
Mobilising
Australia
WATER
Rick Gray

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# WATER

***Water is a strategic asset for any nation and is as essential to life as oxygen.***

As global population and industrial activity increase, water scarcity and costs are rising. This trend is evident in densely populated regions of Europe and Asia, as well as in arid continents like Africa. China faces a major challenge with industrial water pollution, and the threat of water conflicts between countries is also escalating. So, what is Australia's situation?

Today, Australia benefits from the foresight of earlier generations, who, influenced by the harsh, arid environment and economic factors, invested in infrastructure by constructing dams across many rivers. Current generations owe a debt to their efforts.

The earliest dam in Australia was Lake Parramatta Dam, finished in 1856. Currently, the country has over 500 large dams exceeding 15 metres in height, with roughly 100 classified as major by the Australian National Committee on Large Dams. Among these, about 103 are hydroelectric dams, supporting 73 hydro power plants with a total capacity of approximately 7800 MW (GSA, 2025). Overall, there are more than 300,000 water bodies, including lakes and smaller dams.

This has kept water prices low for consumers by global standards; however, this trend is now shifting. Environmental issues and green activist movements have prevented the building of large new dams in Australia since the completion of Wivenhoe Dam in Queensland in 1984.

Building new dams or expanding existing ones has become politically unacceptable. Desalination has become the preferred water source, mainly due to the 1997-2009 Millennium Drought, which highlighted weaknesses in traditional water supply methods.

Australia has constructed around 26 desalination plants, with at least 5 large-scale urban facilities still active. Several smaller or emergency facilities are either mothballed or running at minimal capacity. Perth now relies on desalination and plans to expand its capacity.

Dams are typically more affordable and simpler to operate, whereas desalination offers a reliable water supply regardless of climate conditions, especially during droughts. Often, the optimal approach integrates both methods, customised to meet the specific regional requirements.

Desalination has notably increased water bills in Australia, especially in major cities where large-scale plants were established during the Millennium Drought. In some instances, household expenses climbed by 20–30% due to infrastructure and operational costs associated with desalination. The primary reasons for these cost rises are the high capital investment and ongoing operating expenses.

Desalination is costly to establish, operate, and maintain. Even when idle, plants incur standby costs to stay operational. The price of desalinated water can be two to four times higher per kilolitre than water from dams or groundwater.

***Melbourne pays approximately $600 million annually for the Victorian desalination plant, even if no water is ordered.***

The Gordon Dam in Tasmania, finished in 1974, is the last major dam of national importance and remains Australia's largest. While it is considered the final significant dam from Australia's dam-building era, smaller dams have been constructed since, and some have been expanded.

In 1974, the population was around 14 million. By 2026, it had grown to approximately 28 million, roughly doubling over 52 years. Projections indicate it will reach about 40 million by 2050. As a result, the maximum water supply from dams available to the population in 2026 is only half of what it was in 1974. By 2050, this supply will decline to roughly 35% of the 1974 level. These trends highlight decreasing water availability, pointing to potential disaster when the next "Millennium" drought occurs, an event that is statistically inevitable.

Previous generations built dams, and today we enjoy affordable water. Currently, however, many are driven by ideological beliefs and prefer desalination over dams. This choice will burden future generations with costly water in the years ahead.

***Past generations ensured water security for today. Today's generation is failing to ensure water security for our grandchildren and the nation.***

# *THE WATER STRATEGY*

Australia's existing water strategy is a nationwide, multi-faceted approach focused on sustainable planning, climate-resilient supply, Indigenous water rights, secure urban and remote water infrastructure, and support for irrigated agriculture.

## Data

- Australia has over 500 large dams (major public storages) (ANCOLD, 2026).
- There are about 1.8 million dams in total when farm dams are included.
  - NSW has the most dams: 642,714 (35% of national total).
  - Victoria has the highest dam density: 1.7 dams/km$^2$.
  - About 15% of farm dams are unreported.
  - These small dams collectively store about 12,000 GL of water, far less than the large engineered storages.
- Australia has 103 hydroelectric dams, with 100 classified as major dams. These are part of about 120 hydroelectric power stations nationwide.
- 27 new major dams have been proposed in the last 20 years and only one has been built. Almost every project failed due to cost blowouts, declining yield, environmental constraints, and modern water policy.

