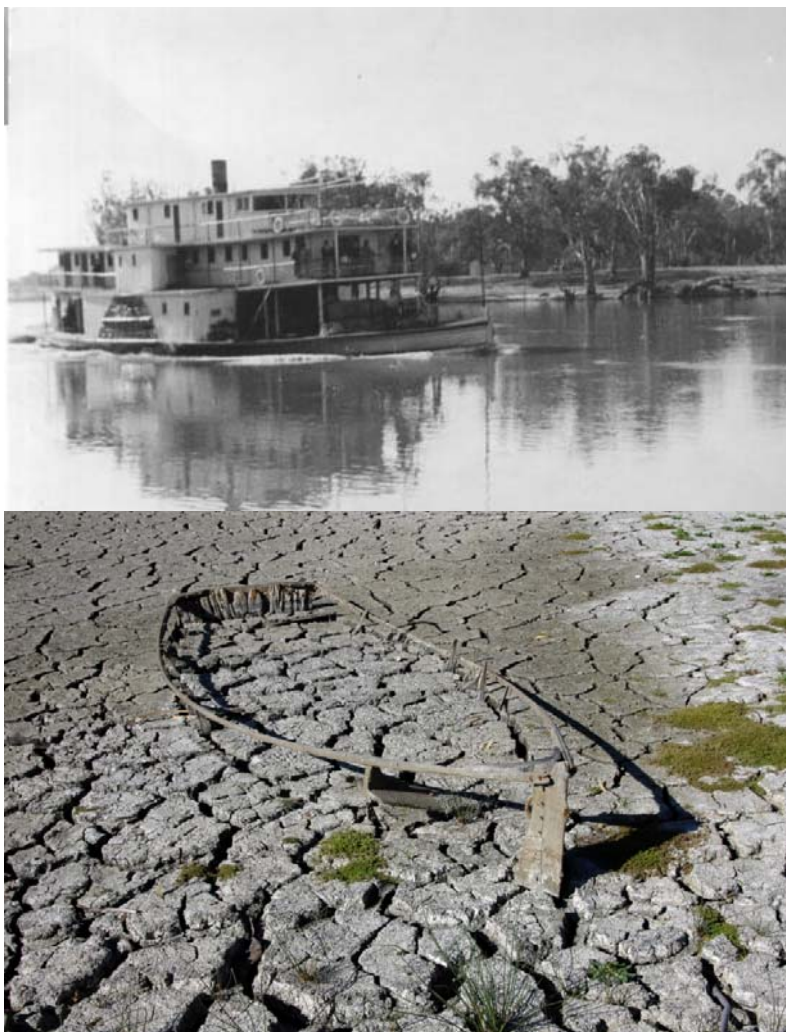


14 Palisades and pathways: Historical lessons from Australian water reform

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*Enjoying the river by paddle steamer (top)
Weathered remains of a fishing boat in river mud (bottom);
Photo (bottom): Greg Rinder 2007, CSIRO Land and Water*

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1. KEY POINTS

1. Historical expectations of a stable and predictable “northern hemisphere” type of hydrological cycle, coupled with riparianism as the institutional basis of water exploitation were inappropriate to manage highly variable Australian water systems.
2. The provision of water supply infrastructure was considered by Australian governments of all persuasions as an unequivocal public good and coupled to the strategic social objective of drought proofing the nation and national development. This culminated in severe environmental degradation, unrelated agency revenues and costs and an agricultural sector reliant on extensive subsidisation.
3. The management of the Murray Darling Basin has struggled to reverse the expansion of water entitlements and management practices that were contrary to the sustainability principles that shape contemporary water reform. The tyranny of small decisions allowed the development of stakeholder groups dependent on unsustainable water practices who vigorously pursued a regimen of institutional capture.
4. *Terra nullius* precluded recognition of Indigenous interests and rights and as a corollary excluded Indigenous knowledge from European water management. Whilst native land claims are recognised, assumptions that the north is characterised by *Aqua nullius* are without foundation. Failure to recognise Indigenous claims to water and include traditional institutions and knowledge in northern water management reintroduces the spectre of *Terra nullius* with attendant tensions and conflict.
5. The successful management of water needs to account for the whole of hydrological cycle specific to the environment in which institutions and governance operate. The nature of northern basins means that storage, extraction and distribution costs are more likely to be borne by private interests. Southern irrigation water impoundments and delivery infrastructure have historically been publicly funded and assigned to government agencies and authorities.
6. The combination of events and flawed assumptions galvanised forces to provide the necessary impetus for the substantial reform of Australian water management, evidenced by the National Water Initiative (NWI).
7. The National Water Initiative represents an ongoing process to articulate principles, objectives and implementation processes to reform Australian water management. The NWI jointly aligns the principles of ecologically sustainable development and micro economic reform.
8. The challenge for southern basins is to implement reform objectives against a historical backdrop of institutional arrangements that encouraged, and were encouraged by, a more singular conceptualisation of water resources. The advantage for northern Australian basins is access to a suite of cogent lessons and design principles with a less compelling historical impetus.

2. INTRODUCTION

This historical perspective and enquiry into southern Australian water management is intended to provide insight into the reasoning that underpinned the rationale and eventual decisions of past water agencies and legislatorsⁱ. It is intended to assist in understanding the evolution of contemporary water institutions, their role in shaping reform initiatives and how those lessons can be applied to water related development in northern Australia. The line of historical examination flags the difficulty in determining a judicious balance between water utilisation and conservation and in establishing a comprehensive, integrated framework of management that accounts for multiple social values in the context of variable terrestrial hydrological cycles.

Applying an historical lens to the management of northern Australian river basins and water resources reveals several important insights.

Firstly, historical expectations of a stable and predictable “northern hemisphere” type of hydrological cycle, coupled with riparianism as the institutional basis of water exploitation were inappropriate to manage highly variable Australian water systems. Rights emanating from a riparian doctrine based on common law proved a brittle foundation for managing water in the arid, highly variable Australian landscape.

Secondly, the provision of water supply infrastructure was considered by Australian governments of all persuasions as an unequivocal public good and coupled to the strategic social objective of drought proofing the nation and national development. Water supply objectives were vigorously pursued without the scrutiny of basic cost accounting conventions and with minimal political distraction. The over assignment of water and lack of financial conservation measures culminated in severe environmental degradation, unrelated agency revenues and costs and an agricultural sector reliant on extensive subsidisation.

