Water Research Australia submission to the National Water Reform 2026 Inquiry

Summary - Key points to note:

- Science and the knowledge generated by research is key to an informed, prepared, secure, resilient, and sustainable water services industry.
- A targeted Gap Analysis across 22 key legislative, regulatory and policy instruments in the Australian water landscape was undertaken in preparation for the input into various review processes in 2026.
- Overall, the analysis found a systemic absence of clear durable arrangements that support stewarding the national water science base, that secure research and funding to support the science for decision making, and that enable translaton of research and innovation into consistent policy, planning and regulatory practice.
- Science and research must be recognised as essential infrastructure for reform, enabling adaptive management in the face of uncertainty, reducing policy and investment risk, informing difficult trade-offs, and sustaining public trust in decision-making.
- Without deliberate and coordinated investment in research and scientific capability, and the creation of knowledge and its translation into into policy and practice, the ambitions of national water reform will be difficult to realise.
- Water Research Australia propose that future reform priorities give prioritiy to providing clear and sustainable arrangements that:
    - allocate responsibility for coordinating and stewarding the national water science base,
    - secure research pathways, processes, and funding to support the creation of the science to support the desired science based decision-making, and
    - translate research and innovation into consistent policy, planning and regulatory practice.

INTRODUCTION

The *Productivity Commission (PC)* has been asked to undertake the *National Water Reform 2026* inquiry. The terms of reference require the PC to:

- assess progress under the 2004 National Water Initiative (NWI) in accordance with the requirements of Water Act 2007 (Cth), which includes making recommendations on actions that parties to the NWI might take to better achieve the objectives and outcomes of the NWI
- assess and recommend water policy and regulatory settings that support a **secure, resilient and sustainable water services industry.**

Water Research Australia wishes to engage in National Water Reform 2026 inquiry processes to ensure that the enabling supporting environment of policy and legislation support good science-based

decision-making, and the secures the role of research to provide knowledge for a secure, resilient and sustainable water services industry.

Water Research Australia is at the forefront of addressing water challenges through collaborative research to support a more sustainable water services industry. Originating as the Cooperative Research Centre for Water Quality and Treatment in 1995, it has evolved into Water Research Australia, a member-based not-for project organisation that is backed by water utilities, regulators, government agencies, universities, and other water related organisations and service providers. With over 70 members, *Water Research Australia* typically manages a portfolio of >100 water research projects and also participates in grant funded projects and research hubs. Their portfolio of research covers a broad range of relevant areas relevant to their members such water quality, catchments, climate, wastewater treatment, research recovery, contaminants, emissions etc. We are recognised globally for our work and collaborate through international networks of research agencies with similar purposes.

Australia's water sector is entering a new phase of reform shaped by climate variability, ageing infrastructure with growth and renewal pressures, digitalisation, affordability concerns, and rising expectations for transparency and meaningful engagement (including First Nations interests). In this context science, research and innovation are not optional or ancillary inputs - they are foundational to good strategy and planning, credible policy design, adaptive management, and durable regulatory decision making.

Science and research must be recognised as essential infrastructure for reform, enabling adaptive management in the face of uncertainty, reducing policy and investment risk, informing difficult trade-offs, and sustaining public trust in decision-making. Without deliberate and coordinated investment in research and scientific capability, and the creation of knowledge and its translation into policy and practice, the ambitions of national water reform will be difficult to realise.

Relevant inputs and reviews

Professor Mary O'Kane AC was commissioned by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) to conduct an independent review of water science and research to provide advice that 1) enables the Commonwealth and potentially others to ensure water science and research investments are strategically aligned, and appropriate to provide expert underpinning to water policy and planning into the future, particularly considering climate impacts on water, and 2) positions Australia as an international leader in water science and research, including national leadership and coordination. The report is intended to contribute advice on water science and research in Commonwealth and intergovernmental forums, as well as implementation of the National Water Agreement and other water initiatives.

The Water Science and research review (https://www.dcceew.gov.au/water/policy/publications/water-science-research-review) identified the characteristics of an effective water science and research system