## Legislation

Australia's current water management strategy is driven by the following legislation:

- The National Water Agreement (NWA).
- The Water Act 2007.

## The Water Act 2007

The Water Act 2007 (Act, 2007) was introduced in response to the 2006–07 Murray–Darling drought, which revealed serious issues of over-extraction and ecological damage. It serves as Australia's main federal legislation for water management, providing a national framework for the Murray–Darling Basin. The Act sets sustainable extraction limits, establishes essential institutions, and incorporates environmental and compliance responsibilities.

It originated from the Commonwealth government's earlier $10 billion National Plan for Water Security, designed to address over-allocated river systems, upgrade irrigation, enhance urban water security, and create a national water governance framework. The plan also mandated basin states to transfer authority to the Commonwealth for integrated basin management. This initiative laid the groundwork for the current National Water Agreement (2025) and the Murray–Darling Basin Plan.

The Act created a number of plans and national institutions to manage its intent:

- **Murray–Darling Basin Authority (MDBA).** An independent statutory body responsible for preparing and implementing the Basin Plan, monitoring Basin health, accrediting state water resource plans, and enforcing compliance.
- **Commonwealth Environmental Water Holder (CEWH).** Manages environmental water entitlements to restore river and wetland health.
- **Inspector-General of Water Compliance**. Oversees enforcement and integrity of Basin water management.
- **Bureau of Meteorology**. Mandated to compile and deliver comprehensive national water information.
- **Australian Competition and Consumer Commission (ACCC).** To regulate water charges and water market rules.
- **Productivity Commission**. To review the Basin Plan implementation and National Water Initiative outcomes.
- **Legislative Basin Plan** that sets sustainable diversion limits (SDLs) for surface and groundwater extraction.
- Mandates **State Water Resource Plans** aligned with Basin Plan requirements.
- Created a **national water-information system.** Organisations must provide water data to the Bureau of Meteorology under the Water Regulations 2008.

## National Water Agreement (2023)

This is Australia's new water blueprint, replacing the 2004 National Water Initiative as states adopt it. It aims to safeguard Australia's water resources amid climate change, population growth, and increasing agricultural needs. While states handle water management, the NWA establishes common objectives. This serves as the governance foundation for Australia's water strategy. It does not supersede state water laws but aligns with them. The major aims of the NWA are to:

- Embed climate-resilient water planning. It forces water plans to use future climate projections, not historical averages.
- Strengthen Indigenous water rights.

- Protect environmental water. It requires environmental flows to be treated as system constraints, not optional extras.
- Set national rules for water entitlements and markets. This is essential for agricultural and urban water security.
- Require secure urban and regional water supply. It directs states to maintain diversified water portfolios, including desalination, recycling and purified reuse, groundwater, stormwater harvesting, inter-basin transfers and emergency drought response. Dams are no longer part of national strategy.
- Improve governance, transparency, and accountability.
- Support irrigated agriculture under climate stress.
- Provide the national policy anchor for 2030–2050 water security

# Dams vs Desalination

The core issues in the dams versus desalination debate focus on five main areas: cost, reliability, energy reliance, environmental impact, and national water resilience. By 2026, these debates are mostly settled in Australian politics, with dams being sidelined due to ideological reasons. Resurgence of dams might only occur during severe droughts or economic crises. The benefits and drawbacks are as follows:

## *Dams*

- **Lower long-term cost.** Dams provide the cheapest bulk water over time
- **Simpler treatment.** Surface water from dams is easier and cheaper to purify than seawater.
- **Multipurpose use**. Dams support irrigation, flood control, recreation, and hydroelectricity.
- **Rainfall-dependent.** Dams rely on consistent streamflow, which is declining in many regions, such as Perth.
- **Environmental impact.** Dam construction can disrupt ecosystems and require significant land access.
- **Vulnerability to drought.** During the Millennium Drought, dam levels in some cities dropped below 20%.

