

## 18 Encouraging conformity with the principles of the National Water Initiative

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Balancing the demands of water for conservation and extraction  
Photo: Greg Rinder, CSIRO Land and Water 2007

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## 1 KEY POINTS

Key points relevant to the principles of National Water Initiative NWI have been summarised below.

### NWI key principles

1. The National Water Initiative (NWI) as written is a broad ranging policy directive which provides an initial framework for resolving conflicts between a wide range of competing and conflicting interests.
2. The NWI is constituted by a 108 clause agreement ratified by the Commonwealth of Australia and all the Australian State and Territory Governments. It is the primary instrument for the management of Australian surface and groundwater systems, setting out the objectives, outcomes, timelines and actions for the ongoing process of Australian water reform.
3. The rule based decision framework articulates the planning processes and policy instruments that allows for the independent and flexible management of both non-consumptive environmental water and extractive uses, characterised by separate and potentially exclusive policy objectives (i.e.; environmental sustainability and economic efficiency).
4. The NWI has an overarching objective to recognise Indigenous needs 'in relation to access and management', including the provision of water for the protection of native title.
5. The NWI is premised on the separation of rights, which provides for the independent management of the twin water policy objectives of distributional equity (including the environment as a legitimate user of water) and economic efficiency in a changing world. Robust separation proposes a three tiered system of instruments to distribute and allocate volumes of water efficiently over time, including water planning; water allocations and water markets.
6. A Water Plan establishes the community values and science-based guidelines to appraise the state of a water system and prescribe the rules to determine the environmental and consumptive "pools". Accordingly the environment is no longer the residual claimant to water. This allows managers to resolve the tension between consumptive use and the environment.
7. When more than one person has an interest in the consumptive "pool" the first policy instrument defines the unit shares of the pool and the distribution of shares to individual interests. This allows water managers to distribute access entitlements to available consumptive water.
8. The second instrument defines an independently managed process to periodically allocate the amount of water to each share. This allows water authorities to independently manage the consumptive pool when faced with changing ambient conditions and to assign the risk of a variable water supply.
9. The third instrument prescribes or proscribes the obligations of water use. Since the impact of water use varies according to geography and activity, this allows the environmental and health impact of water use to be managed independently.
10. Water markets only apply to the consumptive pool, are appropriate when there are no surplus entitlements as a means of re-distribution and allow trading in both entitlements and allocations.
11. See also sections highlighted in text that relate to northern Australia – planning; allocation; progress of water markets.

## 1.1 NATIONAL WATER REFORM FOR WATER DEPENDENT DEVELOPMENT

Water policy development is one of Australia's most complex and fast-moving policy areas [1]. The recent round of National water reform commenced in the 1990s in response to economic, environmental, political, ideological and pragmatic forces [2]. As water reform has become a significant area of concern for the Commonwealth Government, major changes to Commonwealth, State and Territory water policies have been initiated. However, according to the Australian Constitution, water use is largely controlled by States and the Commonwealth's ability to directly impact water use is limited. This means there have been constraints to Commonwealth power in dictating the access to and use of water by individuals, States and Territories in Australia. Nevertheless, pressure by national and international communities galvanised support and sufficient impetus for changes in legislation to reflect ecological values [3] and to address water allocation issues. The Australian Commonwealth is also signatory to the UN Commission on Sustainable Development (UNCSD) and the Ramsar Convention on Wetlands of International Importance, which both impact water policy [4].

The focus of these issues, the need for a national strategy for Ecologically Sustainable Development (ESD), along with the broader microeconomic reform agenda aimed at improving the performing of the Australian economy (NCC 1993), culminated in several iterations of major water policy reform in Australia [5]. In consultation with the various jurisdictions, the Federal Government has initiated and led the development of national policy frameworks to reform the management of Australia's water resources onto a more ecologically sustainable and economically efficient footing. Key national initiatives related to water resource management have guided the policy reforms implemented by the jurisdictions and established the current policy setting. The chronology of the reform agenda has been:

- 1990 - Industry Commission and microeconomic reform
- May 1992 - COAG formed
- December 1992 - National Strategy for Ecologically Sustainable Development
- August 1993 - Hilmer Committee report on National Competition Policy [6] leading to National Competition Council (NCC)
- February 1993 - COAG Strategic Water Resources Policy Framework [7-8]
- March 1995 - COAG adopts the national competition policy package
- 1996 - The National Principles for the Provision of Water for Ecosystems
- 2004 - The National Water Initiative
- 2007 - The National Plan for Water Security
- 2008 - The COAG Intergovernmental Agreement on the Murray-Darling Basin Reform.

Water sharing plans prescribed by the NWI require that the environment is treated as a legitimate claimant of water and that the determination of environmental entitlements is based on the best scientific information available.

COAG [10] also requires consistent rules and arrangements to facilitate cross-border trading where this is appropriate and socially, physically and ecologically sustainable. Further, COAG requires water pricing reform on the principles of consumption based pricing and full cost recovery, the elimination of cross subsidies and fully transparent subsidies.

In 1994 COAG agreed to incorporate these water reforms into National Competition Policy and tasked the National Competition Council with assessing governments' progress in implementation. COAG water reform agenda requires well defined property rights to water coupled with evolving water markets while maintaining economic efficiency and equitable management of public goods [5].

The non-consumptive and consumptive use of water is required to maximise the contribution to national income and welfare, within the social, physical and ecological constraints of catchments. Issues of water allocation and entitlement, reform of irrigation systems, allocating water for environmental purposes and institutional reform were incorporated in the agreement [9].

Satisfactory implementation of water reform obligations set out in the National Competition objectives became a condition for tranche payments to state and territory governments, although it was left largely to individual jurisdictions to decide how to implement these reforms. The development of the National Water Initiative (2004) recognised the over assignment of water for consumptive purposes and resulting stressed river systems [10-11]. The need for a more integrated and coordinated approach to water management became a primary objective. According to Hussey et al. [12], the NWI reflects and extends the major policy reforms introduced in the 1990s and brings these together into one agenda that incorporates, among other things, integrated catchment management, tradeable water rights, full accounting of resources and use, regional water planning, and environmental allocation.

