Water Security issues, trends and solutions – Internationally and in Australia

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Householders' Options to Protect the Environment (HOPE) Inc.'s motto is "Think Globally, Act Locally" and so the topic of water security requires an in-depth review of "issues, trends and solutions" at the international level to understand what measures can be applied in the Australian context.

Figure 1. - UN Sustainable Development Goals

What is water security?

Water security is Goal #6 of the United Nations Sustainable Development Program and is defined as the "availability and sustainable management of water and sanitation for all" (United Nations n.d.). This breaks the definition down into several key goals which include achieving universal and equitable access to safe and affordable drinking water for all; and achieving access to adequate and equitable sanitation and hygiene. Water security also considers all aspects of the environment including development, water attainment, energy and food security and water sensitivity (Boruff, et al. 2018). Water security includes using water efficiently and encouraging waterwise behaviours in others. How can you minimise water waste around your area? What are your opinions about water reuse?

Figure 2. - How water affects plant growth. https://www.gardeningknowhow.com/special/children/how-does-water-affect-plant-growth.htm

What does water security mean to you?

Clean water is essential for healthy food crops and sanitation, as without clean water, disease can very easily and quickly affect populations. The United Nations Development Programme Annual Report 2020 indicated there were 35 million people globally who were able to access basic services between 2018-2020 (United Nations Development Programme 2020, 23). The remaining global populace have to contend with either intermittent access to partially fresh water from wells or relying on Non-Government Organisations (NGOs) such as the United Nations Development Programme to bring water via trucks into developing countries. One option to assist with retaining ongoing access to water is water recycling; this option includes harnessing stormwater, sewage effluent and greywater.

Water security can cause regional concerns, and requires a global solution. What works in one region may not be sufficient for a neighbouring area, so everyone has to play their part. Some tips for water saving include:

- water recycling
  - grey water
    - gardening systems
    - firefighting systems
- minimising water for showers/baths
- reducing non-essential gardening / hosing
- using water efficient washing machines
- using water efficient shower heads and taps throughout the house
  - this can have financial impacts for landlords and tenants
    - for e.g., if a house is water efficient, the tenant will generally have to pay for the full use of water
- water harvesting

Figure 3. - Example of community well. https://www.ncpedia.org/media/village-well-providing

What are the current barriers / threats to water security?

Ongoing free access to water is required for all populations. This free access can come in the form of community wells, which may require travelling long distances on foot in order to retrieve it; or it could come from bored wells which more than 42 million people in the United States utilise for fresh water supply (Groundwater Foundation n.d.). Well contamination can arise from toxic materials leaching into the ground water supply, or chemicals or pathogens being released into the surrounding area and then contaminating the water when they come into contact together (Groundwater Foundation n.d.).

Using recycled water, (whilst water efficient), can cause concern to new recyclers. How can one protect themselves from germs and the like whilst utilising recycled water? One way is to make sure the water supply is from a suitably sized aquifer which can assist in minimising bacteria growth. Bacteria growing in water collected from drains, ditches or streams may have bacteria growing in them and then people can be affected when they drink this water (United Nations Development Programme (UNDP) 2006).

Influence and importance of government policy and support

Water recycling can be utilised in domestic settings such as large apartment blocks, firefighting control, commercial and industry infrastructure (Natural Resource Management Ministerial Council 2006, 1). Other options include pits, terraces, ponds, check dams, sand dams, small reservoirs, cisterns, and open wells (Bitterman, et al. 2016, 75). The Global Water Security report indicated that areas within the United States with water problems will require actions such as integrated water, land use, and economic data (Office of the Director of National Intelligence 2012).

Figure 4. - India https://www.livemint.com/Politics/XGAPqx6WQaW2o91Mbdh9iM/India-faces-water-security-threat.html

What countries are getting water security right?

The World Economic Forum conducted a survey in 2015 which included leaders from the public and private realms and 40% of them indicated that '…water crises as the greatest global risk over the next 10 years.' (Grafton 2017, 3024). That prediction appears to be on track with current global affairs. India has rainwater harvesting tanks which could mitigate water insecurity, however, these have fallen into disrepair and private wells have stepped up to fill this void. India also uses irrigation channels known within India as 'tanks' and these are used for approximately 18% of crop irrigation (Bitterman, et al. 2016, 75).