## *Desalination*

- **Climate resilience.** Desalination doesn't depend on rainfall, making it reliable during droughts.
- **Urban backup.** Cities like Perth now get over half their water from desalination.
- **Scalable.** Plants can be expanded or paused based on demand.
- **High energy use.** Reverse osmosis requires significant electricity, raising costs and emissions.
- **Expensive infrastructure.** Initial setup and ongoing operations are costlier than dams.
- **Limited multipurpose value**. Desalination serves drinking water only, not irrigation or flood control.

A commonly accepted solution involves an integrated approach that combines various methods such as dams, desalination, recycling, conservation, and other management strategies. Coastal cities tend to benefit more from desalination, while inland regions depend primarily on dams and groundwater sources.

# ALTERNATIVE STRATEGIES

Photo - Roman Aqueduct. ar.inspiredpencil.com

There are always sceptics who say something can't be achieved! Nearly 2,000 years ago, the Romans confronted challenges similar to Australia's today—an increasing population and limited water resources. Their response was the construction of gravity-fed aqueducts. Over time, Rome developed 11 major aqueducts that spanned almost 500 miles, providing water to a population of over half a million.

The goal should be long-term water security, with many alternative options worth exploring. Australia’s water future cannot rely on a single major project but requires numerous diverse projects, large and small, tailored to the specific water resources. The water system should include redundancy and diversity, be adaptable, and avoid relying on a single point of failure.

There are many alternative strategies for developing national water resources, some of which are listed below.

- Atmospheric water capture, fog and cloud harvesting.
- Enhanced Rainfall Capture.
- Groundwater Innovation and Managed Aquifer Recharge.
- Micro-Desalination.
- Farm Water Retention.
- Urban Water Retention
- Landscape hydrological restoration.
- Controlled flood releases to recharge soils and aquifers
- Northern Australia water storage and transfer.
- Waste water and industrial water reclamation.
- Data, Modelling, and National Water Intelligence.
- Satellite-Based Water Accounting.
- Optimised water markets and dynamic pricing.

# MANUFACTURING

Water is a vital manufacturing input, comparable to energy and raw materials. It plays a crucial role across nearly every industrial sector, including food and beverage, semiconductors, metals, chemicals, and energy production. Its significance arises from both its large volume consumption—many industries use millions of litres daily—and its diverse functions, such as cooling, cleaning, reacting, transporting, dissolving, and becoming part of the final product.

Water performs multiple critical functions across all major industrial sectors.

- **Direct process input**. As a solvent, reactant, and ingredient for food, chemicals, pharmaceuticals, pulp and paper.
- **Thermal management.** In cooling towers, heat exchangers, condensers, and boiler feedwater. Loss of cooling halts production within hours.
- **Cleaning and contamination control.** Ultra-pure water is essential for semiconductors, pharmaceuticals, and food safety.
- **Transport medium.** To move pulp, minerals, slurries, and waste streams.
- **Waste management.** For dilution, effluent treatment, and discharge cooling, for which compliance costs are rising.
- **Energy production.** For steam generation and electrolysis for hydrogen.

Water's critical role, characterized by its high volume and essential functions, makes it irreplaceable. Disruptions in water supply often lead to critical single-point failures in industrial processes. Even brief outages can result in recovery times spanning days or weeks and lead to substantial financial losses.

## Strategic importance

Water is not just another input; it's a crucial element in manufacturing. Without quality water, production can halt, equipment may be damaged, safety could be at risk, and national industrial strength can weaken. For Australia's manufacturing revival and energy shift, water planning holds equal importance to energy planning.

