Discussion Paper: Resilient Water Governance

Dr Anita Foerster

Prepared with Professors Lee Godden and Jacqueline Peel (Melbourne Law School), Funded by the Carlton Connect Initiatives Fund, 2013-14

# Introduction

The way that we govern the management of water resources is critical to the achievement of multiple objectives, including sustainable water allocation, agricultural productivity and the health of aquatic ecosystems. In Australia and other similarly placed regions of the world, such as the western United States, effective systems of water governance are also an important factor shaping our ability to deal with broader environmental problems, such as mitigation of, and adaptation to, climate change. Yet climate change poses unprecedented challenges for the design and implementation of water governance systems. These include: increased uncertainty around key water variables; heightened variability and changing environmental conditions, including an increased occurrence of extreme weather events; and the threat of irreversible decline and changes in ecological systems with resulting impacts on aquatic species and ecosystem services.

The challenge for water governance is to design and implement systems that are flexible enough to respond to changing environmental conditions while continuing to function at an acceptable level across multiple management objectives. A further challenge lies in ensuring that water governance contributes to both adaptation and mitigation efforts as far as possible, or at least does not result in maladaptive responses to climate change impacts, with unintended or undesirable impacts in other sectors.

There has been considerable research attention given to the design of adaptive governance systems that can enhance the resilience of socio-ecological systems, particularly in light of increased uncertainty and variability as a result of climate change. Nevertheless, there remain significant challenges in translating these concepts into governance institutions in practice. Some recent research has also explored the synergies and trade-offs between inter-related policy areas of water, climate and energy policies. This has highlighted the importance of integration to minimize unintended perverse outcomes in other sectors. This paper reviews this existing research and applies it to current water governance challenges in Australia. It explores the attributes of resilient water governance systems and the contribution that resilient water governance can make in addressing multiple water management objectives and broader environmental challenges, such as mitigation and adaptation to climate change.

The paper was written to frame discussions at a workshop on resilient water governance at Melbourne Law School in September 2014, and a parallel workshop at Stanford University. This final version includes summaries of case studies presented at the Melbourne workshop. The outcomes of the Stanford workshop are also available at: <http://waterinthewest.stanford.edu/sites/default/files/Water%20Governance%20and%20Climate%20C>hange\_final2.pdf

# Key principles and concepts for resilient water governance

There are a number of concepts and principles that underpin the notion of resilient water governance.

Resilience: Closely related to concepts such as *adaptive capacity* and *robustness*, resilience is the long- term capacity of a system to deal with change and continue to develop, yet remain within critical thresholds in relation to system function and structure (Walker and Salt, 2006). Resilience thinking recognizes that there are no natural systems without people, nor social systems without nature. Social and ecological systems are interconnected, highly complex, and interact across spatial and temporal scales.

Adaptive Management: Widely accepted as the best practice approach to ecosystem management, adaptive management explicitly accounts for uncertainty, complexity and variability in natural systems, and adopts a cyclical approach to decision-making to allow for continued learning, re-evaluation and revision in response to new information or surprises (McDonald and Styles, 2014).

Adaptive Governance: Governance can be broadly conceived as the complex of policy, political and institutional settings and social structures that, together with law and regulation, implement collective societal objectives (Godden and Peel, 2010). In the context of the many pressures on natural systems, such as over-exploitation, pollution and climate change, there has been much attention given to identifying the attributes of natural resource governance systems which may enhance the resilience or adaptive capacity of the socio-ecological systems that they govern. The concept of *adaptive governance* specifically recognises that past approaches, which were based on steady state management, preservation and restoration paradigms and that assumed that ecosystem changes were predictable and reversible, may no longer be appropriate to cope with the interlinked, unpredictable and potentially irreversible impacts of environmental problems such as climate change (Milly et al 2008; Kundis Craig 2009; Ruhl 2010). Adaptive governance systems are flexible and responsive to changing conditions and new information. They promote learning and adjustment without limiting future management options. They also seek to match governance to the appropriate scale of management and promote networks and connections across sectors and scales for cooperation and collaboration (Garmestani et al 2013; Cosens and Williams 2012; Huitema et al. 2009; Olsson et al. 2006; Walkerden 2006; Folke et al. 2005; Shindler and Cheek 1999).

