

# Submission to the National Productivity Commission Inquiry into National Water Reform

September 2020

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## Appendices

### About The University of Queensland

Ranked in the world's top 50, The University of Queensland (UQ) is one of Australia's leading research and teaching institutions. We strive for excellence through the creation, preservation, transfer and application of knowledge. For more than a century, we have educated and worked with outstanding people to deliver knowledge leadership for a better world.

### About the School of Public Health

The School of Public Health (SPH) is staffed by world leaders in public health education and research who work with passion to address some of the most complex global health challenges. This experience ensures our students benefit from the latest, evidence-based research, and the kind of complex and considered thinking that has cemented our place as a global leader in public health. The SPH is ranked 1st in the Asia Pacific and 18th in the world. We attract more than \$13 million in annual revenue from research grant income, Australian Aid initiatives and consultancy. Our health research is ranked by the Australian Research Council as the best in Australia and amongst the best in the world. Together with our partners and more than 100 Higher Degree Research students from across the globe, we're working in a supportive environment to make an impact on the world's biggest public health challenges. Closer to home, we are committed to improving the Aboriginal and Torres Strait Islander workforce and working with Aboriginal and Torres Strait Islander people on issues they face, including improving food security and the environment people live within to improve health.

## Purpose of this submission

This Submission was prepared for the National Productivity Commission's Inquiry into National Water Reform (Productivity Commission 2020) by researchers at The University of Queensland. During the course of the Inquiry commissioners noted the links between safe water and human health, especially in remote communities and convened a Roundtable chaired by Commissioner Romlie Mokak on household water services. A representative from The University of Queensland, Dr Nina Hall, was invited to participate. This submission reflects the key points delivered verbally during the Roundtable discussion and also draws on contributions from other University of Queensland researchers with a focus and familiarity with remote communities and health.

## Sources of information

This submission was compiled predominantly from three interdisciplinary research projects conducted by The University of Queensland that investigated the quality and health impacts of drinking water and sanitation in remote Australian communities:

- Hall, N., M. Barbosa, D. Currie, A. Dean, B. Head, P. Hill, S. Naylor, S. Reid, L. Selvey and J. Willis (2017). Water, sanitation and hygiene in remote Indigenous Australia: A scan of priorities, [https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/13903/UQ\\_WASH%20scan%20in%20Indig%20Communities-FINAL-LR-2.pdf](https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/13903/UQ_WASH%20scan%20in%20Indig%20Communities-FINAL-LR-2.pdf) (accessed 4/9/20). Brisbane, The University of Queensland and Wateraid Australia (Hall, Barbosa et al. 2017).
- Milligan, B., C. Blake, N. L. Hall, L. Selvey, H. Grodecki, G. Jackson, C. Go-Sam and T. Veronese (2019). Safe and Healthy Drinking Water in Indigenous Local Government Areas Program: Service Delivery Model Prerequisites for Success. QWater Conference. Brisbane, Australian Water Association (Milligan, Blake et al. 2019).
- UQ (2018). Safe Water Summit program, November 29-30, [https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/18218/2018-11-20\\_SWS-Program\\_final-web.pdf](https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/18218/2018-11-20_SWS-Program_final-web.pdf) (accessed 3/9/20). Brisbane, The University of Queensland (UQ 2018).

The above sources were supplemented by two key publications on the status and availability of water and sewage services:

- QPC (2017). Service delivery in remote and discrete Aboriginal and Torres Strait Islander communities: Draft report. Brisbane, Queensland Productivity Commission (QPC 2017).
- DFAT (2018). Voluntary National Review, <http://dfat.gov.au/aid/topics/development-issues/2030-agenda/Pages/voluntary-national-review.aspx#responsibilities> (accessed 3/9/20). Canberra, Department of Foreign Affairs and Trade (DFAT 2018).

Two case studies were identified from which to provide examples of effective efforts:

- NSW Aboriginal Communities' Water and Sewerage Program (NSWALC 2009, Byleveld, Leask et al. 2016); and
- Safe and Healthy Drinking Water in the Torres Strait Islands (Qld Health 2018, Milligan, Blake et al. 2019).

# Context and status of water and sewage services in remote communities

## Living on Country in remote Australia

This submission and the University of Queensland (UQ) body of research was undertaken with the expectation that Aboriginal and Torres Strait Islander peoples should be supported to live on their traditional Country, irrespective of where that Country is located. 'Country' in this context refers to the place traditionally occupied by distinct cultural groups and encompasses land, waterways, all things living - the plants and animals, the spirits and creation stories. Country is central to Aboriginal and Torres Strait Islander Peoples (hereafter respectfully referred to as Indigenous Australians) as it informs identity, history, responsibilities, respect and cultural practices (Hampton and Toombs 2013). Country is described by Traditional Owners as the place - they speak to, visit, care for, worry about, and long for Country; it provides a resource, a spiritual connection, and an identity (Kingsley, Townsend et al. 2009). The many previous Government policies that forcibly removed Aboriginal peoples from their Country has resulted in impacts on their spiritual, psychological and physical health. Living on Country holds significant importance to many Indigenous Australians (Ranzijn, McConnochie et al. 2009, Creamer and Hall 2019, Gray, Biles et al. 2020). Country is intrinsically linked to Aboriginal Peoples health, because if Country is sick, people are sick (Rigby, Rosen et al. 2011). Not having access to secure water makes people sick. It is within this framework that this submission is written, and this submission provides evidence as to the critical importance of ensuring secure water for Aboriginal Peoples living on Country in regional and remote Australia. (AIHW 2018).