- There is an articulated collective vision, updated regularly, for necessary water and related research, based on a clear process for determining what the right questions are and which of these can be answered by science and research and to what degree of (un)certainty.
- Investments are, as much as possible, strategic, innovative, looking out across horizons, and aligned to collectively agreed policy and program needs (where 'collectively' means across Commonwealth agencies, and with states and territories on issues where national or interjurisdictional consistency is important)
- The science and evidence base is available as much as possible before the policy decisions need to be made. In other words, policy needs are anticipated through 'right question' generation processes
- There is a sense of collective ownership among jurisdictions of the problems and the science and research solutions
- The best available expertise and high integrity research is easy to find and commission
- Climate change and climate extremes are included in all water modelling and planning
- First Nations peoples' water values, interests, knowledge and sciences are elevated in Australian water planning and management and First Nations researchers and academics are recognised
- The output of research studies is of good quality (top international scientific journal quality) and trusted by all stakeholders
- Data is managed and curated well and openly available in line with open government principles, and the contributions of First Nations peoples and their Indigenous Cultural and Intellectual Property are curated and protected appropriately
- There are mechanisms and safe spaces for open data and model sharing between jurisdictions and with users and stakeholders
- Scientific infrastructure (including models) for water science is up to date and available
- Available water science and general research funding is effectively leveraged and utilised fairly to support diverse projects
- There is an organised system for monitoring change in freshwater ecosystems over decades and evaluating the effectiveness of interventions
- Training in water and related science at postgraduate, doctoral and postdoctoral levels is fostered to ensure the future health of the water science workforce
- Australian water science has a high international profile and recognised leadership role
- Communication of water science and modelling in public forums is highly effective
- The water policy and research communities hold frequent workshops. They are well-networked across Australia and with water research communities around the world.

The UK's 2025 **Independent Water Commission Final Report** "The 2025 Cunliffe Review" (https://www.gov.uk/government/publications/independent-water-commission-review-of-the-water-sector) highlights that where regulatory frameworks prioritise cost certainty and short-term efficiency, innovation and science become systematically disadvantaged. The Review finds that inadequate incentives for research and development limit the sector's ability to respond to climate

change, increase long-term system costs, undermine affordability, and erode industry capability. Together, these impacts reinforce a cycle of conservatism that constrains the effective application of research and scientific advancement across the water sector.

The Independent WaterCommission's final conclusions and recommendations were organised around seven themes, articulating that ambitious change was needed to drive a fundamental 'reset' of the water sector. The Commission recommended that **new national strategies** should be brought forward to **provide a better long-term vision that drives delivery, articulates priorities and trade-offs, and has a cross-sectoral focus**. The Commission also recommended more effectively integrated planning across the whole water system was needed – where **planning approaches are significantly streamlined, additional flexibility is built into the 5-year Price Review cycle, and a common and robust approach to economic appraisal** is implemented. The Commission also recommended changes to l**egislative frameworks to drive solutions**, that the regulator should be better resourced to improve monitoring, and that the regulator should have more 'constrained discretion' to achieve better outcomes. The Commission was clear on the need for a much stronger and **integrated regulatory framework** – one that can respond to challenges, regulate the water sector as a whole and command public confidence. As part of a fundamental reset in the way the regulator engages with companies, the Commission recommended the adoption of a '**supervisory approach'**, and actions by regulators and government to reduce risks to investing in the water industry and thereby attract long-term investors. To improve resilience, the Commission recommended that statutory resilience standards be adopted, **and strengthened arrangements in four areas: planning, planning processes, regulatory coordination, and standardised practices**. And to support innovation, it recommendied that regulatory sandboxes are introduced and that the **efficacy of innovative funding mechanisms** were reviewed.

DISCUSSION

In April 2026, *Water Research Australia* engaged GHD to underake a targeted Gap Analysis across 22 key legislative, regulatory and policy instruments in the Australian water landscape. The analysis found three integrated and inter-related themes that demonstrate a systemic absence of clear, durable arrangements that:

- allocate responsibility for coordinating and stewarding the national water research and science base,
- secure research pathways, processes, and funding to support the creation of the science to support the science-based long-term decision-making, and
- translate research and innovation into consistent policy, planning and regulatory practice.

Overall, the Gap Analysis found that water research and science are systemically under-valued, with many instruments treating them as implicit or optional to core functions rather than key enablers of effective water system management. This has significant implications for the achievement of NWI objectives and the effectiveness and durability of water resource management reform.

"Australia's core legislative and policy instruments do not explicitly integrate science, research and innovation in the water sector"

In a Gap Analysis of 22 key legislative, regulatory and policy instruments outside of those relating specifically to water resource management, and those specific to the Murray–Darling Basin, there is no explicit reference to science, research or innovation in key legislative and policy instruments. The water sector's needs are national, and the science is broader including topics such as climate, wastewater treatment, research recovery, contaminants, digital transformations, emissions, behaviour change.

Outside of those exceptions the Gap Analysis found that Australia's core water legislation and policy frameworks do not explicitly articulate the role of science, research and innovation in supporting effective whole-of-system water management. Where these concepts are referenced, they are typically framed at a high level and lack clarity or specificity.

