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MURRAY–DARLING BASIN AUTHORITY

Submission to the Productivity Commission

Inquiry into progress with the reform of Australia's water resources sector

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Acknowledgement of the Traditional Owners of the Murray–Darling Basin
The Murray−Darling Basin Authority pays respect to the Traditional Owners and their Nations of the Murray−Darling Basin. We acknowledge their deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

The guidance and support received from the Murray Lower Darling Rivers Indigenous Nations, the Northern Basin Aboriginal Nations and our many Traditional Owner friends and colleagues is very much valued and appreciated.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

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Executive Summary

The Murray–Darling Basin Authority (MDBA) welcomes the opportunity to provide a submission to the Productivity Commission's 2020 inquiry into the National Water Initiative (NWI). The Issues Paper (May 2020) released by the Productivity Commission has guided the MDBA's submission. As outlined in the Issues Paper, the inquiry focusses on the assessment of both progress towards achieving the objectives and outcomes of the NWI; and examines whether the water reforms agreed in the NWI, along with any other subsequent reforms adopted by Council of Australian Governments (COAG), are achieving their intended outcomes.

The NWI principles informed the development of both the *Water Act 2007* (Cth) (Water Act) and the *Basin Plan 2012* (Cth) (Basin Plan). Over the past eight years, the MDBA has supported the Basin governments to implement the Basin Plan. The Basin is now better connected, there are catchment-level water resource plans in place or undergoing final assessment, and the levels of water take have been reduced to sustainable levels. In under a decade there has been a significant step-change for Basin water management, and all governments continue to adapt and improve.

Throughout the development and implementation of the Basin Plan, the MDBA has learned many lessons, and identified several challenges that face water management across the Basin and Australia more broadly. This submission focuses on the core issues the MDBA has identified during implementation of the Basin Plan, and recommends where NWI principles could be strengthened or adapted.

The climate is changing more rapidly than predicted, water markets are evolving, and there are ever increasing expectations from stakeholders for inclusive and transparent decision making. Despite commitments by governments to improve transparency and increase First Nation's access to water and participation in management, there is still more to do. Water management arrangements must continually evolve to respond to these complex challenges.

Water is a national asset, and with water resources under ever increasing pressure from the changing climate, it is critical that it is managed in a way that can continue to support Australia's communities, ecosystems and industries. A national framework provides guidance for all governments, communities and industries to manage this precious resource in the national interest. While the NWI is an essential component of water management in Australia, and must remain in place, this national framework must continue to adapt to new information and lessons learnt through its implementation.

Based on the experience of implementing the NWI in the Basin, key lessons to be considered for the future NWI are:

- The role of robust and transparent compliance frameworks in any water management arrangements, particularly around the regulation of water markets.
- The requirement for increased First Nations' access to water, to complement direct involvement in the planning and management of water resources.
- The fundamental need for policies and management frameworks to be adaptive to the challenges climate change and other issues present, to facilitate more resilient communities, ecosystems and industries.

- The essential role of information sharing and capability building in ensuring the operating environment is navigable for water users.
- The necessity of policies that complement water management to support adaptation of the whole system, beyond natural resource management, to areas such as regional development, infrastructure and land use planning.
- The importance of investing in science and monitoring of system condition as a key foundation of adaptive management of water policy.

The issues facing Australian water management are challenging and complex. The NWI must continue to evolve to ensure it remains the minimum benchmark that guides Commonwealth, State and Territory governments to achieve sustainable water management for Australian communities, industries, our environment, and First Nations peoples.

Water markets, water resource accounting & compliance

The southern Basin water market is well-established and demonstrates the ability of water markets to support the movement of water resources to their highest value use. It also demonstrates the role of water markets in reforming industry and redistributing wealth and opportunity. It is not the role of the market to ensure this is equitable, however Governments need to create an operating environment that is fair, transparent and allows people to adapt.

Effective water management across jurisdictions must be underpinned by clear governance, consistent market rules, robust monitoring and accounting arrangements and strong compliance and enforcement frameworks. This must be coupled with transparent information regarding the operation and regulation of the system and the market, the physical constraints of the system and water availability.

As water markets grow and water management systems mature across Australia, regulatory arrangements must evolve. The NWI should be updated to include consideration of the critical importance of compliance in any water management arrangements.

