1 Introduction

1.1 Context and overview

The National performance report 2015–16: urban water utilities (2016 Urban NPR) supports the commitments made by States and Territories under the National Water Initiative (NWI) to report publicly and independently on the performance of water utilities (NWI clauses 75–76).

The 2016 Urban NPR compares the performance of 86 water utilities providing urban water services to over 20 million people across all of Australia. It is the eleventh in the series of national performance reports and is produced by the Bureau of Meteorology, in conjunction with State and Territory governments and the Water Services Association of Australia.

This Part A of the report provides commentary and analysis for key indicators that apply to retail/distribution utilities (the major urban centre analysis in Chapter 2 includes performance data for bulk water suppliers). Part B of the report contains data for the full set of 182 indicators that are reported on by urban water utilities and bulk water suppliers for all reporting years.

The analysis and commentary provides a context for each indicator, discusses changes in reporting methodologies, and highlights trends within and/or between different utility size groups. The utilities are grouped according to their number of connections (see 'Common abbreviations and explanatory notes').

The commentary and analysis contained in this report is not intended to be a comprehensive explanation of every reported indicator. It has been prepared to explain some of the more apparent trends or differences between years and utilities. Much of the information is sourced from publicly available documents, such as annual reports, regulatory decisions, and the utilities' websites.

1.2 Reporting

The 86 urban water service providers that have contributed data for the 2016 Urban NPR are listed in Appendix C. A summary of utility type by jurisdiction is shown in Table 1.1.

The 2016 Urban NPR includes changes to utilities in New South Wales due to the mergers of councils. This resulted in Gosford City Council, Wyong Shire Council, Dubbo City Council, and Queanbeyan City Council being removed from the 2016 Urban NPR and being replaced with the three new amalgamated water utilities: Central Coast Council, Dubbo Regional Council, and Queanbeyan–Palerang Regional Council.

The 86 urban water service providers included in this report are comprised of 79 water utilities and councils (collectively referred to as utilities) and 7 bulk water suppliers. Of the 79 utilities, 70 provide both reticulated water supply and sewerage services. The remaining utilities provide only water supply or sewerage services. In summary the breakdown is:

- water supply and sewerage: 70 utilities
- water supply only: 5 utilities
- sewerage only: 4 utilities
- bulk water: 7 suppliers.

Table 1.1 Utilities reporting in the 2016 Urban NPR by size group and jurisdiction

Jurisdiction	Bulk utility	100,000+	50,000–100,000	20,000–50,000	10,000–20,000	Total
Australian Capital Territory	0	1	0	0	0	1
New South Wales	4	3	0	12	12	31
Northern Territory	0	0	1	0	1	2
Queensland	2	4	3	7	6	22
South Australia	0	1	0	0	0	1
Tasmania	0	1	0	0	0	1
Victoria	1	4	5	5	2	17
Western Australia	0	1	0	1	9	11
Total	**7**	**15**	**9**	**25**	**30**	**86**

1.3 Locations of utilities

The administrative boundaries of all utilities reporting data for the 2016 Urban NPR are shown in Figure 1.1. Further details about the utilities are available from their respective websites.