For example, sections 21(4)(b) and 22(3)(k) of the Water Act 2007 (Cth) require Basin planning to be informed by the best available scientific knowledge and supported by specified scientific information and models. While the Water Act 2007 (Cth) embeds requirements for the use of best available information in Basin-scale planning and establishes national water data functions, there is no comparable system-wide framework that defines how scientific capability, research investment or innovation should systematically inform broader water policy, planning and regulation. Consequently, the role of science and research is left to be ancillary, fragmented or discretionary, rather than embedded as a core element of water governance.

For example, the Water Act 1989 (Vic) similarly recognises research as a "function" of water corporations under section 91(2)(a). Beyond this limited statement, there is no guidance or requirement of how the research should be undertaken, supported or translated. There are no clear references to quality, standards, or interactions with other jurisdictions, legislation or policy instruments.

This absence represents a material gap in Australia's water policy architecture and highlights the need for legislative and planning frameworks to more clearly and consistently embed science and research as foundational enablers of resilient and adaptive water management.

"There is no clear legislative allocation of responsibility for coordinating or directing Australia's science and research"

BOM and CSIRO are established as statutory functions for science and research, but water sector direction and engagement, and responsibility for research capability are unclear.

Australia has strong scientific institutions that contribute to water knowledge, most notably the Bureau of Meteorology (BoM) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The BoM has clear statutory functions under the Water Act 2007 to collect, standardise and publish national water data and accounts, while CSIRO is directed to undertake water-related research to inform planning, modelling and management decisions under the Science and Industry Research Act 1949. However, despite these well-defined organisations, there is no overarching legislative or policy framework that allocates responsibility for engaging, coordinating, prioritising or directing Australia's water research capability across jurisdictions and sectors. As a

result, responsibility for research is fragmented across agencies, programs and funding cycles, with no single authority to ensure that research efforts are not duplicated, and aligns with national water reform priorities or emerging system risks.

In the absence of stewardship of the agenda, research coordination relies heavily on member-based organisation such as *Water Research Australia*, informal arrangements, time-limited initiatives and institutional goodwill rather than durable governance settings. This lack of legislative clarity weakens Australia's ability to strategically develop and deploy its water research capability and limits the effectiveness of science as a system-wide enabler of water reform.

The Risks of not appropriately focussing on science

The Gap Analysis identified a set of inter-related risks that arise where science, research and innovation are not clearly governed or systematically embedded within Australia's water framework. These are noted directly below and expanded later in the submission.

1. Lack of clarity of ownership and stewardship of the water science base creates inefficiencies and potential gaps and duplications
2. Poor responsiveness to climate adaptability and system learning due to lack of adaptive and long term research and science
3. Jurisdictional inconsistency and impeded reform velocity due to lack of integrated science and research
4. Reduced regulatory and investment confidence
5. Market inefficiency and long run costs
6. Eroded trust and public confidence through lack of stewardship and transparency of good research and science
7. Failure to deliver innovation and productivity gains
8. Uncertain research funding continuity and priority limits sustained development of scientific knowledge for decision-making and planning
9. Misaligned or absent incentives for utilities to support research leads to gaps in knowledge and broader system and public good benefits

SUBMISSION INPUTS

Water Research Australia wishes to engage in the National Water Reform 2026 inquiry processes to ensure that the enabling supporting environment of policy and legislation support good science-based decision-making, and secures the role of research to provide that knowledge for a secure, resilient and sustainable water services industry.

Key issues identified for consideration by the Productivity Commissions National Water Reform inquiry include:

- *Progress towards the NWI objectives has been limited due to a lack of a formal role for science, research and innovation*
- *Several delivery, investment and system performance risks are introduced across by not embedding science, research and innovation into the Australian water framework*
- *Economic regulation frameworks do not actively incentivise innovation or sustained investment in research and development*
- *Economic regulatory frameworks do not adequately account for long term benefits and cost reductions arising from R&D investment*
- *Current assessment frameworks struggle to capture the risks and costs of deferring or avoiding investment*
- *Environmental and climate investment face disproportionate evidentiary hurdles in economic regulatory processes*
- *Affordability constraints contribute to lower levels of investment in innovation and long-term capability*

Progress of the NWI

Progress towards the NWI objectives has been limited due to a lack of a formal role for science, research and innovation in key legislative instruments. Across multiple NWI objectives, effective delivery is contingent on the availability of consistent, credible and transparent scientific evidence. This is especially evident for objectives related to entitlement security and statutory water planning, which rely on robust information about water availability, system behaviour, and future risk. See Figure below.

