

Property implications of the separation of land and water rights

Henning Bjornlund and Brian O'Callaghan¹
Research Fellow and postgraduate student
Centre for Land Economics and Real Estate Research
School of International Business
University of South Australia

Keywords: water rights, water markets, transferable water rights, valuation of water rights

Abstract:

During the 1980s and 1990s water markets emerged as the preferred means of reallocating existing water between competing users within fully committed resources. This has in reality split the traditionally linked water and land assets into two separate and tradeable components. As a logical consequence of this, most jurisdictions now have legislation in place formally enabling trade in both annual allocations and the underlying long-term entitlements in water, besides formally separating property rights in water and land. Water is not any longer a fixture of land but a personal chattel; this transformation has profound implications for water as a collateral for lending, as a value component when valuing an irrigation property, as a base for rates, taxes and duties, as well as having equity implications. This transformation has also increased the need for better specified and more secure property rights in water, and the need for more detailed and secure registers of such property rights, to record changes in ownership, and protect the significant financial interest of owners, lenders and other parties with an interest in such rights.

This paper discusses some of the property implications of separating land and water rights and establishing a separate market for water. It describes how this separation process has emerged in general terms, but also specifically within each of the four states in the Murray–Darling Basin; it also discusses the implications that have been identified, and indicates areas where further research is needed.

¹ The Australian Research Council and ten industry participants fund the research project, which Dr. Henning Bjornlund is presently working on. From this project is emerging a more detailed research project on the property implication of the separation of land and water rights. This paper contains our initial thoughts on the issue.

1. INTRODUCTION

Water has become an increasingly scarce resource throughout the world; this has especially been so during the last three decades when population pressure has caused an increase in the need for water for drinking and sanitation in growing cities; besides this, demand for water for irrigation purposes has increased markedly in order to increase production and so keep the constantly growing population fed. This scarcity has been amplified by the fact that increase in supply has basically come to a halt, since the construction of new dams largely ceased during the 1970s and 1980s, by which time the good natural sites for dams were had been used, and this consequently increased the marginal cost of new water. During the same period most western countries also saw an increased awareness of the environmental implications of such new projects, which led to lobbying and political pressure against the construction of new dams; in Australia, this was clearly seen in the Franklin Dam case. The expansionary era of the water industry, during which engineers satisfied the increased demand for water by building more infrastructure to increase supply, therefore came to an end. The water industry entered its mature phase, with the policy emphasis changing to satisfy new demand by reallocating existing resources between competing users using economic instruments (Randall, 1981).



Numeric Key To River Names

1 Murray	2 Darling	3 Murrumbidgee
4 Lachlan	5 Campaspe	6 Yarra
7 Goulburn	8 Latrobe	9 Ovens
10 Snowy	11 Derwent	12 Shoalhaven
13 Hunter	14 Macleay	15 Clarence
16 Bogan	17 Macquarie	18 Namoi
19 Barwon	20 Condamine	21 Warrego
22 Dawson	23 Fitzroy	24 Mackenzie
25 Isaac	26 Burdekin	27 Suttor
28 Mitchell	29 Alice	30 Jardine
31 Staaten	32 Flinders	33 Leichhardt
34 Nicholson	35 Roper	36 Wilton
37 Daly	38 Katherine	39 Victoria
40 Ord	41 Drysdale	42 Fitzroy
43 Margaret	44 De Grey	45 Fortescue
46 Ashburton	47 Gascoyne	48 Murchison
49 Swan/Avon	50 Blackwood	51 Coopers Creek
52 Barcoo	53 Thompson	54 Diamantina
55 Georgina	56 Finke	57 Palmer

Fig 1. Map of Australia showing major rivers and highlighting the Murray Darling Basin (Courtesy of <http://www.nativefish.asn.au/ozrivers.html>)

During the expansionary phase water was available cheaply and in abundance, and there was a drive to promote its use to facilitate economic development of remote areas. Water was attached to land and was traded together with land. Water could be obtained for free by writing an application to the relevant authority, therefore water had no value as a commodity, and there was no market for water – why would somebody buy something they could get for free? Irrigators were not concerned about security of their licence, and lending institutions were comfortable lending money to farmers based on

the value of their property including the water component, even though in many instances entitlements to water were limited in time and subject to renewal, some every year, some every five years and others every fifteen years; but there was a great expectation of renewal by both farmers and banks.