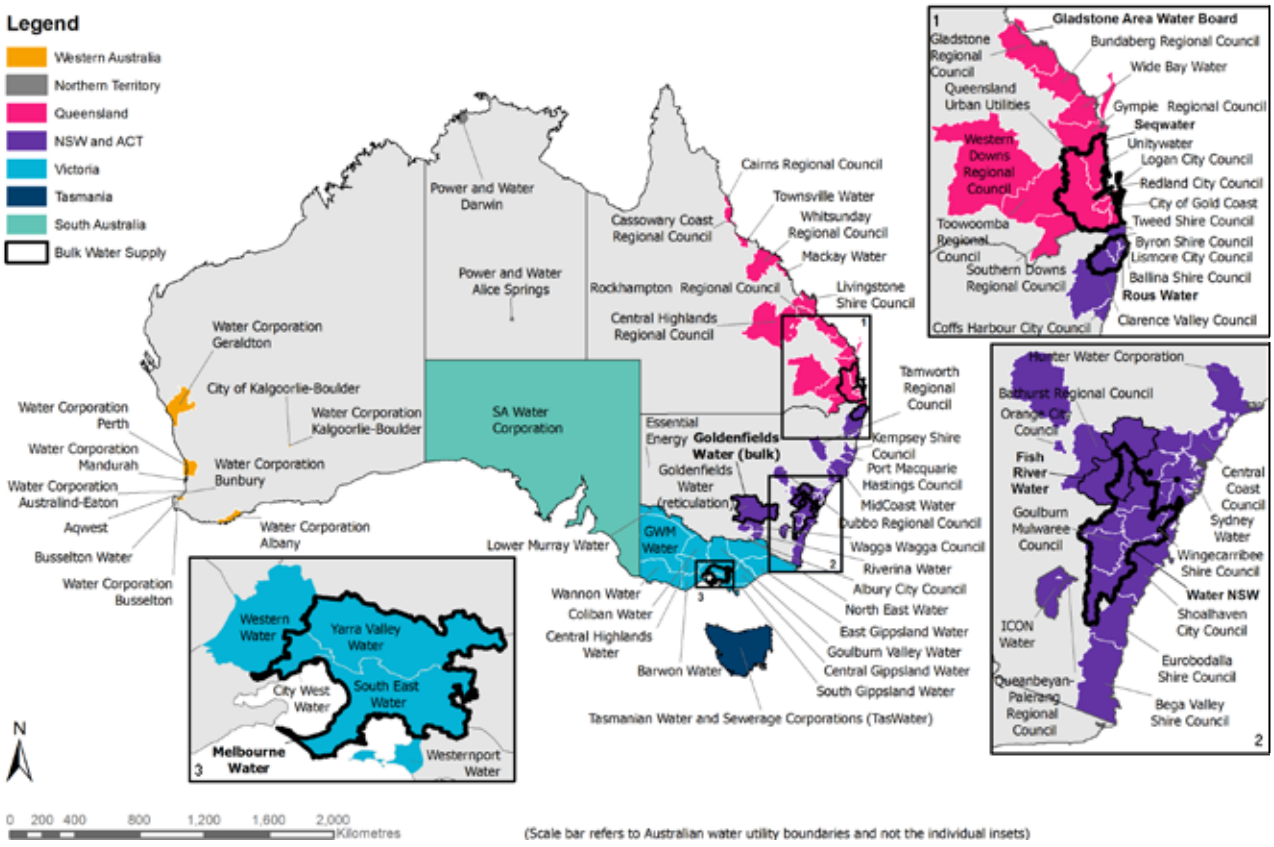

Figure 1.1 Organisational boundaries of utilities reporting to the 2016 Urban NPR

1.4 Key drivers

This section discusses some of the key drivers of the water utility performance presented in the 2016 Urban NPR. Rainfall, temperature, utility size, and sources of water are discussed. Many other factors that also affect performance, including network density, soil types, the age and condition of infrastructure, and government policy and regulation, are not discussed.

1.4.1 Rainfall

Rainfall can affect the performance results of utilities in many ways. These include:

- Significant droughts with prolonged periods of low rainfall can stress urban water supply systems. Depending on the severity of the drought, the security of the system, and the availability of climate–independent water sources (such as desalination or recycled water), the utility may need to impose water restrictions in order to conserve water and assure continuity of the water supply.
- Wet or dry conditions can affect demand for outdoor watering, resulting in a change in urban water and recycled water supplied to residents, councils, and golf courses (indicators W12 and W26 relate to residential water supplied and recycled water). Changes in water consumption affect the revenue collected by water utilities, their profitability, and the strength of their water-usage pricing signal.
- Wet or dry conditions can also affect decisions about which water sources to use (W1–W7). For example, persistent dry conditions can trigger thresholds for production from desalination plants or for the use of particular groundwater or recycled water sources, affecting the operating costs of utilities (F11, F12, F13).
- Increased rainfall can result in infiltration of water into sewer systems. This can increase the volume of sewage to be pumped and treated, increasing the operating costs of utilities (F12, F13) and also greenhouse gas emissions from sewage (E12). Additional rainfall and sewer infiltration can also result in additional sewer overflows. This is especially the case during heavy rainfall.
- Extreme wet or dry conditions can cause expansion and shrinking of reactive clay soils in some parts of Australia, resulting in ground movements that can cause an increase in water or sewer main breaks (A8, A14). This is especially the case when conditions fluctuate rapidly from wet to dry or vice versa. In periods of more even rainfall, the soils maintain more even moisture levels, resulting in less ground movement.

Figure 1.2 (p.12) shows how rainfall has varied from the long-term average across Australia over the past eight years: white shows ‘average’; blue shows ‘above average’; and red shows ‘below average’ rainfall.

