The National Water Initiative and regional development in Tasmania

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> *"The Commonwealth shall not, by any law or regulation of trade or commerce, abridge the rights of the State or of the residents therein to the reasonable use of waters of rivers from conservation or irrigation."*
> Australian Constitution, s100.

Introduction

The Intergovernmental Agreement on a National Water Initiative (NWI) underpins the Australian Government's National Plan for Water Security (NPWS). The NWI proposes significant shifts in nation-wide water policy and when combined with the NPWS signals change in water governance that has significant implications for regional development in Tasmania. This paper contextualises water policy as a regional development issue and provides a basic description of the theories underpinning the NWI and NPWS, the policy issues influencing them, and uses a six point policy analysis method to determine the appropriateness and effectiveness of these policies and the Tasmanian response. To further explore regional development impacts under the NWI and NPWS, semi-endogenous stochastic forecasting has been applied to a hypothetical catchment. The essay concludes with an exploration of the policy implications arising from the modelling and analysis.

Water: A major regional development issue

Since 2000, Australia's southern and south eastern states have been in drought (Rakich 2006). Water users capitalised on the preceding wet period, 1950 – 2000, to develop water use infrastructure that resulted in unsustainable levels of extraction (Rakich 2006 and McKay 2006).

Ray Najar of the Murray Darling association claims that changes in climatic conditions will require community adaptation to new crop technologies and reduced water (Najar 2006(a)). Najar asserts that these impacts will hurt smaller communities and landholders who will be strongly encouraged to 'sell their water downstream'. Najar also states that water is the 'KEY to regional development in Australia', citing the proposed expansion at Roxby Downs by BHP where water is a critical to the viability of expansion options. Najar also asserts that industry development and water use has 'significant impacts on Local Government and rural communities' and that socio-economic impacts result from assured water supply by which communities are able to develop sustainably (Najar 2006(b)). Brennan (2006) argues that water policy reform aiming to better manage inter-temporal risk should firstly improve property rights before 'broadening permanent water markets and institutionalising environmental flows'. Brennan claims that broadened water markets and regulated environmental allocations would 'change the spatial and temporal pattern of water use' in Australia and affect water access reliability.

Water is critical to industry placement and economic development. It is an essential input of Australia's major industries including mining, agriculture, forestry and fishing, manufacturing, electricity and gas supply, and urban and domestic water supply (ABS 2005). The decline in water supply under the drought is creating the opportunity for the expansion of highly priced water markets (Brennan 2006).

The impact of the drought on Australian industries and the associated over allocation of water in southern and south eastern rivers has provided for the development of the NWI as a neo-liberal market-based policy response. The NWI attempts to arrest over allocation through open market instruments that create resource efficiencies and secure environmental, social and economic sustainability across regions and communities.

Underpinning theories and purpose of the NWI and NPWS

According to s100 of the Australian Constitution, the Commonwealth cannot 'abridge the rights of the State… to the reasonable use of waters of rivers'. Sections 81 and 96 however, provide the Commonwealth with the 'power to grant financial assistance to the states and impose conditions' (McKay 2006). By using these constitutional powers, the Commonwealth is able to intervene on water issues.

The NWI is underpinned by a triple bottom line approach that aims to achieve a 'nationally-compatible, market, regulatory and planning based system of managing surface and groundwater resources'. The NWI aims to accomplish this through: water access entitlements; transparent water planning; statutory provisions for public benefit and environmental water use; an open water trading market; best practice water pricing; water resource accounting; urban water reform; knowledge and capacity building; and, community partnerships and adjustment processes (COAG 2004). Connell and Dovers (2006) argue that the key objective of the NWI is to provide sustainable socio and environmental outcomes and that the strategy to achieve this - the development of a nationally-compatible water market, regulatory and planning system conflicts with this objective. They assert that the NWI is divided between 'what is wanted, more comprehensive water markets, and what is… needed, sustainable management' and that the intent to 'recognise and protect the needs of the environment' is in opposition to providing 'protection of third party interests'.