The objectives of the NWI include increasing the security of water access entitlements and ensuring the economically efficient use of water resources. These objectives are to be achieved by altering property rights to enhance trade in water through water planning mechanisms, including environmental flow provisions, intergovernmental coordination and intensive information systems [1]. NWI [10-11] requires establishment of: *“A nationally-compatible, market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes” (Clause 23).*

According to the National Competition Council [13] returning over-allocated systems to sustainable levels are central tasks of the NWI. The NWI represents a shared commitment by the Australian Government and state and territory governments to achieve a nationally compatible market, regulatory and planning based system of managing water resources. Under the 1994 COAG Water Reform Framework, states were to have in place water plans that strike an appropriate balance between environmental and consumptive uses along with establishing first pathways for returning over-allocated systems to sustainability by 2005.

The NWI is currently the primary instrument for the management of Australian surface and groundwater systems, setting out the objectives, outcomes, timelines and actions for the ongoing process of Australian water reform. The rule based decision framework articulates the planning processes and policy instruments that allows for the independent and flexible management of both non-consumptive environmental water and extractive uses, characterised by separate and potentially exclusive policy objectives. The over assignment of water to consumptive interests does not immediately apply to the majority of Rivers in northern Australia hence implementation of voluntary exchange of tradeable entitlements via markets is not an immediate priority. As signatories of the NWI, the States and Territories are required to adhere to ratified principles, regardless of the development status of a river basin. Robust design principles articulated in the NWI, explicitly requires the process of water planning to account for the “potential” for future entitlements and allocations and appropriate re-allocation mechanisms when contestability increases.

The NWI describes outcome and actions for the ongoing process of national water reform in the areas of:

- Water access entitlements and planning
- Water markets and trading
- Best practice water pricing and institutional arrangements
- Integrated management of water for environmental and other public benefit outcomes

- Water resource accounting
- Urban water reform
- Knowledge and capacity building
- Community partnerships and adjustments [14].

In this chapter these elements have been re-ordered, merged and/or split for a sharper focus on the characteristics and current status of northern Australian river and aquifer systems.

## **1.2 WATER PLANNING AND THE CRITICAL CLAIM OF THE ENVIRONMENT**

Water planning is a key component of the National Water Initiative (NWI) and one of the most important tools for achieving sustainable use of water. Water planning links closely to many other NWI elements. It provides a framework for achieving environmental outcomes, addressing over-assigned and/or overused water systems, developing water entitlements and markets, assigning risk for changes in water allocations, and recognising and managing the connectivity between surface and groundwater resources. Water planning also provides for the recognition of Indigenous needs in relation to water access and management and the protection of the integrity of water access entitlements from unregulated growth in water interception as a result of land-use change [15-16].

NWI seeks to ensure the maintenance of acceptable environmental flows via planning instruments and water rights. NWI is therefore really a method for implementing the principles of ESD. A successful water share plan needs to determine volumes and actions that sustain the functional integrity of the river system, prior to specifying any consumptive pool [17]. In consultation with the community, water planning requires consideration of the best available science and water use values to develop measurable objectives to manage water resource systems equitably and sustainably [18]. Water planning is seen as “an important mechanism to assist governments and the community to determine water management and allocation decisions to meet productive environmental and social objectives” [10]. This involves planning for the extraction of water (both quantity and timing) from rivers and aquifers for all consumptive uses including irrigation, municipal, rural stock and domestic and other purposes.

Effective water planning is fundamental to the NWI because it provides certainty about the terms of access for consumptive and environmental water users within an evidence-based, participatory and transparent process. The water plans, based on adaptive management, are to provide for both secure ecological and resource security outcomes. The NWI also requires water plans to include consultation with indigenous interests to ensure Indigenous values are accounted for. An effective water planning regime [15-16] is required as a minimum to:

- Clearly establish how to deal with currently overused and/or over assigned systems, hence help return necessary water to the environment and ensure environmental and resource sustainability
- Provide a clear and secure basis for water access entitlements and allocations, hence, provides certainty to water users and the environment
- Enjoy the support of the community by appropriately balancing economic, social and environmental objectives, by drawing on and utilising the best available science, socioeconomic analysis and community input.

A complementary principle that underpins planning is that water users, interest groups and the general community are to be involved as partners in the catchment planning processes [19]. Rising concern for environmental sustainability and the need for water planning, water entitlements and water trading processes to take account of local circumstances explain the emphasis given to public

participation in the NWI [19]. The NWI explicitly recognises the special character of Indigenous interests in water. Parties to the NWI have agreed that water access entitlements and planning frameworks should recognise Indigenous needs 'in relation to access and management [1] (clause 52). A detailed discussion on Indigenous interests is provided in Chapter 15

Measuring and managing the sustainability of water resource systems across Australia is another key component of the NWI. The component requires the identification of the sustainable yield for water management areas in each state and territory and reflects the intent and operational dimension of the NWI, i.e. the task of operationalising and implementing ecologically sustainable development. Water planning is central to dealing with the challenges of stressed water systems and to determining how valuable water resources are shared between competing uses [18]. NWI requires the return of over-assigned or overused systems to environmentally sustainable levels of extraction (cl 23). NWI provides a statutory basis for environmental and other public benefit outcomes in surface and groundwater systems to protect water sources and their dependent ecosystems (cl 25). Environmentally sustainable levels of extraction also need to be determined for less stressed systems to ensure that they do not become over-assigned.

The approaches to water planning vary significantly from jurisdiction to jurisdiction, planning effectiveness has been variable and plans have not generally been objectively evaluated. Hamstead et al. [18] argue that water plans that are broader in either geographic or thematic scope are often less specific about practical management rules, with less clarity about factors affecting individual water entitlement holders' resource security, and about specific environmental management rules. Conversely, more specific plans are less likely to consider wider trade-offs and broader supply and natural resource management issues, e.g., catchment impacts on river health [18]. Often the trend is toward detailed plans in a context of broad strategic plans or state-wide 'default' policies and rules. Consequently, comparisons of plans constructed for varied jurisdictions must recognise these differences when drawing conclusions.

