: none"> It was stressed that this option has a lot of issues associated with it. It was stated that taking over a non-profitable operation would not be favourable. It also might be viewed as taking water away from the irrigators by changing ownership. Council does not support this option if it involves transfer of the dam's ownership to council. <p>Construct permanent weir at Bega Valley Shire Council off-take</p> <ul style="list-style-type: none"> It was mentioned that this is council's preferred option for managing the last 1,200 ML in Brogo Dam. However, it was stated there could be an issue with managing responsibility for covering the release losses. Additionally, it was stated that a pipeline from Brogo Dam to the offtake would be difficult to construct due to the difficult terrain.

Topic	Comment
Reuse options	<p>A range of reuse options were discussed:</p> <ul style="list-style-type: none"> • It was mentioned that Eurobodalla Shire Council is looking at getting a treatment plant as part of their scheme. Council already recycles treated effluent to three golf courses and multiple recreational facilities in Batemans Bay, Moruya and Tuross Head. • Bega Council mentioned the 10 non-potable reuse schemes across the Bega Valley. Council is planning a survey to consider the appetite for water reuse and the willingness to pay to support the rollout of an expanded reuse scheme. • Concerns were expressed regarding the costs associated with indirect potable reuse. • Concern was raised around public perception of sewage treatment plants and reuse regarding environmental impact. <p>Shoalhaven Water’s Reclaimed Water Management Scheme</p> <ul style="list-style-type: none"> • It was raised that a new reclaimed water scheme should be included as an option in the draft strategy because there is appetite among rural landholders in the area surrounding Milton-Ulladulla for a scheme similar to the reclaimed water management scheme Shoalhaven Water operates around Nowra and Bomaderry. • Shoalhaven Water attendees stated there is now further demand at its existing scheme, with current farms looking for more reuse and new farms and towns looking to connect. It is proposed to build an additional 900 ML storage (in addition to the existing 600 ML).

Topic	Comment
<p>Other draft options and additional ideas discussed</p>	<p>Metering</p> <ul style="list-style-type: none"> It was raised that insufficient/inconsistent metering is an issue in the Bega regulated system. A consolidated, standardised smart metering network was suggested to reduce differences in standards across communities and provide a better picture of how water is moving. It was mentioned that gauges have not been reinstated since the last major flood and that a more permanent structure would be needed. <p>Capacity of Cochrane Dam increased</p> <ul style="list-style-type: none"> It was mentioned that the capacity to enlarge the dam would be affected by the surrounding National Park and electricity costs/market. <p>Catchment-wide programs of instream works, fixing leaky weirs, restoring riparian vegetation</p> <ul style="list-style-type: none"> It was stated that degradation is apparent in the whole catchment, but it was stressed that the Bega River is particularly degraded and that focus is needed on the Bega/Bemboka as farming has degraded the system so highly. <p>Regional desalination for supply augmentation</p> <ul style="list-style-type: none"> It was stressed that more research is first needed to assess if a climate-independent water source is needed and then investigate what this should be. Currently it is believed that in the Bega Valley the level of water security does not warrant a desalination option. <p>Groundwater options</p> <ul style="list-style-type: none"> There was concern that if alluvial water access entitlements increase, Bega Valley Shire's access to groundwater would be negatively impacted. This could undermine the long-term security modelling and planning completed by council. <p>Solar generation</p> <ul style="list-style-type: none"> A suggestion was put forward to align peak water treatment with the constraints or progression of solar technology. Some attendees are keen to encourage solar generation and align it with time of water demand. It was noted that consultants would need to be upskilled to achieve this goal. <p>Protection of intermittently closed and open lakes and lagoons (ICOLLs), Eurobodalla</p> <ul style="list-style-type: none"> In Eurobodalla, the importance of ICOLLs was raised with a caution that those catchments are off limits. It was requested that the draft strategy make it clear that water can't be drawn from these ICOLLs and that these environments need to be protected. <p>Allocation assessment process as part of options</p> <ul style="list-style-type: none"> It was suggested that an assessment process of water allocation be included in the strategy to ensure allocations are managed correctly for the future. <p>Retiring licences</p> <ul style="list-style-type: none"> A suggestion was made to include an option about retiring licences, so allocation could be increased for general security water holders.