Adaptation, Mitigation and Maladaptation: Given the likely impacts of climate change on water resources in Australia and other similarly placed regions like the western United States, the governance of water resources is widely recognised as a major *adaptation* challenge in these jurisdictions (Tan, 2010). In general, climate modelling for southern Australia (where population and water-intensive industry are most concentrated) suggests marked reductions in rainfall in many areas; temperature increases leading to increased evaporation rates; and a potential increase in the frequency and severity of extreme events such as drought, flood, and wildfire in native forests in key water catchments, all with potentially adverse impacts on water availability and quality (CSIRO, 2007; CSIRO, 2009; South East Australian Climate Change Initiative, 2011). Simultaneously, demand for water is expected to increase due to population growth and increased pressure on water resources during scarcity. The western

United States faces similar water management impacts on supply and quality (California Natural Resources Agency, 2009). Additionally, the snowpack of mountain ranges from the Rocky Mountains to the Sierra Nevada are expected to shrink as snow melts earlier in the spring and more precipitation falls as rain rather than snow. These changes in both regions will also exaggerate the impacts of unsustainable levels of water extraction and pollution on aquatic ecosystems and species, making them more vulnerable to climate change impacts (Parry et al, 2007).

Water governance is also an important consideration for climate change *mitigation*, as approaches to the supply, distribution and treatment of water, particularly in an urban or industrial context; vary considerably in terms of energy and water demands (Barnett and O’Neill, 2010).

When considering adaptation and mitigation responses, it is important to think about the way in which they interact with other related policy objectives and sectors. *Maladaptation* has been defined as ‘action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups’ (Barnett and O’Neill, 2010). For example, in an urban water context, responding to water stress via major infrastructure projects, such as desalination or piping water from external catchments, exhibits many of the characteristics of maladaptation, including high energy demands, significant social and environmental costs, and the path dependencies associated with investing in large infrastructure developments.

What is *resilient water governance*?

Drawing on the above terms and concepts, we proposed the following definition of *resilient water governance* to be discussed with participants at the workshop:

*Water governance that is flexible enough to respond to changing environmental conditions, while continuing to function at an acceptable level across multiple management objectives (economic, environmental, social and cultural). In the climate change context, resilient water governance should support both adaptation and mitigation efforts to the extent possible; and avoid maladaptive responses.*

The case studies presented at the workshop and summarised in this paper provide various real-life interpretations of this conceptual definition in a range of different sectors of water governance practice in Australia.

# Legal Tools and Governance Arrangements to support resilience

There are a range of legal and policy tools, and governance arrangements that can be used to deliver a flexible and adaptive approach to water management in practice. Building on the work of Hill Clarvis et al (2013), the two tables below present a range of these options.

Table 1. Legal and Policy Tools for Resilient Water Governance

|  |  |
| --- | --- |
| Water Governance Tool | Application |
| Framing Policy  Can be reflected in governing legislation via statements of objectives, decision guidelines, duties to consider and plan for climate change impacts and/or use best available scientific and socio-economic information etc. | Framing policy provides important direction to decision- makers to ensure consideration of climate change impacts in relevant contexts; and guidance on how to incorporate uncertainty etc. into decision-making. |
| Water Access Rights / Permits  Should cover all water sources (surface and groundwater) and allow variation to reflect changing water availability and in advance of expected changes.  Available mechanisms include:   * shares of available resource, * priority of allocation between water right holders, * periodic allocation separate from volumetric or proportional right/entitlement. | Ensuring water rights / permits are subject to variation is important for responding to current levels of inter- annual variability and larger longer term shifts in timing and/or volume of availability. |
| Explicit public interest requirements  - environmental, social, cultural  May be achieved through water management rules and/or allocation of water rights / permits for public interest purposes.  E.g. environmental water allocation & cultural flows together with limits on allocation for consumptive use. | Variable water rights systems are not sufficient to ensure public interest values are maintained, especially in the context of growing pressure on water resources and increasing competition between users. It is important to introduce explicit legal mechanisms which effectively safeguard public interest values. |
| Water Allocation and Management Planning  Planning may cover:   * short, medium and long term resource assessment; * rules for periodic allocation between competing users (consumptive, environmental etc.); * rules for equitable and fair adjustment of water allocations in response to changing availability; * limits on allocation to reflect resource availability and social and environmental objectives; * mechanisms for review and revision based on new information; * standards for environmental protection (e.g. water quality); * priorities for supplying water in emergency situations,   e.g. critical human & ecosystem needs. | A long term multi-scalar planning framework can integrate climate projections for review and revision to ensure allocated rights are commensurate with changing resource availability. Water allocation plans can provide rules and processes for managing larger shifts in timing and/or volume of availability. |