Water planning decisions need to be based on reliable, accurate information in concert with social and economic analysis to avail greater community confidence that the water planning processes have considered all relevant factors and analyses [2]. Reducing the complexity and intent of plans is necessary as plans often contain discretionary, imprecise or subjective terms and generalised performance indicators that are difficult to evaluate. Notably, if generalised performance indicators are used they may be so generalised that it is difficult to ascertain whether the indicators have been achieved. For example, the NWI requires the economic and environmental sustainability of groundwater and surface water. However, in many catchments of northern Australia, groundwater and surface water are interconnected. Groundwater can seasonally contribute to stream base flows when it is discharged from aquifers while surface water can recharge groundwater resources when it infiltrates into aquifers. Extraction of groundwater (for example) can affect the surface water even if the extraction is tens of kilometres away from the stream. This connectivity means that issues such as over-assignment, environmental flows and river salinity could impact on the water quantity and quality in both ground and surface water systems. In the Daly River, (for example), total groundwater-surface water exchange volume is about 690,000 ML [20]. Also, there is ephemeral and seasonal variation in rainfall which affects the recharge and discharge of groundwater and surface systems in hydrologically independent basins.

Guidelines for water plans and planning processes for States and Territories have been described by COAG [10] in Schedule E including: geographic or physical extent of the water source; health and condition; risks to the water source e.g. climate change, size estimates; objectives of water allocation; knowledge base for decisions; the uses and users of the water; environmental and other public benefit outcomes; rules on dispersal, quantity, rates, times and circumstances of water

extraction; estimated reliability of the water access entitlement; and conditions requiring monitoring and reporting, while minimising impacts on third parties and the environment, and complying with site-use conditions.

NWI guidelines clearly state that:

1. where systems are found to be *over allocated* or *overused*, the relevant plan should set out a pathway to correct the *over allocation* or *overuse*
2. A plan duration should be consistent with the level of knowledge and development of the particular water source
3. In the case of ongoing plans, there should be a review process that allows for changes to be made in light of improved knowledge.

Note that we have substituted the term *over assigned* for *over allocated*. Allocation in this context refers to the distribution of consumptive entitlements or unit shares. Allocation also refers to the proportion of the entitlement that a unit holder can expect to receive for a given period, usually one year. To avoid confusion we refer to the distribution of water entitlements as assignment of water interests and allocation as the periodically determined proportion of water delivered to each entitlement.

Further consideration is needed to include:

- relevant regional natural resource management plans and cross jurisdictional plans
- an assessment of the level of connectivity between surface (including overland flow) and groundwater systems
- impacts on water users and the environment that the plan may have downstream (including estuaries) or out of its area of coverage, within or across jurisdictions
- water interception activities.

Water planning processes include:

- consultation with stakeholders including those within or downstream of the plan area;
- the application of the best available scientific knowledge and, consistent with the level of knowledge and resource use, socio-economic analyses;
- adequate opportunity for consumptive use, environmental, cultural, and other public benefit issues to be identified and considered in an open and transparent way;
- reference to broader regional natural resource management planning processes; and
- consideration of, and synchronisation with, cross-jurisdictional water planning cycles (see [www.nwc.gov.au/resources/documents/Intergovernmental-Agreement-on-a-national-water-initiative.pdf](http://www.nwc.gov.au/resources/documents/Intergovernmental-Agreement-on-a-national-water-initiative.pdf)).

Hamstead et al. [18] presents a conceptual model of water planning (shown in Figure 1) and argues that water planning is, in fact, a specific form of strategic planning with clear objectives.