Australia faces fundamental water supply risks that directly constrain industrial development. These challenges restrict the country's capacity to grow advanced manufacturing, defence industries, critical minerals processing, and hydrogen exports. The key risks include:

- Climate variability and drought cycles affecting supply reliability.
- Fragmented water governance across states, utilities, and regulators.
- High water demand from hydrogen and renewable energy supply chains.
- Under-utilisation of wastewater and recycled water.
- Rising trade-waste compliance costs for industry.
- Regional manufacturing zones lacking long-term water security planning.

# Water security

Water security must be treated as a core economic input, equal to energy, transport, and digital infrastructure. A ***National Water Security Strategy*** must be developed aligned with manufacturing, defence, hydrogen, and regional development. The priority actions should be:

- Industrial water mapping to identify high-risk regions and sectors.
- Investment in recycled water, industrial water loops, and advanced treatment to reduce freshwater dependency.
- Integrated planning with hydrogen and critical minerals projects to avoid water-driven project delays.
- Modernisation of trade-waste regulation to support industrial growth while maintaining environmental standards.

Water is essential for Australia’s industrial strength. Without reliable, high-quality water supplies, the country cannot achieve its goals for manufacturing growth, energy transition, or sovereign capabilities. Therefore, national water planning should be recognised as a top strategic priority.

# Cost of water

Over the last 30 years, water prices in Australia have increased much more rapidly than the CPI, mainly due to infrastructure upgrades, drought-resilience investments, desalination plants, and stricter regulatory standards. While the CPI has grown by about 2–3% annually on average, many regions have seen water charges rise by 4–6% each year, with some periods experiencing double-digit growth. Overall, over three decades, water prices have increased approximately 1.5 to 2 times faster than the CPI (ABS, 2024).

Water is now one of the fastest-rising essential inputs for households and industry. The reasons why water prices outpaced CPI are structural and include:

- Rising capital expenditure for pipes, treatment plants, and reservoirs.
- Higher operating costs from drought resilience and climate variability.
- Increased regulatory compliance costs.
- Financing of desalination plants in major cities.
- Ageing infrastructure requiring renewal.

***The cost of water is a structural driver of manufacturing costs.***

# Case Study: Perth-Kalgoorlie water pipeline

Photo: Perth-Kalgoorlie Water Pipeline: www.smh.com.au

About 70 years ago, I lived in Kalamunda, WA. My parents enjoyed outings to the Mundaring pub, then a popular spot, while my siblings and I played along the large pipeline outside the pub's front. This was the Perth–Kalgoorlie pipeline, and I was amazed that water could be pumped uphill in such large amounts!

The Perth–Kalgoorlie pipeline, known today as the Goldfields Water Supply Scheme, was developed during the 1890s gold rush to combat a severe water shortage. With thousands of prospectors arriving in Coolgardie and Kalgoorlie, the area lacked dependable water sources. This 566 km pipeline transports drinking water from Mundaring Weir, located east of Perth, to the Eastern Goldfields cities of Coolgardie and Kalgoorlie (Goldfields, 2025).

The project was championed by C.Y. O'Connor, WA's Engineer-in-Chief. His proposal was initially ridiculed as financially reckless and technically impossible. Construction began in 1896 and was completed in 1903.

The pipeline continues to operate today, supplying over 100,000 people across more than 33,000 households, as well as mines, farms, and industry. It remains WA's only long-distance water infrastructure of this scale - a lasting engineering achievement.

The Perth–Kalgoorlie pipeline stands as a reminder that bold engineering, controversial in its time, can shape a state's destiny. This pipeline was revolutionary and faced significant opposition. It was driven by need and succeeded.

If it was feasible to construct this pipeline a century ago using the primitive technology available then, there's no logical reason why a similar approach couldn't succeed today.