The NPWS aims to (Australian Government 2007):

1. develop Australia's irrigation infrastructure to line and pipe major delivery channels;
2. improve on-farm irrigation technology and metering;
3. share water savings on a 50:50 basis between irrigators and the Commonwealth Government;
4. address water over-allocation in the Murray-Darling Basin (MDB);
5. create new governance arrangements for the MDB;
6. cap surface and groundwater use in the MDB;
7. develop engineering works at key sites in the MDB;
8. expand the role of the Bureau of Meteorology to provide water data;
9. set up a Taskforce to explore future land and water development in northern Australia; and
10. complete the restoration of the Great Artesian Basin.

According to Connell and Dovers (2006), the NWI is underpinned by 'neo-liberal political philosophy and neo-classical economic theory' whereby markets provide an 'efficient and flexible' method for allocating resources in a sustainable manner. The effectiveness of market-based solutions is highly contested by Connell and Dovers themselves who argue that in order to achieve economic growth – improved institutional capacity and increased research investment is necessary. Exogenous factors resulting from an open market under the NWI combined with endogenous sector responses will play a strong role in determining industry development decisions within and beyond the regional scale.

With open water markets, technological advancements, space reducing technologies, and new governance systems (including the establishment of a National Water Commission and additional responsibilities being assigned to the Natural Resource Management Ministerial Council), traditional concepts of regions vis-a-vis Markusen (1987 in Dawkins 2003) no longer apply. New inter-regional factor mobility (such as inter-catchment water flows) conflicts with the neo-classical Heckscher-Ohlin-Samuelson theorem of comparative advantage. The ability to move water and power long distances is resulting in a breaking away from catchment scale and local government boundaries. Location theory (Isard 1956 and others in Dawkins 2003) suggests that industries will locate where optimal transport costs can be realised – new and existing water infrastructure is likely to play a larger role in such determinations and may also cause the further clustering of some water dependent industries. Semi-endogenous competitive advantage qualities may soon replace comparative advantages between regions and across the continent under the NWI.

Policy issues influencing the NWI and NPWS

According to Mercer, Christesen and Buxton (2007), Australian water management has historically been determined by 'statist developmentalism' and has resulted in a decline in the health of riverine ecosystems. Whittington & Liston (2003) identify intensive catchment land use as modifying the physical and chemical nature of rivers in Australia and that the extraction of large volumes of water for agriculture, industrial and urban uses has severely impacted on wetlands, rivers and groundwater dependent ecosystems.

The existing situation of over allocation and over extraction is a direct result of statist developmentalism and a paradigm shift is urgently required to save Australia's export and domestic agricultural industries. Australia's 'food basket', the MDB is severely affected by the current drought and according to Horticulture Australia Council chief Kris Newton "Australia has never been in a situation where we might not be able to feed ourselves" (Reading 2007).

A recent study by the Australian Academy of Technological Sciences and Engineering, and the Institution of Engineers, Australia (1999), forecast outcomes for policy responses according to an existing trends scenario, a non-adaptive scenario, and an adaptive management scenario. The results of this stochastic study suggest that by following existing trends decreased water availability due to increased agricultural consumption will result. The non-adaptive scenario predicts lower incomes resulting from a failure to improve water use efficiency and reallocation, and provides little growth in output and economic development. Whereas, the adaptive management scenario was based on several key assumptions including the development of water markets, increased water efficiencies, alternative dairy and beef production practices and the relocation of the cotton industry out of the MDB. The results of this scenario predict dispersed regional economic growth resulting from new industry development that follows water availability and the diversion of river systems; there would not be a need to pipe water from northern Australia as the relocated industries would not require northern water; and, that the Australian economy would continue to grow at current rates with little change if any to the agricultural contribution to GDP.

The predominant focus of the NWI and NPWS is on agricultural output although statutory provision for environmental and social sustainability outcomes are included and provided a measure of importance. Some allowance for indigenous interests is also provided but as with the socio environmental provisions, the rhetoric may merely be an afterthought.

The economic, social and environmental demands on water are extensive and the impact of inadequate water supply for consumptive and non-consumptive uses is a major issue for regional development and sustainability in Australia. The Council of Australian Governments' NWI response and the Australian Government's NPWS cannot make it rain, and without rain, market based solutions to water related issues do not work.