Winter 2015

Rainfall was below average across the country during winter 2015, with an area-average rainfall of 53.6 mm for the country. All States except for New South Wales recorded below-average rainfall. The highest area-average rainfall in the season was recorded in Tasmania (369.0 mm). The Northern Territory experienced the driest winter, with area-average rainfall of 13.6 mm. This was also the highest departure from the average (–26 per cent) relative to the long-term average (1961–1990).

The southwestern part of the country recorded very-much-below-average winter rainfall, as did southeastern South Australia, all of Victoria except Gippsland, most of Tasmania, and along the east coast between Sydney and southeast Queensland. Southwest Western Australia, southeast South Australia, and western Victoria continued a long run of drier-than-average months, recording below-average rainfall in each month of winter.

Away from the southwest, southern Western Australia reported very-much-above-average rainfall, as did much of New South Wales inland of the Great Dividing Range and adjacent to part of South Australia, coastal southeast New South Wales, and far East Gippsland in Victoria.

Although seasonally dry, moderate rainfall totals for winter were reported for the eastern Top End, Barkly district of the Northern Territory, and parts of the North Tropical Coast of Queensland and Cape York Peninsula.

Spring 2015

Rainfall was below average across the country during spring 2015, with an area-average rainfall of 51.2 mm for the country. The State averages for Tasmania and Victoria were particularly low with departures from average relative to the long-term average (1961–1990) of –59 per cent and –47 per cent respectively.

Spring rainfall was below to very-much-below average for the South West Land Division and South Coastal districts of Western Australia, western and southeastern South Australia, all of Victoria except Gippsland, all of Tasmania, parts of southeastern and western New South Wales, large parts of Queensland, the south of the Northern Territory, and the Top End. Rainfall was in the lowest 10 per cent of historical observations (decile 1—very-much-below average) for west of the South West Land Division (Western Australia), southeast South Australia, most of Victoria except along the northern border extending to South Gippsland, areas of the Top End, and a part of the southwestern Alice Springs district. A number of sites in Victoria and Tasmania received their lowest spring rainfall on record.

Above-average rainfall was recorded for much of the northern half of Western Australia, extending just into the central western Northern Territory, some small pockets of the east coast between southeast Queensland and the Mid North Coast of New South Wales, and also for some very small areas of Queensland, New South Wales, and southeast Western Australia.

Summer 2015–16

There was close to average rainfall across the country during summer 2015–16, with an area-average rainfall of 203.3 mm for the country. All States except for South Australia and the Northern Territory recorded below-average rainfall. The highest area-average rainfall in the season was recorded in the Northern Territory (366.5 mm). This was also the highest departure from the average (+16 per cent) relative to the long-term average (1961–1990) for the States and Territories. South Australia experienced the driest summer, with area-average rainfall of 66.2 mm, a +6 per cent departure from the long-term average.

The southwestern part of the country recorded very-much-above-average summer rainfall, as did parts of southeastern interior Western Australia, the central eastern part of Northern Territory, and the northeastern regions of South Australia.

January rainfall resulted in above-average rainfall for the season for the Hunter District of New South Wales and parts of north and east Tasmania which experienced extreme rainfall in the last days of the month.

The driest regions, where very much below average to below average rainfall was recorded over the summer were the central region of the northern Pastoral Districts of South Australia, central areas of the Upper Western District of New South Wales, part of tropical Queensland, and the Top End.

Autumn 2016

There was close to average rainfall across the country during autumn 2016, with an area-average rainfall of 121.2 mm for the country, although there was considerable variation across regions. The highest area-average rainfall in the season was recorded in Tasmania (405.9 mm), a +19 per cent departure from the average relative to the long term (1961–1990) average. South Australia was the driest region for the season, with area-average rainfall of 95.1 mm, continuing on from the same relative position in the summer.

Rainfall was above average in South Australia, Tasmania, and Western Australia, while Queensland, New South Wales, Victoria and the Northern Territory were drier than normal.