# Case Study: The Bradfield Scheme.

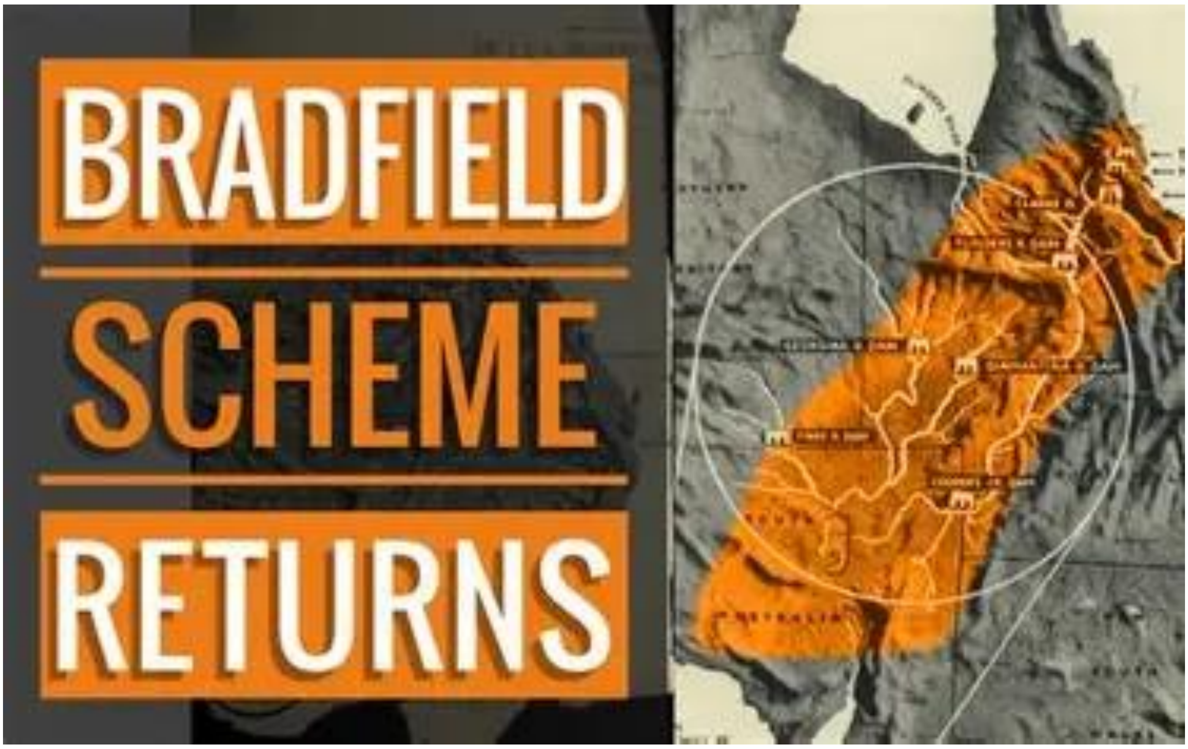



Photo: The Bradfield Scheme: says.heise.com.au

The ***Bradfield Scheme*** (Bradfield, 1938) was an innovative idea that offered a potential means of harvesting some of the vast amounts of monsoonal rain that fall in northern Australia. It has often been investigated and mostly rejected as it poses enormous engineering challenges, very high costs and debatable returns.

It refuses to die simply because, as the Australian population rapidly increases, there is an increasing demand for water resources, and solutions must be found that provide secure, affordable and sustainable water sources for the future.

Proposed in the 1930s by engineer Dr John Bradfield (of Sydney Harbour Bridge fame), the scheme aimed to:

- Divert northern rivers inland (Tully, Herbert, Burdekin, and others in North Queensland).
- Pipe the water westward into the arid interior.
- Create an inland irrigation basin to “green the desert”.
- Encourage population growth and agriculture in a remote region.

## Historic arguments.

The arguments why it has never been built are:

- ***Hydrology.*** The rivers Bradfield suggested diverting are monsoonal, experiencing high flow during a few months and very low or no flow the rest of the year. Modern studies indicate that the annual volume is inadequate for diversion, with significant evaporation losses in inland basins and no dependable year-round water supply. Additionally, climate change could potentially modify monsoon patterns.

