23 The case for a revised National Water Initiative for northern Australia

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Katherine River
Photo: Skyscans

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1. KEY POINTS

Implementation of the National Water Initiative in northern Australia

- The core principles of the National Water Initiative (NWI) provide a good foundation for water management in northern Australia

- Many commentators write of the NWI from an almost exclusively economic perspective but in that form it has much less to offer for the northern Australia situation. A singular economic focus will not be effective in highlighting Australia's long term best interests in the region. Fragmented policy and management frameworks (which are the norm in Australia despite the NWI) have a low capacity to capture key sustainability and environment issues.

- It is the wider original perspective of the NWI that included ecologically sustainable development and transformed institutions that makes the NWI potentially relevant to northern Australia.

- A major theme of the NWI is the importance of taking a whole-of-hydrological system approach to water policy, an aspect which is often ignored or overlooked. The approach accounts for the idiosyncrasies of the specific terrestrial hydrological cycle, adjudicates on equitable distribution and allows for efficient solutions to resolve the competing and conflicting demands of sectoral interests.

- Northern Australia is characterised by a relative absence of the powerful historical legacy of institutions and patterns of behaviour that has worked against whole-of-system policy implementation in the Murray Darling Basin.

- In contrast to southern Australia, it will be much easier to create the pre-conditions in northern Australia for NWI compliant water management. This should be prioritised earlier rather than later to avoid the accretion of incremental steps (the tyranny of small decisions) that allow the development of stakeholder groups dependent on unsustainable practices that they will fight to defend.

- The key imperatives of the NWI of positive relevance to the north are that:

    - policy, planning, management, monitoring and evaluation should be based on a whole-of-system long-term perspective - meaning not just hydrological systems but also political, institutional and economic - able to take account of the threats posed by long time lags (sometimes decades) before the costs of particular activities have to be accounted for. And;

    - all competing interests and issues that define, limit or threaten water availability and quality should be negotiated and managed through the development of comprehensive water plans.

Sustainability indicators

- The 'three pillars' of Integrated Water Resource Management (IWRM): economic efficiency, equity and environmental sustainability, provide a framework for developing the 'goal posts' of an adaptive process to promote water security.

- Implementation of the three pillars requires an adaptive and integrative process in terms of (i) an enabling environment, (ii) management instruments and (iii) institutional framework.

- The effective implementation of IWRM requires a procedurally fair process that will include co-ordination and exchange of information, co-operation in planning processes and possibly collaboration in terms of prioritisation of goals and implementation.

- No single composite measure can be used to assess progress towards the 'thee pillars', but measures of the resilience of bio-physical and socio-economic systems are possible indicators of performance.

- Specific measures of sustainability must be based on how water is used in the landscape and the data available.

- Measures of the ecosystem health of key assets would provide a rough-and-ready-guide to sustainability of progress towards environmental sustainability.

- Comparisons of the marginal net benefit of different water uses (including non-consumptive use) would provide an indicator of economic efficiency in water allocations where the larger the disparities the greater the inefficiencies.

- Measures of equity in terms of water sharing arrangements would need to be developed in co-operation with stakeholders, but could include comparisons of 'winners' and 'losers' and transparency about how water allocations may change over time among stakeholders.

2. THE CASE FOR A REVISED NATIONAL WATER INITIATIVE FOR NORTHERN AUSTRALIA

2.1 The application of the NWI in the south: principles, practices & lessons

The principle argument presented in this chapter is that the core principles of the National Water Initiative (NWI) provide a good foundation for water management in Northern Australia (*1*). Although the pre-conditions do not yet exist for implementation of the NWI in southern Australia, in the north, by contrast, it will be much easier to create them. This is because of the relative absence in the north of the powerful historical legacy of institutions and patterns of behaviour that work against whole-of-system policy and management in the Murray Darling Basin (MDB) (*2,3,4*). To avoid these dangers and achieve a positive outcome, however, will require attention to features of the NWI that have been largely down played in the years since the NWI was introduced in 2004.