This scenario has now changed significantly, and most water resources in Australia have been effectively capped with no new licences being issued. New developments can therefore only take place by reallocating water from existing entitlement holders to new water users. Even though many water entitlements in Australia have a tenure limited in time, and therefore can be cancelled or reduced upon renewal, only the South Australian Government has had the political will to do so back in the 1970s (Bjornlund and McKay, 1998). If governments do not have the political will to reduce existing entitlements, or find it inequitable to do so, the only way such a reallocation can take place is by private arrangements between existing and new entitlement holders using market transactions. To enable this to happen it was necessary to remove the traditional tie between water and land and to establish a separate market for water.

As water got scarce, and became a tradeable commodity, it gained a financial value, and it changed its character from a fixture of land to a chattel. This transformation has profound implications for water as a collateral for lending, as a value component when valuing an irrigation property, as a base for rates, taxes and duties, besides equity implications. It has also increased the need for better specified and more detailed and secure property rights in water, so that buyers and sellers know what they are trading. Similarly, more secure and efficient registers of such property rights are needed, so that changes in ownership can be effectively recorded, and the significant financial interest of owners, lenders and other parties with an interest in such rights can be effectively recorded and protected. In the drive to introduce the separation of land and water by most Australian jurisdictions, especially since 1995, when the Council of Australian Governments (COAG) introduced its new water reform agenda, and the inclusion of this reform agenda in the National Competition Policy, many of these issues were left unresolved, partly resolved or inadequately resolved.

These developments in Australia follows an international trend away from a centralised command and control approach to the management of natural resources toward the devolution of the processes at the lowest appropriate level in the community and the use of economic instruments such as pricing policies and market mechanism to drive the necessary re-allocation of water. This process was originally driven by the United Nations through the Bruntland Report (World Commission on the Environment and Development, 1987) and the Earth Summit in 1992 including the Rio Declaration and Agenda 21 (Sitartz, 1993), but also by organisations such as the World Bank (World Bank, 1993).

This paper discusses some of the implications of separating land and water and establishing a separate market for water. It represents our initial thoughts on the issue, and it forms the foundation for the design of a new research project investigating these implications and how to deal with them in more detail. The second section describes in general terms how this separation process has emerged, and also considers [or: ‘considering more specifically’] more specifically what the legislative status is within each of the four states in the Murray–Darling Basin. The third section briefly discusses the individual implications that have been identified and indicates areas where further research is needed.

2. THE HISTORY OF THE SEPARATION OF LAND AND WATER

As mentioned in the introduction, the pressure to introduce water markets to reallocate water, and thereby the need to separate land and water as property rights developed with increased water scarcity as resources became fully and in many instances over committed and moratoriums were placed on the

issuing of new licences. In all states markets emerged first without formally separating the two rights, and in some instances without specific provisions for trade in the relevant Act. Before proceeding further, it is necessary to understand that access to water has two components. The first is the long-term access to a volume or proportion of water from a given resource. This access has different names in different states: entitlements in New South Wales, water right or licence in Victoria, and licenced allocation in South Australia; in what follows the term water entitlement will be used to cover all these long-term interests in water. The second is the annual access to this entitlement. In South Australia this is not an important issue, since irrigators have access to their full entitlement every year, except under very extreme conditions. However, in Victoria, New South Wales and Queensland allocations are announced every year as a proportion of the entitlement. This proportion varies significantly from year to year, and from state to state depending on the legacy of past allocation policies, and from resource to resource, depending on availability during each irrigation season.