Thirdly, the management of the Murray Darling Basin has struggled to reverse the expansion of water entitlements and management practices that were contrary to the sustainability principles that shape contemporary water reform. The over assignment of water entitlements had been consolidated as a result of uncoordinated development over the past century and represents the accretion of incremental, often politically expedient, policy steps. Stankey *et al.* refer to this as *the tyranny of small decisions*(1), a process that allowed the development of stakeholder groups dependent on unsustainable water practices who vigorously pursued a regimen of institutional capture.

Fourthly, prevailing notions of *Terra nullius* precluded recognition of Indigenous interests and rights and as a corollary excluded Indigenous knowledge from European water management. Water resources in northern Australia have been traditionally managed according to the obligations, rights and responsibilities in accord with the customary laws of traditional owners. Whilst native land claims are recognized, assumptions that the north is characterized by *Aqua nullius* are without foundation. Failure to recognise Indigenous claims to water and include traditional institutions and knowledge in northern water management reintroduces the spectre of *Terra nullius* with attendant tensions and conflict.

Finally the successful management of water needs to account for the whole of the terrestrial hydrological cycle specific to the environment in which institutions and governance operate. Northern basins are differentiated by ephemeral flows, connected ground and surface water,

extreme episodic events, estuarine rainfall patterns and annual water deficits. Opportunities for dams and channel delivery are severely constrained by the topography, rainfall distribution and physical characteristics of northern Australian basins. It is more likely that aquifers will be the primary mode of water storage when available, and extraction and distribution costs borne by private interests. This introduces the potential for quite different northern investment architecture, compared to southern irrigation where water impoundments and delivery infrastructure have historically been publically funded and assigned to government agencies and authorities.

The historical water institutions developed as a consequence of these factors were strongly weighted to favour development and expanded consumptive use. The institutional legacy and inertia eroded the future prospects for sound, contemporary water policy associated with multiple use objectives. However the combination of events galvanised forces to provide the necessary impetus for the substantial reform of Australian water management, evidenced by the National Water Initiative (NWI) (2).

The National Water Initiative represents an ongoing process to articulate principles and objectives to correct these flawed assumptions. As signatories of the NWI, the States and Territories have agreed in principle to the separation of water interests and rights. Contingent on an operational water plan, the separation of water interests is achieved through the independent management of water access entitlements, periodic water allocations and the impacts of extractive use. These correspond with the principles of robust institutional design.

A primary objective of robust institutions is to design a system with a capability to cope with change. A robust system is self maintaining and able to adapt to all levels of identified water development potential or river modification. Each element of a robust system can be managed independently without disrupting the entire institutional framework. The challenge for southern basins is to implement reform objectives against an historical backdrop of institutional arrangements that encouraged, and were encouraged by, a more singular conceptualisation of water resources (3). The advantage for northern Australian basins is access to a suite of cogent lessons and design principles with a less compelling historical impetus.

What remains to be determined is whether the NWI principles, premised on southern hydrology, *Aqua nullius* and historical institutions, are sufficiently robust to accommodate the water resource management of northern Australia? The rest of this chapter and many of those in the Institutions and Governance section of the Task Force report focus on insights and evidence to assist the Taskforce in its deliberations in answering this question.

The structure of the chapter corresponds to three historical phases of European initiated water resource development in Australia (for example refs 3, 4, 5, 6, 7). These are broadly classified as: an establishment phase when developed institutions and attitudes were translated into legislation; a development phase characterised by extensive impoundments driven by nation building and drought proofing; and finally the ongoing reform phase characterised by changing values, attitudes and more adaptive institutions.

The development phase also corresponds to a transition from customary management to an open basin, from open to closed and from closed to critically modified. These concepts refer to examples selected from a typology that describes levels of river ecosystem modification and are discussed more fully in Chapter 22.

2.1 The Establishment phase: British Common Law, riparian rights and Alfred Deakinⁱⁱ

The first one hundred years of European settlement were typified by the informal and opportunistic development of water resources. Survival, food and shelter took precedence over any long-term national planning and development strategy and precluded any pioneering environmental consciousness.

The European colonies of 18th century Australia inherited the riparian doctrine, entrenched in British common law, that gave landholders conditional rights to the access and rights to water contiguous with and adjoining their land. Although modified to suit the attributes of Australiaⁱⁱⁱ, the rules of common law still represent the foundation of the legal system relating to water in Australia (8). Paterson argues that the doctrine of common law impeded the colonial development of mining, agriculture and particularly the urbanisation of Victoria (9). Commentators have identified a coalescence of factors that prompted legislative changes in the late 1800s relevant to the control of water and its distribution. The three main points are summarised as follows.

Firstly, in the mid 19th century, a high proportion of the Australian population resided in urban communities, a characteristic of current Australian demographic distributions. Smith estimates 40 per cent of the European population was urbanised in 1861, rising to 50 per cent in 1881 (5). The dictates of urban water services are piped supply and disposal; at the time these were not being satisfied in any of the major urban communities. The existing rules of common law were inadequate to accommodate the required appropriation of land titles for catchment and storage, transmission canals, community resettlement and land resumption (10, 11). Paterson contends that the required scale of urban water development necessitated access to financial capital, a process predicated on the existence of secure legal water rights (10).

Secondly, the original ideal of a bucolic clone of English cottage farms, inhabited by hard working Yeoman and supplanted in the rural districts of Victoria was facilitated by the land selection Acts of the 1860s. The process of intensification of land use and population was termed “closer settlement”, a process that demanded an increased and more reliable water supply (11, 5). The legal settlers were soon in conflict with the growing number of squatters occupying large tracts of grazing lands and, as an acquisition priority, were associated with water or river frontages. The squatters’ implicit assumption that rights to the land automatically bestowed rights to water reflected the notion of the prior appropriation of water, the prevailing doctrine of water rights of the Western United States. The doctrine of prior appropriation applies formal property rights to water, accrued to the user on a “first in time, first in right” basis (12).

