

Addressing Overallocation and Water Trade in New South Wales, Australia: Namoi Basin Groundwater

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Case Study

Final Report on
Political Economy
of Water Markets

Addressing Overallocation and Water Trade in New South Wales, Australia: Namoi Basin Groundwater

A Case Study for the Political Economy of Water Markets Project

October 2016

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Preface

This paper is one output of a project entitled “The Political Economy of Water Markets.” The project was carried out by Ecosystem Economics LLC and AMP Insights LLC. The outputs of the project include a final report and a set of case studies.

The final report comes in three parts:

1. “Healthy” Water Markets: A Conceptual Framework by Bruce Aylward, David Pilz, Megan Dyson and Carl J. Bauer
2. Political Economy of Water Markets in the Western United States by Bruce Aylward, David Pilz and Leslie Sanchez
3. Comparative Analysis of Legal Regimes with Respect to Fostering “Healthy” Water Markets by David Pilz, Megan Dyson, Bruce Aylward, Carl J. Bauer and Amy Hardberger

The eight case studies consist of the following.

1. The Evolving Water Market in Chile’s Maipo River Basin by Carl J. Bauer
2. Addressing Overallocation and Water Trade in New South Wales, Australia: Namoi Basin Groundwater by Megan Dyson
3. Evolution of Australian Water Law and the National Water Initiative Framework by Megan Dyson
4. Opportunities for Surface Water Right Marketing in Idaho’s Rapidly Urbanizing Treasure Valley by Jeff Fereday
5. Texas Groundwater Markets and the Edwards Aquifer by Amy Hardberger
6. Oregon’s Umatilla Basin Aquifer Recharge and Basalt Bank by Martha Pagel
7. Truckee-Carson Surface Water Markets in Northern Nevada by Leslie Sanchez, Bruce Aylward and Don Springmeyer
8. Smart Markets for Groundwater Trading in Western Nebraska: The Twin Platte by Richael Young

The studies and reports can be downloaded from the AMP Insights website at <http://www.ampinsights.com/rock-report>.

For further information on this work please contact Bruce Aylward at bruce@ampinsights.com.

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Author

Megan Dyson is a sole practising lawyer specialising in environmental law and policy. Megan Dyson is one of Australia's foremost water policy lawyers, advising the Australian Federal Government and various Australian State Governments on reform and implementation of new water laws for more than 20 years. Megan has been a key adviser on many of the important legal changes in Australian water resource management since 1995, including implementation in South Australia of 1995 national water reforms, and the 2004 National Water Initiative (NWI). The NWI continues to guide change in Australian water rights, and was a driving force for the Australian Government's intervention in management of the Murray-Darling Basin in 2008. Megan was engaged by the Australian Government to help draft changes to federal law that provide the legal basis for its role in water management in the Basin.

Author's Note

The case studies for this project include two papers on the Australian experience. The first paper is an overview of the evolution of Australian water rights from common law to statutory rights, and the current framework for water management as set out in the National Water Initiative (NWI) and applied within the Murray-Darling Basin states. The paper examines how NWI principles have been applied to address overallocated resources in the Basin and to facilitate water trading in the Basin. It then outlines the role of the federal Water Act 2007 and the Murray-Darling Basin Plan in establishing sustainable diversion limits and ensuring a consistent Basin-wide framework for water entitlement trading. The second paper (this paper) outlines current New South Wales water law, and explores how an overallocated groundwater resource in the Murray-Darling Basin – the Upper and Lower Namoi – was set on the path to a sustainable extraction level. It goes on to look at trading of water entitlements and allocations in that New South Wales groundwater resource.

The two parts together illustrate that key factors in the evolution of Australian tradable water rights and active markets in those rights – particularly in the Murray-Darling Basin states – have been and continue to be, particular features of the Australian political and institutional, legal, environmental and cultural context. Characterizing the Australian experience through those features might be useful in deciding whether, how, and to what extent, water resource management models operating in Australian states could be adaptable to other contexts.

Throughout the paper quantities are expressed in metric, in some cases with the US equivalent in parentheses. One megalitre (ML) equals roughly 0.8 of an acre-foot. In other words a megalitre is slightly less in volume than one acre-foot. One gigalitre (GL) is 1000 ML or 800 acre-feet, though to simplify you may approximate and say that 6 GL is somewhat less than 6,000 acre-feet. Currency is in Australian dollars (unadjusted for inflation). At May 2016, 1.00 Australian dollar approximates 0.75 US dollar.

Introduction

This paper looks at two related aspects of managing a large alluvial groundwater source in the Australian state of New South Wales (NSW) - reducing water entitlements of users in order to reach a sustainable level of extraction, and trading in entitlements.

NSW covers an area larger than Texas, but has a population of just 7.5 million. Most of NSW lies within the Murray-Darling Basin, and in this area there are 110 separately identified surface water and groundwater management units, grouped for the purposes of the Murray-Darling Basin Plan into 36 water resource plan areas. This paper covers the upper and lower Namoi groundwater resources in the Namoi River Basin region.

After outlining NSW water laws and the physical and social context of the Namoi region, the paper explores how water entitlements of groundwater users were reduced in order to reach a sustainable level of extraction, including community response to the reduction process. The paper then reviews the water trading laws in place for Namoi groundwater, and at actual water market activity since 2006.

NSW water law – general overview

All water extractions and diversions in NSW are managed under the *Water Management Act 2000* (NSW). The Act provides for NWI¹-consistent water access entitlements which are managed through water sharing plans (WSPs) made under the Act. Both the Act and the WSPs are administered by the relevant state Minister, through his or her department.

About 98% of all water extraction in NSW (surface water and groundwater), is now managed under WSPs through NWI-consistent entitlements, which in NSW are referred to as water access licences. Extraction of water for any use (bar stock and domestic, and potentially other exemptions) must be licensed under the Act. This includes mining and coal seam gas operations.

Water sharing plans (WSP)

WSPs are made by the Minister under the Act, following a process that involves classification of the resource on the basis of its social, economic and ecological values and development of rules for sharing available water consistently with those values. Community consultation is undertaken to ensure that additional information about local issues can be incorporated into the WSP as appropriate, and to finalise rules about water sharing under the plan. WSPs have generally taken at least three years, and often more, to develop.