For many people the NWI has become primarily focused on the promotion of water markets and economic development, particularly in the MDB (*5)*. That certainly reflects one of the strands that came together providing the impetus for the NWI formulation. However, it is the wider original perspective - inclusive of ecological sustainable development and transformed institutions (*6,7,8*) - that makes the NWI potentially relevant to northern Australia. The key imperatives of the NWI of positive relevance to the north are that:

- policy, planning, management, monitoring and evaluation should be based on a whole-of-system long-term perspective - meaning not just hydrological systems but also political, institutional and economic - able to take account of the threats posed by long time lags (sometimes decades) before the costs of particular activities have to be accounted for.
  and

- all competing interests and issues that define, limit or threaten water availability and quality should be negotiated and managed through the development of comprehensive water plans.

Water plans as required by the NWI (section E, *9*) are very comprehensive and ambitious products. They are to provide:

- statutory based planning
- secure water access entitlements
- statutory provision for environmental and public benefit outcomes
- plans for the restoration of over-allocated and stressed systems to 'environmentally sustainable levels of extraction'
- measures to remove barriers to trade
- comprehensive and public water accounting
- policies focused on achieving water efficiency and innovation
- adaptive management of surface and groundwater systems with their connectivity recognised where it is significant

- arrangements for Indigenous representation in water planning 'wherever possible' and provision for indigenous social, spiritual and customary objectives 'wherever they can be developed'. They should also include allowance for 'the possible existence of native title rights to water in the catchment or aquifer area'
- capacity to address emerging issues and many more elements, and
- clear assignment of risk for future changes in available water.

At one level the requirement for whole-of-system plans is a motherhood principle in that a version of this can be found in most water policies. At another level they challenge most current practice in that they are rarely seen in operational management systems. Finding a way to practically implement would create a revolution in the way water should be managed. Going back to basics and implementing the two alloyed principles of whole of basin planning and the inclusion of all competing water interests in northern Australia would provide a good foundation for future water development.

Whole of system planning is based on the imperative to comprehensively define the range of relevant emerging or predicted issues and map them and manage them regardless of which boundaries are crossed. Boundaries may be either political or geographical such as those of states; divisions of private or public responsibility; or between different government agencies. Current Australian water management - and that of other countries - is severely splintered along these fracture lines and as a result is a long way from the basic conditions needed for sound[1] water management.

A simple way to illustrate the risks that are created by this splintering of responsibility and accountability (and the limited monitoring of long term costs and benefits which characterises the management of most hydrological systems) is to compare water management to the sharing of a credit card between an unknown number of users. The users of this water management credit card monitor and publicise some but not all types of purchases and there is no central agency providing a regular comprehensive statement of total expenditure. For this card there is no credit limit short of bankruptcy or the sort of ecological collapse that we are currently seeing in the MDB's lower lakes and Coorong (and in the Aral Sea, Colorado, Indus and many other major hydrological systems).

This credit card metaphor is one way to describe something that is better known as the open resources dilemma. In 1968 Garrett Hardin published a short paper titled The Tragedy of the Commons (*10)* in which he argued that it was difficult to restrain over exploitation of common resources such as shared pastures, fish and water. Critics subsequently nominated many examples of successful management of natural resource systems owned in common (common pool resources) and suggested that his thesis was more applicable to open access resources which lack any effective overarching institutional framework able to control and regulate the behaviour of would-be users as a group. In the case of an open access resource it is in the interests of each individual user to expand their own consumption indefinitely because any restraint will only increase the volume available for their competitors. The eventual result is the degradation of the resource to the disadvantage of everybody. That is the development path currently being travelled by most large international hydrological systems.

[1] See the appendix to this chapter regarding measures of water system sustainability

To counter the threats that face open resources the National Water Initiative stresses the importance of a whole of hydrological systems approach to policy and management. This is made clear in many sections of the NWI. It requires 'the return of all currently over allocated or overused systems to environmentally sustainable levels of extraction' and 'recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource' (NWI, section 23: clauses iv and x). Similarly, the planning framework is to 'implement firm pathways and open processes for returning previously over allocated and/or overdrawn surface and groundwater systems to environmentally sustainable levels of extraction' (NWI, 25: clause v). This has many implications, one of the most obvious being that management of the MDB as a number of largely autonomous sub-catchments matching state borders is fundamentally incompatible with the NWI.