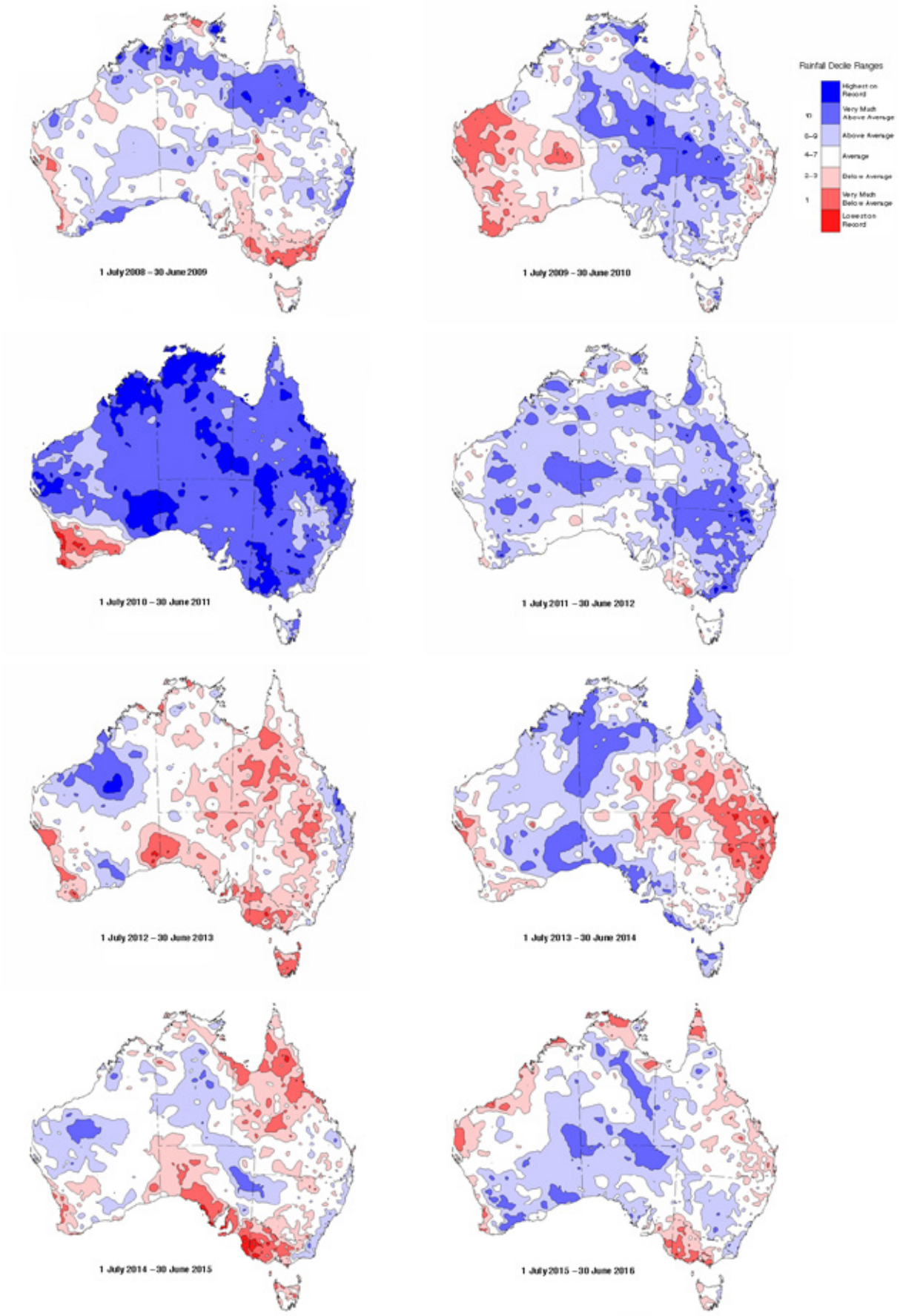

Figure 1.2 Australian 12-month rainfall deciles, 2008–09 to 2015–16. Decile 1 means the lowest 10 per cent of records, decile 2 the next lowest 10 per cent, and so on, up to decile 10, the highest 10 per cent of records.

1.4.2 Temperature

There are many relationships between temperature and the performance of utilities. These include:

- *The relationship between demand and temperature in particular residential and non-residential outdoor demand*. Increased temperature, in particular prolonged periods above long-term averages, can result in increased potable and recycled water supply to residents, councils, and golf courses (indicators W12, W26 and W27 relate to residential water supplied and recycled water). Changes in water consumption affect the revenue collected by water utilities, their profitability (F3, F24), and the strength of their water-usage pricing signal (F4).
- *The relationship between hot weather and an increased risk of bushfires*. This risk can result in the deployment of resources to protect water supply catchments and mitigate the impacts of a bushfire should one occur. Such deployments can affect the operating expenditure of a utility (F11, F12, F13), in particular if responding to an actual bushfire event. In addition, temporary water restrictions that ensure the availability of supply to meet firefighting requirements can be implemented during extreme fire weather. Such restrictions can impact on the volume of water supplied by a utility and in turn affect its operating cost and revenue. Should a catchment be burnt, this can impact on water supply due to water quality issues that may require the storage to be taken off-line for some time.
- *That extended periods of heat or cold can impact on the quality of water sources and supplies and therefore affect decisions about which water sources are to be used (W1–W7) and the level of the treatment required*. For example, a heatwave contributes to the decline in dissolved oxygen levels within a waterbody and can trigger the need to supply water from an alternative source or increase the cost of treatment, in turn affecting the operating costs of utilities (F11, F12, F13).
- *The relationship between temperature and the quality of treated water*. In particular, biological processes are sensitive to extremes of heat or cold as well as rapid fluctuations in temperature. Such events can have important consequences for the quality of water supplied (H indicators) and the operational costs of a utility (F11, F12, F13).
- *Extended hot conditions give rise to dry soil conditions*. Consequently, many plant species will seek out moisture, and their roots can enter the sewer system causing blockages and/or breaks (A14, A15) as well as increasing water main breaks (A8).

Winter 2015

Winter 2015 was the equal eighth warmest on record for Australia. For Western Australia, maximum average temperatures were the second highest behind the record set in 1996.

Each State and Territory recorded a positive temperature anomaly, that is, an increase in temperature from the long-term average (1961–1990), except for Victoria and Tasmania. Tasmania recorded its tenth coolest winter on record and the coolest since 1995, reflecting cooler than average days for much of the southeast.

Spring 2015

Spring 2015 was the second warmest on record with every State and Territory recording average temperatures that ranked in the top eight warmest springs on record.

For Western Australia and Victoria, average temperatures for spring were the warmest on record while Tasmania recorded its second warmest spring. A number of stations in the southeastern States and Western Australia observed record-high average temperatures for the season.

Summer 2015–16

Summer was very warm for much of Australia, with very-much-above average temperatures across much of coastal northern Australia, throughout inland western Queensland and New South Wales, almost all of Victoria, all of Tasmania and much of southern and eastern South Australia.

Each State and Territory recorded a positive temperature anomaly from the long-term average (1961–1990).

Autumn 2016

Autumn 2016 was Australia's warmest on record. All States and the Northern Territory recorded average temperatures that ranked in the top five warmest autumns on record, with records set for Queensland, New South Wales, Victoria, and the Northern Territory. Average temperatures were highest on record for almost all of the eastern mainland States, as well as northern and central parts of the Northern Territory, northwest Western Australia, and southern Tasmania. In total, around half the country experienced its warmest autumn on record.