## Communities and population in remote Australia

As of the 2016 census, the Aboriginal and Torres Strait Islander population was 727,500, comprising just over three percent of the of the total Australian population (ABS 2018). Of the population, 91% identify as Aboriginal, 5% as Torres Strait Island and 4.1% as both Aboriginal and Torres Strait Islander (ABS 2018). The majority of Indigenous Australians live in urban and regional areas with 20% of the total population (148,700) living in remote and very remote areas, as denoted by the Australian Bureau of Statistics' Standard Geographical Classification Remoteness Structure (ABS 2016). This compares to only 2% of the non-Indigenous population living in remote areas. Indigenous Australians who live in remote areas of Australia live in a diversity of environments across the Country. Commonly termed 'communities', the majority of remotely-located Indigenous peoples live in the jurisdictions of the Northern Territory, Western Australian, Queensland and South Australia (Commonwealth of Australia 2017). Within these communities, housing or infrastructure is owned or managed on a community basis (ABS 2007, QPC 2017). Remote communities collectively encompass discrete Aboriginal communities, outstations or homelands (predominantly in the Northern Territory), town camps (also known as Community Living Areas), and communities on land held as a deed of grant in trust (DOGIT; in Queensland only) (Deloitte 2017, QPC 2017, NT HCD 2018). Governance arrangements differ by jurisdiction.

## Housing, crowding and health in remote communities

High levels of unintended crowding and poor housing conditions in Indigenous communities have been widely documented over several decades, with the challenges most acute in remote communities (Foster and Hall 2019). In addition to the insufficient supply of housing stock and inadequate dwelling conditions, the quality and repair of 'health hardware' has been a major concern. Health hardware refers to the equipment or facilities in the house that are necessary for carrying out health living practices, such as washing people, washing clothes, removal of human waste, and preparing food (Torzillo, Pholeros et al. 2008). The importance of health hardware in

Indigenous communities was emphasised in the seminal ‘UPK report’ on housing and health in the Anangu Pitjantjatjara Yankunytjatjara local government area (‘APY Lands’) (NHC, SAHC et al. 1987).

Large-scale environmental health surveys carried out since 1998 observed that a third or more households lacked functioning facilities for washing people, washing clothes, sanitation, and preparation and storage of food. More recent studies have also since identified a sizable proportion of households in remote communities without functioning taps, showers and toilets (Torzillo, Pholeros et al. 2008, Bailie, McDonald et al. 2011, Hall, Barbosa et al. 2017). These data reflect inadequate maintenance and repair services in combination with breakdown rates exacerbated by crowding, environmental factors and poor construction quality (Browett, Pearce et al. 2012, AIHW 2017). This status has strong relevance to the provision and benefits of effective and safe water and sewage services in remote communities.

### Challenges with essential water services in remote Australia

Provision of safe drinking water can be difficult to provide with security in remote Indigenous communities as they are small, isolated, and challenged by additional issues to secure essential power and water services. This places the burden of access to safe drinking water inequitably on Aboriginal and Torres Strait Islander peoples (Hall, Hoy et al. 2019). Drinking water in these remote locations may be sourced from surface water, rainfall or groundwater. It can be contaminated through three main pathways:

- Chemical contamination from naturally occurring chemicals, such as arsenic, cadmium, nitrates, uranium and barium (Hall, Hoy et al. 2019);
- Biological contamination from microbes in sewage and animal wastes (Hall, Barbosa et al. 2017); and
- Agricultural and industrial pollution from chemicals in farming areas from pesticides, herbicides and fertilisers, and from mining areas, and in defence areas that have leached fire-fighting foam into the groundwater (“PFAS” chemicals) (PWNT 2018).

### Links between safe water and human health

An earlier Productivity Commission report noted that health for many remote Aboriginal communities is compromised with access to clean water and functional sewerage being key areas for action (Productivity Commission 2016). Insufficient access to clean water and non-functioning or blocked sewerage systems can create conditions for transmission of hygiene-related infections, and has been identified as a contributing factor to preventable, hygiene-related skin, eye, and diarrhoeal illnesses among Indigenous communities (Knibbs and Sly D 2014, Ali, Foster et al. 2018).

This situation was detailed in a recent partnership study by UQ and Anyinginyi Health, an Aboriginal community-controlled health organisation in the Barkly region, NT. Clinicians reported skin infections being more common than in urban areas, respiratory infections affecting whole families in crowded houses, and seeing daily cases of eye infections. Clinic data confirmed this situation, with the highest infection diagnoses being skin infections (including boils, scabies and school sores), respiratory infections, and ear, nose and throat infections (especially middle ear infection) (Hall, Memmott et al. 2020). Similar findings have been noted in reviews of health data in remote Indigenous communities (Ali, Foster et al. 2018). This is significant long-term because, if repeated infection occurs, these infections can develop into chronic diseases of limited growth (stunting and wasting), blindness, rheumatic heart disease, renal failure, and anaemia (Bailie and Wayte 2006, DPMC2017, Foster 2017). Therefore, how water- and hygiene-related infectious disease may contribute to chronic diseases warrants further investigation (Hall, Redmond et al. 2020).