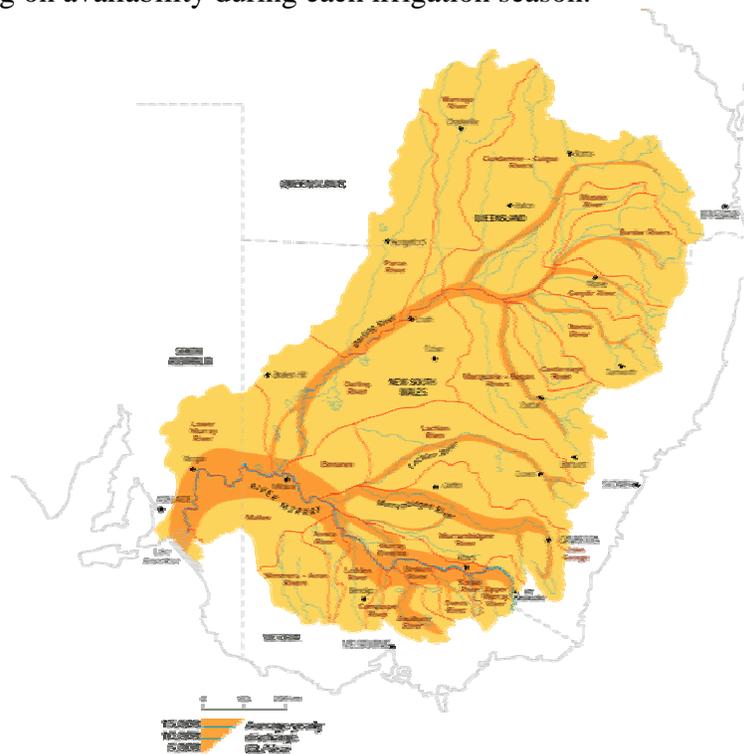


Fig 2: Map of the Murray-Darling Basin showing surface discharge areas of rivers. (Courtesy of MDBC website: <http://www.mdbc.gov.au> MDBC website)

Only South Australia introduced trade in entitlements from the outset, whereas New South Wales, Victoria and Queensland introduced trade in the annual allocation first (also called annual or temporary trade). This reluctance to introduce trade in entitlements (also called permanent trade) was caused by significant community concern about the impact of large-scale sale of water out of certain areas on these communities' ability to survive and maintain services, and the potential impact on the traditional Australian family farm (Pigram et al. 1992). This concern is based on the fact that if water is removed from an irrigation community, the basis for agricultural production and hence property values disappears; this in turn will result in reduced farm incomes, lost job opportunities, and a reduction in the rating base for local councils. All in all, such developments would reduce the community's ability to continue to pay for essential services such as schools, hospitals and roads, and its ability to continue to attract local businesses and shops. Evidence from early water markets in the USA gave clear examples of this impact. In the US demand was generally from the major urban

centres and industry and the sellers was predominantly agricultural users. In some areas most of the water was exported, often over large distances to urban centres with detrimental impact on the local communities of the selling region and therefore growing opposition to water markets (Checchio and Colby, 1988; Colby et al, 1989; Rice and McDonnell, 1993).

In 1995 COAG introduced its water reform process, according to which all State Governments committed themselves to introduce a '*system of water allocations or entitlements backed by the separation of water property rights from land title and clear specification of entitlements in terms of ownership, volume, reliability, transferability and, if applicable, quality*' (COAG, 1994, emphasis added). This reform process ended up as part of the National Competition Policy and associated intergovernmental agreements, non-compliance with which potentially has significant financial implication in the form of lost competition policy payments. Following this, all states (except Victoria) have introduced new legislation formally introducing water markets and separating water from land vesting the water entitlement in the entitlement holder. The Victorian Act already provides for trade, and Victoria is taking a different approach to loosening the tie between land and water (DNRE, 2001)

A final policy development that has impacted on this process is the Murray–Darling Basin Cap. The Basin came under increased stress during the 70s, 80s and 90s following a severe drought in 1967/68, and with large blue-green algae blooms in the early 1990s the issue came to the fore in the minds of many Australians. An audit of water use in the Basin was therefore initiated in 1995 (MDBMC, 1995). It concluded that the level of extraction for consumptive use was far in excess of what was ecologically sustainable, and that usage will continue to increase. All jurisdictions had issued large volumes of water entitlements, which had never been used or only partly used. As water markets take hold, this water is likely to be activated, further escalating the increase in use. The Audit predicted significant environmental and economic impacts if the identified development was to continue. It was therefore decided in 1997 to Cap the volume of water extracted for consumptive use (MDBC, 1997). The Cap was set to limit extractive use to the volume that would have been used at the 1993/94 level of development (MDBMC, 1996). It was recommended that existing entitlements be accepted, whether or not they had been developed. It was left to the individual states to decide how they were going to stay within the Cap, but an Independent Audit Group should review the process (e.g. MDBMC, 1997, 1998).