Lastly, as noted by Fisher and Powell, during the 1850s the control of many rural water resources were commandeered by the mining industry during the Victorian gold-rush to the extent that:

“Mining did eventually highlight the vital significance of water as a resource and distinguished some of the major legal, political and administrative implications inherent in its management in a dry continent. In several districts during the fifties, race holders spurned the toils of mining itself and made a good living from the sale of water rights, contrary to the spirit of the vague legislation which had been developed too casually to link the specified rights of using the water to directly productive activities” (11 p. 39).

According to Fisher, the initial legislative attempts by the Crown to resolve these issues were both cumbersome and confusing. The Crown failed in its attempt to “enforce its rights of ownership of land and secure associated water rights as a basis for providing a supply of water for the community” (8 p.4).

Powell notes that the importance of these early institutional developments in defining water rights is the recognition that the rights to water were increasingly reliant on public administration (11). According to Fisher and Powell these were the precursors of the current centralised public systems of water management (8, 6).

Smith describes the political and institutional outcomes in response to the drought of 1877-81 as “*climatic determinism*” (5 p. 151). Galvanised by the competing water needs of mining, agriculture and escalating urbanisation, the drought catalysed legislative change culminating in the *Water and Conservation Act* of 1880 (and later amendments). The subsequent irrigation trusts formed to supply metropolitan water and later irrigation were the one brief episode in the history of Australian water administration where privately administered and owned corporations constructed, controlled and financed waterworks (5). The private irrigation trusts were poorly designed and constructed, and administered by commissioners with little practical experience. The incentive for a more conservative use of water by farmers was diminished by the imposition of below-cost supply costs, exacerbated by inadequately defined riparian rights Powell (11). The subsequent financial losses incurred by the trusts were subsidised by government funds obtained from urban taxpayers, constituting early variants of cross-subsidies and economic rent-seeking by current water users.

The relevant legislative arrangements in Australian states, including the definition of ownership of water and rights to water use, eventually followed the model established by Alfred Deakin’s Victorian *Irrigation Act* of 1886. This seminal legislation:

- exclusively vested the right to the use, flow and the control of water in any watercourse in the State
- subordinated the rights of the individual in that private riparian rights could not compromise the cardinal rights of the State
- highlighted the need for the rights of the individual and the State be fully defined.

The legislation superseded the traditional English doctrine of “riparian rights” whereby ownership of water went with the ownership of land abutting waterways, and entailed an explicit rejection of the western United States doctrine of “prior appropriation”.

The *Irrigation Act* of 1886 instituted a system of centralised administrative allocation of water rights, managed by a public water authority. Paterson postulates that the consequent nationalised *rights* to water were not the direct causal agent of the current public *ownership* of water resources (10). The *Irrigation Act* did not prohibit the private irrigation or water supply schemes (5). The *Act* is premised on the assignment of water allocations to private, co-operative and municipal water supply corporations (10). Deakin specifies in his original recommendations that:

“...local ‘water masters’ should be appointed to supervise distributions and settle disputes; the duties of these officials should be organised by a central office so as to guarantee the preservation of watercourses and other sources of supply.” (50).

The failure of the private trusts and water trading entities, ratified by legislation in 1905 (11), in concert with the need for secure urban water supplies, culminated in the almost exclusive provision of public water by government authorities (10). The primary role of government agencies, initially defined and codified in Victoria in the 1890s remains as the principal *modus operandi* of Australian water authorities. As Smith notes, it is Deakin’s legacy that marks the period, through the

formulation of statutory and administrative arrangements, rather than the impact of urban and rural water development on the physical landscape (5).

Powell argues that under the aegis of the 1886 legislation and the determining factors culminating in the public management of water, irrigation removed the element of climatic risk and was viewed as the means to “establish man’s final and complete dominion over a hostile environment, or fulfil his sacred commission to improve on nature” (11 p. 132). According to Kirkpatrick (58), the perceived key to colonial wealth, the soil, manifested through agricultural pursuit in concert with access to ample water, was encapsulated in and administered by a public bureaucracy dominated by an engineering ethos (9, 5).

The provision of water supply infrastructure has been considered by Australian governments of all persuasions as an unequivocal public good and intrinsically coupled to the strategic social objective of national and regional development. The primacy of economic development and regional employment resulted in the provision of water diversion and reticulation schemes regardless of cost (13, 3, 10). The comment provided in the first Victorian progress report on irrigation and water supply epitomises the historical and prevailing enthusiasm for irrigation:

“If Victoria is to continue to progress in the settlement of her people upon the lands and multiplication of her resources by the conquest of those areas hitherto regarded as worthless; if she is to utilise her abundant natural advantages, bring her productiveness to the highest point and secure to the agricultural population of her arid districts a permanent prosperity, it must be by means of irrigation. No price, it may be said is too high, indeed, it implies the sapping of the spirit of independence and that of self-reliant energy and enterprise which have won her present position; for by these, and these alone, can she maintain it.” (51).

2.2 The development phase: the role of State Governments as water developers

On the basis of these institutional and policy dictates, State governments became extensively involved in the water industry as developers of water supply infrastructure such as dams, and developers and owners of large-scale urban and rural supply schemes (including irrigation).

The deployment of this grand scheme received broad political and commensurate financial support, and was facilitated by a well-established engineering hierarchy, responsible for the conceptualisation, planning and construction of dams, and reticulated supply, drainage and sewerage systems. Additionally, the statutory authorities responsible for supplying rural irrigation water^{iv} progressively controlled the pattern of rural settlement, inclusive of farm size and crop types. The agency objectives and tasks, whilst large in magnitude and scale, were narrow in scope and comprehensively specified. With minimal political distraction, the achievement of specific hydraulic and engineering objectives was vigorously executed with high levels of technical expertise and utility. According to Paterson and Powell there was no legislated obligation to consider external consequences, and the subsequent metric of rural water development success was couched primarily in engineering terms and measured accordingly (10, 11). Although punctuated by the Depression and two World Wars, the pace of water development, particularly rural irrigation schemes, continued almost unabated over the 100-year period initiated by Deakin’s *Irrigation Act* of 1886.

The period prior to the early 1990s is characterised by: optimistic national development, a regime dedicated to drought-proofing existing and proposed agricultural endeavor, and a policy of intensive and extensive rural settlement (reinforced in later years by the motivation of national defence). According to Paterson, Pigram and Randall, the confluence of factors introduced predictable distortions to water use and the operations of managing agencies (9, 14, and 15). The result was the over-allocation of water supplied at below-cost and a lack of adequate signals or incentives to conserve water (16, 4).