- ***Topography.*** Bradfield assumed the interior was lower than the coastal ranges. Modern surveying shows that you would need massive pumping, and energy costs would be enormous.
- ***Environmental.*** The diversion of monsoon river flows would starve coastal ecosystems of freshwater, destroying wetlands and fisheries, flooding large inland areas, and altering monsoon dynamics and sediment flows.
- ***Cost.*** Modern estimates run into **billions**, and that's before operating costs.

## *The modern argument.*

Today, these arguments must be reconsidered given the increasing need for water.

- ***Topology.*** The amount of water to be diverted remains only a small proportion of the massive monsoonal deluges. Evaporation will be high; however, when water flows are established, they change the environment and ecology of the surrounding area and create their own microclimate.
- ***Topography***. In the near future, power requirements for pumping could be provided by small coal-fired power stations or nuclear reactors, and modern pumps, dams and pipelines are far more efficient than the proven Perth – Kalgoorlie technology of over 100 years ago.
- ***Cost.*** The cost remains high, but probably no more so than many other major projects and would have to be tested against a rigorous cost-benefit analysis.
- ***Environmental.*** Environmental considerations must be balanced against the national need for reliable, sustainable and affordable water resources. Many of the environmental arguments are populist and untested.

Political actors and environmental activists increasingly use "Lawfare" and legal strategies as tools to advance their ideological goals. This tactic, which relies on emotional language and unreliable, speculative models instead of balanced assessments, has proven particularly effective in halting or greatly delaying numerous high-profile projects in Australia. If this trend persists, it could lead to substantial economic harm to Australia.

Today, it is clear that the Bradfield scheme is technically achievable and could significantly enhance the productive capacity of large, largely undeveloped regions in northern Queensland.

Western Australia in the 1890s conceived and accepted one of the great engineering challenges of the day. It was remarkably successful and catalysed an economic boom for the state. The Bradfield scheme offers the same potential.

***If the Perth – Kalgoorlie pipeline was achievable over 100 years ago, then the Bradfield scheme is achievable today.***

# Case Study: Israel

Photo: Israeli Water Technology: hnaftali.com

Israel is among the world's most arid nations. Since its establishment in 1948, it has struggled with persistent water shortages, which have worsened as its population increased from roughly 800,000 in 1948 to nearly 10 million now.

Israel's water management has historically been among the world's most sophisticated and integrated, relying on desalination, wastewater recycling, extensive infrastructure, and strict regulation. This approach has turned a chronically water-scarce country into a water-secure, climate-resilient nation. The modern Israeli water system rests on five key pillars.

**Seawater desalination**. This is now the dominant source of drinking water. As of 2022, 86% of Israel's drinking water comes from desalinating seawater and brackish water. Its plants are among the world's largest and most efficient**.**

**Wastewater reclamation.** Israel recycles about 90% of its wastewater, the highest rate in the world. Reclaimed water is used primarily for agriculture, especially in the Negev desert.

**Advanced irrigation.** This includes **s**urface reservoirs and groundwater management, aquifer recharge, controlled pumping, and reservoir storage to buffer seasonal variability. Drip irrigation and precision agriculture to reduce agricultural water use are widely employed.

**National water infrastructure.** The National Water Carrier supplies about 80% of Israel's drinking water. It operates desalination, brackish-water, and wastewater treatment plants and, through a vast canal system linking the Sea of Galilee to the national grid, delivers water to the nation.

**Regulation & pricing**. Under the Water Law, all water resources are public property and provide the legal basis for national planning, allocation, and pricing. Leak detection and infrastructure upgrades and ongoing investment to reduce distribution losses.

**International Cooperation**. Israel is a world leader in advanced irrigation technology, and this is a major source of export revenue. It is a proven model for Australia to follow.

# Conclusions

Secure, plentiful, and cheap water for consumers and industry is essential for Australia's future. Water must be considered a strategic asset essential for survival.