Water markets

Under the Murray–Darling Basin Agreement and the Basin Plan, the development of water markets within the Basin has been encouraged and supported by successive state and federal governments. Basin water markets provide the mechanisms for competing interests to engage and trade, and for available water resources to be moved to their most productive use. The southern Basin water market is the largest and most developed water market in Australia.

The growth of water markets in the Basin is at least partly a result of the unique characteristics of the water resources and industry mix in the Basin. Large interconnected and regulated water systems, extremely variable inflows and a diverse mix of agricultural industries with different water requirements make the Basin particularly conducive to water trading. Water trade offers water users enhanced flexibility and agency in decision making. It allows them to manage risk and improve business outcomes, providing options to better respond to changes in water availability and market conditions.

Water markets in the Basin continue to evolve and grow. In the 12 months to 30 June 2019, the total turnover of surface water allocation and entitlement trade across the Basin grew to $3.97 billion. The MDBA considers that Basin water markets are, in general terms, working and water is moving to higher valued uses as intended.

This water market is currently being reviewed by the Australian Competition and Consumer Commission (ACCC). The MDBA, in its submission to that inquiry, noted the operation of the southern Basin water market should be improved, based on several existing impediments to market functionality. These include:

- the large number of agencies, both state and federal, involved in Basin water markets
- inconsistent market arrangements, policies and administration practices within, and between, jurisdictions
- misinformation and lack of transparency of information
- physical and environmental constraints impacting the ability to deliver traded water
- climate change and its (unknown/poorly communicated) impact on water supply.

These are likely to be relevant at the broader national scale and may be addressed, in full or in part, through updates to the NWI.

Decisions made by water market participants are based on individual circumstances such as access to financial capital, risk appetite and business models. However, recent changes in the southern Basin show that at a macro level, the trading of water can result in the redistribution of industries, wealth and opportunities. In areas where wealth and opportunity are decreasing, many see this as a failure of the water market. However, a high functioning water market does not result in equitable distribution of wealth and opportunity, rather it enables water to move to its highest value use. This 'highest value use' can also increase the likelihood of a reduction in the diversity of industries, which then exposes the economy to greater boom and bust cycles. Information on how the market operates, and effective water and land planning, is critical and can allow communities and industry to manage these risks.

There is a need for governments to acknowledge the impacts, both positive and negative, of the water markets on individuals, regions and Australia as a whole, and communicate these more clearly. If there are regional and national values arising from the water market, which result in significant and localised social or economic inequities, there is a role for Government to address these by providing support for impacted communities to diversify and transition to a position that supports long term community well-being.

Water accounting

Many of the fundamental objectives of the NWI rely on a robust and transparent method to monitor, measure and account for water. Furthermore, the robustness and transparency of the accounting methods need to be applied at all scales, from sustainable diversion limits (SDLs) at the catchment scale through to individual take at the 'farm scale'. Without strong water accounting capabilities and practices, effective compliance is highly unlikely and trust in the water management system is unachievable.

Within the Basin, there has been good progress in water resource accounting with the implementation of accounting and reporting of SDLs and water use (both consumptive and water for the environment). In 2018 the MDBA published its *SDL reporting and compliance framework*, which complements the annual reporting processes on water take set out in the Water Act and the Basin Plan, by describing the steps for managing water take that exceeds the SDL. Further, the MDBA and

the Basin states have progressed improvements in water metering and measurement through the 2018 Murray–Darling Basin Compliance Compact (Compact). The MDBA has also commenced an annual audit and assurance program which includes audits into the adequacy of Basin state metering policies, monitoring, and enforcement to increase transparency about, and confidence in, Basin state water metering arrangements.

While the MDBA has observed significant improvements in water measurement over the last few years, water is fundamentally difficult to measure at a spatial and temporal scale that makes sense for individual stakeholders, and many challenges remain. These include:

- Ensuring that there are consistent and accurate methods across governments to provide information on water storages; water holdings; and the volumes of different types of water (e.g. consumptive; conveyance; environmental) in relevant locations (e.g. reservoirs; key river locations).
- Ensuring there are consistent and accurate methods of measuring 'take', including floodplain harvesting and farm dams.
- Enhancing general understanding of the methodology of SDL accounting, including how SDLs are expressed on an annual basis as "Annual permitted Take"

Consistent and accurate methods of measuring water are fundamental precursors to effective compliance, and progress against the challenges in this area will strengthen management practices.