Several commentators suggest that due partly to an engineering dominance, the diversion and construction costs of water supply schemes were rarely subjected to the scrutiny of basic cost accounting conventions and certainly not to the rigour of benefit-cost analysis (18, 4, 17, and 42). Influenced by the rubric of national development, major public infrastructure projects were also immune to economic scrutiny. Davidson argues that proponents, when questioning the justification and costs for water development proposals, were generally dismissed as naïve or lacking foresight (18). The opinion has some historical precedence and parallels the commentary on northern Australian agriculture reported by Cook (Chapter 6). Powell notes that the recommendations of restraint and the recognition of caveats on the benefits of irrigation extolled prior to the *Irrigation Act* of 1886 were generally ignored (11).

“We believe that too sanguine views of its profitableness are often entertained from an underestimate of the cost and over estimate of the results, arising from a want of information or due consideration of the conditions essential to success” (52).

Davidson has criticised the level of government expenditures on irrigation schemes, based on a thesis that the drought proofing and the irrigation solution were fundamentally ill-founded and misconceived (18). The extant competitive advantage for Australian agricultural is founded on a high ratio of naturally rain-fed, well watered land per capita. Successful Australian agricultural enterprise enjoyed a natural advantage, predicated on the utilisation of large tracts of cheap land, the use of low levels of labour and the production of relatively durable export commodities (10). Irrigation, as posited by Davidson, was the antithesis of a successful Australian farming system predicated on that natural advantage. Irrigation required smaller parcels of land and was labour intensive (18). Davidson’s examination of the accounting detail of irrigated farming budgets indicated a bleak picture for individual operators. Extensive irrigation development, based on the principle of soldier/closer settlements, was economically irresponsible.

Paterson (10) estimates that based on relatively simple economic criteria, *ex ante*, only 12 per cent of the land in irrigation production in 1987 would have been developed. If the inertia and motivation for agricultural production had been calibrated to economic measures rather than the fervour of national development, the infrastructure that provides 70 per cent of Australia’s water use would not have been constructed. The increase in the area of irrigated land dedicated to pasture from 1987 to 1996-97 (ABS 2000) highlights the entrenched nature of the development doctrine.

Davidson argues that the corollary of the deployment of scarce capital into the development of irrigation rather than the improvement of dryland techniques, is the inability of irrigation farmers to pay for full cost water provision (18). Watson arrived at similar conclusions (19). The partial recovery of supply costs has been inherited by contemporary water institutions managing predominately irrigation water (19, 20 and 21).

Institutional accounting conventions have assumed that as a natural monopoly, formulated in response to the necessary economies of scale, the costs of water institutions would be compensated by the accruing national benefits of economic development, additional external benefits of regional activity and marginally decreasing operating costs (22). The notion that the sale of land associated with irrigation improvements, developed with government funds, would provide a partial recovery of costs persisted, despite the lack of any historical precedent, a body of contrary evidence and the commercial failure of institutional land development enterprises (5).

By the 1980s economists and environmental groups had come to question the wisdom of continued dam building and public subsidisation of rural water use (23, 15, and 24). Greig argues that the expectation of continuing public subsidy of rural water and the desire of politicians to appeal to this sentiment had created a situation conducive to management reform (16). The factors of the over-allocation of water diversions, severe environmental degradation, a lack of adequate signals to conserve water, unrelated agency revenues, and operational costs and extensive subsidisation were also predicates of the reform process (16).

Ideally, the development of natural resource administration and legislation in Australia would reflect the constraints of biophysical parameters in concert with the environment-economic interface, shaped by the prevailing social preferences and values. Paterson and Powell argue that more often, management represents the legacy of past statutory decisions and their precursors, embedded to varying degrees in natural resource law and operations across all constituencies (10, 11). Paterson argues that institutional arrangements to manage water up to the late 1980's were the accretion of policy, both appropriate and inapt, and often the corollary of political expediency, institutional capture and vested interest lobbying (9).

According to Greig, Mulligan and Pigram and Musgrave the heritage of Australian water allocation is no exception, particularly in the exploration of the initial doctrine of exploitation and development and the transition to an ideology of systemic or integrated water management (16, 4, and 25).

2.3 The push to water reform

Prior to the 1980s water authorities had been preoccupied with the development and delivery of water services and supply. By the end of the decade they were compelled to address issues and policies related to the management of water resources in a mature water economy. Randall and Watson and Rose characterise a mature water phase by rising marginal supply costs, intensified competition between disparate users, increasing relative scarcity and increased interdependencies amongst water uses (15, 24).

The incremental cost of water diversion and transmission was sharply increasing and an aging and deteriorating reticulation system was contributing to increased operation and maintenance costs and pressure for replacement expenditure (15). The opportunity cost of capital for water resource development had risen to historically high levels. The majority of accessible dam sites and water resources, characterised by marginally lower diversion costs, had been exploited. Increasing marginal costs of supply were exacerbated by an increasing demand for water resources, both in scale and diversity, particularly community demand for in-stream environmental objectives and consumer concern for improved quality of supply.

Conflict was growing between the old developmental objectives and the newer coalescence of economic and environmental objectives. Tension between potential uses was being played out within institutional settings geared to resource expansion rather than an optimal allocation of a scarce resource. Finally, awareness was growing of the severity of environmental degradation, its irreversibility in some cases, and the consequences including declining quality of water.

Watson identified two interrelating issues associated with these changes (7). Firstly, those concerning the increasing relative scarcity of water resources and the efficiency and equity of their allocation. Secondly, those concerned with increasing environmental impacts, degradation and the sustainability of water use. Watson states these two sets of issues required a fundamental shift away from an axiom of single resource development, to the integrated management of resources as an ecological, economic and social system (7 p. 13).

Watson's identification of economic efficiency and ecological sustainability as the twin focal points of contemporary water policy reflected emerging international trends in resource management and anticipated a recurring theme in water reform initiatives of governments, water authorities and analysts in the subsequent decade. This appraisal, articulated by early analysts and commentators such as Ciriacy-Wantrup, Krutilla and Eckstein and Polanyi, reflected the concerns of the external effects of poorly specified property rights of jointly produced, multiple-purpose resources (inclusive of water) (26, 27, 28, 29).