A WSP sets out how water in a particular resource will be allocated between the environment and consumptive users by defining the long-term average annual extraction limit for the

¹ Described in the companion case study, the NWI is the *National Water Initiative 2004*, a milestone agreement between the federal government and all state governments, setting out a framework for water resource management in Australia.

resource. It will also set rules to manage local impacts of water extraction, and include rules for trading water access licences. The Act requires a WSP to protect the health of the water source and its dependent ecosystems and the basic water rights of landholders. WSPs should also promote other principles set in the Act such as maximising social and economic benefits to communities and applying the principles of adaptive management. WSPs must be consistent with the State Water Management Outcomes Plan, which sets a series of targets relating to matters such as sustainable extraction limits, environmental management, and water use efficiencies (including relating to water trading).

Water access licences

A water access licence is held separately from land, and also separately from approvals associated with water supply works and the use of water.

A water access licence for a water source is generally endorsed with unit shares of the particular source. This system operates to facilitate sharing of available water, as the 'water value' of each share can be varied to reflect seasonal water availability. Each year, allocations are made to the licence corresponding to the number of shares held and the value of a share in that year. The annual water value of unit shares depends on the quantity of water available in the consumptive pool that year. Groundwater resources in the Lower Namoi in 2015/16 for example, are worth 1 ML per unit share (NSW Office of Water 2015).

Licences are managed in accordance with the Act and rules specifically applying to the relevant water resource and set out in the WSP for that resource.

Works and use approvals

Separate works and use approvals are required under the Act to permit the operation of works to extract or divert water, and the use of water at a particular location.

An approval will state its type (whether for works or use, or both), the expiry date (they are generally issued for up to ten years), the location and purpose of water use, the water licence linked to the work for the purposes of taking water, and any conditions applying to the approval.

A water supply works approval for groundwater authorises the holder to construct and operate the well. A water use approval authorises the use of water (that has been allocated under a water licence linked to the water use approval) for a particular purpose at a particular location. Purposes are broadly stated (e.g. irrigation or town water) and generally do not restrict the holder in terms of crop type or manner or extent of irrigation. The specified location will be a parcel of land, and generally water may be used anywhere on that parcel. If required, conditions are added to approvals to minimise adverse impacts on third parties or the environment.

All applications for new wells and for any use approval for irrigation must be publicly notified. Any objections will be put to the applicant for response, and mediation (at the Minister's expense) may follow. The Minister is not to grant an approval unless satisfied that 'adequate

arrangements are in force to ensure that no more than minimal harm will be done to any water source, or its dependent ecosystems' (NSW Act, s 97).

Neither works nor use approvals may be traded to a different location, as they are location specific. If a water licence holder transfers the licence or any allocation made under it, the purchaser will need to obtain their own works and use approvals relating to the location where they intend to take and use the water. The seller's water use and works approvals do not expire, but will not be able to continue to be used unless and until they are linked to another water licence.

Environmental water provision

The Act provides for two types of environmental water – 'planned' water (water provided for under the rules of a WSP for fundamental ecosystem health, and around which rules for taking from the consumptive pool are designed) and licensed environmental water, which is granted under a licence for specific environmental use. Any person may also hold a water access licence and use it, by agreement with the government, for an environmental purpose. Licences for environmental use are issued and managed in the same way as licences for other purposes.

The NSW environmental water register (available online) holds information about the types of environmental water held.

Trading

The general ability to trade water licences and allocations made under them is set out in the Act. More specific trading rules are set out in the *Access Licence Dealings Principles 2007* (a statutory instrument made under the Act) while the relevant WSP for each resource includes additional local trading rules specific to the particular water resource.

Various types of market dealings in water licences are permitted under the Act. With the Minister's consent, a person may:

- sell or lease a licence. The transaction takes effect once it is registered on the register of water access licences. It will only be registered with the consent of any person who has a registered security interest in the licence (e.g. a mortgage held by a bank).
- divide a licence into two or more licences, or do the reverse (amalgamate two or more licences), or sell some of the shares associated with a licence to another licensee.
- sell any part of an annual allocation that has been made to their licence for that year. This type of trade is known as an allocation assignment.
- transfer a licence or allocation for use interstate – that is, sell or lease a licence or assign water allocations made under the licence, interstate. Interstate trade is subject to an interstate agreement between governments. There is presently no interstate agreement for groundwater trade.

In determining an application, the Minister will apply general principles about the objective of water management set out in the Act, the Licence Dealings Principles, and any specific trading rules contained in the WSP.

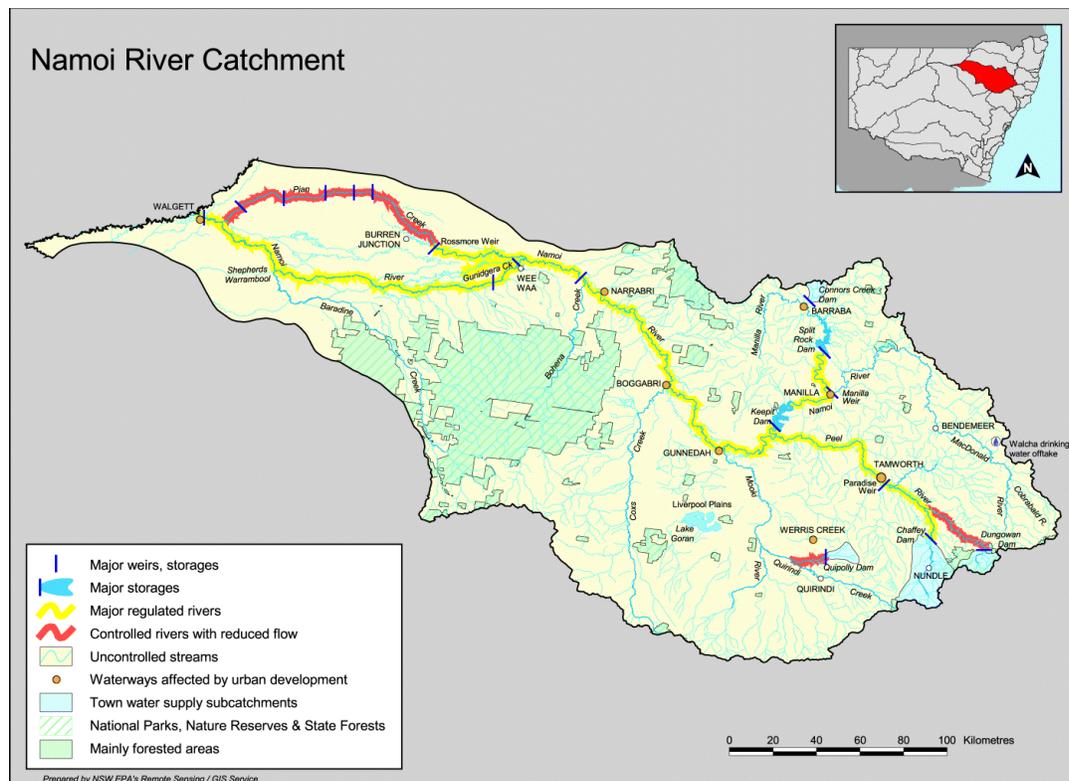
NSW operates a water access licence register (available online), which is a statutory register showing title of all licences and any encumbrances (e.g., mortgages, caveats, etc). The register functions in the same way as the state’s register of land titles.