All feedback has been considered in developing the Draft South Coast Regional Water Strategy and stakeholders will continue to be engaged

throughout the public exhibition process and the finalisation and implementation of the strategy.

Next steps

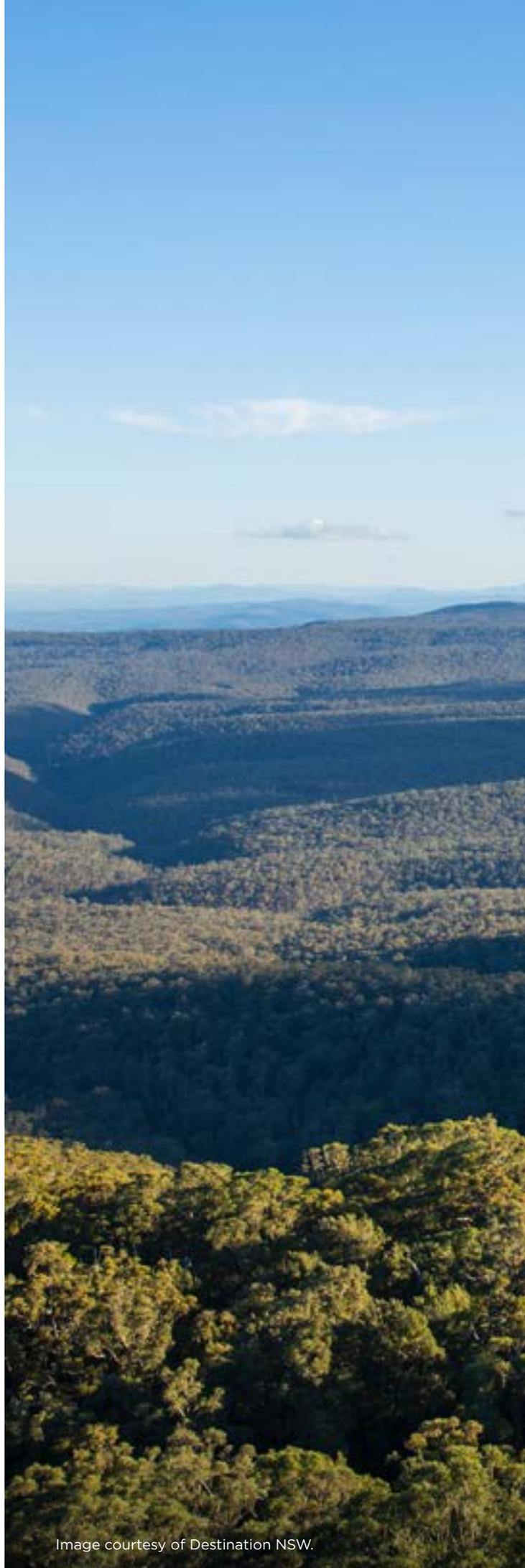
In response to the unfolding COVID-19 pandemic, the Department of Planning, Industry and Environment has redesigned its engagement program for the regional water strategies. The pandemic has changed the way we will engage with our stakeholders and communities, replacing some face-to-face consultation with virtual, online and contactless methods.

In a meeting on 25 March 2020 with Aboriginal peak organisations, the department was advised that face-to-face meetings are the only appropriate way of engaging with Aboriginal people. This means that face-to-face engagement with Aboriginal communities on the South Coast has been delayed.

The department is committed to engaging with the Aboriginal communities on the South Coast as soon as possible to ensure the Aboriginal rights, interests and concerns related to water are heard and included in the final strategy. We will discuss with local Aboriginal communities how we will undertake this engagement in a safe and appropriate fashion while considering pandemic risks.

The Draft South Coast Regional Water Strategy will go on public exhibition from 30 October 2020 for a six-week period. During this period, additional targeted and general public engagement will take place and written submissions will be accepted regarding the strategy.

Following the review of the public exhibition period, further targeted engagement will be undertaken before the final regional water strategy documents are published.