2.3.1 Sustainable water management

The World Conservation Strategy (IUCN 1980) is arguably the first global statement on sustainable development, although it is less well recognised than the World Commission of Environment and Development meeting of 1987. In that year, the United Nations published the pivotal Brundtland report on the environment, the first official international platform for sustainable development (30). Concurrently, Opschoor and Vos reviewed the extent of the Organisation for Economic Co-operation and Development (OECD) application of economic instruments as a tool for environmental management (31). The timing of the two reports is significant in that one of the major strategic imperatives of the Brundtland report is the mutual reinforcement of economic and environmental policy in decision making. It is described as the common theme to all other elements and meant to induce changes in institutional attitudes, objectives and initiative (32). The synthesis of environmental and economic imperatives and the proposed means of compliance and application formed the substratum of the next wave of international conventions, and continue to influence their evolution and implementation.

The Brundtland report managed to distil the rhetoric and vagaries of the then debate, and presented the results as a concise and persuasive argument, compelling enough to catalyse future commissions and committed debate. The concerns of inequality in wealth distribution, population growth and consumption patterns formed the framework for Agenda 21. Most of the conventions post 1992 and recent amendments to the earlier forums and conventions are underpinned by Agenda 21, the working plan for action developed and ratified in Rio (33). As a signatory, the Commonwealth of Australia agreed to comply with the principles of ecologically sustainable development as set out in the Rio declaration. In so doing, the Commonwealth committed the States to adhere to those principles and embed the tenets into current management, planning and policy for water management in Australia.

The implementation of sustainable development principles in the early 1990s postulated an adaptive management approach to stochastic riverine environs based on an imprecise knowledge of environmental perturbations. These principles contrasted with the singular engineering and hydraulic objectives that had informed and dominated water management up to that time. There is no blueprint for ecological sustainability and the subordination of the expansionary doctrine meant water institutions faced an array of emerging problems, many of which were at odds or unrelated to the initial reasons for their establishment.

While this is seemingly cosmetic, there have been signs of a political force and impetus in the management of water. Having transcribed the rhetoric to at least raise the awareness of, and sensitize water institutions and decision-makers to the principles of sustainable water management, there remained a pressing need to design and implement relevant, practical outcomes and assessable methodologies. The National Strategy for Ecologically Sustainable Development was the Council of Australian Governments (COAG) initiative to provide a structured framework of guidelines for natural resource management (COAG 1992). The guiding principles and objectives were similar in intent to the recommendations of the World Conservation Strategy and reflect the prescience of that meeting. The recognition and inclusion of social costs and the interface between economy and environment in the National Strategy for Ecologically Sustainable Development document goes some way to answering Adams (59) criticism of the World Conservation Strategy statement, as “pious, liberal and benign, inevitably ideological and disastrously naïve”.

The policy changes highlight the institutional recognition of a broader suite of water resource issues than those associated with past water management regimes. A number of policy instruments, from all political jurisdictions, have been deployed in an attempt to ameliorate those deficiencies (35, 36, 2, 8). Notably, Deakin’s original perception of the value of water as primarily as a source of national economic development contrasts to the recognised multiplicity of economic benefits attributed to water that condition contemporary Australian Water Reform (46). Although Deakin’s initiative to clarify rights addressed the problem of riparianism, it was solely concerned with solving the problems related to extractive use and ignored amenity and environmental benefits. Musgrave argues that the weighting towards extractive use diminished the provision of non-extractive services (3).

The water reform process was articulated in the Council of Australian Governments reform initiatives, directed by the enforced compliance with the National Competition Council’s recommendations and shaped by the in principle agreements of the National Strategy of Ecologically Sustainable Development (34, 37). The report and proposals on national competition policy of the Hilmer Committee conditioned later recommendations of the National Competition Council (38).

2.3.2 National Competition Policy

The current water reforms are a part of a broader microeconomic reform agenda in Australia that includes a suite of measures taken at the grass roots level aimed at improving the performance of the Australian economy. As Forsyth notes:

Microeconomic reform is about raising standards of living by raising real incomes available for consumption...it includes measures to make individual firms produce their outputs more efficiently, better to provide the goods and services that consumers want, and measures to

make markets more effective conduits between consumers and producers...it is primarily concerned with the efficiency of production and allocation of goods and services (55).

Australia's economic policy and regulatory structure of the economy was reasonably static for the first three decades following World War II. During this time some microeconomic reforms did occur, however, they were limited and ad hoc, and were not part of a coordinated economic reform agenda. During these post-war decades, macroeconomic policies, such as controlled exchange rates were the dominant instruments used by government to deliver economic policy outcomes.

From the mid 1980s the government was still faced with deteriorating macroeconomic circumstances such as rising external debt and high current account deficits, exacerbated by falling commodity prices. Microeconomic conditions were increasingly seen as the underlying cause of macroeconomic problems. The government proposed microeconomic solutions essentially aimed at improving the competitiveness of Australian exports focussing on agricultural pricing and marketing arrangements (54).

The establishment of the Industry Commission (IC) in 1990 reflected a broader and more systematic approach to microeconomic reform. The IC was significant in that its role encompassed economy wide aspects of productivity and competitiveness and embodied a cooperative approach with the states and territories in implementing microeconomic reforms (54). In May 1992, the Council of Australian Governments (COAG) was established to facilitate *inter alia* a cooperative approach to negotiate and implement microeconomic reform.

In October 1992, after agreement with the various tiers of government, the federal government established an independent inquiry into a national competition policy headed by Professor Fred Hilmer. The Hilmer review was released in late 1993 and recommended that competition policy should be pursued on a national basis. The review also recommended a suite of new policy principles to regulate markets traditionally supplied by governments, particularly where there are natural or mandated monopolies.

In 1994, the federal and state/territory governments agreed, in principle, to implement the competition policy principles of the Hilmer review. The governments also agreed the revenue benefits flowing from the reforms should be shared amongst all governments (54). Prime Minister Keating commented that:

Competition policy will be introduced to large parts of the economy that until now have been sheltered from it, including utilities owned by Commonwealth and State governments...including ports, water, gas, electricity and rail (56).

In 1994, COAG endorsed a framework of initiatives for the water industry to run over a seven year period. The framework covered water pricing reform based on the principles of consumption based pricing and full cost recovery, elimination of cross subsidies and making subsidies transparent. Also covered were issues on water allocation and entitlement, reform of irrigation systems, allocating water for environmental purposes and institutional reform (57).