The World Bank suggests that the Global Water Security and Sanitation Partnership (GWSP) are making progress towards finding relevant solutions and attempting to achieve a water secure world. They also comment about India and their water security. In northern India, the capital of Himachal Pradesh, Shimla, hosts 15 times its population every year with tourists. Shimla has to deal with the increase in humans, an increase on its water supply and sanitation infrastructure, as well as the cost and logistics of moving water 1400 metres up to the mountainous city. Through utilising an autonomous system for water and sanitation, the water quality has increased, transmission losses have decreased, however the supply of water has increased and sewage collection has also risen (The World Bank 2021).

The Arab Weekly indicates Egypt, Gabon, Mauritius and Tunisia are the most water secure countries within the African continent. This is despite Egypt being predominantly desert and concerns of a

hydroelectric dam being constructed upriver in the Nile River. Southern Africa has invested in water storage, particularly large dams, which has assisted the region during worsening droughts (The Arab Weekly 2022).

Water harvesting

Suitable water harvesting options which do not compromise the ability of aquifers to recharge (especially the Great Artesian Basin) are running out and therefore the maintenance of sufficient environmental flows in our river systems is required. Water harvesting measures such as large urban/regional dams with interconnecting pipes to transfer water; ring-tanks and dams by the agricultural sector to harvest overland flows; irrigators drawing water from river systems, are all ideas which have been considered throughout Australia and other regions in order to maintain or increase water security. In Africa, which has a considerable amount of groundwater available, 1% of this is used for irrigation and 80% of that occurs in North Africa (MacDonald, et al. 2020, 3).

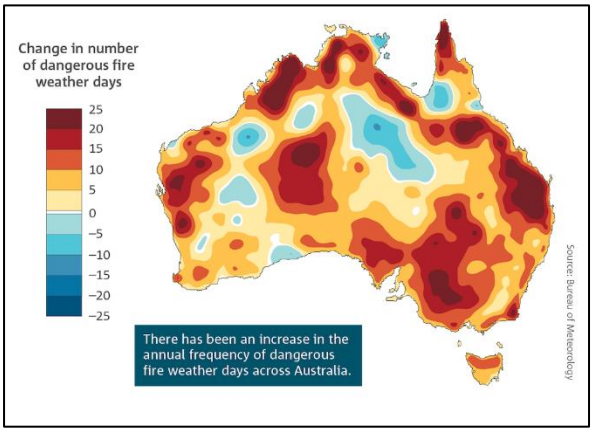

Figure 5. - State of Climate 2020 Report Australia. https://theconversation.com/prepare-for-hotter-days-says-the-state-of-the-climate-2020-report-for-australia-149430

Water Security in Australia and internationally

The global water cycle is significantly affected by climate change, which leads to extreme droughts and floods. Droughts are becoming more severe, with drier and hotter weather conditions and areas such as Southeast Australia suffering a 15% decline in winter rainfall and a 25% decrease in average rainfall. Unfortunately, these weather conditions have led to less runoff into natural water areas in the region (Steffen, et al. 2018). Water shortages, poor water quality and floods, all work against water security globally (Office of the Director of National Intelligence 2012, 2).

Internationally, environmental degradation, deforestation and urbanisation is leading to growing water insecurity and higher levels of climate warming. The Tigris-Euphrates and Lake Chad basins have been linked to ineffective water resource management (White House 2022).The White House report indicates that UNICEF and The World Health Organisation (WHO) estimate 1.6 million people will not have access to safe drinking water by 2030.

Water schemes / policy

The Department of Regional Development, Manufacturing and Water in Queensland has declared that water recycling schemes are critical to ensure the provision of recycled water. A scheme can be declared as critical to ensure it continues to operate and meet essential water supply needs, and any public health risks from the recycled water supply are managed appropriately (Queensland Government - Business Queensland 2021). Australia's first full-scale groundwater replenishment scheme is currently working in Western Australia and the plan is for groundwater replenishment schemes to make up to 20% of Perth's required drinking water by 2060. Geoscience Australia is also working towards improving the understanding of national water resources, under-mapped groundwater resources, remote location water flows, and improved water management (Australian Government 2018, 49).

Water availability

According to the Murray-Darling Basin Authority, 97.2% of the Earth's water is salty and is based in oceans; 0.93% is salty and underground; 2.15% is fresh but frozen in icecaps, glaciers or snow; and 0.615% is fresh and underground. The rest is either water vapour or freshwater lakes, rivers, or swamps. The Murray-Darling Basin is equivalent in size to an area of France combined with Spain and

measures over 1 million km2. The Amazon basin covers 7 million km2, the Nile basin covers 3.4 million km2, and the Mekong (lowland portion) covers 811 000 km2 (Murray-Darling Basin Authority 2021).