|  |  |
| --- | --- |
| Review Mechanisms  Review water allocation at agreed timeframes against certain criteria (e.g. changing availability trends, social and environmental impacts) and provide opportunities for periodic re-allocation following review.  Closely linked to monitoring and information practices – guidance on decision-making under uncertainty important.  May also review other relevant aspects of water governance – e.g. water quality standards and regulations. | Ensuring water extraction entitlements are subject to review is important for responding to larger longer term shifts in timing and/or volume of availability. It is important to regularly assess the impacts of current allocation on social and ecological components of system.  This is an important avenue for the inclusion of new climate observation data. It is critical to incorporate climate scenarios into review processes. |
| Explicit risk allocation mechanisms  Rules for altering water allocation between competing users to respond to changing resource availability and social/environmental impacts.  Linked to review mechanism. | For short term variability, variable water rights/shares help to apportion risk fairly between users. For longer term shifts, explicit risk allocation mechanisms will be useful. |
| Monitoring Requirements and Standards  Should address:   * Roles and responsibilities; * Standards for data collection, distribution and use –   e.g. publicly accessible, suitable for data exchange | Targeted monitoring, data collection and analysis is important to support decision-making in all areas of water governance, particularly in the context of heightened variability, uncertainty etc. |
| Emergency Provisions and Powers – drought, flood Rules, roles and responsibilities for managing water in emergencies, e.g. suspension or qualification of water rights in times of scarcity; water sharing rules for competing users in situations of scarcity; storage management rules and practices for managing flood | These measures provide flexibility/responsiveness in the context of high natural variability and extreme events. Processes for crisis management / avoiding catastrophes will take more prominence in a climate change context.  It is important to introduce decision guidelines to safeguard important public interest values – environmental etc – in emergency decision-making. |
| Water Markets  Temporary and permanent trade in entitlements and allocations.  Should occur in the context of water plans / allocation limits to reflect environmental and other objectives.  May include limits on trade for social or environmental reasons. | Useful for dealing with challenges of distributing rights in areas or times of limited availability.  Trade between environment and water users provides opportunities to increase effectiveness/efficiency of environmental water allocation.  Markets also provide a mechanism for equitable, politically acceptable re-allocation via buy-back.  It is important to ensure that the level of resource available for trading can be changed over time to take account of projected impacts demand and availability. |

Table 2. Governance Arrangements for Resilient Water Governance

|  |  |
| --- | --- |
| Governance Arrangements | Application |
| Nested regulation / trans-jurisdictional arrangements Overarching legislation / plan sets parameters for more flexible application through regulation at catchment and local scale.  Eg. river basin scale diversion limit, to be implemented through local level plans which apportion available resource between users. | Regulations at lower scales can be more responsive to changing conditions and local circumstances.  Strong overarching legislation and framing policy is important for clear parameters on adaptation directions  – how to adapt allocation limits, water rights/permits etc. to longer term shifts in availability. |
| Decision-making matched to biophysical scales – nested scales of management authority  e.g. Coordinating authority at the Basin Scale; active management and decision-making at catchment and local scale. | Decision-making capacity at an appropriate management scale is a key component of catchment management approach. This is likely to remain relevant and important in context of strong overarching legislation and coordinating capacity. |
| Coordination / Integration between sectors Requires vertical and horizontal linkages and networks (formal and informal) between:   * Water users, environment, social / cultural; * Water quality and quantity; * Surface and Groundwater etc. | Managing water resources for multiple objectives (including social, cultural and environmental) is increasingly important.  Inter-sectoral coordination will be crucial to effective adaptation and the implementation of mitigation measures which minimise maladaptation. |
| New institutions for adaptive, multiple-objective water management  Creation of specific institutional capacity at appropriate management scales to manage for multiple objectives / achieve integration / implement adaptive management.  e.g. Environmental Water Holders – independent statutory corporation | It is important to build institutional capacity and locate decision-making at the appropriate scale to reflect changing objectives and requirements.  Former institutional patterns may become redundant. Ongoing institutional evolution critical. |
| Collaboration / consultation with stakeholders  Can occur in various water management contexts:  e.g. allocation planning and review, river management practices.  Consider levels of involvement and influence on decision-making. | Local knowledge and understanding is a critical input for managing water resources effectively for multiple objectives (social, cultural, environmental).  Helps to establish trust and buy-in for ongoing adaptation measures. |