Namoi River catchment and associated groundwater

The Namoi River Basin is one of the largest catchments in NSW, covering more than 42,000 km² (16,200 square miles). The catchment lies near the northeastern border of NSW, its headwaters in the western slopes of the Great Dividing Range (Figure 1). The river flows west to join the Barwon River above the Darling River.

The catchment includes mountain landscapes, rolling hills and open flood plains. The extensive Liverpool Plains are deep, productive alluvial soils, highly valued for agriculture, a result of weathered volcanic basalt washed into the river basin about 10 million years ago. The region’s coal beds are remnants of much older seas and lakes.

Figure 1: Namoi catchment (source: NSW Government)



Surface water

Rain falls mainly in the summer and least during the winter months, averaging 1,300 mm (51 inches) per year in the ranges, down to only 400 mm (16 inches) at the drier, western end of the catchment.

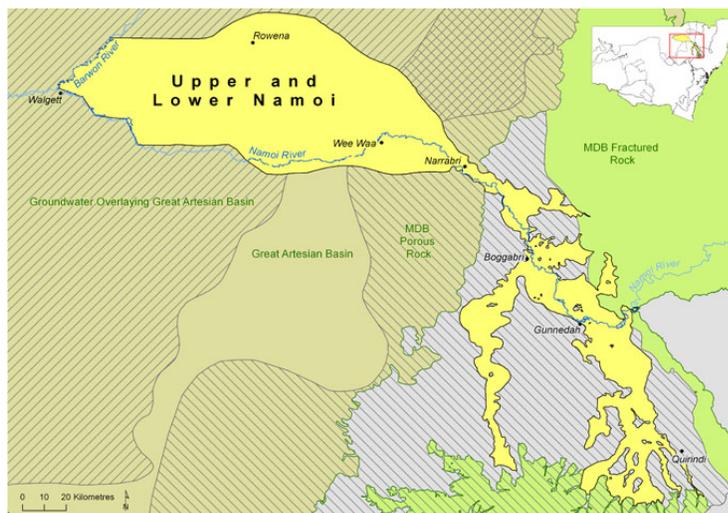
The long-term annual average flow of the Namoi River above the main irrigation areas is 696 GL (560,000 ac-ft). Like many rivers of the NSW Darling system, the Namoi River suffered an extensive blue-green algal bloom in 1991-92. During the Millennium Drought, the Namoi received 9 consecutive years of below average flow between 2001 and 2010.

Groundwater

The high yielding, generally high quality alluvial groundwater beneath the Namoi River Basin is NSW's second most important in terms of groundwater use, representing about 15% of total groundwater extractions in the Murray-Darling Basin.² There are also fractured rock aquifers in the more mountainous areas and sedimentary rock aquifers beneath the middle of the region, some of which are too salty for general use. This case study does not consider those resources.

The alluvial groundwater is managed in two parts - the Lower Namoi to the west, and the twelve Upper Namoi sources in the east (see Figure 2 for Upper and Lower Namoi and Figure 3, for Upper Namoi). Shallow groundwater of high quality in these eastern resources is closely connected to the river systems, and groundwater levels are largely dependent on recharge from surface water flows from the ranges. Towards the western end of the catchment, salinity increases and in some areas the groundwater is too salty for general use.

Figure 2: Upper and Lower Namoi alluvial groundwater (source: NSW government)



Groundwater in the region is used for stock and domestic supplies, townships and industry, and for irrigation. It accounts for about half of all water used in the Namoi catchment. Low reliability of surface water flows in the catchment has resulted in greater dependence on groundwater than in some other parts of NSW.

² The Lower Murrumbidgee groundwater source has a higher extraction limit (280,000 ML per year) and historically higher use than the Namoi source.

All water use in the area (apart from stock and domestic, and some minor exemptions) is licensed under the NSW *Water Management Act 2000*. About 18,000 wells annually take around 343 GL (278,000 ac-ft) (NSW Office of Water 2011).

The NSW government has closely monitored the area since the early 1970s, and now monitors groundwater levels at 644 sites throughout the region. Groundwater models are used to derive estimates of recharge rates and to predict the response of groundwater levels to recharge and extraction.

Significant biodiversity and water-dependent ecosystems

The Namoi catchment provides habitat for a large number of threatened species and ecological communities. There are a number of significant wetlands both connected to and independent of the river system (the latter are drainage basins, relying on surface water run-off from the catchment).

The region is now almost entirely developed, with only small (though significant) areas of native vegetation remaining.

Local economy

About 100,000 people live in the Namoi area, about 36% of them in the regional city of Tamworth. Output from the region is more than \$1 billion per year, approximately half of which is attributable to dryland and irrigated farming. Three large dams on major tributaries were built between the 1940s and '60s, providing a more reliable water supply and heralding rapid expansion of agriculture, mostly intensive cropping. The main irrigated crops, which cover about 1,259 km² (3% of the total catchment), are rice, fruit, nuts and vegetables. On average, about 49% of total water use in the Namoi region is groundwater, with the remaining surface water. Groundwater use rises to about 78% of total during dry years (CSIRO 2007).