Water is more than just an environmental resource; it is a strategic, irreplaceable input critical to Australia's industrial ability, energy shift, and national resilience. Manufacturing depends on consistent, high-quality water. Without it or if it becomes degraded, operations are halted immediately, equipment risks failure, safety is compromised, and regulatory violations can occur.

Water is essential to Australia's industrial strength. Without reliable, high-quality water supplies, the country cannot achieve its goals for manufacturing growth, the energy transition, or sovereign capabilities. Therefore, national water planning should be recognised as a top strategic priority.

Today, Australia benefits from the foresight of previous generations, shaped by the harsh, arid nature of the Australian landscape and climate, and by the economic realities of the time. They invested in the only viable option, building dams across many of the nation's rivers. Today's generations have inherited a secure water supply and are indebted to those efforts.

The last major dam (Gordon River) was completed in 1974, when the population was about 14 million. By 2026, the population is about 28 million, roughly doubling over the 54 years in between. By 2050, the population is projected to be about 40 million.

Based on these raw figures, in 2026 the maximum water available from dams to the population will be only 50% of the 1974 level. By 2050, the maximum water available from dams and newer water storage initiatives to the projected population will be only about 40% of the 1974 level. These figures indicate a declining trend that spells ultimate disaster when the next "Millennium" drought arrives, which is statistically inevitable.

As Australia's population grows rapidly, the demand for water resources is increasing. We need solutions that ensure affordable and sustainable water supplies for the future, guided by practical circumstances and economic factors rather than ideology.

Dams are generally the most economical and practical choice when there are suitable rivers and topography, whether through constructing new dams or raising existing ones. If such conditions are lacking, desalination becomes a suitable alternative.

Necessity drives innovation, and Israel showcases efficient management of scarce water resources, offering a valuable example for Australia.

Innovative strategies will be vital to developing future solutions. Currently, monsoon rains in northern Australia flow directly into the ocean. However, with advances in technology, harnessing this vast water resource offers a promising opportunity and should be a focus for future water supplies.

Historically, our ancestors tackled similar challenges with projects like the Perth-Kalgoorlie pipeline 130 years ago and the Snowy River scheme 75 years ago. These efforts pushed engineering limits and achieved what was once deemed impossible.

They serve as an inspiring example for current water ambitions, provided Australia is willing to accept the challenge.

# Proposals

**The Vision:** The cheapest water in the world for consumers and industry over the next 10 years.

**Government:**

- Agree a bipartisan approach to water management.
- Create a 10-year strategic water plan.
- Remove all legislative barriers to new dams or raising dams.
- Minimise the red, green, and black tape barriers to water projects.
- Establish a government department to foster the sector.
- Set taxation and policy to incentivise the sector.
- Seek international strategic partnerships for development.
- Large-scale water resources to remain in public hands at all times.

**Strategic Industry:**

- The water sector to be declared a Strategic Industry, and national resources mobilised to support it.
- Enact policies, financial and tax incentives, to support the industry.