# Implementing Resilient Water Governance in Australia

Since 1994, there have been fundamental changes made to water governance frameworks in Australia. This period of reform coincided, and was largely driven by, the experience of the Millennium Drought (1995-2010) in South Eastern Australia, thought to be the worst drought on record since European

settlement (South East Australian Climate Change Initiative 2011). As such, the predominant focus was on responding to situations of water scarcity, which had amplified longstanding problems with over- allocation and ecological decline in many regions, particularly the Murray-Darling Basin [MDB].

The Australian national water reform process made considerable progress in establishing institutions for more resilient water governance. Many of the legal/policy tools and governance arrangements described in the tables above were introduced or reinforced in this period to allow for the management of water resources for multiple objectives and to provide the potential to respond to changing circumstances.

Yet many of the suitable tools or governance arrangements could be implemented more comprehensively, or in different ways, or in combination with new approaches, to continue the trajectory towards building resilience in water management in Australia. There are also a range of emerging issues, which have not been comprehensively addressed through water reforms to date. These particularly concern areas of social and cultural water policy and the integration between linked policy areas to avoid maladaptation, which will be of increasing importance in a climate change future. Further, many of the reforms implemented thus far have responded directly to the experience of water scarcity. In 2010/2011, the drought ended with major floods in many regions of Australia, a timely reminder of the importance of managing, not just for scarcity, but for variability and extremes.

The aim of the Melbourne workshop was to use case studies from various sectors of water governance to identify the particular attributes of water governance arrangements that promote flexible, adaptive management for multiple objectives. Participants were invited to look back at what has been achieved to date through national water reform, and to look forward to think about how we can best respond to emerging issues, unfinished business and the pressing imperative to manage for increased variability and uncertainty in the future.

# Key Considerations

Workshop participants were asked to consider the following key questions:

* Do our governance arrangements support managing water resources for multiple objectives – economic, environmental, social and cultural? What tools and institutional arrangements can be used to strengthen this capacity?
* Do our current systems of water allocation appropriately balance the need for stability and certainty for socio-economic objectives, with the need for flexibility and responsiveness to share the risks of climate change equitably, respond to changing values and priorities, and provide for ecological resilience?
* Are there opportunities for better integration of interacting sectors / areas of water governance (e.g. environmental, social and cultural; groundwater and surface water; water quality and quantity)? How should better integration be achieved? How can we avoid *maladaption*?
* Is decision-making on water allocation and management located at an appropriate scale of governance? How can we best foster networks and connections between various scales of water

management? Do we need to formalize or better support existing networks and particularly local participatory measures?

* What aspects of water governance best lend themselves to collaborative, stakeholder approaches to decision-making?
* Are our systems of water governance well-equipped to manage for increased variability, not just scarcity?

# Case Studies in Resilient Water Governance

The case studies below were presented at the Melbourne workshop as examples of governance arrangements which feature particular policy tools, regulatory settings or governance arrangements designed to function effectively in the context of uncertainty and extremes and therefore achieve more resilient water governance. Brief summaries are included here. Presentations and full papers are available at: <http://www.law.unimelb.edu.au/creel/events/water-governance-for-resilience>

1. Water Resources and Information in a Changing Climate - *Dr Robert Argent, Bureau of Meteorology & CSIRO*

One of the underpinning elements of Australian water reforms in recent decades has been improvements in water resource information, including the likely impacts of climate change projections. Improved water information at a range of time scales is an essential ingredient to more resilient water governance. In the words of Dr Argent, ‘the understanding of how climate influences water can help make water management more adaptable, such as through improved seasonal forecasts, and it can help communities plan how they will respond to reduced water availability in future.’