The other main cause of drinking water non-potability is chemical contamination. Drinking chemically-contaminated water containing renal toxicants such as cadmium, nitrates and arsenic can impair kidney function and are risk factors for chronic renal disease (Hall, Hoy et al. 2019). Some of these health concerns garnered media coverage in 2017 and late 2018, in addition to media stories featuring declining water security in remote communities:

- ABC (2017). High nitrate levels in some WA water supplies could cause kidney disease, doctor warns (June 28). Sydney, ABC News (ABC 2017).
- ABC (2017). Link between water quality and chronic health problems in WA's remote indigenous communities, RN Breakfast, July 12, Sydney, ABC Radio National (ABC 2017).
- ABC (2018). Authorities say Borroloola drinking water is safe — but many residents don't trust them, ABC News, August 10, Sydney, ABC Broadcasting (ABC 2018).

### Status: Drinking water

Remote communities have sought to improve drinking water treatment and provision, and have attained some achievements. Water providers seek to follow the Australian Drinking Water Guidelines and aim for high quality, safe and potable water. Centralised, state-wide water utilities can provide superior water supply service and maintenance. Meters have been successful in detecting 'hot spots' of extremely high water consumption (e.g. 1500L/person/day) due to a range of factors such as leaks (Hall, Barbosa et al. 2017). However, challenges remain and include monitoring regimes weakened due to the remote location and minimal staff and a high turnover of skilled water and wastewater management staff on-ground in communities. Contamination can occur biologically from microbes and naturally-occurring chemical elements in groundwater (Hall, Barbosa et al. 2017). The hardness of these chemicals and minerals can damage appliance that provide health benefits such as taps, kettles and washing machines (Hall, Barbosa et al. 2017).

Groundwater for drinking may be treated to be safe, but can have an unacceptable taste, odour and colour. This can have implications on consumption, including an increase in the consumption of purchased beverages such as soft drinks (Lee and Lewis 2018, Fehring, Ferguson et al. 2019). High consumption of soft drinks can contribute to high rates of diet-related conditions in these communities including obesity diabetes, cardiovascular disease and some cancers. It can also increase need to purchase costly bottled water, impacting on food security, finances and sustainability (Lee and Ride 2018). Initiatives to shift consumption to affordable chilled water through co-design with community leaders have found options to create environments that support healthy drink consumption (Fehring, Ferguson et al. 2019).

### Status: Sewage management

Sanitation (also known as sewage management and wastewater treatment) has also improved in some communities. Septic tanks have been replaced with centralised wastewater treatment. Wastewater treatment technology is increasingly being selected as 'fit for purpose, fit for place'. State-wide utilities can ensure improved service provision, reduced response time, and cross-subsidised costs. There is an effort to build the capacity of local staff to manage wastewater treatment (Hall, Barbosa et al. 2017). The remaining challenges include 'self-certification' of septic installations in the NT risks non-compliant installations with health risks. Wastewater output monitoring regimes can lack rigour and be irregular. Non-flushable items (e.g. clothing, nappies, feminine hygiene products) can be flushed down the toilet, causing blockages and risking damage to treatment plants due to a lack of waste bins or lack of regular emptying. There can be a lack of ongoing maintenance and increased installations in wastewater treatment facilities (Hall, Barbosa et al. 2017).

## Effective Case Study 1: NSW Aboriginal Communities Water and Sewerage Program

The NSW Aboriginal Communities Water and Sewerage Program is a partnership between the NSW Government and the NSW Aboriginal Land Council (NSWALC). The partnership formed after evidence showed inadequate drinking water quality standards and sanitation infrastructure posed health risks to many discrete Indigenous communities (NSWALC 2009). The purpose of the partnership is to provide joint and ongoing funding for water and sewerage infrastructure operation, maintenance and monitoring in selected former Indigenous missions and reserves across NSW—reaching an initial total population of 6,000 (NSWALC 2009). It was established in 2008 with a \$200 million investment over a 25-year period (NSWALC 2009).

The key aims of this ongoing program are to improve the health and well-being of Indigenous community members through the delivery of safe drinking water and effective sewerage services at an equivalent standard to the broader community. Financial and technical expertise is delivered to the program in partnership with the NSWALC and local councils. Long-term service agreements with local water utilities are negotiated to implement routine maintenance programs, address repair backlogs and undertake emergency works (NSWALC 2009). Risk-based water and management plans have been developed to enable better understanding and control of risks which in turn has led to safer and more sustainable drinking water (Byleveld, Leask et al. 2016).

Regular monitoring and reporting on drinking water quality has been established, and emergency and capital works have been undertaken in many communities (Byleveld, Leask et al. 2016). Regular community engagement associated with the program is carried out by local public health units and through Aboriginal community participation in four-monthly inspections and reviews (Byleveld, Leask et al. 2016). The outcome of this program has been service improvements in 41 communities, and all 61 remote NSW communities now receive water and sewerage services at an increased level (Hall, Barbosa et al. 2017).

## Effective Case study 2: Safe and Healthy Drinking Water in the Torres Strait Islands

In response to many remote island communities in the outer Torres Straits being exposed to risk from unsafe drinking water and interruptions to water services, including multiple *E. coli* detection incidents, Queensland Health's Tropical Public Health Services Unit and Water Unit formed a partnership with the Indigenous local government, the Torres Strait Islands Regional Council (TSIRC). Also involved were the Queensland's Government's agencies responsible for health, water, infrastructure and local government, now known as the Departments of Natural Resources, Energy and Mines and of Local Government, Racing and Multicultural Affairs (Qld Health 2018, Milligan, Blake et al. 2019).