The Figure above demonstrates the tension between the long-term nature of objectives related to the environment and sustainability, and the limited embedding of ongoing research in monitoring and evaluation mechanisms. Objectives such as restoring over-allocated systems to sustainable extraction levels, achieving public benefit outcomes, and managing surface–groundwater connectivity are inherently science intensive and dynamic, particularly in the context of climate change.

The implications extend beyond technical reform into areas of trust, adaptation and innovation. When science underpinning decisions is perceived as opaque, outdated or weakly connected to policy, community acceptance of reform diminishes. Similarly, policy settings intended to promote efficiency and innovation are unlikely to deliver in practice without deliberate mechanisms for research translation and adoption. Innovation in water management requires active institutional support to move from research to operational and economic outcomes.

The effectiveness of the NWI is closely linked to how well science and research are governed, coordinated and embedded across the water sector's institutional landscape. Addressing these

structural weaknesses is therefore not ancillary to reform, but foundational to achieving the NWI's objectives in a manner that is adaptive, credible and resilient over time.

Barriers and Emerging Risks

The Gap Analysis identified a set of interrelated risks that arise where science, research and innovation are not clearly governed or systematically embedded within Australia's water framework. These risks reflect how structural weaknesses in the science base translate into constraints on reform delivery, investment confidence and system performance.

1. *Lack of clarity of ownership and stewardship of the water science base creates inefficiencies and potential gaps and duplications*

Unclear ownership of the national water science and research base undermines accountability for evidence stewardship, prioritisation and translation into decision-making. As a result, responsibility for maintaining and updating the evidence base is dispersed across jurisdictions and agencies, increasing the likelihood of duplication, gaps, short-term research cycles and reliance on outdated or narrowly scoped information.

2. *Poor responsiveness to climate adaptability and system learning due to lack of adaptive and long-term research and science*

Current water science to policy pathways largely assume linear processes, which are ill-suited to the dynamic and non-stationary nature of water systems under climate change. Limited feedback loops between research, planning and operations constrain system learning and adaptive capacity, increasing the risk of maladaptive planning and investment decisions as conditions evolve. Competition for short term funding further reinforces this fragmentation.

3. *Jurisdictional inconsistency and impede reform velocity due to lack of integrated science and research*

Inconsistent scientific assumptions across jurisdictions slow reform processes for the water sector and increase the likelihood of disputes between governments, water users and communities. In the absence of a coordinated water research framework, jurisdictions apply different baselines, climate scenarios and modelling approaches, reducing the portability of science-based policies and regulatory settings. This increases transaction and dispute resolution costs and weakens national reform momentum.

4. *Reduced regulatory and investment confidence*

Fragmented and short-term water science and research governance undermines confidence in the durability and credibility of regulatory and planning decisions. Where evidence changes abruptly or lacks transparent justification, decision-makers are incentivised to adopt reactive or risk-averse approaches rather than the long-term outlook required to achieve NWI objectives. This increases perceived regulatory and investment risk across the sector.

5. *Market inefficiency and long run costs*

Poor integration of science and innovation contributes to inefficient water markets, resulting in higher long-run marginal and average costs than would be achievable under a coordinated, innovation-enabled system. Slow uptake of efficiency-enhancing technologies and practices reflects the lack of mechanisms to validate, update and embed new knowledge at scale.

6. *Eroded trust and public confidence through lack of stewardship and transparency of good research and science*

Limited transparency and coordination of the evidence base reduces confidence across water planning, markets and environmental management, with flow-on effects to public and consumer trust. Where research priorities, assumptions and updates are opaque or inconsistently applied, stakeholders have limited confidence in decision rationales, particularly where there are material impacts associated with adjustments.

7. *Failure to deliver nnovation and productivity gains*

Innovation fails to deliver operational or economic benefits without active translation, validation and adoption pathways. In the absence of sector-wide mechanisms to move innovations from pilots into business-as-usual practice, productivity gains remain fragmented and localised, resulting in foregone efficiency improvements across the system.

There is a clear need for systematic mechanisms to share evidence, research outputs and scientific insights across jurisdictions and utilities, enabling learning to be scaled and embedded consistently. Without coordinated approaches to knowledge transfer and adoption, the sector is unable to capture cumulative productivity improvements, or realise the full value of publicly funded research and innovation.

8. *Uncertain research funding continuity and priority limits sustained development of scientific knowledge for decision-making and planning*

The absence of a clear, durable funding pathway for water science creates a risk of systematic under-investment and under-prioritisation. Short-term and episodic funding limit the ability to sustain long-horizon research and infrastructure-aligned science. Unlike other sectors, water lacks a dedicated, enduring innovation funding mechanism.