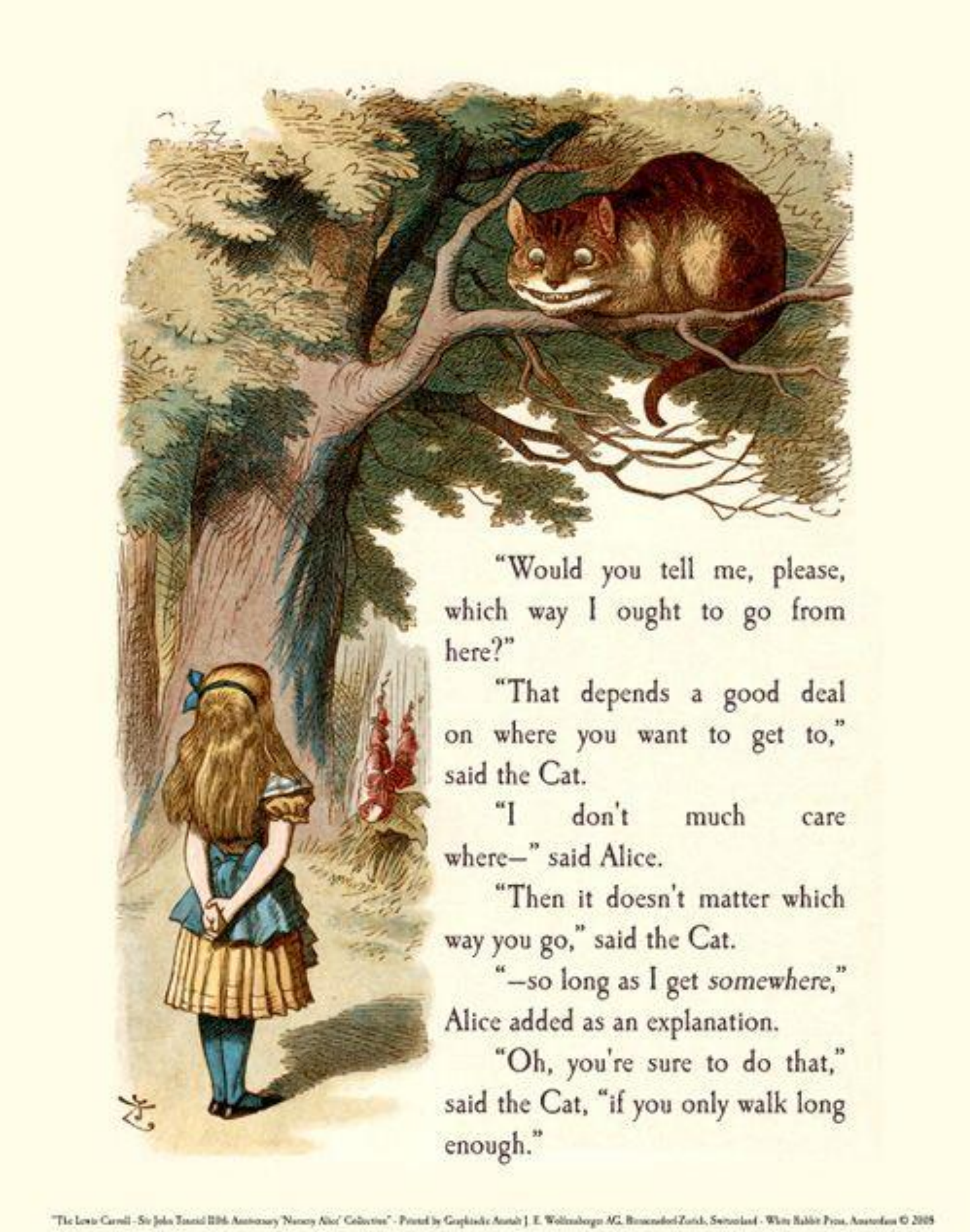
**Strategic Partnerships:** Seek collaborative arrangements through AUKUS or QUAD, or with other allies to develop the sector.

**Future Projects:**

- Plan for the construction of at least one new major dam in each state. This may take the form of new dams or the expansion of existing dams.
- Hydroelectric power to be incorporated into dams where feasible.
- Investigate the potential for harvesting the vast monsoonal runoff in northern Australia.

# THE LAST WORD

The last word belongs to Lewis Carroll and his “Alice in Wonderland” - Alice is lost in the forest, meets the Cheshire Cat and asks for directions. It is a perfect analogy for Australia’s present lack of a national vision, strategic planning and purposeful direction. We are indeed at a crossroads in Australian history.



# The Author

This paper draws on the author's experience in the Australian Army, as well as his industry experience across manufacturing and major defence and construction projects throughout Australia and overseas. He holds academic qualifications in Engineering, Management, and Operations Research. He is retired and lives in Melbourne.

He is a passionate Australian who wishes to see that Australia remains on the right side of history.

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Perth Kalgoorlie Water Pipeline: www.smh.com.au
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