The pilot program, Safe and Healthy Drinking Water, included an audit of existing water treatment and appropriate match with the water supply; upgrades to drinking water treatment infrastructure; tailored competency training in water monitoring and verification of safety; development of tailored standard operating procedures such as instructional videos filmed with the Torres Strait Islander water operators; promotion of the public health importance of water management in the community; and ongoing mentoring and support (onsite and remote) available to water operators. All external agencies were required to undertake cultural competency training prior to engaging with the communities (Qld Health 2018, Milligan, Blake et al. 2019).

As a result of the pilot, the number of microbial drinking water incidents (*E. coli* detection) on participating islands has fallen from 16 incidents in 2016 (pre-pilot) to two incidents in 2018. There is a greater awareness of safe drinking water, and an increased social standing and recognition of the uniformed water operators in their communities (Abey Suriya, Soeters et al. 2019).



Since the pilot's completion and evaluation, the program has been implemented in seven Indigenous community water supply systems across the Northern Peninsula Area of the Australian mainland. The training has been delivered in part by the Torres Strait Islander water operators involved in the pilot program (Hall, Selvey et al. 2018, Milligan, Blake et al. 2019).

### A warming climate can affect water resources and culturally-significant sites

Australia is projected to continue to experience a range of human-induced climate change impacts on the physical environment, including more frequent and severe extreme weather events (Reisinger, Kitching et al. 2014). In turn, these impacts will have both direct and indirect effects on human health (Smith, Woodward et al. 2014). Remote Indigenous communities are highly vulnerable to such physical and health impacts as they are often located in harsh environments, isolated from many services, and the population can be economically disadvantaged and with an existing high burden of chronic and acute disease (Hall and Crosby 2020).

Water-related impacts from climate change in remote areas include impacts on surface water quality and on the speed of recharge of groundwater supplies (Hall and Crosby 2020). In addition to water resource security challenges for basic health and hygiene needs, ancient and natural waterholes may dry up. As many waterholes hold Indigenous creation stories or significant sites, the loss of these could exacerbate sickness from negative impacts on social and emotional wellbeing (Rigby, Rosen et al. 2011). The availability of water supplies also affects the ability to adequately conduct cultural ceremonies, with Indigenous peoples commenting in a climate change workshop that 'water is living for us' and 'cultural ties will disappear if the water goes' (WA Government 2020, p.2).

### Leveraging action

This Inquiry provides a current opportunity under the Water Act 2007 (Cth) to examine Australia's water resources sector through the effectiveness of the National Water Initiative (Productivity Commission 2020). This Inquiry coincides with two other policy settings in which delivery of essential water services is identified and action emphasised:

- The 'refresh' of the National Agreement on Closing The Gap specifically identifies a priority of community infrastructure including 'essential service provision to Aboriginal and Torres Strait Islander communities, including water and sewerage, waste management...' (86 b (i))(Australian Governments and the Coalition of Peaks 2020).
- The Australian Government is a signatory to the United Nations' Sustainable Development Goals (SDGs), including Goal 13 to 'Take urgent action to combat climate change and its impacts' and Goal 6 to 'Ensure availability and sustainable management of water and sanitation for all' (UN 2015). In Australia's first Voluntary National Review of the status of the Goals, it was stated under Goal 6 that 'rural and remote communities in particular may not have the same level of access to water and sanitation services as urban centres. This is particularly the case for remote Aboriginal and Torres Strait Islander communities and can have important flow on effects to health outcomes' (DFAT 2018; p.50).

## Key recommendations

From the research cited in this submission and in line with the ambition of SDG 6, we offer five recommendations, with further details below. We reference the case studies of the NSW Aboriginal Communities' Water and Sewerage Program and the Safe and Healthy Drinking Water in the Torres Strait Islands to provide examples of successful efforts. These recommendations are:

- People factors: support, training, cultural competence
- Cross-agency collaboration: regulators, funders, state and local government
- Technology that is fit for place, purpose, and local people
- Funding that is sufficient and sustainable
- Taking a systems view of view of water and sanitation

### Recommendation 1: People factors: support, training, cultural competence

It is crucial that the on-site water operators in remote communities are appointed from the local population and well supported, have appropriate training on the equipment they operate, and that all external stakeholders engaging with the community have cultural awareness and competence.

This focus was demonstrated in the Safe and Healthy Drinking Water initiative in the Torres Strait Islands. The skills of Torres Strait Islander staff were developed, the staff were mentored in a collegial manner by Queensland Health staff, and the external staff brought an openness, understanding and respect to working on traditional lands of their Torres Strait Islander colleagues (Hall, Selvey et al. 2018, Milligan, Blake et al. 2019).

### Recommendation 2: Cross-agency collaboration: regulators, funders, state and local government

There are many gains in efficiency, skills, understanding and responsibilities through enabling cross-agency and transparent collaboration of water and sewage service delivery by relevant organisations. This includes government departments with responsibility for regulating, funding and monitoring water and sewage, local government and water utilities responsible for delivering the essential services, and local Indigenous community organisations.