Tasmanian responses to the NWI

In Tasmania, Derryl Gerrity, West Coast Mayor has stated that water availability on the West Coast can provide the region with a significant comparative advantage for the supply of water to mainland states (Denholm 2007). Proposals to sell Tasmanian water to the mainland however are not supported by the Tasmanian Farmers and Graziers Association who claim that excess water could be better used within Tasmania to further develop the agriculture sector (Sayer 2007). A recent proposal to transport water from Poatina to the Midlands has been hailed as an opportunity to capitalise on Tasmania's 'water advantage' and the mainland's current drought impacts to expand agricultural production in Tasmania and create a 'southern food bowl' (Shannon 2007). However, David Leaman disagrees and claims that climate change is 'a perennial on Earth' affecting water availability at all scales and as such agriculture should be located where water is climatically available and the soils are suitable, not where these factors are absent (Leaman in Shannon 2007).

Tasmania, as a signatory to the NWI, can take advantage of cross-jurisdictional trading opportunities. As a signatory to the NWI, Tasmania is required to develop a NWI implementation plan (DPIW 2006) which includes new water governance structures and management practice. Legislation governing the use and allocation of water rights in Tasmania is contained in the Water Management Act 1999 (WMA), the Water Management Amendment Act 2006 (WMAA), the Irrigation Clauses Act 1973, the Waterworks Clauses Act 1952, and the Environmental Management and Pollution Control Act 1994. Relevant policies include the Enforcement Policy for the Water Management Act 1999 (interim policy) that relates to the enforcement of the Act by the Department of Primary Industries and Water, the Water Management Policy Water for Ecosystems that details a framework for the provision of water for the environment, and the State Policy on Water Quality Management 1997 that aims to protect surface water quality and enable sustainable development. In turn these policies are supported by the Generic Principles for Water Management Planning, the

Guiding Principles for Water Trading in Tasmania, the Guidelines to Assess Applications for New Water Allocations from Watercourses During Winter, and the three Regional Natural Resource Management Strategies.

The NWI requires a ‘whole of government approach’ and as such Tasmania has created the Inter-Departmental Committee on Water Policy made up of representatives from various Government Departments. The committee’s purpose is to oversee the implementation of the NWI in Tasmania (DPIW 2006), a difficult task with continued opposition to centralised control of water from Local Government bodies (BCC 2007).

The NWI aims for ‘“risk management” rather than “risk elimination”’ (DPIW 2006) and according to the DPIW (2006), water diversions in Tasmania ‘account for about 1% of the mean annual flow from all Tasmania’s rivers’ and extraction levels are well below available water. The continued dry in Tasmania’s midlands however, contradicts these claims with waters in the Macquarie River, the Isis River and other major streams in the region at very low levels (Shannon 2007).

Levers and instruments utilised under the NWI in Tasmania include the previously mentioned legislation and supporting policies, as well as the provision of funds for on-ground outcomes. On-ground activities include Tasmanian components of the CSIRO’s Water for a Healthy Country flagship project which provides funds for scientific research, and Hydro Tasmania’s water metering assistance for water extractors (Tony Norton pers. Comm. 4th October 2007). Cradle Coast NRM is also applying for funds under the NWI to develop regional water infrastructure (Tony

Norton pers. Comm. 4th October 2007). Other initiatives at the national scale will also benefit Tasmania including for example, eWater's River Operations and Management Project that aims to create a hydrological and ecological modelling platform suitable for water managers (eWater 2007).

The success of the NWI and its supporting Tasmanian policy instruments can be analysed using a six point policy analysis framework as adapted by Allison and Keane (2001) from embeddedness themes developed by Gripaios and Gripaios (1993 in Allison and Keane 2001). This analysis methodology investigates policy applicability and effectiveness against (Allison and Keane 2001):

- enterprise development,
- skills transfer,
- supply chains,
- technology, research and development,
- partnerships and networks, and
- civic engagement.