Implementing a whole-of-systems approach that can take comprehensive account of the full range of issues that shape outcomes is, however, easier said than done. Some indication of what is involved is provided by a list of characteristics typical of environmental policy issues such as water management, compiled by the policy analyst Stephen Dovers (*11*). He argues that they make environmental sustainability problems fundamentally different from other policy issues. They occur over much longer time scales and often cut across established administrative boundaries. Poorly defined but finite limits are common but it is difficult to take them into account within economic systems committed to the reducing restraints on short-term growth. Environmental systems are frequently subject to thresholds that result in significant loss when they occur but which are hard to predict and difficult to reverse. There is great uncertainty about the likely effects of policy choices when the benefits can be very long term. Many impacts are cumulative and interact with each other and long established patterns of management can suddenly produce very different results compared with the past. Even more problematic, as the level of development pressure grows, it is difficult to take account of ethical and moral considerations created by the conflicting demands of different sections of society.

The sheer novelty of sustainability problems makes them difficult to handle within traditional modes of management. For political parties, contemporary water management creates divisions that ignore traditional party lines. Robust criteria for determining whether particular water policy issues should be treated as public or private are difficult to develop. A significant underlying factor fuelling the growing crisis is that the predictive capacity of traditional science continues to be limited. Trends and general bio-physical processes can be documented at the larger scale but it is often difficult to identify the links between particular actions and specific consequences with enough certainty to give managers, the courts and the people who will be affected by their decisions confidence in the process or the results. There is a low capacity to organise the economic system to penalise those who are responsible for negative environmental impacts or provide rewards to those who incur extra costs by adopting more sustainable management practices. Despite the growing interest in the so-called triple bottom line approach, accounting systems are ineffective in capturing the environmental/social costs and benefits involved. Further, the legal system is frequently unable to penalise those people responsible for negative environmental impacts and the potential benefactors of remedial action often cannot be identified clearly enough to target the collection of costs.

The NWI (1) , with its emphasis on the importance of taking a whole-of-system approach and the need for comprehensive water planning, recognises this risk. This is made clear in many sections of the NWI. It requires 'the return of all currently over allocated or overused systems to environmentally sustainable levels of extraction' and 'recognition of the connectivity between

surface and groundwater resources and connected systems managed as a single resource'[2] (NWI, 23: clauses iv and x). Similarly, the planning framework is to 'implement firm pathways and open processes for returning previously over allocated and/or overdrawn surface and groundwater systems to environmentally sustainable levels of extraction'[3] (NWI, 25: clause v). This has many implications, one of the most obvious being that management of the MDB as a number of largely autonomous sub-catchments matching state borders is fundamentally incompatible with the NWI. However implementation of those elements of the NWI designed to counter the threats that are the focus of these sections of the NWI has been very slow despite the best efforts of the National Water Commission. The MDB Plan, which is the core element of the Commonwealth Water Act 2007, is meant to introduce whole of system planning but it will be the first major attempt to do so since the approval of the NWI in 2004. It is likely to face significant opposition if it recommends major changes to existing political/administrative and institutional boundaries.

The NWI is shaped by the ambition to radically change the role of governments in relations to water management. This is what is sometimes called a stretch policy. Unlike policies designed to build incrementally on what exists, stretch policies state where we want to go and create pressure to develop the technology and management systems that will make it possible. The aim of the NWI is to change from a past when governments aggressively led the way as the promoters of national development and drought proofing the nation, opening up the dry inland to European settlement, to a future where they will be adjudicators and rule enforcers between competing stakeholders whose rights and responsibilities have been defined. The vision is that of a mature, democratic, pluralist society where people are able to define and pursue their self-interest - social, cultural and environmental as well as economic - to the greatest degree possible within a context regulated to preserve the fundamental resource upon which future opportunities depend.

Making the transition has a number of pre-requisites. Before that new management regime can be put in place the NWI requires that Australian hydrological systems first be restored to a condition of sustainability: that is currently a long way off. There is a risk that rights or entitlements will be created before robust water plans are developed to define the responsibilities that needs to accompany them to protect the resource. Once expectations have been created it becomes very difficult to gain industry acceptance of restraints introduced later. Recent NWC reports such as the 2009 biennial assessment (14) and the Waterlines report No 6 (9) assessing progress with water planning indicate that this mismatch is a real prospect. Progress with the introduction of robust plans has been very slow.