The COAG water reform framework later became linked with the NCP reform package agreed to by COAG in 1995.

An annotated chronology of the recent water reform agenda has been:

- December 1992: National Strategy for Ecologically Sustainable Development (34)
- August 1993: Hilmer Committee report on national competition policy (38)
- February 1994: COAG strategic water resources policy framework (35, 35)
- March 1995: COAG adopts the national competition policy package
- 2004-ongoing: National Water Initiative supersedes the COAG agreements.

2.4 Institutional transitions and implementation

Highly variable physical water environments in concert with an enthusiastically pursued policy of national development were important precursors of Australian water management. Musgrave and Pigram note that the strategy failed to capture the multiplicity of water benefits, the value of ecosystem functions and respond to changing societal objectives (25, 14). Greig, Paterson and Randall note that in addition to the over-allocation of water diversions, resulting environmental degradation and unrelated agency revenues and costs, water management at the time was characterised by a net transfer of public wealth to the domain of riparian water users (16, 9, and 15). The institutional failure, at most jurisdictional constituencies, to recognise and treat water as a resource providing multiple services is viewed by many commentators as the primary causal agent of the current suite of water associated problems (40, 41, 15, 9, 40; 17).

The singular construct of water capture and reticulation, which traditionally reflected the primacy of national development, was increasingly seen as failing to capture the multiplicity of water outputs, ecosystem functions and the changing societal objectives of maintaining in-stream values and water quality. The adopted system of natural resource management depends on the prescribed objectives of the prevailing managing agency or government instrumentality. The ratification of the Ecologically Sustainable Development and the National Competition Policy added complicating dimensions to the previously narrow, well-defined and enthusiastically implemented functions and mission statements of the water authorities. The policy additions, presciently noted by Paterson and Watson, forced the agencies to comply with a more extensive, fluid and stochastic set of parameters measured by diverse environmental metrics rather than the extant engineering specifications (10, 42). The complexity of institutional transformation by water agencies was further exacerbated by the introduction of another set of alien metrics, those of economic efficiency.

The entrenched bureaucracy, accustomed to public support, widespread financial endorsement and independent decision-making, were corralled into an environment of inter-agency cooperative planning^{vi}, committee administration and systemic water management. The diminution of independent decision making resulted in a dissipation of purpose. According to Paterson, the compliance with a management protocol that recognised the multiple functions of water complicated the specification of jurisdictional boundaries and the assignment of functional separability (10). Fisher flags the ongoing difficulty in accurately specifying the interdependency of the catchment/water-use environs and translating that into an operational, binding set of constituent specific statutes (8). The political context of the changing water policy agenda was summarised by the Industry Commission thus:

“Worthwhile changes continue to be thwarted by the outcomes of past policies and the attitudes that those policies have engendered in both water users and government . . . there

are major challenges for policy makers in reconciling the often competing interests of the environment and those using and disposing of water.” (44).

Various fiscal solutions and institutional arrangements to enable water reform have been explored. They have generally been based either on an administered water pricing system, calibrating resource and opportunity costs or a regime of negotiated, constitutional contracts, founded on voluntary consent, distributional equity and the maintenance of existing water related benefits (14, 15, 45). Generally, managing authorities have recently viewed these arrangements less favourably than market based approaches (46). A market based solution, reliant on a nascent regime of transferable water property rights, vested in the individual and negotiated independently of land, was promoted throughout Australian and International water sectors and has gained widespread acceptance (15, 47, and 48).

The primary focus of Australian water reform is reliant on economic instruments, specifically the implementation of functioning and predictable markets in transferable water entitlements. The National Water Initiative (NWI) was ratified in 2004 by the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory; the Northern Territory and Tasmania became signatories in June 2005. The NWI sets out objectives, outcomes and actions for the ongoing process of Australian water reform, and timelines to achieve this reform. The objective of the NWI is the development 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”. (NWI clause 23).

Chapters 18 - 21 of this report detail the key principles of the NWI and the progress of implementation by the Northern Territory, Queensland and Western Australia.

3. SUMMARY

Several commentators broadly classify the history of European initiated water resource development into at least two phases (for example 4, 17, 5, 7 among others). The first one hundred years of European settlement was typified by the ad hoc and opportunistic development of water resources. Survival, food and shelter took precedence over any long-term national planning and development strategy and precluded any pioneering environmental consciousness.

Water resource policies since the Victorian *Irrigation Act* of 1886 (initiated by Deakin) to the late 1980s, like those relating to other natural resources, were focussed on exploitation to promote economic and demographic growth and employment generation. Specific to water, the drought proofing of the nation was entrained in an ethos of national development, vigorously pursued and enacted. Private riparian rights were subordinate to those of the State, and administered according to a doctrine of “non-priority riparian rights”. On the basis of these institutional and policy dictates, State governments became extensively involved in the water industry as developers of water supply infrastructure such as dams, and developers and owners of large-scale urban and rural supply schemes. The period of extensive and prolonged water diversion came to a relatively abrupt halt in the 1980s.

The following quotation succinctly portrays the prevailing attitudes during the transition phase.

“Decades of steady growth, both economic and demographic, have, in a relatively short time, come to an end. The former emphasis on developing new sources of water supply has given way to encouraging more efficient management of existing supplies ...unquestioned endorsement of water development programs can no longer be assumed.... In the harsher economic climate of the 1980s are the financial constraints resulting from intensified competition for funds between water resources development and other priorities for public works and services. These factors, in turn, make more urgent the adoption of more appropriate financing and pricing policies, and more efficient management practices by water administrative bodies. Community attitudes to water are also changing. Environmental constraints are becoming increasingly effective in inhibiting water resources development and an active and vocal segment of public opinion...wants to participate in decisions affecting the physical and social environment” (53).

The confluence of the over-allocation of water, the spread of irrigation-based agriculture and a lack of financial conservation incentives culminated in a situation of severe environmental degradation, unrelated institutional revenues and costs and an agricultural sector supported by extensive subsidisation. The combination of events galvanised forces to provide the necessary impetus for the substantial reform of water management evidenced by the National Water Initiative.