This method of analysis was applied to the NWI, NPWS and the WMA and the results are presented in Table 1 below. The analysis indicates that the NPWS fails to adequately provide for regional and local scale development opportunities and does not facilitate community participation. The NPWS and NWI focus on a top down neo-classical approach to water management. The WMA however, is inclusive of industry partnership processes, enables regional responses, and fosters community participation.

Table 1 Six point analysis of the NWI, NPWS, and the WMA (Tas)

	NPWS	NWI	WMA
Enterprise development	✓ Investment in irrigation infrastructure ✓ Taskforce investigating land and water development opportunities in northern Australia • Failure to foster regional scale enterprise development at the local level • Minimal enabling tools	✓ Open trading markets ✓ Security and commercial certainty of water access entitlements ✓ Minimal transaction costs	✓ Foster development opportunities for sustainable social and economic benefits ✓ Compensation provided for reduced allocations ✓ Water trading mechanisms ✓ Irrigation schemes and rights ✓ Proposal refusal is a last resort for infrastructure development • Stringent approvals process
Skills transfer	✓ BoM assistance with regional scale monitoring ✓ National databases • Minimal land manager learning opportunities	✓ Knowledge and capacity building particularly to the R&D sector • Minimal land manager learning opportunities	✓ Public data sharing ✓ Knowledge and capacity building linkages
Supply chains	✓ Assistance to non-viable irrigators and non-viable areas ✓ Increased delivery efficiency ✓ New water trading arrangements ✓ Transparent pricing • Lacking endogenisation to place	✓ Transparent, statutory water planning ✓ Best practice full cost recovery water pricing	✓ Water storage and delivery pricing mechanisms ✓ Transparent cross subsidisation ✓ Seasonal protection from over allocation

Technology, Research & development	✓ Modernised farm irrigation technology and metering ✓ Major engineering works in the MDB ✓ Sustainable flows and climate impacts research	✓ Some provision for shared public resources ✓ Water accounting ✓ Water use efficiencies research and innovation	✓ CFEV Project ✓ DPIW projects ✓ Research bodies and academic linkages
Partnerships & networks	✓ Water savings and water security • Minimal mutually beneficial collaboration or equitable partnerships • Non-consensus • Minimal regional scale leadership and prescribed power structures	✓ Regional allocation decisions ✓ Variability of conditions through negotiation ✓ Compliance monitoring ✓ Provision of government resources for water management	✓ Industry linkages and partnership arrangements ✓ Cross government partnerships
Civic engagement	✓ New governance structures for the MDB ✓ Risk sharing ✓ Commonwealth control in the MDB • Minimal recognition of communities • Minimal civic participation • Top down approach • Minimal community engagement	✓ Risk sharing ✓ Community and water user adjustment mechanisms ✓ Adaptive management for TBL outcomes ✓ Indigenous needs recognition ✓ Public reporting ✓ Community and stakeholder consultation • Insufficient community participation and avenues of appeal	✓ Water allocations for community needs ✓ Increase community knowledge of sustainability and water management practices ✓ Encourage community participation in water management ✓ Public comment encouraged ✓ Publication of reports ✓ Community linkages ✓ Community partnerships

Although the current drought is impacting on Tasmania, the abundance of water available within the state exceeds domestic use and under the NWI opportunities exist for new inter-jurisdictional trade and the ability to capitalise on this asset. It is too early to determine the catchment scale responses to the NWI in Tasmania as changes in landscape sectoral activity often occurs over decadal scales. As such, semi-endogenous stochastic forecasting has been used to explore sector changes under NWI conditions.

Methodology

Stochastic scenario forecasting in a hypothetical catchment

For the purposes of this study a hypothetical catchment was created based on typical northwest Tasmanian catchment characteristics and is described in the Appendix. The scenario testing explores the stochastic outcomes that may result from Tasmanian implementation of the NWI. To better understand the predicted impacts of the NWI on regional development issues a brief review of the current literature and semi-endogenous modelling was performed.