The NSW Aboriginal Communities' Water and Sewerage Program displays such collaboration by involving the NSW Government departments responsible for health and water, in partnership with the NSW Aboriginal Land Council. This partnership took several years to establish a working and transparent relationship but is now funded for 25 years (NSWALC 2009, Byleveld, Leask et al. 2016). Similarly, the Safe and Healthy Drinking Water initiative in the Torres Straits involved four state government agencies (responsible for health, water, infrastructure and local government) representing the regulator, funder and monitor of the services, with the local Indigenous council, TSIRC (Qld Health 2018). In the evaluation of the pilot, the government officers described the benefits of this collaboration noting that for adequate drinking water management, one agency 'can't do it alone', and that starting with a common vision and then maintaining an information exchange was crucial (Hall, Selvey et al. 2018).

### Recommendation 3: Technology that is fit for place, purpose, and local people

Government agencies and water utilities are increasingly describing how a ‘one size fits all’ approach to water and sewage treatment is inappropriate for the diversity of water sources and challenges in remote communities. Evaluation of water treatment efforts in remote communities has previously identified how a limited budget can result in compromised infrastructure rather than what was required. For example, chlorine pumps may be low quality, not regularly serviced and too small for the required task, resulting in pump failures and not providing accurate feedback to enable monitoring of chlorine dosing (Hall, Selvey et al. 2018). Furthermore, more advanced technologies may not be as robust, easy to repair or operate or as appropriate in locations with climatic extremes (Hall, Hoy et al. 2019). Instead, water treatment technology specifically selected for each community that is ‘fit for place, purpose and people’ is more appropriate and sustainable (WSAA 2018).

This guidance for tailored water and sewage technologies is reflected in the Safe and Healthy Drinking Water initiative in the Torres Straits. This program audited the existing water treatment technology for appropriate use for the water source and contamination risks on each island, and then upgraded or installed treatment options through engagement with the local water operators. Training was delivered onsite to the water operators, and ongoing support was offered by phone and in-person follow-up visits (Qld Health 2018).

### Recommendation 4: Funding that is sufficient and sustainable

Water and sewage treatment required funding for both the capital expenditure for treatment technology as well as long-term funding for repairs and maintenance and staff support. In Queensland’s 16 Indigenous councils, this funding can be difficult to obtain due to the state legislation prohibiting rates to be raised on Indigenous land held in trust – despite these councils being responsible for managing and delivering a range of essential water, energy and local health services (Ellerman 2002, QPC 2017). Without a rates base, Indigenous councils rely on sporadic government grants (Hall, Selvey et al. 2018).

A recent and positive example to address this absence of sufficient and ongoing funding is a commitment by the Western Australian Government in mid-2020 of \$38.9 million to upgrade and normalise water and wastewater facilities in Aboriginal communities under the 2020 WA Recovery Plan. The intention of this funding is for both capital expenditure as well as essential service delivery, operations and maintenance that is ongoing in at least four remote communities (WA Government 2020).

### Recommendation 5: Taking a systems view of water and sanitation

The delivery of safe water and effective management of sewage is an essential service that is critical to consider beyond the regulatory requirements of delivery to a property boundary. Although monitoring often occurs at this property boundary, health outcomes can be affected by additional behaviours and activities that occur within a property or household. Beyond the property boundary is also important to consider, as the treatment technologies may be unintentionally impacted by the physical setting in which they are situated. Therefore, a systems view of water and sewage services is recommended. This more holistic perspective can assist to bring together the range of responsible agencies and organisations for a coordinated response and maximise health gains (Bartram and Platt 2010, Hall 2019).

An example of this systems understanding can be viewed in the challenges address by the Safe and Healthy Drinking Water initiative in the Torres Straits. Within the property boundary, regular stoppages in mains water delivery had triggered residents to previously install water tanks to temporarily store water for later consumption. This unregulated and unmonitored storage raised the risk of consumption of biologically contaminated water. Outside of the property boundary, previous

water treatment efforts has installed a treated water storage pond. This pond had subsequently attracted migratory birds that roosted on the pond covers and resulted in water contamination by bird faeces. The Safe and Healthy Drinking Water initiative sought to consider this broader 'system' of water collection, treatment, delivery and ultimate consumption to prevent unintended contamination (Hall, Selvey et al. 2018, Milligan, Blake et al. 2019).

## Final words from the lived experience

A dedicated face-to-face Safe Water Summit was held at The University of Queensland in Brisbane in November 2018. It brought together researchers, clinicians and community organisations, biomedical scientists, Aboriginal land councils and medical doctors to discuss the challenges and options for ensuring safe water in remote Indigenous communities (UQ 2018). At the Summit, residents from remote Indigenous communities presented their views and experiences from their lived experience of inadequate and insufficient water and sewage management. Their words provide the closing comment to our submission.