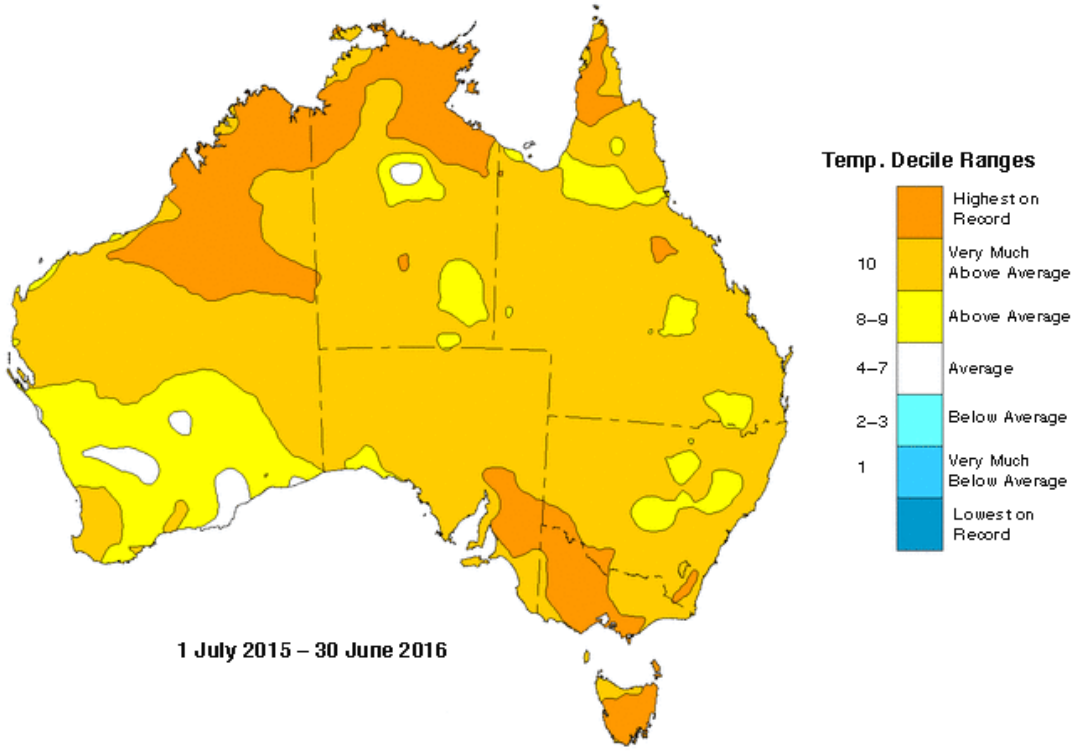

Figure 1.3 Australian 12-month maximum temperature deciles for 2015–16. Decile 1 means the lowest 10 per cent of records, decile 2 the next lowest 10 per cent, and so on, up to decile 10, the highest 10 per cent of records.

Figure 1.3 shows the annual maximum temperature deciles for 2015–16, indicating largely above-average to very-much-above-average temperatures across the majority of the country, with highest-on-record maximum temperatures decile observed in the southeast and northwest regions.

2016 was Australia's fourth warmest year on record. This is consistent with general trends of warming over recent years, with seven of Australia's ten warmest years on record having occurred in the twelve years since 2005. Only one cooler-than-average year has occurred in the past decade (2011) and the 11-year average temperature for 2006–2016 was the second highest on record at 0.56 °C above average.

A number of heatwaves and warm spells, important because of their impacts on water use, were experienced across Australia, in 2015–16. Most notable were an early season heatwave in October which affected nearly all of southern Australia, extreme December heat across much of southeast Australia, and a prolonged heatwave affecting much of the country during late February and early March. The latter part of this heatwave contributed to Australia's warmest March and warmest autumn on record.

1.5 Utility size

While many factors influence performance, there is a relationship between the size of the utility's customer base (in terms of the number of connections) and its performance on a number of indicators. This relationship may be causal, coincidental, or due to a related matter (for example, larger utilities are subject to price regulation while many smaller utilities are not).

1.6 Sources of water

The sources of water used by a utility and the geographical relationship between the source and the urban centre it supplies are two important drivers of performance. The combination and interaction of these drivers serve to create widely varying engineering, operational, and social challenges for each utility across the country. The sources of water available to a utility are an important driver of a number of key performance indicators. For example, the cost of treating water to an acceptable standard and supplying it to users affect the revenue collected by water utilities, their profitability (F3, F24), and the strength of their water-usage pricing signal (F4).

Traditionally, Australians have relied on surface and, to a lesser extent, groundwater sources to meet their urban consumptive needs. Increased demand driven by factors such as population growth and changes to the reliability of existing sources (predominantly driven by water quality and climatic variability) have resulted in a need to further develop water supply sources to ensure supply is maintained. Financial, environmental, and social considerations mean a reduced number of opportunities exist to develop more of these traditional supply sources. As a result, utilities and bulk water suppliers across the country are developing non-traditional (alternative) supply sources such as desalination and recycling, while continuing to explore options for stormwater and rainwater harvesting.

This diversification has important consequences for the performance of urban water utilities. It impacts upon how much it costs to treat water to an acceptable standard and supply multiple water types to end-users while meeting regulatory requirements.

For example, water from a storage in a protected (or 'closed') catchment is typically of a higher quality than that of an 'open' catchment and therefore requires less treatment, hence reducing the cost of supply. Groundwater sources can also vary significantly. The type and depth of an aquifer as well as the quality of the water it contains both have a significant impact on the extraction and treatment of the water. Urban water users supplied from recycled sources typically require a dual-pipe supply system to separate the recycled water from potable water and thereby incur a greater infrastructure cost.

Figure 1.4a and b shows the breakdown of sourced water for each State and Territory for utilities reporting in a given year. These charts show all results for all reporting utilities for each year. Therefore, care should be taken when comparing the total source water volumes between years. Additionally, differing interpretations of the definition of water sourced from recycling (W4) have most likely led to the under-reporting of these volumes. By definition, W4 only includes the volume of recycled water supplied that has been directly substituted for potable supply; that is, had the recycled water not been available potable water would have been used to meet the demand. Because of the observed issues in interpreting this definition the total volume of recycled water supplied (W26) is preferred and will replace W4 in future Urban NPR reporting. By way of comparison, in this reporting year the national total volume against Indicator W4 was 139,063 ML while the total volume against Indicator W26 was 194,478 ML, the bulk of which was for agricultural irrigation.