Pressure from the key stakeholder groups, however, has pushed the water reform process to define rights and promote water trading as quickly as possible. It has not waited for the MDB system to be restored to sustainability or the responsibilities needed to protect the system to be defined. This situation has significantly increased the difficulty of the reform implementation task in the MDB and it points to a major source of risk for water development in the north.

The literature regarding the determination of what is required for environmental sustainability under the NWI proposes that planners working on a given hydrological system start by nominating the key environmental assets and conditions that should be protected. They should then work out the volumes of water and the management regime needed to protect them. The residual or balance of water is available for production. In practice it is accepted that there would

[2] National Water Initiative 2004 section 23, clause iv and x.
[3] National Water Initiative 2004 section, 25, clause v.

inevitably be a process of bargaining back and forth to determine how much should be preserved at what cost to production (irrigation supplies to towns etc).

Another way to describe this approach is to say that three steps are required:

1. First – after weighing up the relative value of environmental assets and production activities – society determines through the water planning process the level of modification that it is willing to accept for a given system (i.e. very little modification for the Paroo system but substantial modification for the Goulburn and Murrumbidgee systems). In effect society makes decisions about what package of ecosystem services it would like from and for a given river. In some cases the package would emphasise production in others it might be urban amenity or biodiversity values.

2. The best available science is used to determine the minimum water needed and the management regime that will have the least negative impact on productive activities, that is compatible with that level of modification and which can protect the environmental assets and conditions nominated for protection.

3. The water that is left after these requirements are met is then made available for production.

A key element of the approach contained in the NWI is that once there is agreement about what water should be preserved, the achievement of that goal becomes the first priority. The goal can be changed if society decides that the cost to productive activities is too high but once a new negotiated goal is agreed it must be the first priority to supply the water and management regime needed to achieve the new goal. Over time an adaptive approach will need to be taken to take account of improved understanding of the way the hydrological system responds to management actions and changing biophysical circumstances. If that is not the case the whole conceptual framework falls apart.

That is the principle.

In practice the situation for Australia's major productive hydrological systems is that we are attempting to move from existing levels of allocation and modification to the situation described above. Unavoidably this means that in practice the debate about protecting or restoring environmental conditions has as its starting point 'what can we afford to give up from production?' Not 'what can we make available for production after we have protected key environmental assets as the NWI proposes?'

The switch to sustainable management faces many obstacles. There are fears that there will be significant cost to communities whose size and patterns of business are based on over assigned consumptive entitlements and unsustainable practices. The proposition that a reduction in irrigation might have other economic benefits – such as increasing the attractiveness of a town so that it attracts increased numbers of retirees - is often hotly contested (*12, 13*). The meaning of the concept of sustainability is poorly defined and not agreed. The NWC has noted that failure to agree on a shared approach to defining sustainability is a serious factor undermining the development of comprehensive water plans (*14,15,16*). At many levels of society production activities are given priority in practice over environmental assets or hard-to-define requirements

for sustainability to a much greater degree than is reflected in official policy. In addition there are major policy lags. The difficulty in making the transition from existing water management practice to sustainability is compounded by the agreement to honour existing water sharing plans until their designated expiry dates, in NSW to 2014 and in Victoria to 2019. As a result environmental conditions will continue to decline making the eventual achievement of designed goals increasingly difficult and in some cases impossible.

As conditions decline it is very difficult to put before the community a range of choices that they can debate and select from, much less develop a range of options based on consultation to determine what they want at the beginning of the process. Instead a crisis such as that developing around the lower lakes of the Murray and the Coorong is much more likely to eventuate. In such a situation, the result of over a century of development and the growth of stakeholder dependencies on unsustainable management policies, the debate is unavoidably framed around the discussion of a range of unsatisfactory triage type options – all of which are merely better than even worse alternatives – which creates public confusion and anger.

2.2 Applying the NWI in the north

How can the dilemma of the MDB be avoided in the north? The situation in northern Australia is not one where water managers have to find a way to make the transition from an established developed condition where the pre conditions for implementation of the NWI do not exist to one where they do. In the north it should be easier to strengthen the whole-of-system approach and the water planning – two propositions that are central to the NWI as argued at the top of this section. (Other propositions are argued in the section re lessons from the MDB)

Further - it is important to resolutely establish the fundamentals of the future system and not take an incremental approach to institutional development and resource allocation where remedial actions are undertaken only after problems emerge. The incremental approach allows strong stakeholder groups to emerge with dependencies on unsustainable practices and over-allocation. Once in place they become strong opponents of change.

