



Closing the water gap

Water, sanitation and hygiene for Aboriginal
and Torres Strait Islander Communities



Clean water is critical to Closing the Gap in health outcomes for Aboriginal and Torres Strait Islander people.

Access to secure, reliable and safe drinking water is essential to human health and well-being and is recognised by the United Nations as a human right. Many Aboriginal and Torres Strait Islander communities have inadequate drinking water, sanitation, and hygiene (WASH) accessibility. This explainer outlines certain approaches that can be made to protect against water inequalities in remote Aboriginal and Torres Strait Islander communities. These issues sit alongside other challenges such as the need to improve urban water resilience— however, this sits outside the scope of this explainer.

Australia's national water quality statistics exclude water service providers with less than 10,000 connections (WSAA 2022, pg. 41), meaning that approximately 8% of the Australian population, or around two million people, fall outside of reporting. There are more than 1,200 remote communities across Australia (WSAA 2022, pg. 32). Many of these communities experience significant and ongoing challenges related to adequate and safe drinking water supply— areas of concern include water supply security, quality, and asset maintenance and reliability.

Water quality issues are long-term, persistent and, in some cases, getting worse in remote communities. There have been numerous publications and public commentary on this issue, however poor water quality in remote communities is persisting (Beal et al., 2020; Lansbury et al., 2016; Moggridge et al., 2022). Implementing a long-term solution to these water issues is often challenging during relatively short-term research funding cycles and political leadership roles (Beal et al., 2020).

Some communities have experienced contamination from nearby agricultural and mining operations, including uranium, arsenic, fluoride, nitrate, manganese, iron, and microbial contamination, that exceed the thresholds set by the Australian Drinking Water Guidelines, causing health impacts such as kidney inflammation which requires specialist medical treatment (Balasooriya et al., 2023). Access to dialysis is extremely challenging for people living in remote areas, usually necessitating hundreds of kilometres of travel. This schedule is difficult to maintain and often leaves individuals without the treatment they need (Butler, 2023). Some progress has been made, with the Australian Government delivering new renal dialysis units in six remote locations (of Australia's more than 1,200 remote communities) in South Australia, Western Australia and the Northern Territory (Butler, 2023; WSAA, 2022, pg. 32).

Remote communities can have poorly maintained bores or groundwater impacted by livestock such as cattle, causing more immediate microbial risk from pathogens (e.g. *Escherichia coli* and *Naegleria*) (Balasooriya et al., 2023). Australia is the only developed nation with endemic Trachoma eye infections (caused by infection with the bacterium *Chlamydia trachomatis*), resulting from poor WASH principles such as poor water quality (Balasooriya et al., 2023).

Chemicals from farming (such as pesticides) and mining activities also contribute to polluted water. High levels of magnesium and calcium block pipes and other water hardware in housing. This leads to poorer-tasting water which may be a factor in the higher consumption in remote communities of unhealthy alternatives. A study of over 900 Aboriginal and Torres Strait Islander children showed that sugar-sweetened beverage consumption was significantly higher in children living in remote areas (62.8 %), compared to those in major cities (36.3 %) (Thurber et al., 2020).



KEY TAKEAWAYS

Mineral, chemical and microbial contamination exceeding safe thresholds set by the Australian Drinking Water Guidelines for prolonged periods are causing chronic health impacts in Aboriginal and Torres Strait Islander communities.

Remote communities lack baseline data on water quality, and many are not able to access regular testing to know if they meet the drinking water guidelines.

Issues with poor water, sanitation, and hygiene (WASH) in Aboriginal and Torres Strait Islander communities have lasted for decades, and have been compounded by short-term research funding cycles and political leadership roles.

Contributors to water pollution, such as mining and agriculture industries, need to be held accountable to reduce water pollution issues.

Greater communication is needed between council staff, water treatment plant operators, and local community champions to adequately address poor water quality issues in remote Aboriginal and Torres Strait Islander communities.

More fit-for-context water treatment technologies are needed, such as modular water treatment systems that are designed for poor water quality (e.g. high salinity, low pH) found in remote communities.



WATER SECURITY IN ABORIGINAL AND TORRES STRAIT ISLANDER COMMUNITIES

Conventional and advanced water supply systems in Australia have generally been developed for large cities. These systems have very high capital and operating costs, require a regular supply of chemicals, and need daily intervention by experienced and well-trained operators. They are often not economically viable solutions for replication across Australia's hundreds of remote communities, with more stringent regulations required to ensure clean water for all. Challenges such as economies of scale, logistics, long distances, etc. prevent the transfer of innovation from urban systems to remote systems. Further regulation is also needed around holding contributors to water pollution (such as from mining and agriculture industries) to account— taking a proactive and reactive approach to water pollution issues.