The charts show the following:

- Water sourced from surface water (W1), from rivers, streams, and dams, is the dominant water source in all States and Territories except Western Australia, where most of the water supplied is sourced from groundwater (W2).
- The importance of desalination (W3.1) as a reliable source of water continues to grow for Western Australia, which has shown an increase to 138,645 ML since 2014–15 due to the constraints on traditional water sources. This represents 41% of Western Australia's total water source. South Australia, which started using desalination water in 2011–12, has not been as reliant on it in 2015–16, reporting only 7,774 ML (3% of total water sourced). This is because South Australia had an increase in the availability of surface water within the year which reduced its reliance on desalination.
- Desalination in other States remains minimal, with plants in New South Wales, Victoria and Queensland operating in maintenance or 'stand-by' modes.

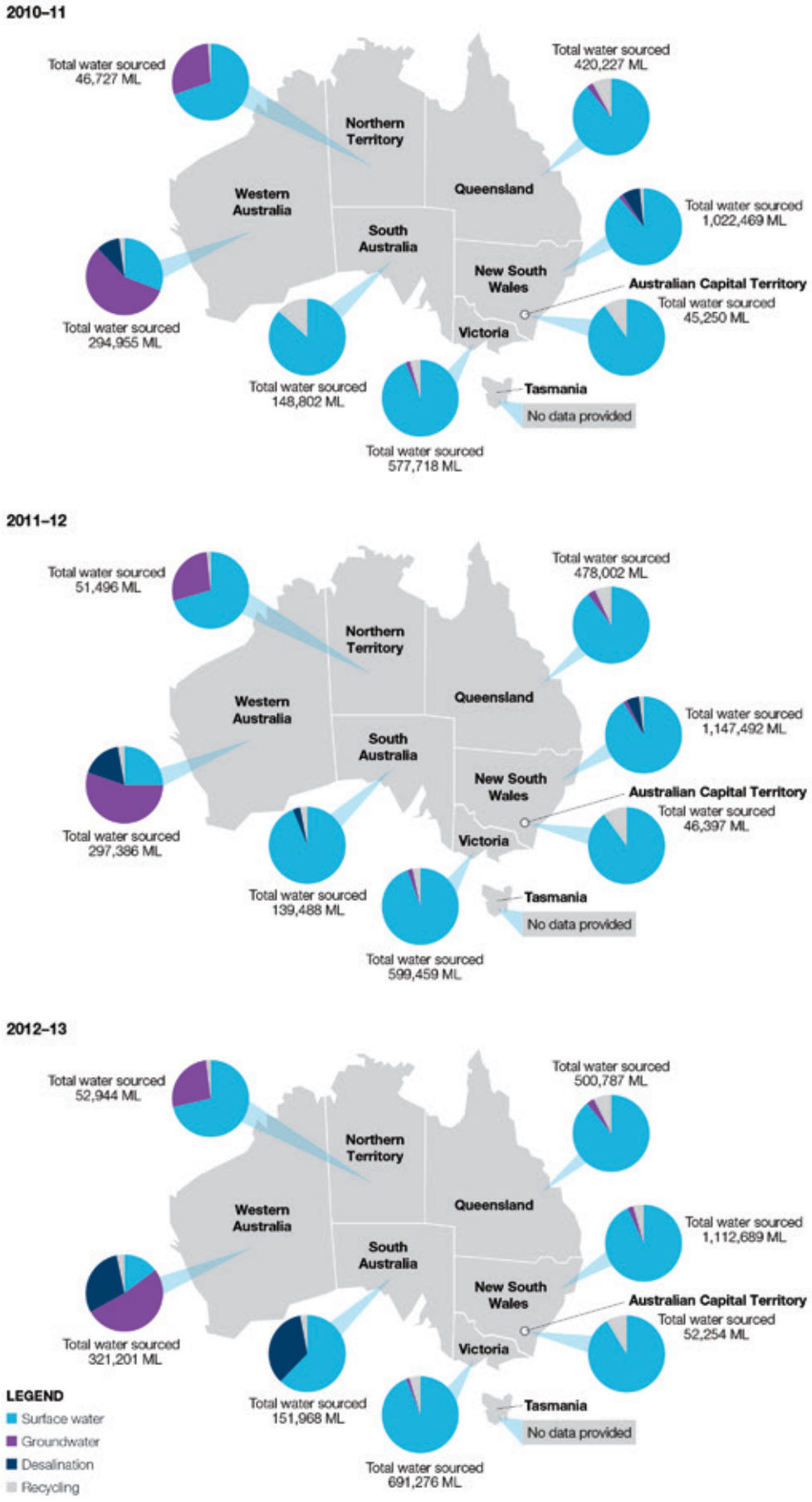

Figure 1.4a Water source breakdown (W1, W2, W3.1, W4) in each State and Territory, 2010–11 to 2012–13