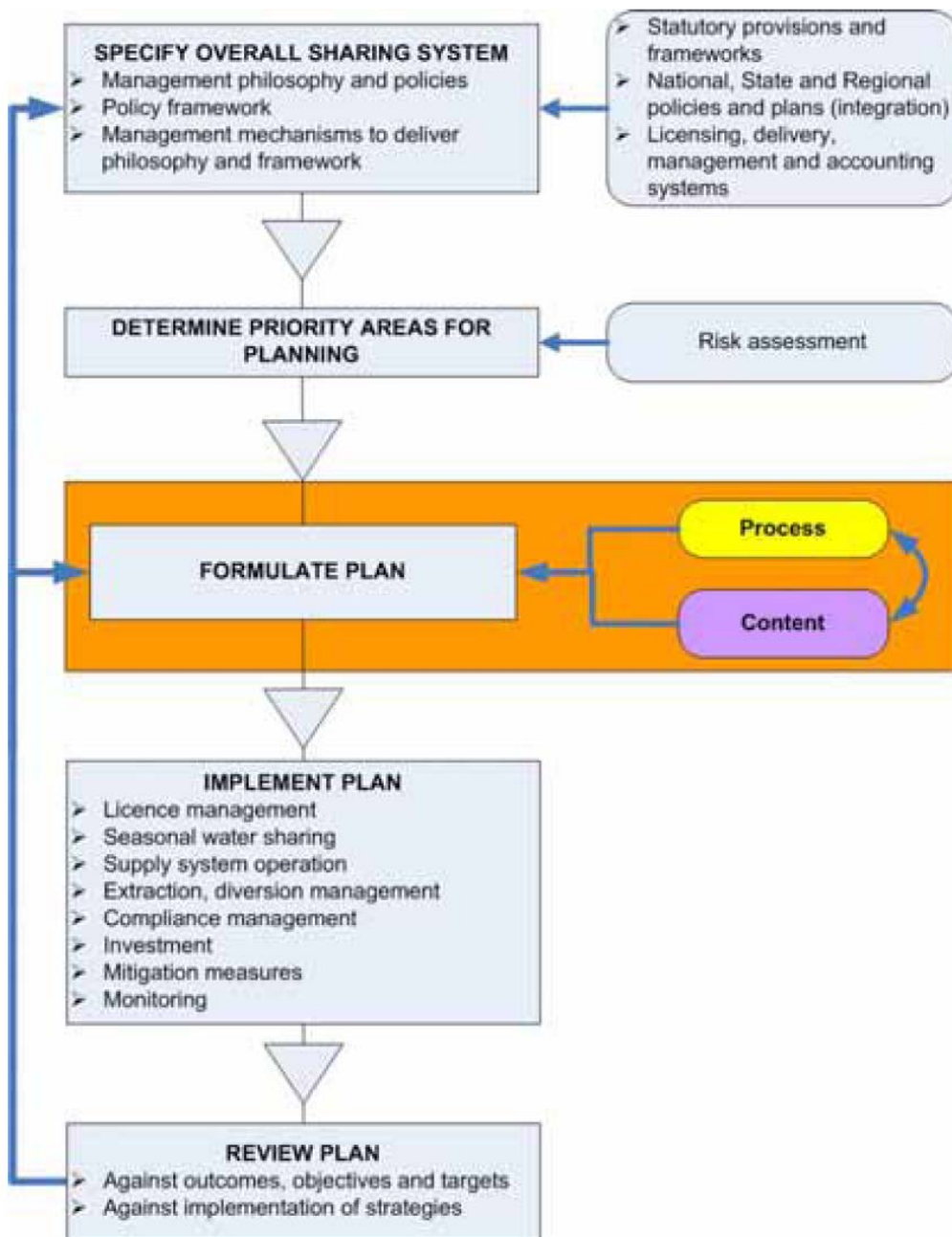


Figure 1. Water planning conceptual model  
 Source: Hamstead et al. [18]

Based on a general strategic approach, Hamstead et al. [18] disaggregated the water plan preparation process into seven steps (shown in Figure 2), including: planning initiation; situational analysis; setting directions; identifying and assessing strategies; selecting a strategy; building in adaptability; and approving plan.

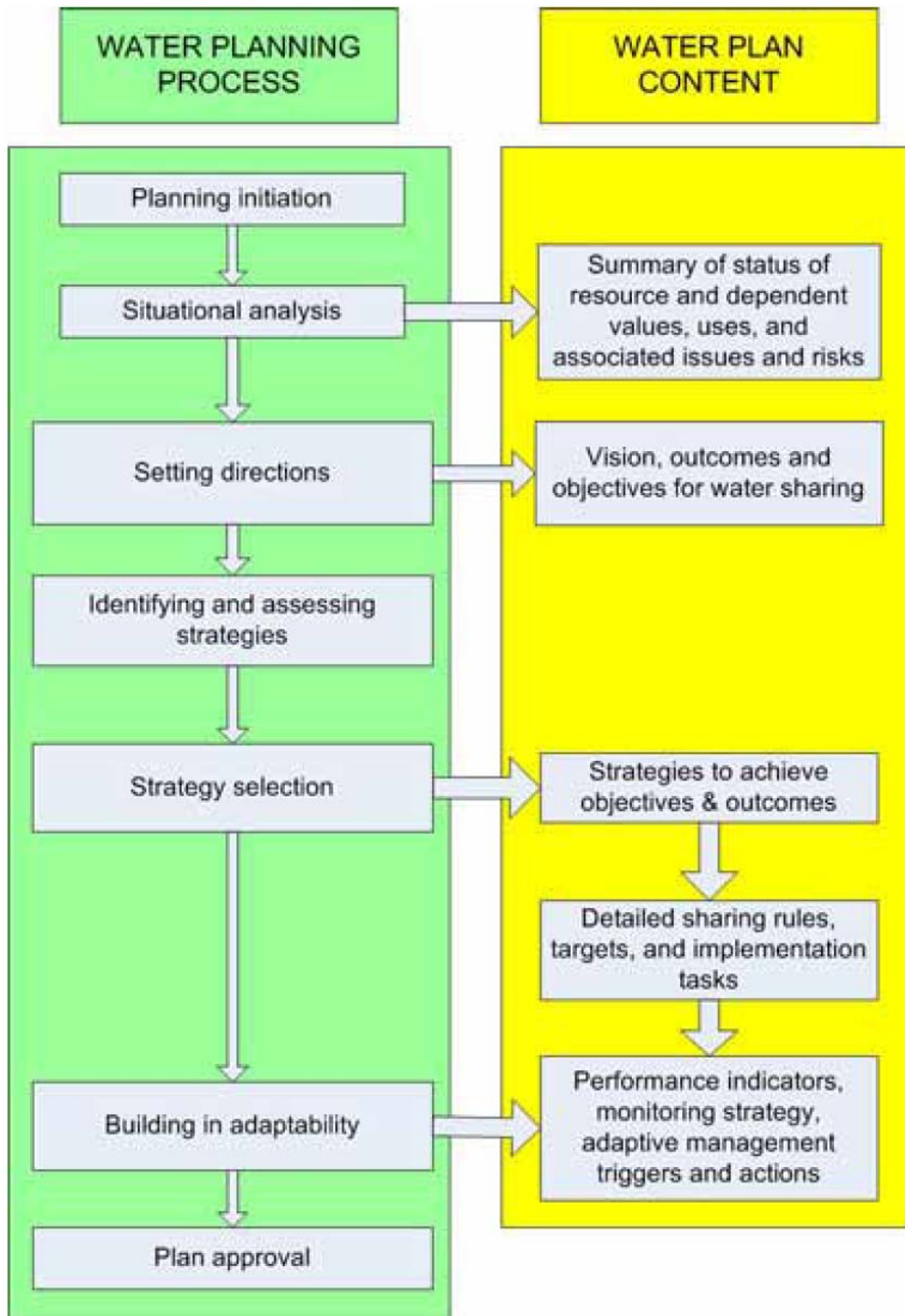


Figure 2 Water planning processes and plan content  
Source: [18]

Water plans have been developed for four basins in the three jurisdictions of northern Australia. Tan [2] maintains that in many parts of the region, there is little understanding of the NWI in general and the processes which should be used in collaborative water planning in particular.