Tisdell (2001) argues that water markets result in water being used by the most profitable extractive uses and warns that market-based extraction can fail to consider natural flow regimes and hence exacerbate water availability issues. Connell and Dovers (2006) argue that water markets under the NWI will result in:

> 'increasing tensions between irrigation groups and surrounding regions as water supply security declines, the incomes and viability of irrigated enterprises and communities across the basin will become increasingly sensitive to seasonal and climatic variation and water trading will become more aggressive.'

Connell and Dovers add that rural communities will become increasingly 'alienated and isolated from the rest of society' and that to avoid this scenario, better policy instruments and knowledge-based systems are required to understand natural systems and sustainable resource extraction.

Policy impacts on regional sector development can be factored into conceptual modelling and it is because of the localised endogenisation of sector responses to exogenous inputs (including the NWI, resource availability and environmental degradation) vis-a-vis Van den Bergh and Nijkamp (Stough 1998), that a conceptual semi-endogenous growth model has been developed.

Semi-endogenous modelling

It can be argued that the Commonwealth Government, through the NWI, aims to erode State constitutional power over water and create neo-liberal market controls to develop opportunities for expanded trade and optimal economic efficiency. It is under the combined effects of open water trading, cluster possibilities, spatial factors and location theory, exogenous inputs, accumulated government policy distortions and investment decision making that the semi-endogenisation of sector innovation and policy responses will determine catchment scale intra-regional development. To better understand how these factors function, a semi-endogenous conceptual model of water dependent sector development has been created and is presented in the Appendix.

The conceptual model presented in Equation 1 (see Appendix) has been applied to the hypothetical catchment under NWI conditions and for the purpose of this study excludes exogenous factors beyond the NWI, and assumes ceteris paribus. Equation 1 demonstrates that sector growth is endogenised through investment in sector capital and human capital and that in the context of water dependent sectors, exogenous government policies, particularly with regard to water, play a critical role.

Under the NWI environmental flows are provided statutory provisions and where over allocation has occurred sustainable extraction limits will be enforced (COAG 2004). Under Tasmania's WMA however, environmental flows can be renegotiated and as such predictions of sector change under the NWI become highly variable. Further complicating the issue is the cost of water trading that remains an unknown under the NWI which broadly states that water will be traded to 'be competitively neutral' and at 'minimum transaction costs' and that the NWI will aim to achieve user pays best practice water pricing (COAG 2004). Equation 1 requires consideration of the agglomerated affects of government policy, as well as costs and other factors. For the purpose of this study, the model has been applied with certain constraints – that environmental flow allocations are static at time, and that perfect conditions are assumed.

Given the above conditions, a high environmental flow allocation will result in reduced water availability to water extraction dependent sectors and an increase in interceptive sectors throughout the entire catchment. In the hypothetical catchment, irrigated agriculture would decrease in catchment cover, whilst plantation wood production and non-irrigated agriculture would increase. A low environmental flow regime would provide a reversed outcome whereby irrigated agriculture could obtain as much water as required to maximise productivity and hence profits, invest those profits into capital and human capital, and hence increase in catchment cover. These findings are consistent with sector modelling and water management undertaken by Brennan (2006) and based on the Victorian temporary water market.

The impact of government water policy is fundamental to sector development within catchments. With inter-regional water trading possibilities, factor mobility becomes increasingly important and is subject to investment in public capital. Government intervention in water is therefore capable of having profound impacts on regional development issues.

Conclusion and implications for regional development

The conceptual model presented in Equation 1 reflects the importance of water security to capital investment decisions vis-a-vis the Victorian temporary water market (Brennan 2006). Equation 1 and modelling by Brennan (2006) suggest that sector-based capital investments directly respond to water supply security and costs. Profit and hence growth is directly linked to water allocation which, as previously described, is directed by government policy. As the analysis presented in Table 1 indicates regional scale development is a weakness of the top down NPWS. Merely reinventing water trading arrangements does not provide water to stressed water systems and is unlikely to receive community support without inclusive community participation.

The changes occurring to water policy as a result of the NWI and the proposed NPWS will affect communities across Australia and impact on regional development planning responses across all jurisdictions. Tisdell (2001) argues that water trading results in the expansion of profitable crops and significant environmental externalities.