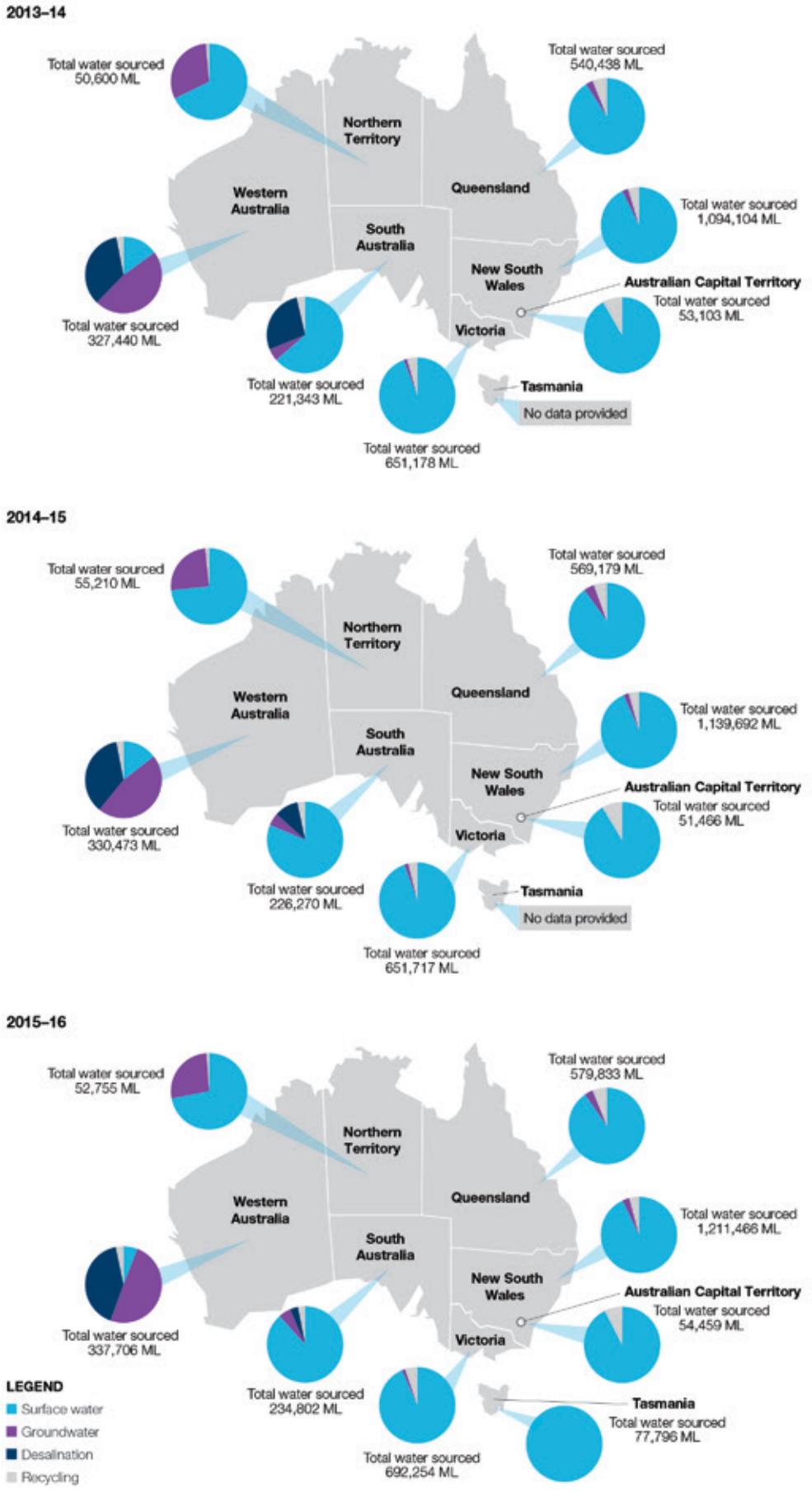

Figure 1.4b Water source breakdown (W1, W2, W3.1, W4) in each State and Territory, 2013–14 to 2015–16