Attachment 2

Glossary

Term	Definition
Access licence	<p>An access licence entitles its holder to take water from a water source in accordance with the licence conditions.</p> <p>Key elements of an access licence are defined in section 56(1) of the NSW <i>Water Management Act 2000</i> as:</p> <ul style="list-style-type: none"> (a) <i>specified shares in the available water within a specified water management area or from a specified water source (the share component), and</i> (b) <i>authorisation to take water:</i> <ul style="list-style-type: none"> (i) <i>at specified times, at specified rates or in specified circumstances, or in any combination of these, and</i> (ii) <i>in specified areas or from specified locations (the extraction component).</i> <p>An access licence may also be referred to as a water access licence or a WAL.</p>
Acid sulfate soils	<p>Soils that are saturated with water and contain microscopic crystals of iron sulfide materials. Acid sulfate soils are harmless when undisturbed, if dug up or drained they come into contact with oxygen and the iron sulfide crystals oxidise. This turns them into sulfuric acid, which can cause damage to the environment and structures.</p>
Allocation	<p>The specific volume of water licence holders can access. The amount of water allocated to licence holders varies from year to year based on the type of licence, size of their individual entitlement, dam storage levels, river flows and catchment conditions.</p>
Aquifer	<p>Geological structure or formation, or landfill, that can hold water.</p>
Basic landholder rights	<p>Where landholders can take water without a water licence or approval under section 52, 53 and 55 of the NSW <i>Water Management Act 2000</i>.</p> <p>There are three types of basic landholder rights under the NSW <i>Water Management Act 2000</i>:</p> <ul style="list-style-type: none"> • domestic and stock rights—where water can be taken for domestic consumption or stock watering if the landholder’s land has river frontage or is overlying an aquifer • harvestable rights—where landholders can store some water from rainfall runoff in dams • Native Title Rights—anyone with a native title right to water, determined under the <i>Commonwealth’s Native Title Act 1993</i>.
Blackwater event	<p>An event that occurs when flooding washes organic material into waterways where it is decomposed by bacteria, releasing carbon, depleting oxygen levels and giving water a black or tea-coloured appearance. The sudden decrease in oxygen can result in the death of fish and other organisms.</p>
Catchment	<p>A natural drainage area, bounded by sloping ground, hills or mountains from which water flows to a low point. Flows within the catchment contribute to surface water sources as well as to groundwater sources.</p>
Cease-to-pump rule	<p>A requirement in water sharing plans that licence holders stop pumping when the river flow falls below a certain level.</p>

Term	Definition
Climate-independent water source	A source of water that does not depend on rainfall or streamflows for replenishment. Includes seawater desalination and recycled water.
Climate variability	Describes the way key climatic elements, such as temperature, rainfall, evaporation and humidity, depart from the average over time. Variability can be caused by natural or man-made processes.
Cold water pollution	An artificial decrease in the temperature of water in a river. It is usually caused by cold water being released into rivers from large dams during warmer months.
Cultural flows	While the NSW <i>Water Management Act 2000</i> does not define cultural flows, the Murray Lower Darling River Indigenous Nations Echuca Declaration, 2007, defines cultural flows as: 'water entitlements that are legally and beneficially owned by the Nations of a sufficient and adequate quantity and quality to improve the spiritual, cultural, natural, environmental, social and economic conditions of those Nations.'
Direct employment	Refers to employment directly arising from the demand for a specific product or service.
Effluent	Flow leaving a place or process. Sewage effluent refers to the flow leaving a sewage treatment plant. An effluent stream is one that leaves the main river and does not return.
End of system	The last defined point in a catchment where water information can be measured and/or reported.
Entitlement	The exclusive share of the available water that a licence holder can take, subject to allocations.
Environmental asset	Natural features that contribute to the ecosystem of a region.
Environmental water	Water allocated to support environmental outcomes and other public benefits. Environmental water provisions recognise the environmental water requirements (planned environmental water) and are based on environmental, social and economic considerations, including existing user rights.
Evapotranspiration	The combined effect of evaporation and transpiration.
Evaporation	The process by which water or another liquid becomes a gas. Water from land areas, bodies of water and all other moist surfaces is absorbed into the atmosphere as a vapour.
Extraction limit	A limit on the long-term average volume of water that can be extracted from a source.
Fish passage	The free movement of fish up and down rivers and streams.
Floodplain	Flat land bordering a river or stream that is naturally subject to flooding and is made up of alluvium (sand, silt and clay) deposited during floods.
General security licence	A category of water access licence under the NSW <i>Water Management Act 2000</i> . This category of licence forms the bulk of the water access licence entitlement volume in NSW regulated rivers and is a low priority entitlement (i.e. receives water once essential and high security entitlements are met).
Gross regional product	A measure of the market value of all goods and services produced in a region within a period of time. Gross Regional Product is a similar measure to Gross State Product and Gross Domestic Product.