The Gunnedah Coal Basin, one of the largest producers of coal in NSW, lies in the middle of the Namoi catchment. Both open cut coal mining and coal-seam gas mining take place in the region and account for most of the remaining non-farm regional production.

Current issues

Past farm management practices, as well as the cumulative effect of coal mining, have led to decline in water quality, dryland salinity, loss of topsoil, and loss of vegetation and biodiversity generally.

There is considerable community tension relating to demands of the mining industry for groundwater and productive land. Increasing coal seam gas extraction is also a cause of community concern.

Ongoing drought and the anticipated effects of implementing sustainable diversion limits for the surface water flows under the Basin Plan contribute to apprehension about the region's farming future. The Basin Plan requires surface water diversions in the Namoi catchment to be reduced by 10 GL (total estimated long term annual average diversion is estimated at 508 GL).

The catchment must also contribute additional reductions to meet the 'shared reduction' amount for the northern Basin catchments (12 catchments must together find 143 GL). As at June 2016, it was estimated that federal and state buy-backs had already recovered the 10 GL reduction, with an additional 1.5 GL recovered and available to contribute to the shared reduction amount.

Groundwater management in the Namoi region

This case study focuses on groundwater entitlements and trade in the Upper and Lower Namoi alluvium groundwater sources, both of which are now managed under the *Water Sharing Plan for Upper and Lower Namoi Groundwater Sources 2006* (Namoi WSP).

Early days – Water Act 1912

From 1955 onwards, a licence under the NSW *Water Act 1912* was required for drilling any well. Licences were issued on a 'first come, first served' basis, and were issued for a fixed term, capable of renewal. From 1984, with monitoring of the Namoi groundwater showing a decline in levels, groundwater licences were subjected to a maximum annual volume and conditions were imposed allowing the government to alter the maximum volume or the rate at which it was pumped. The government also announced an 'embargo' on licences, preventing the issue of any new licences and effectively establishing a cap on permissible extraction from the resource. In 1994, Namoi groundwater licensees were subjected to additional controls, including the potential to restrict pumping rates and volumes, and requirements to monitor and report on groundwater levels, connect meters or other measuring devices to continuously record water taken.

A report by the Murray-Darling Basin Commission in 1996 found total entitlements for the Upper and Lower Namoi were more than double the estimated sustainable yield (entitlements amounted to approximately 500 GL per year, with estimated sustainable yield about 210 GL per year (MDBC 1996)). During drought years, actual use was nearly as high as those entitlements. The aquifer was showing strain by the mid 1990s, with monitoring showing consistent decline in pressure and groundwater levels. The NSW government's 1998 Aquifer Risk Assessment Report identified the Upper and Lower Namoi alluvium as the highest risk aquifers in the state (NSW Government 1998). Irrigators appeared to accept that the resource was overallocated – in some areas, farmers were receiving only 5% of their groundwater entitlements each year (McDonald 2007). In 1995, a groundwater management plan was introduced by the government, reducing allocations by between 10% - 35%, varying according to the degree of overallocation in each zone (Carter 2000).

Groundwater trading, which had been occurring informally in the area since the 1980s, was permitted formally from the late 1990s.

Water Management Act 2000

Following the CoAG water reforms of 1994/95³, the NSW *Water Management Act 2000* was passed to replace the *Water Act 1912*. A process of conversion to the new regime began. For each water resource, a water-sharing plan (WSP) would be prepared in consultation with affected communities. Amongst other things, the WSP would identify sustainable diversion yields and set out the pathway by which entitlements under the 1912 legislation would be converted to new water access licences, and where necessary, levels of entitlements reduced to meet sustainable yields. Water resources showing signs of stress from overuse and overallocation, including groundwater in the Namoi and surrounding regions, were amongst the first WSPs.

Namoi groundwater sharing plan 2003

The *Upper and Lower Namoi Groundwater Resources Water Sharing Plan 2003* (Namoi WSP) sets out current management rules for the resources. The Upper and Lower areas are managed separately, and the Upper Namoi is managed in 12 zones corresponding to aquifers beneath the main reaches of the tributaries.

A central element of the WSP is the reduction of total extraction limits from the demonstrably unsustainable levels that previously applied: for the Upper Namoi, a reduction in entitlements of nearly 60% (from 301.9 GL to 122.1 GL), and for the Lower Namoi, about 50% (from 172.2 GL to 86 GL) (MDBA 2012). Sustainable extraction levels were determined from model predictions of pressure level responses to different levels of groundwater pumping, and are calculated on the basis of estimated annual average recharge (Namoi WSP, s 27).

In summary, reduction was achieved by issuing permanent entitlements up to the full extraction limit. Additional 'supplementary licences' were issued to water users whose historical use exceeded their new entitlement, so that the total available to such users approximated their past actual use. The quantity of water available per unit share of supplementary licences each year was then subject to annual reduction, culminating in supplementary licences disappearing altogether in 2016.

Table 1: Upper and Lower Namoi groundwater extraction limits - prior to and under Namoi WSP

| | Lower Namoi (GL) | Upper Namoi (total of zones 1 – 12) (GL) |
|--|---------------------|--|
| Sustainable extraction limit (WSP estimate) | 86.0 | 122.1 |
| Entitlements on issue 1999-2006 (approx.) | 172.2 | 301.9 |
| WSP extraction limit (at 2015-16) | 86.0 | 122.1 |

³ CoAG is the Council of Australian Governments, comprising the Prime Minister and the Premier of each State and Territory. As discussed in Part I of this paper, CoAG agreed to a raft of economic reforms, including in relation to water management, in 1994.

Sources: *Namoi WSP, Upper Namoi Groundwater Source – Status report 2011, NSW Office of Water 2012 ‘A NSW Groundwater Management Perspective’, MDBA 2012*

Environmental water provisions

The Namoi WSP reserves for the environment the long-term average storage component of the aquifers. Only the estimated average annual recharge is available for consumptive use. An amount for supplementary access licences is permitted to be taken from the environmental reserves until 2016 (see below). There are no high priority groundwater dependent ecosystems identified for the WSP. The WSP includes rules about trade and new well approvals that aim to protect wetlands and streams in the catchment from impact.