Since the introduction of federal water legislation in 2007 (*Water Act 2007* (Cth)), the federal Bureau of Meteorology is required to collect, hold, manage, interpret and disseminate Australia's water information (*Water Act 2007*, s 120). The BOM (in conjunction with CSIRO) now provides regular reports on the status of Australia's water resources and patterns of usage as well as regular forecasts on the future availability of Australia's water resources (streamflow forecasts, climate outlook and projections). They also compile and maintain publicly available water accounts for Australia (National Water Account); and issue national water information standards to guide monitoring and data collection practices at various levels of the water governance framework.

In terms of resilient water governance, the strengths of these recent reforms include clear legal duties, obligations and standards on monitoring and information collection, and the centralisation and coordination of governance institutions. Governance is centralised and located at a federal scale which is well-suited to resourcing and coordinating the collection of information at a variety of governance levels in a way that enables data exchange and transfer.

1. Water Reform In Australia: experiments in adaptive governance - *Jason Alexandra, Alexandra and Associates*

Water governance systems in Australia have already undergone multiple major transitions that reflect changing societal priorities and values over time. Jason Alexandra reflected on the most recent transition – national water reforms in the Murray Darling Basin from 1994 - as a ‘difficult, incomplete and contested transition,’ and cautioned that ‘assessing progress after two decades of water reforms remains difficult because it depends on how broad aspirational policy goals are interpreted and our expectations of how rapidly the reforms would be implemented.’

The key aspects of national water reforms over this period were the introduction of water markets, allocation of water to the environment and a centralised regulatory and planning framework for the MDB, which differed significantly from historic partnership approaches to the governance of shared MDB water resources. There are indeed some lasting changes resulting from the reform period. Of particular relevance to the resilient governance theme are water market reforms which have proven to be an effective adaptation tool, particularly in a drought context, moving water resources from low to high value uses and enabling trade between uses and users. Also significant is the increased environmental water held and managed adaptively by a dedicated Commonwealth Environmental Water Holder (CEWH) and similar institutions at the State and local level.

Despite these ‘successes’, Alexandra argues that climate change impacts will force much deeper transitions in modes of water governance in the future. He argues that recent reforms remain tied to notions of ‘averages’ and stationarity and have not really grappled with the extremes and uncertainties associated with climate change projections. He advocates ‘more dynamic and flexible approaches to river catchments and bioregional planning including the use of future scenarios and risk-based planning,’ providing that these processes empower people to conceive of and prepare for different futures.

1. Adaptation Planning for Water Resources - *Jane Doolan, University of Canberra*

One of the central strategic water planning mechanisms for implementing national water reform objectives in the state of Victoria were the Sustainable Water Strategies (SWS), prepared under the *Water Act 1989*, Part 3. From 2006-2011, these strategies were prepared for four different regions of the state. They sought to understand the threats to water availability including the implications of climate change and variability; ensure secure water entitlements for towns, industry and the environment; encourage economically viable and sustainable agriculture and improve the flexibility for entitlement holders to manage risks of climate variability; and where possible, improve the health of rivers, wetlands and aquifers from the impacts of drought, climate change and other risks. Jane Doolan presented the planning process and resulting substantive policy changes arising out of the Northern Region strategy as a case study of long term strategic adaptation planning for water resources.

The context for the development of the Northern SWS was prolonged drought. Northern Victoria had experienced 10 years of below average rainfall, there were severe water shortages with water availability less than contemplated in normal management rules and drought response plans. As a result, towns were on severe water restrictions; irrigation allocations were very low leading to rapid and

painful adjustment by water users, including sacrificing large areas of permanent horticultural plantings. Environmental flows were also greatly reduced. Investigations of potential climate change impacts on water resources confirmed that such impacts were likely to worsen in the future.

The SWS proposed a range of policy changes and investments that were aimed at ensuring that water management objectives could continue to be met under a drier and more variable future climate. These included reforms to improve the flexibility and effectiveness of water entitlements and markets, such as the introduction of rules to allow entitlement holders to carry over allocation to the following year; changed system reserve rules to reduce the likelihood of zero allocations and the need for emergency intervention; and improvements to the Victorian water grid to maximise opportunities for water trade. A range of measures to supplement supply and manage demand for urban water use were also proposed, including more flexible carryover and trade options; increased use of alternative sources such as recycled water; and corresponding investment in infrastructure augmentation to facilitate trade and access to alternative sources.