Tisdell asserts that the only sure way to protect environmental flows and continued sustainable extraction is to reduce extractive allocations. Connell and Dovers (2006) also call for increased extractive regulation whilst Barasel and Destouni (2007) suggest the adoption of stochastic uncertainty accounting to underpin environmental water management issues.

Managing water for sustainable triple bottom line outcomes is a complex task and requires a paradigm shift from a productivist trajectory to an integrated sustainable management philosophy. By adopting a triple bottom line approach to water management, regional development can plan for sustainability, introduce governance frameworks that encourage increased efficiencies and integrated systems management and foster sector investment, resilience and adaptability.

These impacts will be felt by communities across rural and regional Australia and regional planners need to factor in mechanisms that account for variable externalities. New institutional structures are needed to manage increasingly scarce water resources (Hatfield-Dodds, Syme and Leitch 2006) and adaptancy requirements. To accomplish community supported change Hatfield-Dodds, Syme and Lietch argue that successful water management involves consideration of complex social values and often ‘conflicting human needs and aspirations’.

Water use across all sectors must be re-evaluated and better managed. Greater efficiencies and more responsible use is required if we are to sustain consumptive and non-consumptive supply to industries, communities and the environment (Parliament of the Commonwealth of Australia 2002). The stochastic modelling presented in this essay demonstrates that policy reform must consider the full implications of factor responses to policy adjustments and clearly indicates that the NWI will have profound effects on sector activity across landscapes.

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Appendix

Hypothetical catchment description

The hypothetical catchment covers an area of 37,500ha and ranges in altitude from 1,107 meters to sea level. 15% of the catchment is native vegetation managed for conservation (mostly riparian), 25% is managed for native forest wood production and 14% for plantation wood production (mostly in the upper catchment). 42% of the catchment is used for agricultural production, of which 8% is irrigated (including dairy). 2% of the catchment is built environment and the remaining 2% is minimal use. Estuarine and offshore environments are not used for commercial production; however some recreational fishing takes place. Threatened species are present within the catchment and the local marine environment.

Long term rainfall averages 2,200 mm per annum at the top of the catchment and 970 mm at the catchment outlet with a peak monthly long term average rainfall of 127.2 mm occurring in July and the driest month being January with a rainfall average of 44 mm. Average temperature range in July is 5.8°c to 12.7°c, whilst average temperatures in February range between 13.1°c to 21.1°c.

Equation 1

Based upon principles of semi-endogenous growth theory, water dependent sector growth within catchments can be expressed as:

$$g_a = P_a \rightarrow K_a, h_a{}^{L_a} \qquad (1)$$

$$where$$

$$P_a = f\left(\left[K_a{}^{h_a L_a} Y_a, J, S, C\right] \pm GP^b \right), D(t)$$

$$Y_a = f\left(\left[M_a - W \pm W^{GP(t)} WA_a\right] I_a, A_a, K_a, J \right)$$

Equation 1 demonstrates that growth g of sector *a* results from increases in the reinvestment of profits *P* into capital *K* and human capital *h* of labour force *L*. The ability to generate profit *P* is determined by a function of capital *K* (subject to human capital *h* of labour force *L*, defined as the aggregate level of education and training of sector personnel), multiplied by the output level *Y*, and influenced by the available public capital *J*, spatial factors *S*, and cost of production *C* ($C = f(IP,Y,J)$, where IP is the vector of input prices (including water trading costs) and is determined by exogenous factors[1]), and the aggregated influence of government policy GP^b (including Managed Investment Schemes, subsidies, tariffs, etcetera), and product consumption *D* at time *(t)* subject to exogenous market behaviour.

Output level *Y* results from a function of the quantity of water required for maximum production *M* of the sector minus the available useable and securely allocated water *W,* plus or minus the aggregated impact of water related government policy W^{GP} at time *(t)* (inclusive of environmental flows, permitted water allocations, etcetera) multiplied by water efficiency technologies *WA*; multiplied by the area of land under irrigation *I,* and influenced by the levels of technology A, private capital K, and public capital J).

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[1] $C = f(IP,Y,J)$ as developed by Dalenberg 1987, Keeler and Ying 1988, and others, in Button 1998.

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