It is generally accepted that the present Cap will have to be revised, and that the volume of water for consumptive uses will have to be further reduced (DNRE, 2001) – the question is, by how much? The Murray–Darling Basin Commission (MDBC) has just started a community process, 'The Living Murray' (MDBMC, 2002), to determine how much more water should be set aside for environmental purposes, in order to secure continued prosperity within the Basin, and how such reduction should be paid for and implemented. The document sets out three reference points: 350 GL per year, 750 GL per year and 1,500 GL per year. These processes have generated policy uncertainty within the irrigation industry in the Basin, and have been a major impediment to the adoption of permanent trade (Bjornlund, 2002a,b).

Water markets have been an important instrument enabling irrigators to manage the impact of the Cap, and are anticipated to play an even more important role in facilitating the process of further reductions (MDBMC, 2002). The MDBC has therefore established a 'Pilot Interstate Permanent Water Trading Project' within a part of the Basin (Young et al. 2000), and is working hard on finding ways of expanding the program.

These developments clearly illustrate the importance of effectively working markets. The following sections briefly describe how the different jurisdictions have dealt with the issue of the introduction of trade and the separation of land and water rights.

2.1 South Australia

South Australia reacted early to the risk of over allocating water and therefore placed a moratorium on the issue of new entitlements in 1969. Entitlements were made volumetric with the Water Resources Act 1976 based on their current, and in some cases, potential level of development. It was soon evident that some entitlements were excessive. It was therefore decided in 1979 to revise all licences based on their actual use during the 1976 to 1979 period, which resulted in a reduction of total volume of entitlements by nearly 10% (Bjornlund and McKay, 1998). The availability of resources was therefore limited, and the demand for water from the expanding horticultural industry in the Riverland was strong, thus putting pressure on the government to provide mechanisms to facilitate the movement of water from existing users to new users. Prior to 1979, transfers were only possible if a parcel of land was rendered unsuitable for irrigation. The owner of such land could transfer the entitlement to another parcel of land under his or her ownership. Then, in 1979 this right was expanded to allow amalgamation of all entitlements between all land in common ownership, which allowed expanding farmers to increase their entitlement by buying up land with existing entitlements, amalgamate the entitlements, and sell the land again, sometimes to the original owner. At that time there was significant community opposition to a more flexible transfer system. The Minister was finally convinced in 1982 that considerable gains could be obtained by introducing more flexible transfer systems; the introduction of such systems was however delayed because of a change of government. Trade, both in entitlements and allocations, was finally introduced in March 1983, when the new Minister released the 'Transfer and Amalgamations Policies Statement for the River Murray Water Proclaimed Watercourse in Respect of Licensed Water Allotments' (Tuckwell, 1984). At that time the need for this change was also starting to be more widely acknowledged within the agricultural community (Thomas, 1984).

Trade was thus introduced without any changes to the Water Resources Act 1976. It was generally considered that the power was available to the Minister under the wider powers given in relation to proclaimed areas (Curd and Schonfeldt, 1990). When the Water Resources Act 1976 was revised in 1990, trade was still not formally included in the Act. Explicit provision for trade was first introduced within irrigation areas with the new Irrigation Act 1994, and for river pumpers with the Water Resources Act 1997. The ability to trade was initially restricted in various ways, but has since been freed up to a point, where trade can take place between all entitlement holders along the River Murray in South Australia. For a discussion of this development see Bjornlund (1999). The present rules for trade along the river are set out in the Water Allocation Plan for the River Murray Prescribed Water Course (RMCWMB, 2002).

Trade is, however, still restrained for irrigators within the irrigation areas managed by the Central Irrigation Trust. Under the present rules, voted in by the irrigators in these areas, only 2% of the total entitlement of each area can be exported out of the area. This limit has now been reached for most areas thus restraining trade between irrigators within these areas and other irrigators along the River Murray. For a discussion of this issue see Bjornlund (2002b).