### **1.3 ASSIGNING WATER INTERESTS: MANAGING ENTITLEMENTS, ALLOCATIONS AND USE OBLIGATIONS**

As signatories of the NWI, the States and Territories have agreed in principle to the separation of water interests and rights. COAG requires comprehensive systems of water allocations or entitlements backed by separation of water property rights from land title and clear specification in terms of ownership, volume, reliability, transferability and, if appropriate, quality. Contingent on an operational water plan, the separation of water interests is achieved through the management of water access entitlements, periodic water allocations and defined obligations set the limitations on the impacts of use. Water access entitlements are specified as perpetual unit shares of a defined consumptive volume of a water resource. Periodic allocations are made in accord with annual inflows, storage volumes and in proportion to the number of shares held. The limits on final water use attempts to reduce the external effects on other water users by accounting for variability in the biophysical attributes and activity across the landscape. The risk of variable annual water availability is prescribed and assigned between users and the Government [10], (c.28, c.37).

A water entitlement or water access right is a perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan [10]. It defines an individual's or group's ongoing right to access water from a specified source. Water entitlement is one of the key elements of the NWI and critical in enhancing the security and commercial certainty of water access entitlements by clearly specifying the statutory nature of those entitlements. It provides a statutory basis for environmental and other public benefit outcomes in surface and groundwater systems to protect water sources and their dependent ecosystems by limiting the amount of water extracted from the system for consumptive use (NWI, 2004, cl 25). The NWI requires that water access entitlements be compatible across jurisdictions to improve investment certainty, be competitively neutral and to minimise transaction costs on water trade. However, there is interconnectivity between groundwater aquifers and surface water systems which is generally not taken into account. Due to the variation in the interconnectivity and ephemeral and seasonal variation in rainfall in northern Australia, it will not be possible to have a compatible entitlement regime in different catchments of northern Australia. Further, water trading may not be feasible in many basins of northern Australia due to: the potential surplus of water entitlements compared to prevailing demand and a lack of hydrological connectivity required for water trading.

The terminology and nature of entitlements varies significantly within and across jurisdictions [21] in Australia. The high degree of variability in water policy between states has led people to use different terms to describe the same concept (e.g., in Victoria entitlements are called water rights or diversion licences while in NSW they are called access licences) or use the same word to describe different things (e.g., in SA both a water entitlement and an allocation are called water allocations, while in Victoria and NSW the term allocation is used only to describe the amount of water received annually by an entitlement holder) [21].

Shi [21] developed a classification framework to identify any type of entitlement from different perspectives, including: a) the nature of the supply system; b) the management zone; c) the allocation category or pool. The last grouping collects a large variety of use conditions and restrictions. Shi [21] further specified the feature of a type of water entitlement by referring to four entitlement attributes: supply reliability; entitlement and allocation tradability; tenure describing the number of years of water access; access priority describing the order in which water is taken from institutionally differentiated pools of the system.

An important consideration in designing water trading systems is the choice of mechanism used to assign the initial entitlements to various interests. How entitlements are initially assigned is the key

determinant of who experiences costs and benefits and participation in water markets ([22]; cited in [23]).

When governments face escalating demands and increasing water scarcity four main options are available: either (a) continue to permit users to consume water on a first-come first-served basis (b) regulate the consumption of water by assigning water among competing users based on eligibility criteria (e.g. “grandfathering” based on historical use, land area, current use) (c) auctions or (d) random access via lottery [24-26]. Auctions [29-30] and free distribution [31] (grandfathering in the case of historical use and the granting of newly established entitlements) are the two main procedures employed by governing agencies to assign water interests. Generally, revenues from auctioning entitlements go to the state, whereas the benefits gained from grandfathering accrue to those granted the entitlement [25]. Procedural justice, equity and wealth distribution outcomes assume importance as factors influencing constituent responses to policy directives [27]. Economic theory suggests that auctions are more efficient, although grandfathering is often viewed as the most practical mechanism to overcome equity concerns that may otherwise thwart the successful assignment of water interests amongst competing demands.

In some cases, water rights are assigned on a priority basis (such as California in USA) while in other cases they are proportional (share) over a variable flow or quantity (such as Chile) [21]. Historically water entitlements have ranged from simple legal forms such as event based permits, time based licenses, supply by agreements or water rights in irrigation districts, to a standard supply service typical for town water supply [28]. Water entitlements require some underpinning or complementary administrative tools such as seasonal allocation or restriction methods, or operational or trading rules, to help define their attributes [28].

Key objectives of the NWI in relation to entitlements are to:

- Enhance security and certainty of water access entitlements by clearly specifying the statutory nature of those entitlements
- Ensure they possess clear and nationally-compatible characteristics
- Ensure entitlements clearly assign the risks arising from future changes to the consumptive pool, including unregulated growth in interception through land-use change
- Be exclusive, able to be traded and enforceable recorded in publicly-accessible water register.

The separation of water entitlements from land entitlements, which is a focus of the National Water Initiative, has given greater security and more options in relation to water.

The majority of the 64 River basins in northern Australia are characterised as customary management basins, or relatively un-modified open basins and therefore potentially managed according to different regimes. Some will be more constrained: for example those located in conservation zones with wilderness tenure are restricted to conservation regimes.

## **1.4 WATER ALLOCATIONS**

Water allocation is the specific volume of water allocated to water access entitlements in a given season, defined according to rules established in the relevant water plan (NWI, 2004). The periodic allocation of water to an entitlement is to be consistent with the requirements and rules set out in the relevant water plan. Under Schedule E to the NWI parties have acknowledged the need to manage the risk of climate change impacts on water resource availability. The current/existing water sharing plans give priority to consumptive water uses and environment gets the least. However, NWI

clearly assigns risks from future changes to the consumptive pool. The parties agree to apply a risk assignment framework to any future reductions in the availability of water for consumptive use, that are additional to those identified for the purpose of addressing known overuse in accordance with the pathways agreed (cl 46).

An effective risk management framework is recommended where a new share-based water access entitlements framework has been established. According to this new arrangement, water access entitlement holders will bear the risks of any reduction or less reliable water allocation arising from reductions to the consumptive pool. This could be either due to seasonal or long-term changes in climate or periodic natural events, such as drought. In the MDB, the risks of any reduction or less reliable water allocation under a water access entitlement, arising as a result of bona fide improvements in knowledge of water system's capacity to sustain particular extraction levels are to be borne by users up to 2014.