The more recent institutional recognition of the increasing relative scarcity of water, manifested as limits to consumptive abstraction, has resulted in the emergence and wider acceptance of the notion of water as an economic resource, simultaneously providing multiple benefits. Strategies to offset supply constraints on future economic growth include comprehensive water planning, a more technically efficient application of existing supplies in conjunction with the transfer of low value water uses to higher value uses. Constrained by physical, ecological, environmental and social thresholds, ensuring the mobility of water to facilitate higher valued uses is fundamental to the water assigning decision-making process.

The national goals of water management have been shaped and conditioned by a number of policy agreements, ratified by the Federal and State Governments. These in turn have been directed by a number of international conventions and treaties. Much of the impetus for water reform has come from the twin focal points of ecologically sustainable development and a national agenda of micro economic reform and prescribed economic efficiency. Both are viewed as cardinal objectives and often couched in at times conflicting ideological terms.

The extent to which economic and environmental objectives dovetail (as asserted in current Federal and State government policies), or whether there remain tensions between them, is a recurring theme. The robust separation of rights and robust design (48) are the foundational principles of the National Water Initiative (2). A primary objective of robust institutions is to design a system with a capability to cope with change. A robust system is self maintaining and able to adapt to levels of identified development potential or river modification. In a robust system each element can be managed independently without disrupting the entire institutional framework. Chapter 22 provides a synthesis of robust design principles.

4. REFERENCES

1. Stankey, G. H., Cole, D. N., Lucas, R. C., Petersen, M. E. and Frissel, S. S. (1985). The Limits of acceptable change (LAC) system for wilderness planning. Ogden, Utah: USDA, Forest Service, Intermountain Forest and Range Experiment Station.
- (2) Council of Commonwealth Governments (CoAG) (2004) Intergovernmental Agreement on a National Water Initiative.
http://www.Coag.gov.au/meetings/250604/iga_national_water_initiative.pdf
- (3) Musgrave W. 2008 Historical development of water resources in Australia: the case of irrigation policy in the Murray-Darling Basin. In (ed) Crase L 2000 *Water policy in Australia*, Resources for the Future Washington, D.C. pp28-43
- (4) Mulligan, H. and Pigram, J. (1989) *Water Administration in Australia: Agenda for change*. Occasional Paper 4. University of New England, Australia ISBN 085834 839 x.
- (5) Smith, D. (1998) *Water in Australia: resources and management*, Melbourne: Oxford University Press.
- (6) Powell, J.M. 2002 Environment and Institutions: three episodes in Australian water management, 180-2000. *Journal of Historical Geography* , 28(1) pp100-114.
- (7) Watson, B. (1990) An overview of water sector issues and initiatives in Australia. In: Pigram, J. and Hooper, B. (Ed.) *Transferability of Water Entitlements: an International Seminar and Workshop*, pp.11-44. Armidale: Centre for Water Policy Research.
- (8) Fisher, D. (2000) *Water Law*, Sydney: LBC Information Services.
- (9) Paterson, J. (1987) *Law and water rights for improved water resource management. DWR staff paper 01/87*, Melbourne: Department of Water Resources, Victoria.
- (10) Paterson, J. (1987) The privatisation issue: water utilities. In: Abelson, P., (Ed.) *Privatisation: an Australian experience*, pp.181-204. Mosman, Sydney: Australian Professional Publications.
- (11) Powell, J. M. (1976) *Environmental Management in Australia, 1788-1914. Guardians, Improvers and Profit: an introductory survey*, Melbourne: Oxford University Press.
- (12) Colby, B. (1995) Regulation, imperfect markets, and transaction costs: the elusive quest for efficiency in water allocation. In: Bromley, D., (Ed.) *Handbook of environmental economics*, pp.475-502, Cambridge USA: Blackwell.
- (13) Crase, L., O'Reilly, L. and Dollery, B. (2000) Water markets as a vehicle for water reform: the case of New South Wales. *Australian Journal of Agricultural and Resource Economics* **44**, pp.299-321.
- (14) Pigram, J. (1993) Property rights and water markets in Australia: a evolutionary process toward institutional reform. *Water Resources Research* **29**, pp.1313-1319.
- (15) Randall, A. (1981) Property entitlements and pricing policies for a mature water economy. *Australian Journal of Agricultural Economics* **25**, pp.195-220.
- (16) Greig, J. (1998) Water Pricing-some current issues. In: *Proceedings of the national agricultural and resource outlook conference: commodity markets and resource management*, Canberra. Canberra: ABARE.
- (17) Musgrave, W. (1996) The irrigation industry in the Murray-Darling Basin and aspects of its reform. In: Pigram, J., (Ed.) *Security and Sustainability in a mature water economy: A Global perspective*, pp.43-63. Armidale: Centre for Water Policy Research.
- (18) Davidson, B. (1969) *Australia Wet or Dry? The Physical and Economic Limits to the expansion of Irrigation*, Melbourne: Melbourne University Press.
- (19) Watson, A. (1996) Conceptual issues in the pricing of water for irrigation. In: Pigram, J., (Ed.) *Security and Sustainability in a mature water economy: A Global perspective*, pp.213-227. Armidale: Centre for Water Policy Research.
- (20) Hall, N., Poulter, D. and Curtotti, R. (1994) *ABARE model of irrigation farming the southern Murray-Darling Basin. (ABARE Research Report no. 94.4)*, Canberra: Australian Bureau of Agricultural and Resource Economics.