The Indigenous participants from remote communities stated that their water is not safe to drink, and that they have no reasonable or practical alternatives and minimal help:

- One Aboriginal custodian from Katherine, NT, told Summit participants that the levels of PFAS from fire extinguishers were high in their soil and water. Worried locals stopped picking berries or fishing from the river. Despite their protests for action, they said they felt ignored (UQ 2018). Their concerns were based on the 2017 testing of water bores around Katherine's air force training base with raised PFAS levels (NTG 2017).
- In Borroloola, NT, situated near a zinc, lead and silver mine, the community were told by the mining company that the ground (bore) water on the McArthur River was contaminated with lead and manganese. Community representatives told the Summit: '[We were told] we should not drink it, and then they said it was safe and that the high lead had come from our pipes and not the mine ... a monitoring group said that our fish are toxic with lead from the mine, so we stopped fishing and started worrying ... We can't live with this contamination anymore. We need the water to be clean' (UQ 2018).
- In the Kimberley, WA, a traditional owner stated that: 'Our water is contaminated with nitrates ... They say the level is ... too high for babies under three months and pregnant women ... now the whole community (150 people) cart water from this one tap for drinking and cooking. ... We feel fear and we don't know how much damage is being done to us' (UQ 2018).

## Acknowledgements

Thank you to the representatives of the Indigenous, government, utility, NGO and research organisations who contributed time to be interviewed for the research cited here, and for their ongoing contribution to improving water, sanitation and hygiene outcomes for remote Indigenous communities.

## References

- ABC (2017). High nitrate levels in some WA water supplies could cause kidney disease, doctor warns (June 28). Sydney, ABC News.
- ABC (2017). Link between water quality and chronic health problems in WA's remote indigenous communities, RN Breakfast, July 12 <http://www.abc.net.au/radionational/programs/breakfast/link-between-water-quality-and-chronic-health-problems-in-was/8700174> (accessed 26/9/17). Sydney, ABC Radio National.
- ABC (2018). Authorities say Borroloola drinking water is safe — but many residents don't trust them, ABC News, August 10, <https://www.abc.net.au/news/2018-08-10/indigenous-protest-lead-contamination-water-borroloola/10103122> (accessed 11/11/18). Sydney, ABC Broadcasting.
- Abey Suriya, K., S. Soeters, M. Jackson, N. Hall, P. Mukheibir and Beal C. (2019). Safe water and sanitation for all in remote Indigenous Communities: Exploring the roles and opportunities for the water industry (commercial in confidence). Melbourne, Water Services Association of Australia.
- ABS. (2007). "CHAPTER 3 - A PROFILE OF DISCRETE ABORIGINAL AND TORRES STRAIT ISLANDER COMMUNITIES." Housing and Infrastructure in Aboriginal and Torres Strait Islander Communities, Australia, 2006 Retrieved 20 August 2007, 2007, from <https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4710.0Main%20Features42006?opendocument&tabname=Summary&prodno=4710.0&issue=2006&num=&view=>.
- ABS. (2016, 15 March 2018). "Defining Remoteness Areas." 1270.0.55.005 - Australian Statistical Geography Standard (ASGS): Volume 5 - Remoteness Structure, July 2016 Retrieved 16 March, 2018, from <https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/1270.0.55.005Main%20Features15July%202016?opendocument&tabname=Summary&prodno=1270.0.55.005&issue=July%202016&num=&view=>.
- ABS. (2018, 17 September 2018). "Estimates of Aboriginal and Torres Strait Islander Australians, June 2016." Retrieved 31 August, 2018, from <https://www.abs.gov.au/ausstats/abs@.nsf/mf/3238.0.55.001>.
- AIHW (2017). Aboriginal and Torres Strait Islander Health Performance Framework 2017 report: Queensland (Cat. no. IHW 184). Canberra, Australian Institute of Health and Welfare.
- AIHW (2018). Australia's health 2018. Australia's health series. Canberra, Australian Institute of Health and Welfare,; 1-570.
- Ali, S., T. Foster and N. Hall (2018). "The Relationship between Infectious Diseases and Housing Maintenance in Indigenous Australian Households." Int. J. Environ. Res. Public Health **15**(12).
- Ali, S., T. Foster and N. Hall (2018). "The Relationship between Infectious Diseases and Housing Maintenance in Indigenous Australian Households." International Journal of Environmental Research and Public Health **15**(12): 11.
- Australian Governments and the Coalition of Peaks (2020). National Agreement on Closing The Gap. Canberra, Australian Governments and the Coalition of Peaks.
- Baillie, R. S., E. L. McDonald, M. Stevens, S. Guthridge and D. R. Brewster (2011). "Evaluation of an Australian indigenous housing programme: Community level impact on crowding, infrastructure function and hygiene." Journal of Epidemiology and Community Health **65**(5): 432-437.
- Baillie, R. S. and K. J. Wayte (2006). "Housing and health in Indigenous communities: Key issues for housing and health improvement in remote Aboriginal and Torres Strait Islander communities." Australian Journal of Rural Health **14**(5): 178-183.
- Bartram, J. and J. Platt (2010). "How health professionals can leverage health gains from improved water, sanitation and hygiene practices." September 2010 Vol 130 No 5 | Perspectives in Public Health **215** **130**(5): 215-221.
- Browett, H., M. Pearce and E. Willis (2012). "Cost Implications of Hard Water on Health Hardware in Remote Indigenous Communities in the Central Desert Region of Australia." International Indigenous Policy Journal **3**(3).