Term	Definition
Gross value added	A measure of the value of goods and services produced in an area, industry or sector of an economy. Gross value added is a similar measure to Gross Regional Product.
Groundwater	Water located beneath the ground in the spaces between sediments and in the fractures of rock formations.
Groundwater-dependent ecosystem	Ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services.
Harvestable rights	Harvestable rights provisions entitle landowners to build a dam or dams of a certain capacity in certain locations to capture a proportion of the rainfall runoff from their land. Landowners can do this without needing a water access licence, water supply work approval or a water use approval.
High flows	Also called bankfull events, these reshape the channel, creating habitats such as pools, bars and benches.
High security licence	A category of water access licenses in regulated rivers implemented under the NSW <i>Water Management Act 2000</i> . Receives a higher priority than general security licences but less priority than essential requirements in the available water determination process. Many high security licences are held by water users that have inflexible water demands, such as those growing permanent plantings and mining companies.
Hydrologic stress	Hydrologic stress is a risk rating measure to report alteration to flows within catchments or sub-catchments. Used in river and catchment assessment, this can assist in priority setting for water management planning in unregulated rivers. The stress measure is based on estimates of current daily water use by proportioning estimates of peak daily water extraction to an estimate of low streamflow in the peak demand month.
Inflows	The amount of water coming into a surface water source or groundwater source.
Intermittently closed and open lakes and lagoons (ICOLLs)	Intermittently closed and open lakes and lagoons (ICOLLs) are coastal lakes and lagoons that alternate between being open or closed to the ocean. ICOLLs are separated from the ocean by a sand beach barrier or berm that forms or breaks down depending on the movement and distribution of sand and sediment by waves, tides, floods and winds.
Joint organisation	An entity formed under the NSW <i>Local Government Act 1993</i> to perform three principal functions in a region: strategic planning and priority setting, intergovernmental collaboration and shared leadership and advocacy. Each joint organisation comprises at least three member councils and aligns with one of the State's strategic growth planning regions.
Local water utilities	Generally, these are council owned and operated utilities that provide water supply and sewerage services to local communities.
Managed aquifer recharge	Intentional recharge of water to aquifers for subsequent use or environmental benefit.
Operational rules	The procedures for managing releases and extractions of water (surface and groundwater) to meet the rules of relevant legislation and policy (e.g. water sharing plans, long term water plans).