Although there is nothing to prevent a groundwater licence being held for environmental purposes, there are none in the Upper and Lower Namoi groundwater regions. Provided the sustainable extraction limit has been correctly set, and there are appropriate location and trade rules in place for the use of wells, there is no need for environmental provision to be made by environmental water licences.

Water access licences

The Namoi WSP sets extraction limits, in megalitres (ML) per year, for the Lower Namoi and for each of 12 zones of the Upper Namoi groundwater sources. The total limit is approximately 210 GL/year plus an unspecified amount for basic rights (stock and domestic use), and corresponds to the sustainable diversion limits set in the Basin Plan for the areas. Extraction limits were set in 2006 based on understanding about recharge to the resource.⁴

Water access licences for irrigation and other industry uses are issued as unit shares. Local utility water (i.e., township) licences are issued as fixed maximum volumes. Each year, an ‘available water determination’ is made for the resource, announcing water allocations that will be made to each licence. For local utility licences, it is expressed as a percentage of the maximum volume, and utilities have to date received 100% of their share. For licences issued with unit shares (irrigation and other industry), the determination is in ML per unit share, and is based on water remaining from the extraction limit after deducting water for basic rights, local utility supply and supplementary licence amounts.

If any 3-year average of extraction exceeds the extraction limit for an area or zone by more than 5% (for example, because basic rights increase significantly), then allocations to entitlements will be reduced in the following year by an amount determined necessary to return to the extraction limit.

Conversion to water access licences

The WSP sets out how 1912 Act water entitlements are converted to new licences under the 2000 Act, and reduced - by up to 60% in some places - to meet the sustainable extraction limits.

⁴ Extraction limits may be changed after June 2010 to reflect improved knowledge about recharge or environmental water requirements. The WSP sets minimum and maximum levels within which limits can be changed.

For licences in some zones, and for some specific licences, the conversion was straightforward. However, the majority of 1912 Act licences were subject to a complex formula that took into account history of metered extraction by the licensee over a particular period, the zone from which water is taken, estimated recharge (as set out in the WSP), and water requirements of local utilities and certain other existing licences.

Trading provisions

The WSP sets out rules that permit trading of water access licences, unit shares and water allocations within the groundwater source. A system of zoning streamlines the assessment and approval process. The rules are described in more detail in the section of this paper 'Current trading in the Namoi groundwater region'. Although groundwater trading had been occurring in the area since the 1980s, it was suspended during development of the WSP in order to maintain the status quo while solutions were developed to resolve the over-allocation issues.

Works and use approvals

The Namoi WSP contains rules designed to limit impacts of extraction and use on third parties or the environment. The impact of a proposed new well on any stock and domestic well within 100 metres must be assessed (at the applicant's cost). Wells for any commercial purpose are required to be at least 400 m apart, and at least 200 metres from the property boundary. The Minister may vary the distance restrictions if the applicant satisfies the Minister that a hydrogeological study demonstrates 'no more than minimal potential for adverse impact on existing users'.

Environmental impacts are limited by preventing wells from being situated within 500 m of a wetland or 200 m of a river. Local access restrictions may be imposed directly by the Minister if necessary to prevent adverse impacts on groundwater levels or water quality, or to protect land from subsidence, or for other reasons.

All wells are issued with a set of standard conditions under the WSP, including compliance with specified drilling standards, installation and maintenance of a meter, and compliance with any local impact rules made by the Minister. A well is linked to a water licence, and only water allocated under that licence may be taken from the linked well.

Negotiating the WSP: 2001-2006

The conversion and reduction in water rights, and the way this was achieved, was not popular. There was considerable debate about definition of the sustainable extraction level and the way that entitlements should be reduced to meet that level. Although the Namoi WSP was completed in 2003, it did not come into effect until 2006.

During 2005, the NSW and federal governments developed a program called *Achieving Sustainable Groundwater Entitlements* to set out the plan for conversion from the 1912 Water Act to sustainable extraction under the WSP, and it was in conjunction with this program that the WSP finally came into effect. The adjustment program was developed on the advice of the Groundwater Adjustment Advisory Committee formed by the NSW government. The committee comprised representatives of the NSW Irrigators' Council, local catchment

management authorities and senior representatives from the state and federal governments. It involved amongst other elements a package of financial assistance to licensees and the region more generally.

Development of the WSP

The Namoi Groundwater Management Committee, a group comprised of local water users and environmental representatives tasked with negotiations relating to the conversion and reduction, was unable to find any consensus on an appropriate method to reduce entitlements. Two methods were proposed – ‘across-the-board’ (i.e., a proportional reduction) or reduction based on historic use. Active licensees had more to lose from an across-the-board cut, and favoured reductions based on past use. An across-the-board cut was announced in 2001.⁵ It was not received well and in November 2003 the NSW government announced that the reduction method would be re-examined. Amendments were made to the Act in 2005 to allow a WSP to contain a more complex methodology for conversion and reduction.

A survey of groundwater licensees conducted in 2006 (Kuehne and Bjornlund 2006) found common themes of distrust and criticism of the NSW department responsible for water, and complaints over the consultation process.⁶ Respondents felt that they had been dictated to, not communicated with, and that the department had been dishonest. One respondent, whom the researchers felt summed up the responses of those who had used high amounts of their entitlements in the past, said:

‘Because I have participated in the so-called consultation process, and because I have seen the duplicity, bungling and political point-scoring at close range, it means the WSP, to me, is symbolic of a Public Service out of control and elected politicians without the ability to manage anything other than getting re-elected.’