- (21) Grey, F. (1998) *Taxpayer support of the irrigation industry*, Sydney: Nature Conservation Council of New South Wales.
- (22) Watson, G. and Johnson, M. (1993) Pricing: Cheap water or an environmental perspective. In: Johnson, M. and Rix, S. (Ed.) *Water in Australia: managing economy, environmental and community reform*. pp.212-233. Leichardt, Sydney: Pluto Press.
- (23) Hartman, L. and Seastone, D. (1970) *Water transfers: economic efficiency and alternative solutions*, Baltimore: John Hopkins Press for Resources for the Future.
- (24) Watson, W. and Rose, R. (1980) *Irrigation issues for the eighties; focussing on efficiency and equity in the management of agricultural water supplies.*, Adelaide: Paper presented to the Annual Conference of the Australian Agricultural Economic Society.
- (25) Musgrave, W. (2000) The political economy of water price reform in Australia. In: Dinar, A., (Ed.) *The Political economy of water pricing reforms*, pp.299-321. New York: Oxford University Press for The World Bank.
- (26) Ciriacy-Wantrop, S.V. (1968) *Resource conservation: economics and policy*, Berkely, CA: University of California Press.
- (27) Ciriacy-Wantrup S. (1952) *Resource conservation economics and policies*, CA. University of California Press.
- (28) Krutilla, J. and Eckstein, O. (1958) *Multiple purpose river development*, Baltimore: John Hopkins Press for Resources for the Future.
- (29) Polanyi, K. (1944) *The Great Transformation*, New York: Rinehart.
- (30) WCED (1987) *World Commission on Environment and Development, (The Brundtland Report)*, Oxford: Oxford University Press.
- (31) Opschoor, J. and Vos, H. (1989) Economic instruments for environmental protection. Paris: *OECD*.
- (32) Turner, K. and Opschoor, H. (1994) Environmental economics and environmental policy instruments: introduction and overview. In: Opschoor, H. and Turner, K. (Ed.) *Economic incentives and environmental policies*, pp.1-38. Holland: Kluwer Academic.
- (33) UNCED (1992) *Agenda 21. United Nations Conference on the Environment and Development. Rio De Janeiro, June 1992*, New York: United Nations.
- (34) Council of Australian Governments (1992) *National strategy for ecologically sustainable development*, Canberra: AGPS.
- (35) Council of Australian Governments (1994) *Report of the Working Group on Water Resource Policy: Communiqué*, Canberra: Council of Australian Governments.
- (36) Council of Australian Governments water reform taskforce (1995) *Water allocation and entitlements: A national framework for the implementation of property rights in water. Occasional Paper No.1*, Canberra: Agriculture and Resource Management Council of Australia and New Zealand.
- (37) National Competition Council (NCC) (1998) *Compendium of National Competition Policy Agreements*, Second Edition, Melbourne, June. at
- (38) Hilmer, F., Rayner, M. and Taperell, G. (1993) *National Competition Policy report of the independent committee of inquiry*, AGPS, Canberra, 25 August.
- (39) Easter K., Rosegrant M. and Dinar A. (1999) Formal and informal markets for water: Institutions, performance, and constraints. *World Bank Research Observer* **14** (1), pp.99-116.
- (40) Pigram, J. (1999) *Tradeable water rights: the Australian experience*, Armidale: Centre for Water Policy Research, UNE.
- (41) Davidson, B. (1969) *Australia Wet or Dry? The Physical and Economic Limits to the expansion of Irrigation*, Melbourne: Melbourne University Press.
- (42) Watson, B. (1990) An overview of water sector issues and initiatives in Australia. In: Pigram, J. and Hooper, B. (Ed.) *Transferability of Water Entitlements: an International Seminar and Workshop*, pp.11-44. Armidale: Centre for Water Policy Research.

- (43) Industry Commission (IC) (1992) Water resources and waste water disposal. IC report no. 26, AGPS, Canberra.
- (44) Industry Commission (IC) (1992) op cite p.21.
- (45) Dinar, A., Rosegrant, M. and Meinzen-Dick, R. (1997) Water allocation mechanisms- principles and examples. *World Bank policy research Working Papers* **1779**.
- (46) Council of Commonwealth Governments (CoAG) (2004) Intergovernmental Agreement on a National Water Initiative.
http://www.Coag.gov.au/meetings/250604/iga_national_water_initiative.pdf
- (47) Saleth, R. and Dinar, A. (1999) Evaluating water institutions and water sector performance. *World Bank Technical Paper* **447**.
- (48) Young, M. and McColl, J. (2003a) Robust reform; the case for a new water entitlement system for Australia. *Australian Economic Review*: 36(2); 225-34.
- (50) Deakin 1885 p. 55 cited in Smith, D. 1998 op cite.
- (51) First progress report 1885 p. 113; cited in Powell, J. M. (1976) op cite p. 133
- (52) Irrigation Committee Report 1882, 10-11 cited in Powell, J. M. (1976) op cite p. 128
- (53) Mulligan and Pigram 1989 op cit p. 1-2
- (54) Bureau of Industry Economics (BIE) (1996) *Monitoring microeconomic reform- setting the scene* at <<http://www.pc.gov.au/icpubs/biepubs/96-01>>.
- (55) Forsyth, P. J. (Ed.) (1992) *Microeconomic reform in Australia*, St Leonards: Allen & Unwin. p. 5.
- (56) Keating, P. J. (1994) Speech by the Prime Minister to the Business Council of Australia's Annual General Meeting, Sydney, 15 October. In: Bureau of Industry Economics (BIE) (1996) *Monitoring microeconomic reform- setting the scene* at <<http://www.pc.gov.au/icpubs/biepubs/96-01>>. P.23)
- (57) Industry Commission (IC) (1998) *Microeconomic reforms in Australia: a compendium from the 1970s to 1997*, Research Paper, January Canberra: AGPS.
- (58) Kirkpatrick, J. (1994). *A continent transformed: human impact on the natural vegetation of Australia*. Melbourne: Oxford University Press.
- (59) Adams, W. M. (1990). *Green development: Environment and sustainability in the Third World*. London: Routledge

ⁱ J.M. Powell provides an account of the history of water development in Australia. In particular Environmental management in Australia (Powell 1976), Plains of promise, rivers of destiny; Water management and the development of Queensland 1824-1990 (Powell 1991), Watering the garden state; water land and community in Victoria 1834-1988 (Powell 1989). See also Musgrave 2008.

ⁱⁱ Material for this chapter was adapted from a previous publication. Ward J. 2000 Chapter 2 The evolution of water management in Australia. in Tisdell J. *et al.* 2000 The Development of water reform in Australia. CRC Catchment Hydrology, Melbourne.

ⁱⁱⁱ See *Mabo v Queensland* 1992 (Fisher 2000).

^{iv} The Water Conservation and Irrigation Board in NSW and the State Rivers and Water Supply Commission in Victoria (Smith 1998).

^v This section has been sourced from Grudzinski T. 2000. Chapter 3 Overview of National Competition Policy in Tisdell J. *et al.* 2000 The Development of water reform in Australia. CRC Catchment Hydrology, Melbourne.

^{vi} Paterson (1987b p. 5) notes this was more likely a case of "pervasive territorial conflict with their peers in the fields of land protection".