For environmental water, the SWS developed a new and innovative approach that was designed to ensure river and wetland assets survived during dry sequences and were able to recover during wet sequences. This involved a more strategic approach to environmental recovery to ensure that available water was sufficient and well-suited to delivering environmental objectives (e.g. high reliability water for maintaining drought refuges and low reliability water for supplementing flood events in wet years). Considerations of efficiency and the need to minimise impacts on other water users meant that infrastructure improvements and trade were central to the environmental water recovery strategy, and the strategy proposed a number of structural works that would help to maximise outcomes from the use of environmental water. The SWS also introduced an explicit adaptive management approach to the delivery of environmental water over short and longer time frames, including decision guidelines for making trade-offs between competing environmental objectives in different water availability scenarios. Central to these reforms was the development of a new institution, the Victorian Environmental Water Holder, with the mandate and capacity to trade in water entitlements, coordinate the delivery of environmental water and work together with other existing institutions to optimise environmental outcomes.

The SWS planning process was led by state government, but involved considerable stakeholder engagement. Key to its success was the fact that, as a result of the experiences of drought, the community was willing to listen and engage, and the government was willing to act and invest in the proposed reforms. In the words of Jane Doolan, this case study confirms the pattern that ‘the best water reform occurs during a crisis.’

1. Managing Groundwater as a ‘drought reserve’ in a drying climate - *Alex Gardner, University of Western Australia*

Climate change poses considerable water resource challenges for the community of South West Western Australia, the temperate region of the State that is home to nearly 2 million people and a biodiversity hotspot. In the past 45 years, there has been a significant drying trend from declining winter

10

rainfall (17% since 1970) and a dramatic decline in stream flow to south west reservoirs (more than 50%). There has also been a substantial impact on groundwater resources through reduced aquifer recharge and rapidly increasing demand as a growing population turned to alternative water sources. The depletion of aquifers has significantly impacted surface wetlands and dependent ecosystems. In the past decade, the search for alternative sources has seen the development of desalination to supply nearly half of metropolitan Perth’s current reticulated water supply and, in the past 5 years, the development of managed aquifer recharge, especially the Water Corporation’s Beenyup groundwater replenishment project using highly treated wastewater. Even with these technological developments, sustainable groundwater management remains crucial to economic and social well-being – on 2009 figures it meets approximately 75% of the south west’s water needs – and for adapting to the environmental impacts of climate change.

This case study explored how new regulatory and governance principles for groundwater management can complement technological developments to respond to this challenge. It was based on a report by Michael Bennet and Alex Gardner, *Groundwater Regulation in a Drying South West* (2014), available at: <http://www.law.uwa.edu.au/research/water-resources-reform/regulatory-framework-for-management-> of-groundwater

Recommendations for legal and governance reform include:

* *Explicit statutory duties to address climate change in statutory groundwater allocation planning*

- water resource management legislation should require the Minister to consider climate change risks in the preparation of statutory water allocation plans and to address those risks in the plan provisions: for example, via declining allocation limits over plan life and/or zoning areas for no consumptive use, including by domestic bores.

* *Regulatory tools to govern the sustainable use of groundwater as a drought reserve* – options include reforms to groundwater entitlements to allow carryover and borrowing rights in suitable aquifers, but require compulsory banking of a proportion of entitlement (e.g. 10%) which is accessible only on ministerial declaration. The drought reserve could be made available to water users via an auction process for short term licenses in specific drought conditions. Managed aquifer recharge should also include a share that is banked to restore the groundwater reserve.

1. Social and Cultural Values: Indigenous Interests in Water Governance - *Sue Jackson, Griffith University*

Indigenous interests in water have been excluded from systems of water governance until this century and have only been partially addressed in recent national water reforms. A reform agenda has emerged, which calls for greater equity in water distribution, including resource rights; Indigenous control of water (e.g. ‘cultural flows’); more effective participation in water management; and restoration of environmental systems. The prospects for reform and their perceived legitimacy differ significantly however between northern and southern Australia due to differences in climate, levels of existing entitlements, water cultures and histories of development. In northern Australia water resources are comparatively ‘under-developed’ and there is a significant and relatively powerful indigenous sector

strongly attached to intact, unregulated rivers. In contrast, in southern Australia, opportunities to recognize indigenous interests in water are severely constrained by water scarcity, intense competition between water users, lack of legal recognition of indigenous rights to water, and smaller and more marginalized Indigenous populations with attenuated connections to water resources.