Compliance

Effective water compliance and enforcement frameworks are critical to community and industry confidence in the management of water resources. In 2017 and 2018, a number of water compliance inquiries reported that there were serious shortcomings in water management and compliance in the Basin. In response to these inquiries, Basin governments undertook collective action by committing to the Compact with the intention of driving consistent improvements in water management across the Basin and restoring public confidence in government management of water compliance. The Compact includes a range of key themes that could be considered for inclusion in an NWI update, as foundational principles for an effective compliance system:

- *Transparency and accountability* – in both the legitimacy and fairness of water sharing rules and allocation decisions, and the consistent application of those rules.
- *Robust compliance and enforcement frameworks* – with a focus on continuous improvement and collaborative professional networks to build capability. These frameworks and their application, for example through compliance and enforcement activities, must be supported by public reporting.
- *Metering and measurement of water* – with a focus on meter coverage and accuracy of water meters. Compliance with the arrangements must be measured, publicly reported on in a timely manner, and independently verified.
- *Protecting and managing environmental water* – through improving and implementing water sharing rules and arrangements.

In addition, non-compliance with water take rules needs to be deterred through robust regulatory offence and sanction regimes. As part of the Compact, Basin governments reviewed and, in some cases, legislated changes to their penalty regimes and their enforcement policies with the view of improving and bringing some consistency to arrangements across the Basin. Significant effort in NSW following the 2017-2018 compliance inquiries focused on increasing the penalties for water compliance offences and bringing forward prosecutions through a new and dedicated regulator, the NSW Natural Resources Access Regulator. Work on a consistent national approach to penalties and offences had previously commenced as part of the National Framework for Water Compliance and Enforcement Systems for Water Resource Management (2012-2016), a COAG initiative which the Commonwealth provided $60 million to the state governments to implement, but was never finished. The principles of the National Framework were incorporated into the Compact, and should also be considered in an update to the NWI.

The Basin states are responsible for regulating compliance with their state water rules and laws. The MDBA takes a Basin-wide view of water compliance by conducting assurance of the adequacy of state-based arrangements in water compliance. Performance audits and reviews of compliance with rules contained in water resource plans form a key part of the MDBA's compliance activities. In the context of managing a highly connected system at the Basin scale, this work is critical for public confidence.

Any update to the NWI should include consideration of the critical importance of effective and transparent compliance regimes in water management arrangements.

First Nations people's participation in water management

It is well-established that the identity, culture and wellbeing of First Nations are intrinsically linked to land and water, yet there are limited opportunities for First Nations to participate in water planning and management, or access water for their cultural and economic needs. This is in part due to an ongoing lack of understanding of and support for cultural water.

The NWI objectives should be strengthened to reflect the need to increase First Nations' access to water to complement direct involvement in planning and management of water resources.

First Nations people's identity and culture is intricately tied to their traditional land and waters, encapsulated in the concept of 'Connection to Country'. The MDBA's Aboriginal Weather Watchers project, undertaken by the MDBA from 2016-2019 to build knowledge on Aboriginal uses and values of water-dependent natural resources, reinforced that there is a very strong relationship between water availability and First Nations people's wellbeing. Given the existing high level of vulnerability of First Nations communities in many parts of Australia, water reform must ensure it is providing opportunities for these communities, not further compounding existing cultural, economic and social disadvantage.

Capability and representation of First Nations

Increasing the opportunity for First Nations people can be driven through increasing their participation in both water planning and water management. Key elements, in the Basin context, include:

- *Capability* – Improving First Nations people and community's knowledge of current water management approaches will assist them to have better capacity to effectively contribute to water management decisions and future planning. However, this education should be two-way, with reciprocal sharing of First Nations approaches and views of water management with non-First Nations people and organisations. This will assist in developing a greater understanding and acceptance of First Nations needs and cultural responsibilities.
- *Representation* – First Nations people should be represented in water planning and management, not as bystanders or part of the engagement model. The MDBA has made significant headway in this area through strengthened relationships with the Northern Basin Aboriginal Nations (NBAN) and the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) groups. The appointment of the first Aboriginal Chair of the Basin Community Committee; and the imminent appointment of an Indigenous Authority member are important steps for further progress in this area. The challenges of identifying who can 'speak for country' remains as well as ensuring that representative bodies represent all Nations they purport to.
- *Decision making* – First Nations people should be an integral part of any decisions about water management, especially in relation to their cultural values and economic needs. In any water planning or management activity it is important that First Nations are enabled to develop planning provisions based on their needs, with government providing an assistance role ('Nothing about us without us'). Through initiatives such as the First Nations Water Guidance (pilot) Project, Commonwealth water agencies and First Nations groups have received mutual benefits through building Aboriginal knowledge into environmental water planning and decision making. Initial discussions about the review of the Basin Plan are focused on setting up arrangements for First Nations to 'hold the pen' when developing planning provisions that directly apply to them, and the MDBA encourages any updates to the NWI to consider this approach.

Access to water

In the Basin, water sharing arrangements are based on historical practices, which did not build in First Nations water access or management principles, though there are a number of initiatives underway to address this.

An important initiative for MLDRIN, NBAN and other representative groups is attaining water rights (cultural and economic) through the Aboriginal Water Entitlements Program. This program is indicative of both the goodwill and difficulty in redressing a complex history of Aboriginal inequity and exclusion. The MDBA notes both the complexities in implementing the program, as well as the slow progress being made.

A key consideration for current and future programs relating to First Nations access to water, including in terms of economic, health and cultural needs. Determining cultural water needs and

building them into planning instruments is an important component of any water planning activities. While the current NWI, Water Act and Basin Plan have made considerable progress in this area, there is a need to further define how water management impacts the cultural responsibilities of First Nations people, beyond inclusion of cultural needs in environmental watering, and beyond specific delivery targets to cultural sites. This will require a different approach to water management, supported by further research into First Nations needs and responsibilities.

While the focus in current arrangements is primarily on cultural needs, which while important, are not adequate to redress equity issues. First Nations people and organisations may have economic aspirations that could alleviate some of the disadvantage that their people and communities are experiencing. Access to water for economic purposes as well as the ability to use that water through the provision of infrastructure, land and support is vital going into the future.

The NWI calls for the *recognition of indigenous needs in relation to water access and management*. While the detail of the NWI goes on to identify clear actions in relation to this, as an overarching, headline objective, *recognition* is too passive and does not address the urgency for First Nation's people to not only have their needs recognized; but for their needs to be included and given parity alongside the needs of other stakeholders. Consideration should be given to increasing the level and strength of ambition in the headline objectives of the NWI relating to First Nations people's participation and management of water resources.

Climate change

Climate change is one of the biggest challenges for water management in Australia. Lower inflows and more frequent extreme events are already placing significant pressure on already stressed water resources.

Water management arrangements in the Basin have mechanisms to respond to climate change and adapt to new information, and water managers recognise that these will need to continually evolve to respond to new research and adapt to the challenges of a changing climate.

Recent drought and extreme events experienced across the Basin demonstrate the need for better planning across jurisdictions, and more formalised and coordinated processes to manage the on-ground impacts of climate change on critical human and environmental water needs.

The NWI should be strengthened to reflect the critical need for policies and management frameworks to be adaptive to the challenges climate change presents to facilitate more resilient communities, ecosystems and industries.

There is a substantial body of evidence showing that the climate is changing across Australia, and there is broad acceptance from Australians that both mitigation and adaptation actions are needed. For the Basin, hotter temperatures, more regular extreme events and lower inflows will result in changes to Basin communities, environmental assets and local and regional economies. Meeting the objectives of the NWI will be increasingly challenging under our climate change future, and governments, water users and communities will need to be adaptive in response.

Policy mechanisms

The Basin Plan was developed to consider and respond to the challenges of climate change, as described in detail in *Managing water in the Murray–Darling Basin under a variable and changing climate* (Neave et al., 2015). For example, many of the Basin Plan's key elements were designed to provide policy responses to climate extremes, such as prolonged and severe drought, by including:

- Annual water allocations for both consumptive and environmental use, based on prevailing climatic conditions (i.e. water availability in the system).
- Sustainable diversion limits, providing the additional water (beyond the Baseline Diversion Limit) to support healthy water-dependent ecosystems (i.e. supporting resilience in the face of a drying climate).
- Annual environmental watering priorities, which guide environmental water holders on what environmental assets should be prioritised in response to the prevailing and longer-term water resource outlooks, and previous environmental watering actions.