The Water Resources Act 1997 formally separates water rights from land rights. The Act provides for two separate allocations under an entitlement namely, a taking allocation, and a holding allocation. The taking allocation enables the irrigator to take the water from the river, and apply it to a certain parcel of land. To get a new taking allocation or expand an existing taking allocation the irrigator must,

under the new water allocation plan, prove a water use efficiency of 85% (RMCWMB, 2002). A water holding licence, on the other hand, only gives the holder ownership of the entitlement, and it can only be converted to a taking licence upon proving a water use efficiency of 85%, when the water is applied to a particular parcel of land. In essence any person or legal entity anywhere in Australia can now own an entitlement; as a result, some Victorian water buyers purchased water as part of the MDBC Interstate Permanent Water Trading Pilot Program onto a water holding licence in South Australia (Young et al, 2000). You can't really 'purchase...onto' something; not sure how to phrase this though; this would be an instance of the reviewer's saying that the English needed to be improved

2.2 Victoria

Until the introduction of the new Water Act 1989, water in Victoria was effectively tied to land, and in fact the process toward the new Act was quite prolonged. Any increases in supply in Victoria up until the late 1960s had largely been used towards supplying existing entitlement holders according to a succession of area based formulas (Department of Water Resources, 1986). Irrigator expectations were still high during the 1970s that supply would be further increased upon the completion of Dartmouth Dam. However, the environmental impact of irrigation in northern Victoria was increasingly being acknowledged and the State Government therefore initiated two major investigations in 1975 (Langford and Foley, 1990), which resulted in three major reports in 1982, 1984, and 1986. These reports came to the conclusion that the water made available by the Dartmouth Dam had already largely been committed, and therefore only a small volume (approximately 4%) should go to increasing supply and that generally no new entitlements should be given to irrigation. The reports also recommended that auctions should be used to allocate the limited volume of new water, and that water markets should be used to facilitate future reallocations of water between irrigators (Bjornlund, 1999).

The new Water Act 1989 provided for both trade in entitlements and annual allocations. However, the issue of separating water and land rights was dealt with inconsistently. Entitlements given to irrigators within irrigation areas (water rights) were still attached to land. Trade took place by the authority detaching the water from one parcel of land, and then reattaching it to another parcel of land. On the other hand, entitlements given to private pumpers (diversion licences) were vested in the licensee, and thus formally became a personal chattel (Bjornlund, 1999). Victoria is currently pursuing other avenues of obtaining the benefits of increased flexibility provided in the three other states by formally separating land and water rights (DNRE, 2001).

Evidence of informal transfers of annual allocations can be traced back to the drought of the 1940s'1940s where informal arrangements were made between farmers to transfer water, and where the local water bailiff was simply asked to redirect the water to a different parcel of land for a period of time. In the mid 1980s it became increasingly common for dairy farmers to buy land with water on it, in less productive areas, and then through amalgamations effectively transfer at least part of the new water to their home block (DNRE, 2001).

A legislative amendment in 1987 made it possible to start trading in annual allocations within some irrigation areas during 1987/88, before trading was formally introduced with the new Act in 1989. Trade in entitlements (permanent trade) did not start until late 1991, when the regulations for permanent trade were approved, with the first transfers being registered in the record of Goulburn–Murray Water in January 1992. For the first seven years of temporary trade less than 1% of total water use was facilitated through trade, this has now increased considerably to around 18% during

periods with resource constraints (Bjornlund, 2003), while during periods of 'normal' supply, trade seems to account for about 6% of total water use (DNRE, 2001).

2.3 New South Wales

Water resources in NSW were overcommitted at an early stage as a result of the government's drive to settle the State and promote economic activity. The problem was aggravated by area-based allocations with no control on actual water use. To overcome this, volumetric allocations were introduced in some areas in 1975/76, and within the Murray River as such in 1981, which effectively stopped the exploitation by existing users. During the 1970s an administrative embargo was placed on the issuing of new entitlements for irrigation within some areas, until a full embargo was put in place in 1981, and later in 1989 for industrial entitlements, thereby effectively limiting an increase in commitment of water resources (Sturgess and Wright, 1993).