Term	Definition
Permanent plantings	Crops that are not replanted after a growing season. These crops generally require more than one growing season to be productive. Examples include grapes, citrus fruits and almond trees. These are different from annual (or broadacre) crops, which are harvested within 12 months of planting and require replanting to produce a new crop.
Recharge	Groundwater recharge is a hydrologic process where water drains downward from surface water to groundwater. Groundwater is recharged naturally by rain, floods and snow melt and to a smaller extent by drainage directly from surface water (such as rivers and lakes).
Recycled water	Water that has been treated to a 'fit-for-purpose' standard for a specific application as per the Australian Guidelines for Water Recycling.
Regulated river	A river system where flow is controlled via one or more major man-made structures (e.g. dams and weirs). For the purposes of the NSW <i>Water Management Act 2000</i> , a regulated river is one that is declared by the Minister to be a regulated river. Within a regulated river system, licence holders can order water which is released from the dam and then taken from the river under their water access licence.
Resilience	Resilient water resources as those that are able to withstand extreme events, such as drought and flood, and/or adapt and respond to changes caused by extreme events.
Riffle habitats	Riffles are short segments of shallow water in a river or stream created by the deposition of rocks and gravel, characterised by fast, turbulent water. The rocky bottom of riffle habitats provides shelter, food deposition and protection from predators.
Riparian	The part of the landscape adjoining rivers and streams that has a direct influence on the water and aquatic ecosystems within them.
Salinity	The concentration of sodium chloride or other dissolved minerals in water.
Stochastic climate datasets	Stochastic climate datasets are extended climate sequences that are synthesised using statistical methods applied to observed data of rainfall and evapotranspiration and can include paleoclimatic data. These extended sequences include a more complete sample of climate variability, part of which describes more severe drought sequences.
Storage	A state-owned dam, weir or other structure which is used to regulated and manage river flows in the catchment. There are also a range of storages owned by local water utilities. Also refers to the water bodies impounded by these structures.
Stormwater	Flow generated from rainfall falling on hard (impervious) surfaces.
Supplementary licence	Where a surplus flow from rain events cannot be captured in storages or weirs, and this water is not needed to meet current demands or commitments, then it is considered surplus to requirements and a period of Supplementary Access is announced. Supplementary Water Access Licence holders can only pump water against these licences during these announced periods. Other categories of licence holders may also pump water during these periods.
Surface water	All water that occurs naturally above ground including rivers, lakes, reservoirs, creeks, wetlands and estuaries.
Synthetic datasets	Data that is artificially created using algorithms and not obtained by direct measurement or generated by actual events.
Transmission losses	Water, from an accounting perspective, that is considered lost. This water has been lost through surface water seeping into the ground or evaporation.

Term	Definition
Transpiration	The process where plants absorb water through their roots and then evaporate the water vapor through pores in their leaves.
Tributary	A smaller river or stream that flows into a larger river or stream. Usually a number of smaller tributaries merge to form a river.
Unregulated river	<p>These are rivers or streams that are not fully controlled by releases from a dam or through the use of weirs and gated structures. However, in some catchments there are town water supply dams that control flows downstream.</p> <p>Water users on unregulated rivers are reliant on climatic conditions and rainfall.</p> <p>For the purpose of the NSW <i>Water Management Act 2000</i>, an unregulated river is one that has not been declared by the Minister to be a regulated river.</p>
Wastewater	<p>Water that is an output of or discharged from a particular activity; for example, from domestic, commercial, industrial or agricultural activities.</p> <p>The chemical composition of the wastewater (compared to the source) will be contaminated.</p>
Water reliability	Refers to how often an outcome is achieved. It is often considered to be the likelihood, in percentage of years, of receiving full water allocations by the end of a water year for a licence category. For example, a 60% reliability means that in 60% of years a licence holder can expect to receive 100% of their licensed entitlement by the end of the water year. Other measures of volumetric reliability could also be used; for example, the percentage allocation a licence holder could expect to receive at a particular time of the year as a long-term average. Reliability may also refer to how often an acceptable water quality is available. A reliable water supply gives some clarity to water users and helps them plan to meet their water needs.
Water rights	The legal right of a person to take water from a water source such as a river, stream or groundwater source.
Water security	Water security in the context of regional water strategies refers to the acceptable chance of not having town water supplies fail. This requires community and government to have a shared understanding of what is a 'fail event' (for example, no drinking water or unacceptable water quality) and the level of acceptability they will pay for.
Water sharing plan	A plan made under the NSW <i>Water Management Act 2000</i> which sets out the rules for sharing water between the environment and water users, and between different water users, within whole or part of a water management area or water source.
Water source	<p>Defined under the NSW <i>Water Management Act 2000</i> as 'The whole or any part of one or more rivers, lakes or estuaries, or one or more places where water occurs naturally on or below the surface of the ground and includes the coastal waters of the State.'</p> <p>Individual water sources are more specifically defined in water sharing plans.</p>
Water trade	The process of buying and selling water entitlements and water allocations.
Water year	The annual cycle associated with the natural progression of hydrological seasons: starting with soil moisture recharge and ending with maximum evaporation/transpiration. In NSW (as for all of the southern hemisphere), the water year runs from 1 July to 30 June.
Wetland	<p>Wetlands are areas of land where water covers the soil—all year or just at certain times of the year. They include swamps, marshes, billabongs, lakes, and lagoons.</p> <p>Wetlands may be natural or artificial and the water within a wetland may be static or flowing, fresh, brackish or saline.</p>





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