The NWI as it stands has a very strong focus on water separate from the many other elements in the socio/ecological system with which it interacts. This was a reversal of over two decades of increasing emphasis on integrated catchment management in official policy documents and in the international research community. The focus on water as a largely independent variable appeared to be a throw back to the 1960s and beyond. Among other things it encouraged a view of sustainability that is not much more than the equation that inputs should at least match outputs.

It has been argued that the emphasis on water alone was necessary in order to achieve a degree of simplicity that could be accepted by political leaders new to water issues. It has also been argued that this simplicity was a product of a strong focus on water markets that require discrete product boundaries and as corollary property right specification of sufficient clarity to enable market exchange.

Against this a counter case can be mounted, however, that the NWI emphasis on whole-of-system thinking ultimately pushes back to an integrated catchment approach. Analysis will

quickly reveal that these other elements need to be taken into account if policy makers and managers want to take into account the factors that cause ongoing decline in environmental conditions and resource security. This broader view is particularly relevant to the north not just from a biophysical perspective but also in view of Indigenous perspectives. Indigenous critics have long rejected the idea that water be treated as separate and independent. They have argued that this is fundamentally hostile to their holistic view of the world in which water is just one of many completely intertwined elements. The fact that this cultural view fits well with established scientific thinking about what is needed for best practice water management cannot be ignored and is highly significant.

Box 1

Changing attitudes towards water markets

In the current NWI context, a planned water system is institutionally partitioned into the environmental and the extractive or consumptive pools. According to the whole of system management intent of the NWI, the volume of extracted water represents the degree of acceptable river modification that corresponds with social and scientific consensus regarding environmental values and the continuing provision of river based ecosystem services. The environmental pool maintains the status of a common pool resource and is generally conserved through regulation, statutory instruments or community crafted compacts. Opportunities for market exchange only emerge in circumstances of water scarcity; i.e. when all the consumptive entitlements have been assigned to water interests. Trading is limited to and occurs between holders of entitlements in the extractive pool and/or those that wish to enter the extractive pool.

In principle effective water markets have a lot to offer water policy planners and managers Firstly, they include carefully designed incentives to elicit the accurate disclosure or revelation of individual information regarding the value of water. Secondly, in response to revealed information, they provide a mechanism to collectively coordinate decision making into outcomes that are economically efficient and better aligned to policy objectives. In response to well designed incentives, the best private choices coincide with the best social choice. Rather than rely on regulations to identify the best course of action, individuals are able to select actions based on typically superior individual information. Generally, reliable and accurate information on individual values or costs of production is not readily available to policy makers or is cost prohibitive to obtain.

Important insights into evolving responses to water markets can be found by examining changing attitudes to market based instruments (MBI) for conservation provision and environmental management. Longitudinal assessments of water trading indicate increasing acceptance and reduced scepticism of water markets (*17, 18*)

Although theoretical consideration of MBI dates to the 1960's, development and on ground application to manage natural resources has mainly occurred over the last 10 years or so (*19,20*). Commenting on attitudes to economic instruments for environmental policy, Tietenburg (*21* p. 86) states:

"As recently as a decade ago, environmental regulators and lobby Groups with a special interest in environmental protection looked upon the market system as a powerful adversary. That the market unleashed powerful forces was widely recognised and that those forces clearly acted to degrade the environment was widely lamented. …..Groups seeking to protect the environment set out to block market forces whenever possible."

With insight into the current natural resource policy arena he further elaborates that:

"Among the more enlightened participants in the environmental policy process the air of confrontation and conflict has now begun to recede in many parts of the world. Leading environmental Groups and regulators have come to realise that the power of the market can be harnessed and channelled toward the achievement of environmental goals, through an economic incentives approach to regulation".