9. *Misaligned or absent incentives for utilities to support research leads to gaps in knowledge and broader system and public good benefits*

An implicit assumption that utilities will “take care of” water research, without an explicit mandate or cost-recovery mechanism, risks chronic under-investment in sector-wide science that would produce a public benefit. Investment tends to occur only where directly linked to immediate regulatory obligations or price determinations, leaving broader system, environmental and resilience research underprovided.

Reform Priorities

Water Research Australia propose that future reform priorities give prioritiy to providing clear and sustainable arrangements that:

- allocate responsibility for coordinating and stewarding the national water science base,
- secure research pathways, processes, and funding to support the creation of the science to support the desired sciened based decision-making, and
- translate research and innovation into consistent policy, planning and regulatory practice.

Focus on these reform priorities will support Australia's water sector as it enters a new phase of reform in the context of significant change and uncertainty shaped by climate variability, population growth and urbanisation, ageing infrastructure, rapid digitalisation, affordability concerns, and rising expectations for transparency and meaningful engagement.

Focus on these reform priorities will support science, research and innovation to be foundational to good strategy and planning, credible policy design, adaptive management, and durable regulatory decision making.

Focus on these priorities will recognise research and science as essential infrastructure for reform, enabling adaptive management in the face of uncertainty, reducing policy and investment risk, informing difficult trade-offs, and sustaining public trust in decision-making.

Focus on these reform priorities will coordinate effective investment in research and scientific capability, and the creation of knowledge and its translation into into policy and practice, enabling the ambitions of national water reform.

See later section on "Potential reform solutions responding to the key issues identified"

Aspects of current water services arrangements that creates risks, inefficiencies and misalignments

Issue: Economic regulation frameworks do not actively incentivise innovation or sustained investment in research and development.

As identified through the Gap Analysis, regulatory frameworks across Australia currently provide limited incentives for research, innovation, experimentation and risk-taking. As a result, planning for long-term system resilience is neither strongly supported nor consistently rewarded through existing regulatory mechanisms.

The 2025 Cunliffe Review of the UK Water Sector highlights that where regulatory frameworks prioritise cost certainty and short-term efficiency, innovation and science become systematically disadvantaged. The Review finds that inadequate incentives for research and development limit the sector's ability to respond to climate change, increase long-term system costs, undermine affordability, and erode industry capability. Together, these impacts reinforce a cycle of conservatism that constrains the effective application of research and scientific advancement across the water sector.

A step-change in regulatory thinking is required to address challenges such as climate change, the infrastructure renewal challenge, while simultaneously balancing service reliability, affordability and financial sustainability.

Without stronger incentives for innovation, the regulatory framework continues to favour conservative, asset-led solutions, constraining the sector's ability to pursue innovative, adaptive responses to long-term uncertainty.

The PREMO framework, implemented by the Victorian Essential Services Commission, stands out as one of the few regulatory models in Australia that actively incentivises innovation through the potential for a higher rate of return. PREMO is designed to reward water businesses that deliver greater customer value by linking financial outcomes to the ambition of their proposals. It does this through five assessed elements: performance, risk, engagement, management and outcomes.

Under PREMO, innovation is incentivised by allowing Victorian water businesses to earn a higher return on equity where ambitious, customer-focused and efficient proposals, often underpinned by research and innovation, credibly deliver improved outcomes and accept greater risk on behalf of customers. This represents a deliberate shift away from uniform returns and risk-averse regulation, placing responsibility and opportunity at the board level.

Issue: Economic regulatory frameworks do not adequately account for long term benefits and cost reductions arising from R&D investment.

Science and research play a critical role in strengthening the evidence base underpinning prudency assessments of both capital and operating expenditure. Robust scientific analysis, spanning areas such as climate modelling, asset deterioration, water quality risk, system resilience and service reliability, provides the empirical foundation needed to demonstrate that proposed investments are not only technically sound, but necessary and reasonable in the face of evolving risk profiles.

In the absence of this evidence from research and science, prudency assessments risk becoming backward-looking, anchored in historical norms rather than forward-facing assessments of system vulnerability and long-term service obligations.

Well integrated research also materially improves optioneering and efficiency outcomes. By enabling comparative assessment of intervention pathways under different risk scenarios, science-based decision-making supports more transparent trade-offs between capital intensity, operating strategies and risk exposure. This allows regulators to distinguish between genuinely inefficient expenditure and prudent investment designed to avoid low-probability but high-impact service failures. In this context, research acts as an enabler of efficiency (not a cost) by reducing uncertainty, avoiding over- or under-investment, and supporting least-regret decision-making under deep uncertainty.