Water usage

In regions such as arid or semiarid areas where water quality and quantity are minimised; reduction, restoration and reclamation are important considerations which should be addressed (Mishra, et al. 2021, 12). The World Bank's 2021 Annual Report indicated that 6 out of 10 countries will be at risk by 2050 due to unsustainable water resource management (The World Bank 2021, 50). The same report indicated their efforts in the 2021 financial year were focussed on improving water resource management by ensuring acceptable quantities and quality of water were available for health, livelihoods, ecosystems and productions; as well as reducing water related risks to people, the environment and economies. These measures have assisted with the advancement of risk-management approaches to dam safety in areas such as India where there is a risk of aging infrastructure (The World Bank 2021, 50).

Figure 6. - Drought. https://www.theaustralian.com.au/subscribe/news/1/?sourceCode=TAWEB_WRE170_a_GGL&dest=https%3A%2F%2Fwww.theaustralian.com.au%2Fscience%2Fnasa-satellite-data-reveals-depths-of-australias-drought%2Fnews-story%2Fdc552b73f2f209dfb7646302c4533dd3&memt

Threats

Threats to water safety and security are numerous. These include insufficient resources for high-risk dams, inadequate consideration of scientific evidence; high or severe water stress in productive river basins during the dry seasons; and a lack of resilience for current and future water supplies (The World Bank 2021, 50, 52, 56, 58). Threats can also come in the form of secure access to water resources, malfunctioning ecosystems, contamination of surface and groundwater, and appropriate wastewater management (Mishra, Kumar, et al., Water Security in a Changing Environment: Concept, Challenges and Solutions 2021, 1, 2). The Queensland government indicates population growth, droughts, and aging infrastructure are factors which affect water security (Queensland Government 2022). Raising community awareness of water usage (including where and when to use water), has been a focus of the Queensland government for some time. Some water management tips include minimising water leaks, minimising water theft, and supporting increased water efficient appliances (Queensland Government 2021). Climate change is another threat which cannot be misunderstood. Increasingly variable weather patterns have been predicted, with longer dry periods, more severe rain events, and higher than average temperatures (SEQ Water 2017).

Current state of water security in Australia

The Bureau of Meteorology indicated that the annual rainfall for Australia over the 2019/2020 period was 347 mm, which was below the average of 457 mm. The annual flow in some rivers across the southern part of Australia were the lowest on record, particularly in New South Wales.

The South Australian government indicates climate and geography have a large part to play in low rainfall and droughts which can put water supplies at risk. Planning for the future will ensure that water is used and stored effectively. Adelaide has invested in recycled wastewater and desalination infrastructure, as well as increasing the use of recycled wastewater, stormwater and desalinated water (Government of South Australia 2022).

Queensland has a bulk water security strategy which ensures safety of dams; uses existing water resources more efficiently; supports commercially viable bulk water infrastructure development; and considers investment in water projects for regional economic benefits (Queensland Government 2022). There is also a water planning framework which applies to rivers, lakes, springs, overland flow and underground water. This balances the use between water users and environmental requirements (Queensland Government 2021). The Gold Coast has a desalination plant which produces water and currently supplements approximately 15% of the regional drinking water supply which equates to approximately 300 000 homes (Urban Utilities 2021).

Tasmanians utilise rainwater tanks, waterways, bores and dams for their water supply. But these are untreated water sources and can carry harmful germs, chemicals or other contaminants (Tasmanian Government 2022). Hydro Tasmania has a license from the Tasmanian government to use water for generation purposes and they use modified lakes, rivers, streams and canals (Department of Natural Resources and Environment Tasmania 2021).

New South Wales is working towards increased funding for regional communities in order to improve water security and prepare for future droughts. This funding will work towards dam augmentation, pipeline and bore works, as well as water efficient mechanisms (NSW Government n.d.). Due to the amount of people impacted by droughts throughout NSW, several councils are investing in water source diversification in order to safeguard against future droughts. This includes irrigation systems using recycled sewage for parks; using treated wastewater on golf clubs; creating sewage treatment plants to expand reuse programs; and purchasing irrigation farms (Hogan 2022).

The Northern Territory has inadequate access to water as 90% of water is supplied through bores and groundwater levels are running low in the Darwin region. The National Water Initiative was agreed to by the Council of Australian Governments in 2004, with a purpose to support and sustain economic and industrial growth (De Wilde and Feely 2019). Whilst Darwin receives significant rainfall during the wet season, only a small percentage falls within the Darwin River Dam and surrounding catchment area. Approximately two thirds of this water evaporates; the population is increasing, and Northern Territory currently uses almost twice the amount of water as other cities with similar climates. Offers such as free garden ‘tune ups’ or water saving tips such as irrigation sprinkler details are publicised on websites such as ‘Living Water Smart’ (PowerWater n.d.).