- Byleveld, P. M., S. D. Leask, L. A. Jarvis, K. J. Wall, W. N. Henderson and J. E. Tickell (2016). "Safe drinking water in regional NSW, Australia." Public Health Research and Practice **26**(2).
- Commonwealth of Australia (2017). *Introducing Competition and Informed User Choice into Human Services: Reforms to Human Services: Productivity Commission Inquiry Report*. Canberra, Productivity Commission.
- Creamer, S. and N. L. Hall (2019). "Receiving essential health services on country: Indigenous Australians, native title and the United Nations Declaration." Public Health <https://doi.org/10.1016/j.puhe.2019.08.024>.
- Deloitte (2017). *Living on the edge: Northern Territory Town Camps review*. Darwin, For the Department of Housing and Community Development, Northern Territory Government.
- Department of the Prime Minister and Cabinet [DPMC] (2017). *Remote Housing Review: A review of the National Partnership Agreement on Remote Indigenous Housing and the Remote Housing Strategy (2008-2018)*. Canberra.
- DFAT (2018). *Voluntary National Review*, <http://dfat.gov.au/aid/topics/development-issues/2030-agenda/Pages/voluntary-national-review.aspx#responsibilities> (accessed 19/3/18). Canberra, Department of Foreign Affairs and Trade.
- Ellerman, Z. (2002). *Making a Difference: Governance and Accountability of Indigenous Councils*. Brisbane, Crime and Misconduct Commission Queensland.
- Fehring, E., M. Ferguson, C. Brown, K. Murtha, C. Laws, K. Cuthbert, K. Thompson, T. Williams, M. Hammond and J. Brimblecombe (2019). "Supporting healthy drink choices in remote Aboriginal and Torres Strait Islander communities: a community-led supportive environment approach." Australian and New Zealand Journal of Public Health **43**(6): 551-557.
- Foster, T. (2017). *Unfinished business: Water, sanitation and hygiene in remote Indigenous communities in Australia's Northern Territory*. Water and Health, October 16-20. Chapel Hill, NC, USA, University of North Carolina.
- Foster, T. and N. L. Hall (2019). "Housing conditions and health in Indigenous Australian communities: current status and recent trends." International Journal of Environmental Health Research.
- Gray, S., B. Biles and J. Biles (2020). *Exploration of history, culture, cultural bias, race and racism. Aboriginal and Torres Strait Islander Peoples' Health and Wellbeing*. B. Biles and J. Biles. Victoria, Australia, Oxford University Press: 27-47.
- Hall, N., M. Barbosa, D. Currie, A. Dean, B. Head, P. Hill, S. Naylor, S. Reid, L. Selvey and J. Willis (2017). *Water, sanitation and hygiene in remote Indigenous Australia: A scan of priorities*, [https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/13903/UQ\\_WASH%20scan%20in%20Indig%20Communities-FINAL-LR-2.pdf](https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/13903/UQ_WASH%20scan%20in%20Indig%20Communities-FINAL-LR-2.pdf) (accessed 12/9/17). Brisbane, The University of Queensland and Wateraid Australia.
- Hall, N. L. (2019). "Challenges of WASH in remote Australian Indigenous communities." Journal of Water, Sanitation and Hygiene for Development **9**(3): 429-437.
- Hall, N. L. and L. Crosby (2020). "Climate change impacts on health in remote Indigenous communities in Australia." International Journal of Environmental Health Research.
- Hall, N. L., W. Hoy and S. Mott (2019). *Groundwater Contamination, Remote Communities and Indigenous Health: Starting a National Conversation*. OzWater 2019. Melbourne, Australian Water Association. **May 7**.
- Hall, N. L., P. Memmott, S. Barnes, A. M. Redmond, C. Go-Sam, D. Nash, P. Frank and P. Simpson (2020). *Pilyii Papulu Purrukaj-ji (Good housing to prevent sickness): A study of housing, crowding and hygiene-related infectious diseases in the Barkly Region, Northern Territory*. Tennant Creek, Northern Territory. , Commissioned from the University of Queensland for Anyinginyi Health Aboriginal Corporation.
- Hall, N. L., A. M. Redmond, P. Memmott and S. Barnes (2020). "Fix housing and you'll reduce risks of coronavirus and other disease in remote Indigenous communities." The Conversation, [theconversation.com](https://theconversation.com) **April 15**.
- Hall, N. L., L. Selvey and C. Go Sam (2018). *Evaluation Report: Safe and Healthy Drinking Water in Indigenous Local Government Areas Pilot – Torres Strait Region (Phase 2) (commercial in confidence)*. Brisbane, Prepared for Health Protection Branch (Water Unit), Queensland Health.
- Hampton, R. and M. Toombs (2013). *Culture, Identity and Indigenous Australian Peoples*. Indigenous Australians and Health: The Wombat in the Room. M. Toombs and R. Hampton. Melbourne, Oxford University Press: 3-27.
- Kingsley, J., M. Townsend, R. Phillips and D. Aldous (2009). "'If the land is healthy ... it makes the people healthy': The relationship between caring for Country and health for the Yorta Yorta Nation, Boonwurrung and Bangerang Tribes." Health & Place **15**(1): 291-299.