Prudency tests struggle to accommodate investments driven by emerging scientific understanding rather than historical evidence of asset failure or service non-compliance. Where risks are uncertain or probabilistic in nature, regulated businesses face significant evidentiary hurdles in demonstrating that expenditure is both prudent and efficient, despite signals from climate science, environmental monitoring or system modelling that service reliability is deteriorating. As a result, investment decisions are frequently deferred until risks crystallise, at which point costs, disruptions and affordability impacts are materially higher.

More fundamentally, existing frameworks tend to assess prudency at the project or cost-line level, rather than at the system or portfolio level where resilience benefits are realised. This narrows the scope for regulators to recognise the value of redundancy, modularity, or adaptive capacity - features that are central to managing high-impact risks but may appear inefficient when assessed in isolation. Without explicit mechanisms to value uncertainty reduction, optionality and avoided future costs, regulatory decisions can unintentionally discourage innovative or preventative solutions.

Strengthening the role of science and research within regulatory decision-making therefore requires a shift from viewing uncertainty as a justification for delay, to recognising it as a rationale for action.

It also requires clearer regulatory signals that well-founded research and long-term risk mitigation constitute prudent behaviour, even where benefits extend beyond a single regulatory period.

Ultimately, embedding research and science more deeply into prudency and efficiency assessments would support more resilient, efficient and equitable outcomes for customers. By enabling regulators to better account for long-term system risks, high-consequence events and the value of foresight, regulatory frameworks can more effectively balance service reliability, affordability and financial sustainability under conditions of increasing uncertainty.

Issue: Current assessment frameworks struggle to capture the risks and costs of deferring or avoiding investment that have been enabled by good science and research.

Current assessment frameworks are not well equipped to deal with the valuation of the counterfactual as it relates to emerging research and science. Prudency and efficiency tests are typically framed around observable costs, historic performance and relatively short regulatory periods, which makes it difficult to recognise the value of investments aimed at reducing uncertain but potentially catastrophic risks. Where the probability of an event is low or its timing uncertain, regulators often default to requiring a high standard of proof that the expenditure is immediately justified, even where the consequences of failure to act would be severe, irreversible or system-wide.

Science and research can narrow this evidentiary gap by improving understanding of emerging risks, clarifying causal pathways and strengthening confidence in long-term projections. Improved climate science, asset degradation modelling, emerging contaminant risk assessment are some examples of to making previously latent risks more visible and defensible in regulatory decision-making. However, even with better science, existing frameworks struggle to translate this knowledge into an economic valuation that sits comfortably within conventional prudency tests. In particular, they provide limited mechanisms to recognise the value provided by research of reduced uncertainty, avoided future disruption, or the option value created by earlier, proactive investment.

This creates a structural bias towards deferral, with investment decisions often only supported once risks crystallise through service failures, compliance breaches or extreme events. At that point, the counterfactual becomes obvious with hindsight, but the costs to customers, communities and the environment are materially higher than if action had been taken earlier. The inability to adequately value avoided costs or non-events means that regulatory decisions can unintentionally favour short-term cost minimisation over long-term resilience and productivity.

Without reforms that better integrate research and scientific evidence into prudency assessment and explicitly recognise the risks and costs of inaction, current frameworks risk undermining service

reliability, increasing long-run costs, and constraining the sector's ability to respond efficiently to growing uncertainty. Addressing this challenge is therefore central to improving productivity outcomes and ensuring that regulatory settings support timely, risk-informed investment decisions

Issue: Environmental and climate research and innovation investment face biases in economic regulatory processes

Short price review cycles favour proven, capital-intensive solutions that deliver visible outcomes within a single determination period. Whereas the research, science and innovation required to arrest system challenges such s environmental degradation and impacts of climate change requires sustained iterative effort and attention over the long term.

The Cunliffe Review discusses how the UK's regulatory structures can actively shape innovation behaviour. Without mechanisms to manage regulatory risk, allow controlled experimentation, and recognise long-run benefits, utilities rationally default to lowest-risk, short-term compliance strategies.

Adaptive approaches such as nature-based solutions, carbon drawdown, emissions reduction are essential longer term strategies, whose benefits may not be fully understand or measured until subsequent pricing periods disadvantaging approaches such as these.

Issue: Affordability constraints contribute to lower levels of investment in innovation and long-term capability.

Affordability pressures within current regulatory and funding frameworks can unintentionally constrain investment in innovation and long-term capability, even where such investment would improve productivity and system resilience over time. In practice, the strong emphasis placed on near-term bill impacts and short-run cost containment limits the scope for regulated entities to pursue research, trials and capability-building activities whose benefits accrue gradually or materialise beyond a single regulatory period.