Agencies such as water authorities and councils in charge of operating small remote water supply systems face many challenges associated with the delivery and maintenance of water infrastructure. These challenges include long distances, high transportation costs, a lack of qualified personnel (both technical and cultural understanding), slow emergency response, and a lack of frequent preventative maintenance. A 2021 audit found that a Western Australian government agency providing water services to remote communities did not conduct routine drinking water quality testing in 51 small remote communities (Pope et al., 2021; Wyrwoll et al., 2022).

The supply of services is mostly commercially unviable and requires considerable subsidy across the customer base. Many communities experience maintenance delays and a lack of customer service, compounding their water supply issues (Balasooriya et al., 2023). Challenges with water service supply are not new and are likely to increase without intervention.

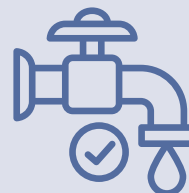
Conditions caused by climate change are placing additional pressure on the already stretched reliability of water supplies. Climate change projections indicate that regional and remote areas are likely to be severely impacted by longer, more frequent, and more extreme drought, leading to less water, extreme fluctuation in water quality and greater uncertainty. As freshwater becomes contaminated with salt during sea level increases, natural freshwater wells are impacted— this is particularly an issue for some Torres Strait Islander communities (Moggridge et al., 2022).

Collaboration and accountability to improve essential water services to Aboriginal and Torres Strait Islander communities

Understanding the specific water needs and capacity of any Aboriginal and Torres Strait Islander community is a crucial first step in understanding the status of water quality followed by designing, delivering, and maintaining improved water services— this means early empowerment and collaboration with the community and local contacts who are knowledgeable about water supply issues in remote communities. Currently, Government, industry and water suppliers are not appropriately briefed on the water needs and practices on a cultural level (Moggridge et al., 2022). There is the opportunity for the establishment of new Aboriginal and Torres Strait Islander-led and designed operating models to meet the challenge of lifting liveability standards. Baseline data on community water quality is also needed, as many communities do not have regular testing.

From a policy standpoint, numerous sources of information can be consulted in providing clean water to remote communities. These include the National Water Grid Authority (National Water Grid, 2024), Australian Drinking Water Guidelines (NHMRC, 2022), the Sustainable Development Goals (United Nations, 2023) (specifically, Goal 6 about clean water and sanitation), and the National Water Initiative (including the new, proposed National Water Agreement (DCCEEW, 2024)).

Traditional education strategies embedded in water values have the potential to increase the effectiveness of water demand management strategies in Aboriginal and Torres Strait Islander communities. Several participants in a study by Beal et al. (2020) of the Kirirri community (located in the traditional lands and seas of the Kaurareg people) supported that the sharing of water stories with friends, family and at school is an effective way for Elders to draw on Traditional Knowledge and improve water literacy within the community. CASE STUDY ONE demonstrates the successful implementation of a program that championed communication between community members, the council, and water operators to deliver improved water services to remote Aboriginal and Torres Strait Islander communities.



CASE STUDY ONE

In 2016, Queensland Health Public Health Units recognised a history of non-compliance with water regulations among some Indigenous Local Governments. A new approach was taken to the drinking water quality issues in the form of a pilot program. The program used a three-step delivery methodology:

STEP 1: Consultation with the Indigenous Local Government, water operators and community/leaders.

STEP 2: An intensive support mentoring program involved a routine week-in/week-out rotation in many cases. This helped cement relationships and trust between Public Health Units and participating communities.

STEP 3: The program transitioned to an ongoing support model, tailored to the specific community. This included undertaking follow-up visits, conducting routine checks, mentorship, and maintaining contact with the community, council staff, water operators and their supervisors.

This information was adapted from Blake et al. (n.d.) and Hall et al. (2021).



Harnessing clean water technology to provide safe and reliable water services to Aboriginal and Torres Strait Islander communities

Conventional modern methods of water treatment are reverse osmosis and electrodialysis reversal. Reverse osmosis uses a semi-permeable membrane to separate water molecules from dissolved salts, organics, bacteria and pyrogens, and works by filtering high concentrate into lower concentrate (Puretec Industrial Water, 2024). Whereas electrodialysis reversal works by using an electric current to drive ions through membranes instead of water (Saltworks, 2018). Both methods have challenges associated with the nature of water needing purification—including wastewater management, sludge disposal, chemical supply for treatment and operator training. Most installed units are automated and not appropriately monitored to enable the local community to undertake maintenance.