Some licensees (notably mostly those who had used high quantities) felt that where the WSP could have been a revolutionary and positive change, instead ‘the process has been continually thwarted by bureaucratic time-wasting and cover-ups and also by political point scoring and tightening of purse strings where rural communities are left to shoulder the financial and emotional cost’ (Kuehne and Bjornlund 2006). There was also a strong feeling amongst

⁵ An ‘across-the-board’ approach had also been used for another NSW groundwater source, the Murrumbidgee. That WSP treated the aquifer as one zone, even though different areas experienced different rates of recharge. The Murrumbidgee WSP was challenged and although it was not found to be invalid, the judge commented unfavourably on the WSP, saying that “by imposing a uniform reduction on all irrigators, irrespective of their capacity to use the water theoretically available under the licence, the Plan will operate unfairly on some irrigators in a manner which could have been avoided. However, an approach which was based entirely on historical usage would also have been unfair to those who were still developing their properties and may have rewarded inefficient irrigators more than efficient users unless detailed rules in relation to the method of irrigation were imposed.” However, it was not the court’s role to make the Minister’s decision, only to rule on the validity of the WSP; the WSP was upheld.

⁶ The validity of the WSP was challenged in the NSW Land and Environment Court by two community groups representing water users, an irrigator and a corporate licensee, in *Upper Namoi Water Users Association Inc & Others v Minister for Natural Resources* [2003] NSWLEC 175. The applicants claimed that amongst other things, they had not been afforded ‘procedural fairness’ in the making of the WSP. The case did not proceed.

licensees that the repeated delays to the WSP were making things worse. Licensees wanted certainty of the outcome (whatever it was), and to know whether they would be entitled to adjustment payments – in other words, they wanted to be able to plan for their futures.

The lesson for government was to listen well and communicate clearly, be consistent, and be prepared to pay.

Financial incentives – 2006-2016

The NSW Act allows a licensee to claim compensation if their licence allocations are reduced as a result of a limited range of changes in a WSP. Compensation is payable at the Minister's discretion and subject to a number of exceptions for reductions in water allocations made because of changes during the initial period of a WSP (generally 10 years). For reductions made because of a change to a WSP after the initial period, the circumstances in which compensation is payable reflects provisions in the NWI about sharing the burden of reductions depending on the reason for the reduction (see NWI paragraphs 46 – 51, as mentioned in the companion paper on NWI). In the circumstances of the Namoi WSP, no compensation was payable under the Act.

Nevertheless, the NSW government determined to give licensees in the Namoi some financial assistance. As part of the *Achieving Sustainable Groundwater Entitlements* program, an adjustment package was developed for all affected groundwater sources including the Upper and Lower Namoi. The NSW and federal governments would make available a total of \$125 million to affected licensees, and \$9 million for a Community Development Fund. Payments to licensees were made available based on the value of licences – both active and 'sleeper', as determined by the NSW State Valuer-General. The costs of valuations and consultation required a further \$1 million of public funding.

Apart from the adjustment package, changes in the nature of water licences – to perpetual duration rather than for a limited term, amongst other things making them easier and probably more attractive to be used as financial security – may also have made the WSP more palatable to licensees. Water licences would also be fully tradeable, but as trade in entitlements and allocations under the 1912 Act was already available, access to trade was not a new incentive.

The adjustment package was challenged in the High Court (*ICM Agriculture Pty Ltd v The Commonwealth* [2009] HCA 51) on the basis that it amounted to an acquisition of property by the federal government (i.e., via the tied funding grant it had given the NSW government) without just compensation. (The Australian Constitution prevents the federal government from legislating to acquire property except on just terms. There is no such limit on State governments.) It was conceded by both governments that there would not be a 'full monetary equivalence' between the 1912 licence and the new licence plus the payment amount. The court found that the replacement of 1912 Act licences with licences under the 2000 Act did not amount to an acquisition of property by the federal government. First - because the licences were not 'property' in the relevant sense: they were statutory rights, and therefore inherently susceptible to change or termination under the terms of the statute, even though they had some features of property. The second reason was that the reduction did not result in either

the federal or state governments acquiring any proprietary interest in any licence. Rather, the state government had exercised its inherent power to limit the volume of water to be taken from the resource.

Effect of WSP on the resource

A report on groundwater status in the Lower Namoi in 2008 showed that the reductions could barely happen fast enough. Groundwater levels showed steady decline in all monitoring wells. Part of a previously confined aquifer had become unconfined due to decline in water levels and pressures. In some areas, the direction of flow of groundwater had in fact been reversed due to pumping. Drawdown was up to 60% of the saturated thickness of the aquifer in some places, with decline in recovery (the return of water levels once the pumping season has finished) of more than 10 metres since recorded levels from the early 1970s (NSW Government 2009).

The results were presented to the community in 2008, and by November that year new criteria were adopted for assessing trade applications in areas where drawdown exceeded 40% of saturated thickness, to limit impacts.

Drought is once again an issue, with the recent NSW Office of Water's *General Purpose Water Accounting Report 2014-15* showing the potential recharge to groundwater in the Namoi catchment very much lower than the long-term mean. The final National Water Commission report in 2014 also noted that recent monitoring indicates decline in groundwater quality in some zones (NWC 2014).

Managing impacts on connected surface water resources

Although the Namoi WSP includes controls on the grant of works approvals designed to protect wetlands and rivers that may be directly affected by pumping, these controls do not on their own necessarily effectively manage impacts of groundwater extraction on the connected surface water resources. Taken in conjunction with the sustainable diversion limit for groundwater they may give improved surface water protection, although it is notable that the diversion limit for the Upper and Lower Namoi groundwater sources is set at 100% of the estimated average annual recharge. This might not adequately provide for needs of gaining streams in the upper alluvium.

Requirements under the Murray-Darling Basin Plan will see any replacement of the Namoi WSP accounting more explicitly for its impacts on significantly connected surface water resources. In setting the Namoi groundwater diversion limits for the Basin Plan, the Murray-Darling Basin Authority noted that based on its view that the risk of groundwater depletion during the next ten years was low, it would accept the diversion limit set by the WSP and continue to monitor and assess the impacts of groundwater take, reviewing Basin Plan limits if required (MDBA 2012). However, the Basin Plan groundwater limits, and in particular acceptance of the WSP diversion limit for resources such as the Namoi, have been criticised for not properly recognising impacts of groundwater take on surface water resources and generally overlooking the ecological role of groundwater (Nelson 2012).

Review of WSP

The Namoi WSP is due to expire in 2017, and is currently under review; the process will no doubt generate new information on the status of the resources. According to the NSW government, the review is exploring whether the WSP is contributing to productive and resilient water-dependent industries, security of supply for rural and urban communities, and the health and resilience of groundwater sources and associated water dependent ecosystems. The new Namoi WSP will form part of the water resource plan for the Namoi Alluvium water resource plan area under the Basin Plan.