Affordability often considered achievable only through short term cost control to be balanced alongside long-term efficiency and service reliability, discretionary expenditure such as innovation, applied research and system transformation tends to be deferred. These investments are often perceived as higher risk or less immediately tangible than cost controls, core asset replacement or compliance-driven upgrades, particularly when regulatory frameworks provide limited recognition of their future productivity benefits or risk-reduction value.

Over time, this dynamic can reinforce a cycle of under-investment in research, science and innovation. Utilities focus on incremental, lowest-cost solutions to manage short-term pressures, while opportunities to improve operating efficiency, reduce long-run costs, or adapt to emerging challenges are foregone. As a result, affordability constraints may paradoxically lead to higher costs for customers in the long term, as systems become less flexible, less efficient and more exposed to shocks that require expensive reactive responses.

This tension is particularly acute in the water sector, where rising input costs, increasing climate variability and ageing infrastructure place growing demands on system performance. Science and

evidence-based innovation such as new treatment processes, data-driven asset management, demand management approaches or alternative service models, has the potential to moderate these pressures over time. However, in the absence of explicit regulatory signals or funding mechanisms to support investment in innovation under affordability constraints, these options are often deprioritised in favour of proven, short-term solutions.

From a productivity perspective, this suggests that current arrangements may not be optimally supporting dynamic efficiency. While affordability considerations are essential, reform settings that consistently favour short-run cost minimisation over long-term capability development risk locking in higher costs and lower performance over time. Addressing this imbalance would require a clearer framework for recognising the long-term value of research and innovation and system capability, and for enabling investment that improves affordability outcomes over the medium to long term rather than constraining it.

The Cunliffe Review reinforces the conclusion that affordability-driven regulatory and funding frameworks, while essential for protecting customers in the short term, can unintentionally inhibit the very forms of innovation and capability-building required to deliver sustainable affordability over the long term. Where regulatory emphasis is placed predominantly on near-term bill impacts and short regulatory cycles, investment in research, innovation and system transformation is deprioritised, even where these investments would materially reduce future costs, improve resilience and enhance service outcomes.

The Cunliffe Review highlights that while competitive, project-based innovation funding is valuable, it has delivered uneven results, with implementation constrained by short-term funding horizons, concentration of awards among larger incumbents, and limited pathways for scaling successful trials into business-as-usual practice. These dynamics mirror broader challenges in water regulation, where innovation is supported at the margins, but not consistently embedded within core regulatory, pricing and governance arrangements. As a result, innovation remains episodic rather than systemic, and productivity gains are slow to diffuse across the sector.

Innovation, affordability, and resilience are not competing objectives, but interdependent ones. Regulatory and governance frameworks that treat affordability as an overriding constraint risk locking the sector into higher long-term costs and reduced adaptability. Achieving secure, resilient and affordable water services will therefore require reform settings that explicitly enable research and innovation, support collaboration, and recognise the long-term productivity and risk-reduction value of science-based investment.

Recommendations for Reform

Potential reform solutions responding to the key issues identified

Recommendation 1: Treat research and science as essential infrastructure

Science and research considerations to be explicitly incorporated into relevant statutory instruments that are explicitly concerned with decision-making frameworks, planning instruments and long-term system outcomes that depend directly on the availability, quality and use of scientific evidence.

Research and science cannot be treated as optional or ancillary inputs to the water sector, but are are essential infrastructure for:

- Driving change and reform
- Enabling adaptive management in the face of uncertainty
- Reducing policy and investment risk
- Informing difficult trade-offs
- Sustaining public trust in decision-making

Without deliberate and coordinated investment in scientific capability, data systems and the translation of research into policy and practice, the ambitions of national water reform will be difficult to realise.

This essential research infrastructure must be inclusive of:

- Research that is high quality and enables sector decision-making and innovation
- Pathways to impact mechanisms and options for translating great research, science and knowledge into outcomes in practice and policy
- Sustainable research funding that provides ongoing certainty and stewardship of the the science and knowledge

Recommendition 2: Strengthen water science and research stewardship, transparency, and coordination

A coherent national approach to the stewardship of water science and research should be explored, that is inclusive of all water-related sectors, interests and scientific needs and endeavours. This should be inclusive of community and environmental stakeholders, and the integration of indigenous knowledge and decision-making.