The noted change in attitude culminated in widespread recognition that carefully designed markets could be turned into a powerful ally and paradoxically correct past market failures. Subject to controversy and debate ten years ago (*22*), MBI have evolved to the point of becoming received wisdom in many environmental policy circles (*19*). The National Action Plan for Salinity and Water quality and the National Heritage Trust exemplify a federal impetus for the increasing application of market based solutions in Australia.
Source: (*23*)

Water trading has a very mixed record in the MDB. Originally seen by the designers of the 1994 COAG rural water reform program as the source of *energy* that would transform Australian water management, water markets have tended to disenfranchise stakeholder groups such as the environmental movement and Indigenous interests which lack entitlements carried over from the pre-market phase of water management history (see Box 1). This has had the unexpected result of undermining the water trading process itself because these groups have been able to mobilise significant political support for their interests.

Given the strength of these groups in the north it is likely that any attempt to create a strong water trading regime - especially because of its separation of water entitlements from land - would attract even more opposition than in the south. It would also undermine the consultative water planning processes that will need to be promoted in the north in order to get a significant degree of public support for any new water management regime. In conclusion it can be said that the NWI has general principles that are useful for water development in the north but that it also has a number of features that are likely to be dysfunctional.

3. SUMMARY AND CONCLUSIONS

The National Water Initiative (NWI) - as written - provides a good foundation for water management in northern Australia. The NWI - as currently practised - requires significant modification before it will adequately serve the interests of those that depend on the north's water resources.

As written, the NWI stipulates that a long-term, whole-of-system approach be used to inform water policy, planning and management. Under its provisions, the issues that define, threaten or limit water availability and quality are to be negotiated and managed through comprehensive water plans. Its long-term perspective is critical because it enables, for example, 'rapid' production benefits to be realistically weighed against 'slow' environmental costs. Its whole-of-system approach is critical because it recognises that water is not simply a hydrological entity, but impacts on and is impacted by political, institutional, economic, social and environmental imperatives. Water plans are essential, because they provide the method by which water's various values can be understood, negotiated and adaptively managed.

As practiced, the NWI falls short of that required for optimal water management because it:

- Has not been able to overcome the management of water according to (e.g. political) boundaries that do not reflect the flow or use of water;
- Has not been able to entrench frameworks that reconcile the long time frames of the environment against the shorter time frames of production-consumption, especially where productive-consumptive water use has historically received a priority right; and
- Has tended to focus on the economic (e.g. water trading) elements of water policy, at the expense of its broader whole-of-system social and environmental values

The north has several advantages over the south, that present an opportunity to improve implementation of the NWI:

- Historically low intensity of consumptive water use in the north means that there is a relatively small 'legacy' volume of water that will have accumulated 'rights' through habitual use: the majority of the water resource can be assessed without prior constraint in water plans;
- Furthermore, this suggests that limited effort is required to restore systems to environmental sustainability: the implementation of NWI can generally proceed from a sound basis; and
- The relative infrequency with which water crosses political boundaries increases the ease with which water planning can proceed with reference to the flow of water, though this advantage may be offset by the frequency with which water crosses cultural or language group boundaries.

Fully realising theses advantages will require application of the three pillars of integrated water resource management (IWRM): economic efficiency, equity and environmental sustainability. No single measure can guide progress towards these. Economic efficiency can be gauged by assessing the marginal net benefit of alternative water uses (the bigger the disparity, the lower the overall efficiency). Environmental sustainability could be guided by science-based measures of health of key ecosystem assets, and knowledge of the volumes of water an management regimes required to protect them. Measures of equity would need to be negotiated with stakeholders, and would include a comparison of winners and losers and transparent mapping of

how water allocations amongst stakeholders may change over time, as water use is adaptively managed.

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APPENDIX

PRIMARY SUSTAINABILITY INDICATORS

The World Summit on Sustainable Development in 1992 endorsed key concepts in terms of the principles or pillars to govern the sustainable use of water resources. These principles form the basis of Integrated Water Resource Management (IWRM) which is a process that promotes co-ordinated development and management of water and land resources so as to optimise economic and social welfare in an equitable way without compromising the sustainability of vital ecosystems.

The Three Pillars

The 'three pillars' of Integrated Water Resource Management (IWRM) are:

- Economic efficiency;
- Equity; and
- Environmental sustainability.