The Basin Plan also requires Basin states to prepare water resource plans that include an assessment of climate change risks. Where risks exceed a set threshold, the plans must also include management strategies, including for extreme dry periods. There are minimum requirements that must be reached in order for water resource plans to be accredited (noting that at time of writing all water resource plans have been accredited with the exception of NSW which were being assessed).

While there are mechanisms embedded within the Basin Plan and water resource plans to respond to the water resource implications of climate change, these instruments will need regular adaptation to continue to keep pace with the challenges of climate change.

The MDBA signalled the need for the Basin Plan to continue to engage with climate change in its February 2019 discussion paper (*Climate change and the Murray–Darling Basin Plan*). This research is well underway, with the MDBA recently completing Phase 1 of its climate change strategy, which scanned across the key social, economic and environmental vulnerabilities in the Basin under climate change. The work also included a range of possible climate scenarios that Basin communities, environments and economies would need to be able to adapt to, in order to remain sustainable.

Water resource plans too must continue to adapt. The MDBA commends the work that the states have put in to addressing climate change and extreme events in their water resource plans. However, more work in understanding the risks, alongside an increased focus on developing and implementing management actions will be required, in order to offset the significant changes expected, and already being faced, under climate change.

The Basin experience has shown that flexibility of policies and frameworks is critical to adapting to the challenges of climate change, though practically, this is difficult to achieve. There are several elements of the Basin Plan that are set out in legislation, which has inhibited the ability of the policy to respond at the same pace as our changing climate. Climate change will challenge the ability of the whole system to adapt, and governments need to ensure that policies are truly flexible to facilitate more resilient communities, ecosystems and industries.

Extreme events

While the Basin's legislative frameworks have mechanisms to respond climate change and adapt to new information, the challenging realities of actually managing the on-ground impacts of severe drought and other extreme events have become very apparent in recent years. Extended dry periods, devastating bushfires, and extreme storm events are fast becoming the norm for many Basin communities; and policy is being stress-tested to provide equitable and effective solutions for Basin communities, economies and the maintenance of its environmental values.

In December 2018 and January 2019, the lower Darling River was subject to numerous fish death events, which resulted in the appointment of an independent panel to assess the causes and influencing factors of these deaths and provide recommendations for future management (*Independent assessment of the 2018-19 fish deaths in the lower Darling).*

The MDBA supports the key findings of this assessment, which calls for policy makers to prioritise:

- the protection of low flows
- Basin connectivity
- improving Menindee operations
- provide joint plans for Northern Basin Toolkit Measures
- increase investment in research and development.

For Basin water managers, priorities are:

- emergency native fish response and early warning systems
- ongoing monitoring
- collaboration with key stakeholders
- management of water for the environment
- climate change research.

The MDBA notes the progress made by the Commonwealth and Basin states in the development of the *Native Fish Recovery Strategy*, and the Commonwealth's $20 million research and development investment into the *Murray–Darling Water and Environment Research Program*.

Lessons from the 2018-19 fish deaths have been learned. For example, significantly improved planning and management arrangements for the MDBA were put in place across the 2019-20 summer period to act as our early warning and emergency response system. Across this high-risk period, the MDBA implemented a planned process of sharing information with states to understand risk trajectories and pre-emptive management responses; reporting regularly to MDBA Executive; and triggering urgent advice to the Minister for Water as required. These processes were invaluable both in the context of the higher risk to native fish during summer under drought conditions and also as the bushfire season placed additional pressure on the quality of the Basin's water resources. The MDBA notes the considerable efforts by the Basin states in managing native fish throughout this period, and the spirit of collaboration and information sharing committed to by all stakeholders.

While management of water quality and its environmental pressures underwent a positive step change in 2019-20, the severity of the drought also placed huge pressures on the availability of critical human water needs for many northern Basin communities. During 2019 and 2020 many of

these communities relied upon water to be trucked in. The MDBA acknowledges the challenges placed on states in managing these shortages and encourages ongoing consideration of the matter, given severe droughts are likely to be a more common occurrence under climate change.