Clause 25(i) of the NWI requires implementation of firm pathways and open processes for returning previously overdrawn surface and groundwater systems to environmentally-sustainable levels of extraction. NWI requires those pathways to be defined in water plans. However, the meaning of the term 'pathways' is not defined in the NWI [15]. According to NWC, a firm 'pathway' involves clearly stating the current level over-assignment and overuse; setting an agreed goal or target for the sustainable level of extraction based on best available science; and establishing transparent and time-bound processes and steps for moving to the sustainable level of extraction. NWC [15-16] further argues that a clear pathway that specifies each of these elements will provide greater level of certainty for entitlement holders, which will be critical in helping them adjust to a future with less consumptive water availability.

In northern Australia, the majority of systems are not overdrawn, therefore, there are no pathways in place (for example in NT). The Tindall aquifer in the Northern Territory has been assessed with a potential for the over-assignment of consumptive entitlements. A water sharing plan for that system has commenced. Further, the Northern Territory government is a partner in the Great Artesian Basin Sustainability Initiative (GABSI). This will reduce extractions of artesian water through bore capping, bore rehabilitation and piping [15]. In Qld, a number of mechanisms and legislative instruments occur to provide a pathway, such as rationalisation of water access entitlements, caps on further resource development, water trading and water sharing rules. The Qld Government is also partner in the GABSI with the aims of reducing extractions of artesian water. Chapter 20 discusses the water management legislation for the three northern Australian States.

## **1.5 A SIMPLE PROCESS OF ACCOUNTING FOR CONSUMPTIVE AND NON-CONSUMPTIVE WATER USES**

Water accounting provides information on the amount of water being delivered, traded, extracted for consumptive use, recovered and managed for environmental and other public benefit outcomes (NWI cl 80). Water accounting helps policy makers, planners and managers make sensible decisions about how to use water, and supports public and investor confidence [15-16]. Water resource accounting is the fifth element of the NWI. The outcome of water resource accounting requires adequate measurement, monitoring and reporting systems are in place in all jurisdictions. Water resource accounting requires the application of a consistent, structured approach to identify, measure, aggregate and report water information including its occurrence, extraction, diversion, storage, trade, use, loss and discharge. The parties agreed to benchmark jurisdictional water accounting systems on a national scale by including:

- State based water entitlement registering systems

- Water service provider water accounting systems
- Water service provider water use/delivery efficiency
- Jurisdictional/system water and related data bases.

Without effective measurement and monitoring, it is difficult to adequately manage the resource. The parties also agreed to develop and implement:

- Accounting system standards, particularly where jurisdictions share the resources of river systems and where water markets are operating
- Standardised reporting formats to enable ready comparison of water use, compliance against entitlements and trading information
- Water resource accounts that can be reconciled annually and aggregated to produce a national water balance, including:
  - a. for all managed water resource systems, a water balance covering all significant water use
  - b. systems to integrate the accounting of groundwater and surface water use where close interaction between groundwater aquifers and streamflow exists
  - c. consideration of land use change, climate change and other externalities as elements of the water balance.

It is envisaged that implementation of an effective water accounting system will [15-16]:

1. Measure, and report on, how much water is extracted, used, traded, and recovered and managed for the environment, in all Australian jurisdictions
2. Inform effective planning and management of water, and support public and investor confidence in the allocation of water and the amount of water being delivered, traded, extracted, and managed for the environment
3. Be well understood, readily available and widely accepted
4. The outcome is intended to provide more confidence for those investing in the water industry due to more secure water access entitlements, better and more comprehensive registry arrangements, better monitoring, reporting and accounting of water use and improved public access to information.

## **1.6 MARKETS AND REGULATIONS**

When consumers can abstract water from a common source without impinging or diminishing the perceived needs of other consumers, there is no need or incentive for the voluntary exchange in water or defined rights to water. In the absence of water scarcity (both actual or perceived), there is little pressure for the clear assignment of decision making entitlements to water resources as all demands can be adequately met with current supplies. It precludes the need for a social solution [32] and avoids the attendant costs of water planning and accounting. As the level of relative scarcity increases, an escalation in tension arises between competing uses, necessitating some form of adjudication or the striking of a judicious balance between users. Contingent on preconditions being satisfied, the NWI promotes water markets as the mechanism to coordinate individual actions and decisions in preference to negotiated bargaining or administrative alternatives.

Water market are reliant on a regime of transferable water property rights vested in the individual and negotiated independently of land. They have been widely endorsed as an instrument to achieve the economically efficient allocation of water. There are arguments in favour of and against each of these instruments.

The efficient allocation of water via water markets (or water trading) requires water rights to be clearly defined and the mechanisms to facilitate and monitor trades must be established. The way property rights are defined will structure the incentives and disincentives which members of society face in their decisions regarding water ownership, use and transfer. Similarly, a well-defined set of rules is necessary to permit market transactions to take place [33].

The opportunity of the market exchange of water is restricted to those holders of property rights assigned to a share of the consumptive pool, an aspect of water trading that is often misunderstood and neglected in general debate about water management. Whilst water entitlements can be purchased from the consumptive pool to increase environmental flows, the environmental pool remains as a common pool resource, subject to a State sanctioned regulatory framework or negotiated, reciprocal community compacts.

Alternatively, water regulations are legal rights of accessing water and obligations for its use. The legal term for water rights is "riparian rights". Riparian rights are the legal rights of owners of land bordering on a river or other body of water. A "riparian owner" is a person who owns land that runs into a river. Riparian rights are not ownership rights but rights of access to the water such as for drinking water, bathing, or irrigation.

The interactions between the buyers and sellers of rights comprise a water market [33]. Well-defined water property rights and market prices can effectively allocate scarce water among irrigators, industries and households [34]. In a water market, water is allocated at a price set by the free exchange of some type of property rights to the use of water either for a limited time (a lease or seasonal allocation) or in perpetuity (a sale or permanent transfer of entitlement).