This case study explored some of the emerging models and mechanisms for including Indigenous interests in water governance, including indigenous water entitlements, representative consultative groups, Indigenous input into water planning, Native Title Agreements, and the Indigenous Water Policy Group, which was established by the Nth Australia Indigenous Land and Sea Management Alliance specifically to promote research and policy development to support recognition of indigenous interests of water in the implementation of the national water reform agenda. One of the major substantive outcomes from the Water Policy Group was the proposal to include Strategic Indigenous Reserves within water allocation plans currently being developed in northern Australia. The reserve would be used to allocate water from the available consumptive pool to Indigenous interests, with the amount available depending on the proportion of land within the water catchment area that was under Indigenous ownership, management or native title claim.

Commenting on these developments in the context of resilience theory and its application to questions of water governance, Sue Jackson reminded us of the important and often under-recognised normative dimensions of water governance: considerations of who governs, who defines what states and thresholds are desirable and for whom, and whether prioritising the resilience of some livelihoods results in the vulnerability of others. She argued that the focus of national water reform has been on institutions (getting the rules right) rather than attention to the processes and relations that support these structures. In order to properly realise indigenous interests in water, the core principles of national water reform should be revisited from the standpoint of differently placed groups with different norms and values, with reference to different historical contexts and cultural differences. It is critical that we avoid overly narrow framings of social and environmental priorities and allow the development of options that deal with contested values and address inequalities, such as the re- allocation of water to indigenous groups, buy-back funds and trusts to finance re-allocation, and providing water for indigenous environmental assets.

1. Urban Water Reform: governance challenges - *Cathy Wilkinson, Executive Director, Planning and Projects, Victorian Department of Environment and Primary Industries*

Resilience has become a prominent policy objective in a range of different public policy contexts, including water governance. For public policy makers, resilience thinking provides new language and metaphors for understanding the dynamic of change in complex systems; new tools and methods for analysis; and importantly, it challenges established modes of governance based on predictability and controllability. There is currently a major program of urban water reform being undertaken in Victoria. Developing institutional and governance arrangements that promote resilience is a core theme. This case study explored how Victoria’s urban water reforms are grappling with the challenge of governing for resilience.

An important aspect of the Victorian urban water reforms is clear framing policy reflecting resilience principles. For example, the goal of maintaining system resilience is framed as ‘an ongoing process rather than a static fixed goal’. Management for resilience requires an institution ‘that indefinitely monitors and adjusts the track along which the system is heading’ and accepting that every successful adaptation is ‘only a temporary solution to the system operating at the time’.

One of the central mechanisms for implementing resilient water governance in the urban context in Victoria is the integrated approach to water cycle planning and management at a range of different scales (regional to local) and over different time frames. This strategic planning mechanism encompasses all aspects of the water cycle (mains water, rainwater, stormwater, wastewater, groundwater) and all benefits of water (water security, waterway health, flooding, liveability etc.). It integrates land-use planning (strategic and statutory) with water cycle planning and adopts a collaborative governance approach involving all stakeholders and broad community engagement. One of the emerging challenges is how to develop an effective system of network governance; wherein government may take the role of broker, catalyst, facilitator and/or leader, but a range of diverse partners are also involved. Challenges arise because these partners may not have clear heads of power to act; or may be required to act outside their traditional realms of regulatory and policy activity.

# Conclusion

Resilience principles are reflected, either explicitly or implicitly in many of the legal and policy tools and governance arrangements that have been introduced in Australia during the most recent wave of intensive law and policy reform. The case studies presented at the workshop profiled a number of different sectors of water governance and explored the characteristics of these systems which either support or impede our ability to respond to changing environmental conditions, while continuing to function at an acceptable level across multiple management objectives (economic, environmental, social and cultural), avoiding maladaptive responses. They have illustrated that the practice of ‘governing for resilience’ differs considerably between sectors and geographically in Australia, and that there are both promising examples of more flexible and adaptive water governance emerging and also areas where progress is sorely lacking. The scope of the workshop was broad and exploratory. Its wide-ranging overview of water governance and resilience in Australia provides a starting point for a myriad of different research directions to explore in more detail whether and how resilience principles are being implemented in water governance, and the impacts and effectiveness of such measures.