It is highly likely that climate change will require difficult decisions to be made both at the national scale through to Basin and local scales. An almost certain outcome is that there will be insufficient water resources, or predictable rainfall/runoff patterns, to continue business-as-usual. The debate between the prioritisation of the environment (*environmentally sustainable levels of extraction: NWI Objective (v)*), and the equitable distribution of insufficient water resources (i.e. a triple bottom line), can only be expected to intensify over the coming years and decades.

For the Basin, trade-offs between the long-term viability of the Basin's environmental values, communities and industries will inevitably need to be made. The extent to which such trade-offs need to be made, and 'winners' chosen, will depend on the ability of non-water reform policy decisions (e.g. regional development; industry transitions; infrastructure development; natural resource management) to be considered and integrated at the regional and Basin scales.

Information and capacity building

Water management in the Basin is complex, and the operating environment is difficult for water users, communities and the general public to navigate. Governments need to invest in sharing information and building capability to create an operating environment that is fair, transparent and allows people to adapt in a timely and sustainable manner.

Public trust in institutions is declining and transparency continues to be a significant challenge for governments. There is a need for governments to understand what transparency means for communities and change the way management information and decisions are shared to meet these needs.

Any future NWI should continue to advocate for information to be shared in a way that that is accessible, timely and user focussed, in order to build knowledge and capacity for communities to navigate and adapt to the water management system. This should consider user needs at a regional and local level.

Water management is only part of a broader system and there is a need for complementary policies to support adaptation of the whole system, beyond natural resource management, to areas such as regional development, infrastructure and land use planning.

The NWI identified *Knowledge and Capacity Building* and *Community Partnerships and Adjustment* as two of the eight key elements underpinning the objectives of the landmark agreement. In the Basin, an underinvestment in these areas is reflected in decreased trust in governments and calls for Basin governments to change the way they share information and engage with the public, as current mechanisms are not effective.

Engagement and information sharing

The Basin is an inherently complex system and a vast amount of information exists regarding its condition and management arrangements. The complexity of responsibilities and rules is challenging for water users to navigate, and the macro scale management arrangements and decisions communicated by governments are often disconnected from the information that users require.

Many reviews into Basin water reform have called on all parties to respond to the need for greater transparency, more effective engagement and better information sharing. This includes a growing demand from Basin stakeholders for governments to provide information and engagement opportunities that are fit for purpose at a regional and local scale.

The MDBA continues to make advancements in these areas. In particular, the MDBA has made progress in building genuine engagement opportunities and improving stakeholder relationships through initiatives such as the Basin Community Committee, its relationships with Murray Lower Darling River Indigenous Nations and Northern Basin Aboriginal Nations, and its expanding regional footprint. Concurrently, the MDBA has refined its understanding of stakeholders and audience types and made significant improvements in the array of engagement and communication tools and approaches available to share information with different audiences. These initiatives demonstrate that audiences and stakeholder needs change both spatially and temporally in response to complex, interacting factors such as market forces, urbanisation, drought and water reform progress. Governments need to recognise this and continually evolve their approaches to meet the changing needs of stakeholders.

Despite recent commitments by government to improve transparency and information sharing, stakeholder consultation continues to find that the needs of water users, communities and the broader public are not being met. This indicates that there is a disconnect between what transparency means for governments and what it means for communities, in terms of content, accessibility and priority information. In addition, the experience in the Basin has shown that in order to maintain support for water reform, there is a need to provide information on the social, economic, environmental and cultural impacts at a local level. Basin-wide impacts are not enough—communities and individuals need to be able to see tangible examples of the costs and benefits of the reform in their region to have confidence that governments understand the local impacts and consider these in decision making.

In the Basin, there is a need for governments to reconsider the way information is shared. The focus must shift from providing more information about 'what Governments are doing' to providing better information addressing 'what water users need' to navigate the system, run their businesses and have confidence in management arrangements. This should consider ways to create an effective operating environment in which water users and communities have information that is accessible, understandable, timely, relevant and credible. This approach could be highlighted in any update to the NWI to ensure governments provide the information stakeholders require to have confidence in water management.