The effective operation of water markets is primarily conditional on the recognised relative scarcity of water and the establishment of a regulatory framework to ensure the specification and enforcement of property rights and contractual regimes<sup>1</sup>. A competent and willing regulatory framework to ensure the coherent specification and enforcement of specified property regimes and the entrained rights to those benefits is antecedent to effective markets [37]; [38-39].

Effective water markets provide opportunities for water to be reallocated between competing uses, providing more flexible and rapid responses to emerging issues, such as drought and climate change and financial opportunities. Water markets are a coordinating mechanism central to the NWI goal of managing water in a way that optimises economic, social and environmental outcomes [15-16]. By ratifying the NWI, the States have agreed when appropriate, to facilitate the operation of efficient water markets and make efforts to minimise the transaction costs on water trades. Efforts to promote an appropriate mix of water products and markets will need to recognise and protect the needs of the environment and provide appropriate protection of third-party interests.

There are numerous benefits conferred by water entitlement transfers mentioned in the literature, contingent on a functional, effective water market framework. Water markets provide:

- An institutional framework enabling the flexible transfer to a range of alternative water uses characterised by higher marginal benefits and value [39-40]

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<sup>1</sup> 35. Greif, A. *Contracting, Enforcement, and Efficiency: Economics beyond the Law*. in *Annual World Bank Conference on Development Economics 1996. 1997*. Washington, D.C.: World Bank. and 36. Cooter, R.D. *The Rule of State Law and the Rule-of-Law State: The Economic Analysis of the Legal Foundations of Development*. in *Annual World Bank Conference on Development Economics 1996. 1997*. Washington, D.C: World Bank. Both authors argue that neo-classical theory does not imply the prerequisite existence of a formalised legal system for water right contracting and jurisdictional enforcement. Whilst not necessarily costless, and often typified by asymmetric information, informal water markets, based on social ties, personal trust and compliance with social norms are common.

- A mechanism for smoothing obligate structural adjustment required of water users and suppliers associated with mature water economies [41]
- A mechanism for the partial or complete exit of low value users, unable to meet the requirements of full cost water supply, with compensation for the relinquishment of entitlements. Payment should be commensurate with the net present value of the entitlement for permanent transfers or the marginal benefit for temporary transfers [24, 42]
- An opportunity for governments to enter the water market to acquire entitlements and if needed, reallocate or retire them [40]
- High value, profit maximising users, are presumed to plan their enterprises around the true costs of water. The profit maximising axiom ensures a constant cost incentive for users to seek improved technical productivity, innovation and onsite efficiency gains (for example strategies to improve delivery of water to plant root and moderate return flows)
- Sufficient price signals to promote the conservation of water, reducing over use and resultant impacts of salinisation, water-logging and environmental degradation
- Allow redistribution, entry and exit without public subsidy or compensation, values of water revealed through the signals of exchange
- A means of entry for newcomers into a mature water economy, constrained by allocation thresholds. Markets do not create shelters for established companies or competitive impediments for new entrants [43]
- An improved revenue stream for agencies, enabling funds for ongoing maintenance to extant diversion and transmission infrastructure, reduced transmission losses and investments in superior reticulation strategies [40]
- An increased incentive to invest, a corollary of the incentive to accrue excess water entitlements, which can be traded profitably [41, 44]
- An approach, which, where appropriate, can be administered from a decentralised network [43]
- An institutional framework to ensure that water management and use occurs where marginal costs are lowest and therefore they offer the least cost for society [43].

Since the late 1980s limited water markets have been increasingly trialled and promoted in Australia as a preferred instrument to reallocate scarce water resources. Victoria in the late 1980s was the first state to allow the transfer of water rights through markets. Prior to 1994, the nexus between land and water entitlements persisted, limiting opportunities for the independent exchange of water. Over the past decade, this nexus has gradually and progressively been broken, allowing water to be traded as an asset separate to land and enabling it to move to higher-value uses [45]. In the 1990s, water markets were actively promoted by policy makers as the preferred mechanism to reallocate water between competing users in an over assigned MDB [46]. The last decade has also witnessed significant progress in the development of water markets as a key instrument in achieving more efficient and sustainable use of water resources [21, 47-50].

Despite the development of water markets, the volume of net interregional trade ('trade-out' minus 'trade-in') in seasonal allocations remains small and varies across irrigation districts from year to year [51]. Despite significant progress of water markets in the southern part of the MDB, there are several barriers that inhibit a more effective functioning of water markets [21, 47-48, 52]. One of the major objectives of NWI is the progressive removal of barriers to water trading and meeting other requirements to facilitate the broadening and deepening of the water market. NWI (2004) requires of all states and territories that their water market and trading arrangements:

- Facilitate the operation of efficient water markets and the opportunities for trading, within and between States and Territories, where water systems are physically shared or hydrologic connections and water supply considerations will permit water trading

- Minimise transaction costs on water trades, including through good information flows in the market and compatible entitlement, registry, regulatory and other arrangements across jurisdictions
- Enable the appropriate mix of water products to develop based on access entitlements which can be traded either in whole or in part, and either temporarily or permanently, or through lease arrangements or other trading options that may evolve over time
- Recognise and protect the needs of the environment
- Provide appropriate protection of third-party interests.

Other key areas of reform include: a) establishing a national registry system to support intra and interstate trade; b) developing and introducing national standards for metering water extractions; c) improving confidence in water intermediaries; d) improving water market transparency; e) improving trade process capacity of various authorities and agencies; and f) removing barriers to trade in water access entitlements.

Progress has been made in establishing water trading but it remains administratively complex and takes time to establish. Barriers to implementation, personal reservations and local suspicion suggest the need for the regulation of water trading [14]. While the NWI sets out the principles of water pricing and regulation, there is a need for national guidelines to further develop the principles that encourage the market exchange of transferable water rights [14]. An expansion of permanent trade in water could bring more profitable use of water and more cost-effective and flexible recovery of water to achieve environmental outcomes. Rural water markets are not working as effectively as they might to help adjust to an environment of reduced water availability. Water appears to be undervalued and water resource management under resourced in a number of urban and rural communities.