Irrigator views

A recent survey of groundwater licensees showed that only 5% agreed that the science used to set the sustainable diversion levels in the Basin Plan was sound (it was the same science as that used to set the extraction limit in the WSP in 2006), and most felt unable to adapt to any further reductions in surface or groundwater licences (Sharp and Curtis 2012).

One third of respondents thought that their groundwater region was overallocated, with significant variation between zones. It was widely agreed (80%) that groundwater needed to be shared, and that landowners should be expected to manage their land in ways that do not harm the environment. In spite of the latter response, 60% thought that long-term environmental benefits did not warrant any short-term reduction in farm production.

Nine years after the WSP was developed, resentment about the WSP process was still very evident. Of those surveyed, 41% felt that input from local farmers had not shaped the WSP, and 45% did not think there had been meaningful opportunity to participate in making the WSP. Most (61%) agreed however that government oversight of rules developed with input from landowners was an appropriate management regime. These responses probably highlight that expecting a group comprised of community representatives (the Groundwater Management Committee) to negotiate a significant reduction in water entitlements through the WSP process may not have been realistic, or fair on those involved. Perhaps it could have been successful with better support or more skilful management. The process was later discontinued; WSPs are now developed by government with subsequent community consultation.

The survey showed high levels of distrust in the Office of Water, but probably no more than should be expected as a natural response to the threat to individuals' previously enjoyed levels of water entitlement. According to the researchers, the findings suggested that implementation of collective management will be more acceptable to licensees if it has the strong support of practitioners on-ground whom licensees find more trustworthy: local 'champions' who are seen as arms-length from government.⁷

⁷ The NSW process can be contrasted with the 'locally-driven' water allocation planning processes required by South Australian laws, where catchment boards comprised largely of local community members are responsible for developing the plan, with technical assistance from Departmental scientists.

Current trading in the Namoi groundwater region

Trading rules

The trading rules are set out in the NSW Act, the Licence Dealing Principles (see above) and in the WSP, as detailed in this section. Trading is facilitated by the use of zones; a map showing the various zones for the Upper Namoi is provided on the next page.

Allocation assignment

Rules

For both the Upper and Lower Namoi, the WSP prohibits allocation assignment which would result in the total share components or credited allocations permitted to be extracted to exceed 600 ML/km², or that would cause an adverse local impact on either third parties or the environment. (A credited water allocation is an amount of allocation standing to the credit of a water access licence account at any point in time: i.e., water available to be used.) Allocations made under supplementary licences cannot be assigned.

Generally trade is permitted within a zone, but the rules stipulate a range of exceptions for trade between zones. For example in the Upper Namoi (which is managed in 12 zones), allocation trades to zone 10 may be permitted provided total allocations remain below 70% of the recharge for that zone. In the Lower Namoi (which uses areas rather than zones for trade decisions), allocations may be traded from area 3 into either of the other two areas, but allocations generally cannot be traded into area 3.

Market activity

In the Upper Namoi, there was active trade in allocations in 2014/15, although quantities vary widely between zones. For example, within zone 1 there were two transactions totalling 75 ML (61 ac-ft), while in zone 3 there were 15 transactions totalling 3,083 ML (2,500 ac-ft). There was also active trade in the Lower Namoi in 2014/15, with 49 individual groundwater allocation transactions amounting in volume to 14,357 ML (11,640 ac-ft).

The first 4 years after the WSP commenced (2006 – 2010) was the other most active trade period for allocations in both the Upper and Lower groundwater sources. In the Upper Namoi in zone 5 alone, there were 39 trades totalling 7,962 ML (6,455 ac-ft). In the Lower Namoi, 104 parcels changed hands for a total of 25,687 ML (20,824 ac-ft). This was a period of severe drought in the Namoi surface water catchment, a likely driver for increased groundwater demand. Nevertheless, in spite of trade activity in particular zones, total use in the Upper Namoi for each year between 2006/07 and 2010/11 was less than half of what was available (available water includes carryover of unused water from previous years). Use since 2010/2011 has increased markedly.

Share transfer and assignment

Unit shares may be sold or leased, but not if they are held on a supplementary licence. Transfer of shares (i.e., entitlements or portions of entitlements) is not as common as allocation trade. Transfer of shares can be a result of farm retirement from irrigation, or from farming altogether. Alternatively it might be a result of a permanent change in irrigation infrastructure, farming practices or crop type, which has resulted in water savings.

In the years since the WSP commenced, there has been quite active share trade in the Upper Namoi. For instance in zone 5 there have been 17 sales representing about 1,800 ML (1,459 ac-ft), while there were 10 sales totalling 630 ML (510 ac-ft) in zone 3. There have been only a handful of share sales in the Lower Namoi; the largest was in 2009, when a single licensee sold three packages of shares totalling 280 ML (227 ac-ft) to three different purchasers. The price paid was \$1,500 per ML (US\$ 1,500/ac-ft), or \$420,000 in total.

Market participants

Current market participants for groundwater trade are primarily irrigators. The Basin Plan has not required a further reduction in the level of groundwater extraction, so the federal government is not buying back groundwater entitlements. Township supplies are effectively fixed at current levels until the WSP is reviewed.

Transaction costs

Government fees

NSW government (Office of Water) fees are fixed by an independent pricing tribunal, and are based on cost-recovery by government. For groundwater licence and allocation trade 2013-16, they are as follows:

- New licence (licence only - zero share) - \$268
- Licence with shares - \$575 plus 27.80 per unit share up to 120 units
- Sale or lease of whole licence - \$758
- Assignment of allocation – \$242 (plus \$27.81 per unit share, where ‘special assessment’ is required)
- Work approvals (i.e., to drill or use a well) - \$1,284 (which includes advertisement of the application and the ‘basic’ assessment. If an application falls outside of parameters of a WSP rule, a further assessment might be required, carried out at cost to applicant.)
- Use approval - \$1,284 (includes basic assessment; add \$24 per hectare where ‘special assessment’ is required.)