Collectively, they provide a framework for developing the 'goal posts' of an adaptive process to promote water security. To implement and integrate these principles and adaptive management process is required that consists of three underlying frameworks (see Figure 1):

- An *enabling environment* that includes policies (goals for water use); and legislative framework (the rules to achieve goals);
- An *institutional framework* that defines responsibilities and roles for water management, the integration of management across stakeholders, and methods for capacity building; and
- A suite of *management instruments* that comprise: water resource assessment, demand management, water planning, information management and exchange, regulatory instruments, and market-based instruments ([i]).

A bottom-up process to help facilitate the implementation of IWRM has been developed for the Murray-Darling basin, but is equally applicable to any water basin or jurisdiction, including Northern Australia. The process has been labelled TACTIC which incorporates six key conditions for effective water governance:

- *Transparency* in governance;
- *Active-adaptive management* that recognises the inherent uncertainties in water management, especially in terms of inflows;
- *Co-operation* and effective co-ordination across stakeholders and jurisdictions;
- *Trade-offs*, or explicit consideration of directing water to different uses and between use and non-use;
- *Interdependencies*, or evaluation of the bio-physical linkages (ground and surface water, upstream and downstream, etc.) and socio-economic feedbacks across different stakeholders' consumptive and passive uses;
- *Capacity* to effectively manage in terms of human and financial resources ([ii]).

Procedural Fairness

The successful implementation of IWRM requires that the process be 'fair' and accepted by key stakeholders. This requires transparency in the allocation, planning and management of water that could include:

- *Co-ordination* across stakeholders such as information sharing;
- *Co-operation* that would comprise active participation in the planning and management processes, and;
- *Collaboration* that would include formalised agreements between parties and joint management and institutions ([iii]).

In locations where some stakeholders lack the human or financial resources to participate in the IWRM process, resources need to be provided to overcome these unbalances. Without this support, the IWRM process will lack legitimacy that may compromise the planning process, the management instruments, and even the enabling environment.

A procedurally fair process for integrating the three pillars should:

- Involve all key stakeholders in specifying key goals and priority setting;
- Ensure broad acceptance of key facts and understandings of values across stakeholders; and
- Substantive agreement of management actions and on-going review.

Indicators of Sustainability

A major challenge of IWRM is to develop frameworks and processes to integrate across actions so as to ensure that all three pillars are supported. The concept of water security can be used as an integrating device. It may be defined as an outcome that achieves an agreed to allocation and flow of sustainable public and private benefits that explicitly account for climate variability and encompasses all uses and non-uses (including the environment) and values ([iv]). Using this definition, sustainability would *not* be defined by a given flow regime or the maintenance of an ambient water quality measures. Instead, it would be about ensuring bio-physical and socio-economic systems are resilient so that they can deliver the desired benefits and meet the goals of IWRM under a wide range of conditions. These underlying systems are linked, but can be defined separately as:

- *Bio-physical systems* that generate the sustainability of natural resource use and on-going ecosystem services; and