## **1.7 THE PROGRESS OF NORTHERN AUSTRALIA WATER MARKETS**

The NWC trading data reveals a limited number of examples of water trading in the north. This is really no surprise as there is ample, arguably surplus water to meet most needs. Markets apply to the consumptive pool only. Further, markets only work when there are no surplus entitlements, i.e. they have all been assigned. NA has only a few water plans. There are only four completed water plans in northern Australia listed in the NWI implementation register and five draft plans requiring completion. Of the four declared consumptive pools, generally surplus entitlements remain, although in the case of the Daly current entitlement applications of 75 GLs are likely to exceed the available consumptive pool of 16 GLs.<sup>2</sup> Also, water markets only work if there are hydrologic connections for water transfer within and across catchments as well as low transaction costs compared to the benefits of trade. In northern Australia, there are constraints to water markets due to geographically constrained basins and limited hydrological connections coupled with limited access to suitable soils and labour constraints.

However the NWI principles can be applied to plan for future eventualities where reallocation is needed. Markets may or may not be appropriate, conditioned by relative transaction costs, and fulfilling the precursors of effective market based voluntary exchange. Negotiation or social compacts may be more cost effective alternatives. In fact there are examples of other arrangements, such as Warrabandi, discussed in Box A.

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<sup>2</sup> In the case of the Daly River-Tindall Basin, current extraction is 1.5 GLs per annum, cap is 16 GLs, applications for future entitlements is 75 GLs along with 25 GLs for Indigenous use.

#### **Box A**

*Warabandi* means fixing of turns for irrigation water for each farmer on a water course. There are two types of *warrabandi* namely '*Kacha*' and '*Pucca*'. The *kacha warrabandi* is arranged by the farmers themselves. Its rotation varies from 10 to 15 days depending upon the number of farms on a given watercourse. This system of water rotation had many problems. Big farmers exploited the small farmers and did not adhere to the agreed upon arrangement of water supplies. This resulted in conflicts and farmers got involved in time-consuming and expensive litigation. The large farmers did not care for the irrigation needs of the small farmers. The tailenders were the main losers [53]. On contrary, *Pucca warrabandi* is system when the canal department is approached by some farmers to address the water distribution issue. The canal department regulates the supply of water and fixed the turn of each farmer in a given crop year. If any farmer violates this arrangement, he/she is liable to prosecution.

The farmers who receive water from the watercourse in the area are on a seven day rotation schedule. Each farmer is assigned a propriety right for a period of time, e.g. from 10.00 am to 12.00 noon every week for which he/she is entitled to all of the water in the watercourse. After every year the turn of each farmer is rotated, i.e. if farmer X has a turn in the day time, in the next rotation his turn is shifted to night time. In this way, this system of irrigation turns is operated without any serious problem of equity as far as irrigating one's fields during the night are concerned. The ration's duration varies from one week to 10 days at a given watercourse in a different area [53]. The theory of the *warabandi* arrangement is 'a time share' where the volume of water available during that slice of time belongs to a particular farmer and becomes a property right. The *warabandi* share, as a property right, then serves to organise the social relations of irrigation among the cultivators and between them and the irrigation agency [54].

*Warabandi* works through a system of rotation and rationing at three levels. First, a main canal carries the water from the source, which may be a river or a reservoir. The main canal feeds two or more branch canals which operate by rotation and may or may not run full supply. This is the primary distribution system and runs throughout the irrigation season with varying supply. Branch canals supply water to a large number of distributaries, which must run at full supply level by rotation. The distributaries operate by eight-day periods. This is the secondary distribution system. Distributaries supply water to watercourses through ungated, fixed discharge outlets. Watercourses are designed to run at full supply when the distributaries is running full supply and its water is allocated by the farmers through the *warabandi* schedule. This is the tertiary water distribution system. A period of seven days (168 hours) is divided among the farmers in proportion to the size of their land-holdings. An eight-day period for running the distributary ensures a minimum of seven-days running for each watercourse including the most distant from the distributary head. The eighth day is needed for filling the distributary. Water deliveries are controlled by time and are proportional to land. Main and branch canals are operated with variable flow (e.g. in response to variable river flows), but distributaries and minors are intended to be operated either full ON or full OFF [54].

The widespread failure of traditional water agencies to adequately manage water scarcity, over-assignment and water quality through traditional means has prompted many countries to actively involve farmers in the operation, management and maintenance of irrigation systems. One response has been the transfer of irrigation system management to farmers, Australian management transfer programmes are referred to as irrigation management transfer (IMT) and in India they are referred to as participatory irrigation management (PIM). PIM refers to the involvement of farmers and water users in different aspects of irrigation management such as planning, designing, construction and supervision, policy and decision making, operation and maintenance and evaluation of irrigation systems. PIM appears to be a subset of the broader concept of Irrigation Management Transfer (IMT). IMT is the full or partial transfer of responsibility and authority for the governance,

management and financing of irrigation systems from the Government to water user associations (WUA) [55].

## 1.8 SUMMARY

The NWI is a useful framework for resolving conflicts between a wide range of competing and conflicting interests. It is the primary instrument for the management of both surface and groundwater systems in Australia by setting out the objectives, outcomes, timelines and actions. The framework allows for the independent and flexible management of both non-consumptive environmental water and extractive uses, characterised by separate and potentially exclusive policy objectives.

To manage Australian water systems, the NWI requires the separation of rights and provides for the independent management of the twin water policy objectives of environmental sustainability and economic efficiency. Robust separation proposes a three tiered system of instruments to distribute and allocate volumes of water efficiently over time.

A Water Plan establishes the community values and science-based guidelines to appraise the state of a water system and prescribes the rules to determine the environmental and consumptive “pools”.

When more than one person has an interest in the consumptive “pool” the first policy instrument defines the unit shares of the pool and the distribution of shares to individual interests. The second instrument defines an independently managed process to periodically allocate the amount of water to each share when there is a need to assign the risk of a variable water supply. The third instrument determines the obligations of water use and associated impacts.

Water markets only apply to the consumptive pool, are appropriate when there are no surplus entitlements as a means of re-distribution and allow trading in both entitlements and allocations. Irrigation water markets can function when there is sufficient differentiation in the relative value of water and hydrologic connections available in different catchments.

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