This stewardship function should consider research and science standards, capability building, removing of siloed science and the avoidance of duplication. It should focus on creating the enabling supporting environment for good science-based decision-making, and the secures the role of research to provide that knowledge for a secure, resilient and sustainable water services industry

Industry member based associations like Water Research Australia, the Water Services Association of Australia, the Australian Water Association, VicWater's Intelligent Water Networks, the Queensland Water Directorate, the NSW Water Directorate, and large commonwealth funded centres like the OneBasinCRC already play significant roles in water stewardship across the nation, and is largely

based on the goodwill and generosity of its members, and needs to be secured for the longer term with increased transparency and collaboration for more effective and efficient outcomes.

Recommendation 3: Economic regulation for water that enables and incentivises research and innovation

Economic regulators should be required to assess and value long-term productivity, resilience and risk-reduction benefits of innovation, rather than treating such expenditure as discretionary or ancillary to core service delivery. To support this, mechanisms to recognise benefits that accrue beyond a single regulatory period, including through longer planning horizons, benefit carry-over provisions, or explicit innovation outcome incentives should be strengthened to help provide greater clarity on how these benefits can be assessed by economic regulators.

Long-term system resilience is neither strongly supported nor consistently rewarded through existing regulatory mechanisms. A step change in regulatory thinking is required to address the infrastructure renewal challenge, while simultaneously balancing service reliability, affordability and financial sustainability. Without stronger incentives, the regulatory framework continues to favour conservative, asset-led solutions, constraining the sector's ability to pursue innovative, adaptive responses to long-term uncertainty.

Strengthening the role of science and research within regulatory decision-making therefore requires a shift from viewing uncertainty as a justification for delay, to recognising it as a rationale for action. This includes greater acceptance of scenario-based evidence, probabilistic risk analysis and adaptive pathways planning within prudency frameworks. It also requires clearer regulatory signals that well-founded research and long-term risk mitigation constitute prudent behaviour, even where benefits extend beyond a single regulatory period.

Ultimately, embedding science more deeply into prudency and efficiency assessments would support more resilient, efficient and equitable outcomes for customers. By enabling regulators to better account for long-term system risks, high-consequence events and the value of foresight, regulatory frameworks can more effectively balance service reliability, affordability and financial sustainability under conditions of increasing uncertainty.

Recommendation 4: Establish a reliable, equitable, and recurring funding base for water science, research and innovation.

Funding mechanisms should move beyond short-term, competitive and ad-hoc arrangements to provide stable support for both the development and implementation of innovation, enabling longer-term capability-building, knowledge sharing and system transformation. A predictable funding base would reduce regulatory and investment risk, support sector-wide productivity improvements, and ensure that innovation contributes to improved affordability, resilience and service outcomes over the medium to long term. Consideration should also be given to aligning Commonwealth and state R&D funding with regulatory and pricing frameworks to ensure publicly funded research can be translated into regulated operations and investment decisions.

Recommendations from the Cunliffe Review regarding the establishment of regulatory sandboxes for the water sector to allow utilities to trial innovative technologies and service models under controlled conditions, with regulatory flexibility and clear governance parameters should also be considered

Recommendation 5: Assurance expectations supporting research and evidentiary requirements

Exploration of assurance frameworks for research, science and evidentiary standards should be considered and explored.

Effective water science should be rigorous and focused on delivering the best available and reliable knowledge, while recognising that research is inherently uncertain, evolving and unlikely to produce single definitive answers, particularly in complex and highly variable systems. Exploration of assurance frameworks for research, science and evidentiary standards should be considered and explored.

As highlighted by O'Kane (2025), the role of science and research is to inform policy in an open and transparent manner, but not to predetermine outcomes.

One example would be to consider requirements for standardised "Evidence Statements" to accompany key water decisions, including system planning, regulatory approvals and major infrastructure investments. Evidence Statements would set out the scientific evidence and research relied upon, describe key uncertainties and limitations, and explain how evidence has informed decision-making. This would strengthen transparency, improve decision assurance, and ensure that evolving scientific knowledge is consistently and explicitly considered alongside policy and value-based judgements.

CONCLUSION

Australia's water sector is entering a new phase of reform in the context of significant change and uncertainty shaped by factors such as climate variability, population growth and urbanisation, ageing infrastructure, rapid digitalisation, affordability concerns, and rising expectations for transparency and meaningful engagement.

In this context, science, research and innovation are not optional or ancillary inputs - they are foundational to good strategy and planning, credible policy design, adaptive management, and durable regulatory decision making.

Science and research must be recognised as essential infrastructure for reform, enabling adaptive management in the face of uncertainty, reducing policy and investment risk, informing difficult trade-offs, and sustaining public trust in decision-making.

Without deliberate and coordinated investment in research and scientific capability, and the creation of knowledge and its translation into into policy and practice, the ambitions of national water reform will be difficult to realise.

Acknowledgements & additional considerations

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