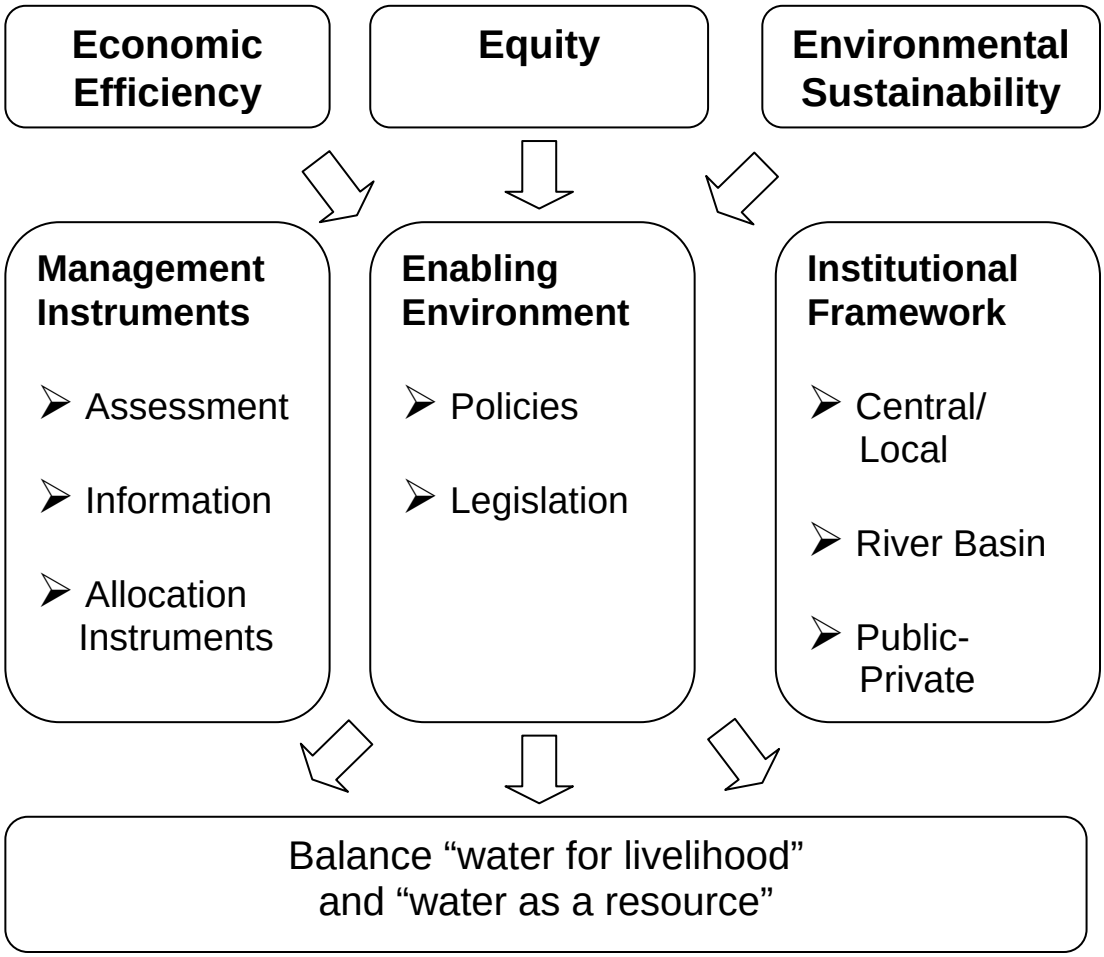
- *Socio-economic systems* that reflect the myriad of benefits and uses from water resources that would market, non-market and cultural values of water.

No single indicator can do justice to measuring water security or whether the goals of IWRM have been achieved. One approach is to develop a series of indicators that provide the multi-dimensional characteristics of water security. For instance, changes in water stress measures, such as the proportion of water diverted to net inflows or yields, provides an indicator of how

current water use may be degrading bio-physical resilience. In terms of socio-economic resilience, measures of social and economic vulnerability in communities, and dependence on water in terms of livelihoods and values, would indicate the ability of communities to respond to shocks from, say, changes in water availability.

Specific measures of sustainability must be based on how water is used in the landscape and the data available. Measures of ecosystem health of key assets would provide a rough-and-ready-guide to sustainability of progress towards environmental sustainability. Comparisons of the marginal net benefit of different water uses (including non-use) would provide an indicator of economic efficiency ([v]) where the larger the disparities the greater the inefficiencies. Equity measures would need to be developed in co-operation with stakeholders, but could include comparisons of 'winners' and 'losers' and transparency about how water allocations may change over time among stakeholders.

Figure 1: The three pillars of Integrated Water Resources Management



The "three pillars" of Integrated Water Resources Management

[i] Global Water Partnership (2004) *Catalyzing Change: A Handbook for Developing Integrated Water Resources Management (IWRM) and Water Efficiency Strategies*, Stockholm.
[ii] Connell, D. and R.Q. Grafton (2008) 'Planning for Water Security in the Murray-Darling Basin' *Public Policy* 3(1), pp. 67-86.
[iii] UNESCO (2006) *Water a shared responsibility The United Nations World Water Development Report 2*, UNESCO, Paris, p. 394.
[iv] This definition is a modified version of Connell, D. and R.Q. Grafton (2008, p. 72).
[v] See Griffin, R.C. (2006, pp. 34-53) *Water Resource Economics The Analysis of Scarcity, Policies, and Projects,* The MIT Press: Cambridge, Mass.