There are several opportunities available to address the challenge of remoteness of many Aboriginal and Torres Strait Islander communities, however, more research is needed into location-specific technologies. This includes developing technologies relevant to each community, such as systems that are less reliant on chemical input and complex treatment processes. Potential technologies that might be considered include water treatment systems powered by solar energy with battery backup and developed to recognise the mineral content, contaminants, suspended solids, and/or salinity of inland waters. Remote sensing via satellite could also be used. CASE STUDY TWO below demonstrates a novel modular water purification system that can be applied to remote communities with poor water quality.

CASE STUDY TWO

Aurecon partnered with Ampcontrol to create a novel off-grid water purifying system for use in remote Aboriginal and Torres Strait Islander communities.

The modular purifying system has been demonstrated in the community of Gillen Bore in the Northern Territory, which has bore water with high salinity, water hardness and low pH. The community was relying on the continued transport of potable water from Alice Springs (a 150km round trip).

Gilghi (meaning “water” or “place of water” in the Barkindji language) is a modular system housed in a standard shipping container that can be fully constructed offsite and transported by a single truck to a remote site. Gilghi comprises of photovoltaic (PV) solar, batteries, and a backup diesel generator. It can take in water from various sources, including bores, streams, brackish, and saltwater. The poor-quality water is stored in an inlet tank before it passes through three stages of treatment:

- Media filtration (sand media, carbon and softener)
- Reverse osmosis
- UV disinfection and outlet tank

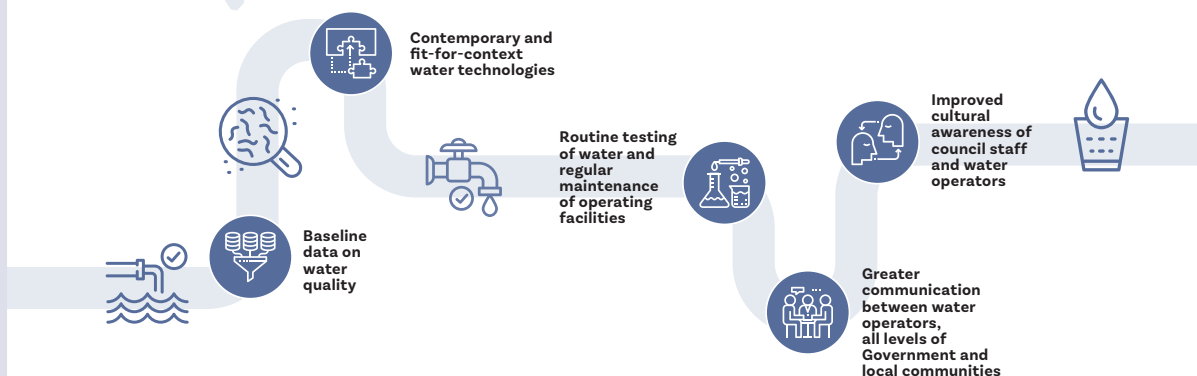
The waste treatment includes an evaporation pond to treat brine from the reverse osmosis process. The unit is capable of producing 28KL a day—equivalent to 46,000 bottles of 600ml water.

This information was adapted from ATSE (2021) and (Aurecon (n.d.)).



CLOSING THE WATER GAP

Water in remote communities



CONCLUSION

Water technologies in remote Aboriginal and Torres Strait Islander communities need to be fit for purpose, place and people. Issues around inadequate water, sanitation, and hygiene (WASH) practices could be better addressed with improved accountability from all levels of Government, industry and water suppliers. Strategies such as routine checks of water facilities, staff mentorship, and maintaining contact with the community, council's staff, water operators and their supervisors, can help address unsatisfactory clean water supplies in remote Aboriginal and Torres Strait Islander communities. Contemporary technologies can also be harnessed to ensure that the objectives of culturally appropriate management, economic participation, design, delivery and maintenance are met.

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Image sources

Cover: Water infrastructure in Punju Njamal, WA. Credit: Eric Vanweydeveld.

Page 2: Borroloola Treatment plant, NT. Credit: Eric Vanweydeveld.

Page 3: Typical elevated water tank, Warralong, WA. Credit: Eric Vanweydeveld.

Page 5: Aerial photo of Pmara Jutunta, NT. Credit: Eric Vanweydeveld.

Page 6: Aurecon's Project Gilghi Australian Finalist in CAETS Communication Prize. Credit: Aurecon

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