- Knibbs, L. D. and P. D. Sly D (2014). "Indigenous health and environmental risk factors: An Australian problem with global analogues?" Global Health Action **7**(1).
- Lee, A. and M. Lewis (2018). "Testing the price of healthy and current diets in remote Aboriginal communities to improve food security: development of the Aboriginal and Torres Strait Islander Healthy Diets ASAP (Australian Standardised Affordability and Pricing) methods." International Journal of Environmental Research and Public Health **15**(12): 2912.
- Lee, A. and K. Ride (2018). "Review of programs and services to improve Aboriginal and Torres Strait Islander nutrition and food security." Australian Indigenous HealthInfoNet **18**(4).
- Milligan, B., C. Blake, N. L. Hall, L. Selvey, H. Grodecki, G. Jackson, C. Go-Sam and T. Veronese (2019). Safe and Healthy Drinking Water in Indigenous Local Government Areas Program: Service Delivery Model Prerequisites for Success. QWater Conference. Brisbane, Australian Water Association.
- NHC, SAHC and AHOSA (1987). Report of Uwankara Palyanyku Kanyintjaku: An environmental and public health review within the Anangu Pitjantjatjara lands. Adelaide, Nganampa Health Council, South Australian Health Commission and Aboriginal Health Organisation of SA.
- NSWALC. (2009). "Aboriginal Communities' Water and Sewerage Program " Retrieved 29 May 2017, from <http://www.alc.org.au/nswalc-in-the-community/water-and-sewerage.aspx>.
- NT HCD (2018). Town Camps Review. Darwin, Department of Housing and Community Development, Northern Territory Government.
- NTG (2017). Commonwealth Releases PFAS Guidelines, Minister of Health, Media release, April 3, <http://newsroom.nt.gov.au/mediaRelease/23019> (accessed 2/11/18). Darwin, Northern Territory Government.
- Productivity Commission (2016). Overcoming Indigenous Disadvantage: Key Indicators 2016. Canberra, Productivity Commission for the Steering Committee for the Review of Government Service Provision.
- Productivity Commission (2020). Inquiry into National Water Reform, <https://www.pc.gov.au/inquiries/current/water-reform-2020#draft>. Melbourne, Productivity Commission.
- PWNT (2018). PFAS, Power Water NT, [https://www.powerwater.com.au/networks\\_and\\_infrastructure/water\\_services/pfas](https://www.powerwater.com.au/networks_and_infrastructure/water_services/pfas) (accessed 11/11/18). Darwin, Power Water Northern Territory.
- Qld Health (2018). Closing the Gap Performance Report 2017, [www.health.qld.gov.au/data/assets/pdf\\_file/0030/706647/Queensland-Health-Closing-the-gap-performance-report-2017.pdf](http://www.health.qld.gov.au/data/assets/pdf_file/0030/706647/Queensland-Health-Closing-the-gap-performance-report-2017.pdf) (accessed 11/11/18). Brisbane, Queensland Health Department.
- QPC (2017). Service delivery in remote and discrete Aboriginal and Torres Strait Islander communities. Summary Report, 2017. QPC, Queensland Productivity Commission 1-32.
- QPC (2017). Service delivery in remote and discrete Aboriginal and Torres Strait Islander communities: Draft report. Brisbane, Queensland Productivity Commission.
- Ranzijn, R., K. McConnochie, A. Day and W. Nolan (2009). Psychology and Indigenous Australians: Foundations of Cultural Competence. South Yarra, Palgrave Macmillan.
- Reisinger, A., R. Kitching, F. Chiew, L. Hughes, P. Newton, S. Schuster, A. Tait and P. Whetton (2014). Australasia. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. C. Field, V. Barros, D. Dokken et al. Cambridge, United Kingdom and New York, USA, University Cambridge Press. **AR5**: 1371-1438.
- Rigby, C., A. Rosen, H. Berry and C. Hart (2011). "If the land's sick, we're sick:\* the impact of prolonged drought on the social and emotional well-being of Aboriginal communities in rural New South Wales." Australian Journal of Rural Health **19**(5): 249-254.
- Smith, K., A. Woodward, D. Campbell-Lendrum, D. Chadee, Y. Honda, Q. Liu, J. Olwoch, B. Revich and R. Sauerborn (2014). Human Health: Impacts, Adaptations, and Co-Benefits. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. C. Field, V. Barros, D. Dokken et al. Cambridge, United Kingdom and New York, USA, Intergovernmental Panel on Climate Change: 709-754.
- Torzillo, P. J., P. Pholeros, S. Rainow, G. Barker, T. Sowerbutts, T. Short and A. Irvine (2008). "The state of health hardware in Aboriginal communities in rural and remote Australia." Australian and New Zealand Journal of Public Health **32**(1): 7-11.
- UN (2015). Transforming our world: The 2030 agenda for sustainable development. New York, United Nations.
- UQ (2018). Safe Water Summit program, November 29-30, [https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/18218/2018-11-20\\_SWS-Program\\_final-web.pdf](https://drupal-gci-op.uat.drupal.uq.edu.au/filething/get/18218/2018-11-20_SWS-Program_final-web.pdf) (accessed 5/12/18). Brisbane, The University of Queensland.

WA Government (2020). Aboriginal communities to receive \$38.9 million water service upgrades, Media Release, August 5, <https://www.mediastatements.wa.gov.au/Pages/McGowan/2020/08/Aboriginal-communities-to-receive-38-point-9-million-dollar-water-service-upgrades.aspx> (accessed 4/9/20). Perth, Government of Western Australia.

WA Government (2020). Climate Health WA Inquiry: Targeted workshops summary report. Perth, Department of Health, Government of Western Australia.

WSAA (2018). Closing the gap - WSAA and AWA Policy Stream at Ozwater'18, <https://www.wsaa.asn.au/news/closing-gap-wsaa-and-awa-policy-stream-ozwater18> (accessed 11/11/18). Melbourne, Water Services Association of Australia.