# References

Jon Barnett and Saffron O’Neill, ‘Maladaptation’ (2010) 20 *Global Environmental Change*, 211-13.

California Natural Resources Agency, *2009 California Climate Adaptation Strategy*, Chapter VII – Water Management (2009).

Barbara A Cosens, ‘Legitimacy, Adaptation and Resilience in Ecosystem Management’ (2013) 18(1) *Ecology and Society* 3.

B A Cosens and M K Williams, ‘Resilience and water governance: adaptive governance in the Columbia River basin’ (2012) 17(4) *Ecology and Society* 3.

CSIRO, *Climate Change in Australia: Technical Report 2007: Executive Summary* (CSIRO, 2007). CSIRO, *Climate Change in Australia: Science Update 2009 – Issue One* (CSIRO, 2009).

C Folke, T Hahn, P Olsson and J Norberg ‘Adaptive governance of social-ecological systems’ (2005) 30 *Annual Review of Environment and Resources* 441-473; <http://dx.doi.org/10.1146/annurev.energy.30.050504.144511>

Lee Godden and Jacqueline Peel, *Environmental Law: Scientific, Policy and Regulatory Dimensions* (Oxford University Press, 2010).

Margot Hill Clarvis, Andrew Allen, David Hannah, ‘Water, Resilience and the Law: from general concepts and governance design principles to actionable mechanisms’ (2013 in press) *Environmental Science and Policy*.

~~–~~

A S Garmestani, C R Allen, and M H Benson ‘Can law foster social-ecological resilience?’ (2013) 18(2) *Ecology and Society* 37. <http://dx.doi.org/10.5751/ES-05927-180237>

D Huitema, E Mostert, W Egas, S Moellenkamp, C Pahl-Wostl, and R Yalcin ‘Adaptive water governance: assessing the institutional prescriptions of adaptive (co-)management from a governance perspective and defining a research agenda’ (2009) 14(1) *Ecology and Society* 26. [online] URL:[http://www.ecologyandsociety.org/vol14/iss1/art26/.](http://www.ecologyandsociety.org/vol14/iss1/art26/)

Robin Kundis Craig, ‘Stationarity is Dead – Long Live Transformation: Five Principles for Climate Change Adaptation Law’ (2010) 34 *Harvard Environmental Law Review* 9.

Jan McDonald and Megan C Styles, ‘Legal Strategies for Adaptive Management under Climate Change’ (2014) 26

*Journal of Environmental Law*, 25 53.

P.C.D. Milly, J. Betancourt, M. Falkenmark, R.M. Hirsch, Z.W. Kundzewicz, D.P. Lettenmaier and R.J. Stouffer, ‘Stationarity is Dead: Whither Water Management?’ (2008) 319 *Science* 573.

P Olsson, L Gunderson, S Carpenter, P Ryan, L Lebel, C Folke, C Holling ‘Shooting the rapids: navigating transitions to Adaptive Governance of Social-Ecological Systems’ (2006) 11(1) *Ecol Soc*, 18.

M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds), *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007* (2007), Chapter 3, Freshwater Resources and their Management.

J.B. Ruhl, ‘Climate Change Adaptation and the Structural Transformation of Environmental Law’ (2010) 40

*Environmental Law* 363

B Shindler, K Cheek, ‘Integrating citizens in adaptive management: a propositional analysis’ (1999) 3(1) *Ecol Soc* 9. South East Australian Climate Change Initiative, *Understanding Future Changes in Climate and Streamflow* (2011); South East Australian Climate Change Initiative, *The Millennium Drought and the 2010/11 Floods* (2011).

Poh-Ling Tan, ‘Adaptation Measures for Water Security in a Changing Climate: Policy, Planning and Law’ in Tim Bonyhady, Andrew Macintosh and Jan McDonald (eds), *Adaptation to Climate Change: Law and Policy* (The Federation Press, 2010), 137–138

B Walker and D Salt, *Resilience thinking: sustaining ecosystems and people in a changing world.* (Island Press, Washington, 2006).

G Walkerden ‘Adaptive management planning projects as conflict resolution processes’ (2006) 48(1) *Ecol Soc*.