Capacity building and adaptation pathways

Throughout the development and implementation of the Basin Plan, there has been a lack of investment in building knowledge and developing capability of water users. There is an implicit expectation that water users understand the various rules and policy mechanisms, how they work, why they are needed, and how they affect users at a local level. This expectation is unrealistic—the system is highly complex and for most people it takes considerable time and investment to understand the various mechanisms of water reform.

Many communities in the Basin have developed around irrigated agriculture, and the changes brought about by the Basin Plan have resulted in a new operating environment that water users need to adapt to. In a review released in early 2020, the Murray–Darling Basin Interim Inspector General described the current operating environment for irrigators and market participants:

- Water literacy has changed, such as the need for irrigators to now understand and have knowledge of how a water market operates. A farmer needs to not only farm, but simultaneously be an economist, trader, and weatherperson.
- There remains a lack of entry strategies that support young farmers who want to get into the industry with the required information, knowledge and support.
- Many farmers just want to grow produce, and do not have time to 'play the water markets'.

At an individual business level, there is a need to build targeted knowledge and capacity of water users, including farmers, water brokers and advisors, natural resource managers and local government, to enable them to adapt their businesses and better navigate the system.

At a community level, the fast pace of change and fragmented government investment in building capability and assisting in adaptation has meant that there has been an uneven ability of communities to take up the opportunities provided by the Basin Plan and adapt to the new operating environment. Governments need to complement improvements in information with investment in building capability and leadership at individual and community levels to create an equitable operating environment that supports communities and industries to adapt.

There is also a need for governments to recognise that water management is only part of a broader network of policies and external drivers that contribute to the conditions in the Basin, and in regional Australia more broadly. The NWI recognises the need for natural resource management policy to complement water policy, but this could be expanded to include reference to other intersecting policies such as regional development, infrastructure and land use planning.

Applied science and monitoring

Applied science is critical to the sustainable use and management of water. Without consistent investment and commitment to applied science there are limits to effective and efficient water management.

Applied science is about much more than generating new knowledge. It is also about enabling change, solving problems, developing new opportunities, monitoring the system and supporting innovation. Any future NWI should highlight the importance of consistent investment and use of applied science as well as the value of water managers working effectively with researchers for effective water management.

Traditional methods of collecting data through robust scientific methods and academic institutions alone are no longer enough to adaptively manage water reform frameworks. The involvement of stakeholders in the planning and interpretation of the monitoring is essential for validity and value of the information.

Investments in science and monitoring are critical to the development of water policy and the ongoing adaptive management of water policy. Monitoring allows information on the benefits and changes brought about by water policy to be communicated to stakeholders, which is essential for transparency and trust in government. Adaptive management is only mentioned once in the National Water Initiative, as an outcome under the element of Water access entitlements and planning framework.

Adaptive management is a key aspect of the Basin Plan. Throughout the Basin Plan's implementation, a vast amount of information regarding Basin conditions and operations across the many different agencies involved in its management, has been collected. However, this information is often fragmented due to unstable funding streams, disconnected across state boundaries, and sometimes conflicting in its conclusions. The information can also be difficult to locate and to access.

Observations from the Basin Plan implementation experience are that:

- Real-time information is limited, with significant time-lags in being able to report on water use and outcomes, particularly in terms of environmental water use.
- There remain significant gaps in being able to monitor and report an integrated view of the Basin's social, cultural, economic and environmental conditions over time.
- Even when information is provided, there is a lack of trust in the agency providing the information.

Due to the lack of coordinated investment, and monitoring investment directly to the MDBA, the Basin Plan water reform remains under pressure. The lack of relevant information means that government cannot effectively describe the conditions of the Basin and the contributions the water management framework has made to the environment and Basin communities and economies. Additionally, the lack of relevant and accessible information has left a vacuum in the public domain, which is consequently filled with misinformation, misperceptions or misappropriation of available information, that only further erodes trust and support.

Investments in monitoring need to be long-term, scientifically robust, include multiple lines of evidence; and must involve those affected by water reform. ‘Arms-length’ assessments by government and scientists, no longer have the validity and trust they once had; and close involvement by stakeholder is essential if the results of any monitoring are to be trusted.

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