The Office of Water’s website for water licensing applications notes that a basic assessment is designed to cover “small or standard applications where impacts are assessed to be minimal”. A special assessment may be required for transactions “which have the potential to cause greater impacts and therefore require a more intensive, specialised assessment (e.g. a field assessment or referral to a hydrogeologist).”

Brokers and brokerage fees

There are at least six specialist broking firms operating in NSW. Local land agents may also offer water brokerage.

A 2006 report for the Australian Productivity Commission *Transaction costs of water markets and environmental policy instruments* (The Allen Consulting Group 2006) found that overall, brokers' fees for a 'basic assessment' permanent trade in NSW were around 3.5% of the total value of the trade (most trades being parcels of around 100 ML, at about \$1500/ML average – although this varies significantly). Temporary trade (average parcels of 60 ML at about \$40/ML) carry transaction costs of about 3%. WaterFind, one of Australia's biggest water brokers, was charging 1.5% of total value of a trade to the buyer, and 3% to the seller (both permanent and temporary trade) in 2006 (The Allen Consulting Group 2006). Current WaterFind fees are at a similar level but there is some variation depending on factors such as complexity of a trade.

Lawyers are not needed in order to conduct a trade, so there are no transaction costs arising from legal fees. (Lawyers may be required in relation to other aspects of a deal, for example to prepare mortgage documentation, but these are not necessary or inherent transaction costs of the trade.)

Time taken for trade approval

Trade of an allocation can be completed in a matter of days. Obtaining extraction and use approvals can take between 2 weeks to 6 months, depending on the nature of assessments that need to be undertaken (e.g. on-site visits or specific modelling). Generally trade within a trading zone need only be assessed against criteria for impacts on neighbouring wells and restrictions on proximity to streams and wetlands.

Key enabling features for development of the Namoi groundwater market

The key enabling features for development of the market for water licences and allocations in Namoi groundwater are readily identifiable.

The extraction limit (that is, the 'cap' part of a 'cap and trade' model)

The limit on permissible extractions protects the resource and creates demand for trade. Important features of the extraction limit that contribute to its strength include:

- It has been set openly and transparently by government, following community consultation, meaning that water users understand what it is and why it has been set.
- It has been set at what the science indicates to be a sustainable level (estimated average annual recharge) so is not undermined by failing to provide for its own future. Ongoing monitoring and public reporting by the government on groundwater status helps provide confidence about the extraction limit. Surface water providing recharge to the resource is also managed under WSPs with a sustainable diversion limit.
- It includes all water users – stock and domestic users, miners and township suppliers are all included within the cap; all licensees must comply with their licences.

- It is enforced: water cannot be allocated that exceeds the cap, all licensed extractions are metered, and licence compliance is enforced to ensure users remain within their allocations.

Perpetual, well-defined water entitlements (variable annual allocation)

Water licences are perpetual (not issued for a limited term). Rules that affect the value of a water licence are set out in the WSP for the term of the WSP, and can be altered during the term only in limited circumstances. Under the Act, water licences can be cancelled or suspended only if the licensee has failed to comply with a term or condition, or on other limited grounds relating to the licensee's behaviour.

Every licence is explicit about the number of unit shares held. Annual allocation announcements dictate how many megalitres each share will receive in that year.

The trading rules

Trading rules facilitate trade. They do this by being:

- Explicit – they are set out in the Water Management Act, the licence dealing principles and the WSP. Criteria for assessment of trade applications are also published. All are accessible online.
- Consistently applied (i.e., certain) – the trading rules are mandatory and therefore applied to all applications, so all market participants know what to expect.
- Rules protect third parties and the environment (i.e., while the cap protects the environment and other users from over-extraction, local impacts arising for example from pumping near streams or domestic water supplies, are protected by restrictions or conditions).

Good market information

Water trades are published quarterly on the NSW water register, which also shows the price at which water was sold for each transaction. There are a number of specialist water brokers, all of whom operate sophisticated websites allowing buyers to see what water is available, and sellers to advertise. Government fees relating to trades are published on the government website.

Water register

A Water Register records ownership of all licences and allocations. A trade does not take effect until it is entered on the Register, and takes effect at that moment. This provides certainty about ownership.

Cultural acceptability

There is a long history of water trading in NSW, including trade of Upper and Lower Namoi groundwater. Allocation trade is a commonly used tool for annual reallocation of water amongst farmers, providing considerable flexibility to farming operations.

Conclusions

A 'cap and trade' model for allocation of water as a scarce resource has proved to operate effectively in NSW, including in the Namoi groundwater region. An assessment by the National Water Commission of the social, economic and environmental impacts of water trading in the southern Murray-Darling Basin over the decade to 2008/09 concluded that water trading had significantly benefited individuals and communities across the southern Basin, with aggregate economic benefits to the southern Basin and the national generally (NWC 2010). While the Namoi region is part of the northern Basin, there is no reason to expect that these broad findings would be different. The well-developed and well-informed market operating in NSW as illustrated by the Namoi case study in this paper enables the reallocation of water amongst users, assisting irrigators to offset dry-year impacts by allowing water to move to higher value uses. Environmental impacts of trade can be minimised by preventing or limiting trade that causes local impacts due to a change of location at which water is taken or used.

The effectiveness of the 'cap' part of the model as a tool to ensure long term sustainability of the resource depends on factors relevant to setting the extraction limit including the adopted definition of sustainability, the long-term impacts of decisions made about the level of environmental health required to achieve sustainability, and the accuracy of scientific estimates about the impacts of different scales of water take on environmental health.

Identifying and then achieving a sustainable extraction limit is a process that does not necessarily need to include direct engagement with water users, but the more effective the engagement, the greater community confidence in the need for change, and in the reliability of the final extraction limit. High levels of community confidence generally translate to lower risk of legal challenge of the limit or of actions associated with reaching the limit, and fewer resources required to enforce compliance with the limit. Confidence in the extraction limit, including an understanding of the factors that might alter that limit, also leads to higher value being placed in the water rights held under that limit. While a unit-sharing model such as that operating in NSW means that annual water allocations made to a licence may vary depending on water available from year to year, owners and would-be owners of licences can at least proceed in the knowledge that the value of the right will not be undermined by unknown or unaccounted-for factors.

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