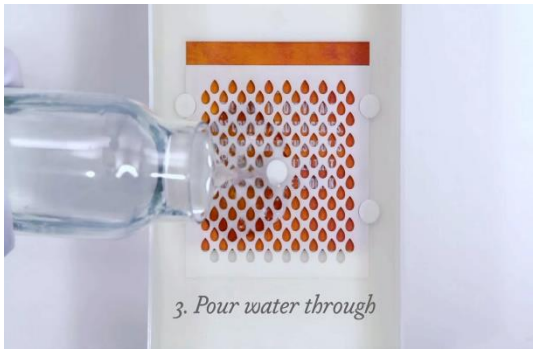

Figure 7. - Drinkable Book. https://www.npr.org/sections/thetwo-way/2014/05/13/312121969/book-news-each-page-of-a-drinkable-book-kills-bacteria-in-drinking-water

Solutions

The Australian Government’s SDG report indicates they are looking at innovative financing with public-private partnerships and alternative revenue streams for major projects (Australian Government 2018, 65). Improved water management and water related sector investments are also ways forward for the current water problems (Office of the Director of National Intelligence 2012, iv).

Development and political instability provide significant risks towards water security and the rapidly growing competition for water related resources. Building resilience against water related risks is a key element to being able to work towards water security globally (Tetra Tech 2022). Items such as solar powered water filtration, fog catchers, desalination plants, drinkable books, water from air-zero mass water, and life-straws are just some of the technical solutions which are currently available (GoodNet - Gateway to doing good 2019).

What you can do at home:

- Individual or shared rain harvesting systems are one example of what can be done in homes or regions (Blue Mountain Co 2017) (Laux 2019). WASH (water supply, sanitation, and hygiene) are important aspects of water usage and sometimes go unnoticed (Ringler and Wilf 2021) but using clean water for sanitation and hygiene are key to ensuring infections aren't picked up or passed on.
- Buying local fruit, veggies and meat from your local market, will cut down on the travel and packaging required for long distance food distribution.
- Home gardens can be irrigated in an environmentally safe fashion by using drip feeders, drip irrigation, soak hoses, emitter systems, drip tape or micro-misting systems (Aloi 2022).
- Water reuse is one way of assisting with water security on a micro level. This can take the form of taking shorter showers, using the half flush button on the toilet, choosing waterwise plants, or using a pool cover to reduce evaporation (Urban Utilities 2021).
- Installing water saving features throughout your hose can also save water and money (eartheasy 2022). From a state or national perspective, the cost of assets is the biggest cost which is passed down to consumers for water storage and transport. Using recycled water decreases this price as the water is stored closer to where it is collected and used (Urban Utilities 2021).
- Using your washing machine for full loads, instead of partial loads, can save water. Soaking items in the laundry sink or upgrading your washing machine for a high efficiency model can also help(eartheasy 2022).
- When brushing your teeth – turn the tap off; likewise, when shaving – use the sink rather than running hot water continuously (eartheasy 2022).
- Believe it or not, using a dishwasher rather than handwashing can save time, money, and water. If you dishwasher is efficient, and you use full loads, it can save thousands of litres of water a year (eartheasy 2022).

Figure 8. - Water Efficient Australia. https://www.wsaa.asn.au/sites/default/files/publication/download/water%20efficient%20aust%20screen.pdf

Concluding statements

There are several ways to assist your family, your neighbourhood and your community with saving water. There are also several websites you can visit, or subscribe to, to keep up to date with tips and tricks. We can make water saving a normal part of our day, but some homework is required. Using recycled water, as long as it comes from a respectable source, should not be a concern. Using gray-water (water from the washing machine and other sources), can be used for non- food uses. Australia has a way to go before we get water security 100% correct, but we are on our way. Help from everyone is one way to make sure we can all use our water for the longest time possible.

Don't be afraid to test some activities out around the home or in your community to see what works in your area, and then feel free to send these ideas through to office@hopeaustralia.org.au or put them on any of our social media platforms such as HOPE Inc. Australia (Facebook), HOPE. Inc. (Australia) (Twitter), hope.inc.australia (Instagram), or HOPE AUSTRALIA Householders' Options to Protect the Environment (HOPE) Inc. (website).

Looking forward to hearing from you and seeing some of your ideas.

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