Transfers of annual allocations between entitlements in the same ownership and within the same irrigation area were allowed in NSW during periods of drought such as 1967/68, 1972/73, 1980/81 and 1981/82. In 1982/83 transfers were allowed between irrigation areas, and between irrigation areas and private diverters (Cummings, 1990). The Water Act was finally amended in 1983 to allow trade in annual allocations. The annual transfers were subject to a number of volumetric restrictions, which were gradually removed during the period from 1984 to 1989, and multiple year transfers of up to four years were introduced. Trade in entitlements (permanent trade) was introduced with the revision of the Act in 1989. This, however, only applied to private diverters and not to irrigators within irrigation areas or districts, since there was still significant concern about permanent trade in these areas (Morgan, 1990). Permanent trade was effectively made possible within irrigation areas, and between areas and private diverters, as the irrigation areas were privatised. It was then up to the board of directors to decide whether or not to allow trade. Most boards have decided not to allow trade in entitlements out of areas, or to limit such trade significantly (Bjornlund, 2002b).

Within the privatised irrigation areas and districts the entitlements are attached to the shares in the company, and they have thus been removed from land; however, trading rules within the companies restrict the ability to trade the entitlements, both within and outside the area. With the new Water Management Act 2000, water and land rights have been formally separated for diversion licences, and the entitlement has been separated into an access right and a use right (DLWC, 1999, Burchmore, 2000, Cleary and Gill, 2001). When the Act comes into force (this is still awaiting the approval of the necessary regulations and is estimated to be July 2003) it will be possible to hold water entitlements separately from land ownership.

2.4 Queensland

In Queensland water entitlements have also traditionally been tied to land, and the pressure from irrigators for more flexible management opportunities of water increased during the 1980s, as unused water was locked unproductively to land where it was not used, while other irrigators went without or relied on excess water use (Fenwick, 1990). The first policy to try to activate the unused water was to move from fixed annual allocations to the announcement of variable annual allocations, allowing water held by inactive irrigators to be activated through higher annual allocation levels to active irrigators. This system was first introduced in the St. George area in 1978, and resulted in announced allocations of up to 180% of nominal allocations. Consequently, it gave active irrigators access to the annual use of water held by inactive entitlement holders. However, this did not provide water for new developments, and the extra water was spread over all water users, rather than being concentrated in those with the most efficient use and those valuing water the most. In addition, the variability of annual allocations did not satisfy water users with permanent plantings.

Trade in annual allocations has therefore emerged since 1987/88 on an experimental basis within a number of irrigation areas: Dumaresq River, in the Border Rivers region, in 1987/88, St. George and Bundaberg in 1988/89, and the Upper Condamine and Emerald schemes in 1989/90. To prevent windfall gains by irrigators who have never used their water, irrigators could only sell if they could prove a history of use. This development took place after significant irrigator pressure, and it came only three years after a position statement on transferability by the Queensland Water Resources Commission, which proposed that Queensland had no intention of implementing transferability in any form (Fenwick, 1984). Temporary trade was finally introduced in the Water Resources Act 1989, but no provision was made for trade in entitlements. In 1990 a new policy was introduced according to which all new entitlements were subject to a capital charge set by auction or tender. If an entitlement was purchased on such an auction it could subsequently be traded on the market (Tan, 1999).

Trade in water entitlements was made possible with the new Water Act 2000 (Parker and Went, 2002). The conversion of existing entitlements into tradeable entitlements, however, can only take place after a comprehensive basin-wide water resource plan has been approved, granting tradeable water entitlements and subject to transfer rules contained in the resource operation plan for the catchment (NRQ, 1999). Although water entitlements will be specified with respect to location, they will not be tied to land; it will thus be possible for water entitlements to be owned by non-land holders or transferred to non-land holders and leased to water users (NRQ, 1999). Three new draft water resource plans were released in July 2002 (NRM, 2002a,b,c), each setting out trading rules in section 8. The more controversial plan for the Condamine River has been postponed while an independent expert group is trying to identify the environmental needs. At the completion of these water resource plans the resource operation plans will be developed, at which time the existing entitlements can be converted to tradeable entitlements. So far, one pilot permanent trading trial has been held in the Mareeba area since 1999. Under this program trade can take place between holders of what is called interim allocations within regulated supply systems; these entitlements are attached to land, and they will therefore after sale be reattached to another parcel of land. Such trade is made possible under the new Act provided regulations have been put in place (NRM, 2002d).

3. SOME ISSUES THAT HAVE EMERGED

The discussion in section 2 clearly illustrates how trade has emerged in all four states in response to resource constraints, and this process has eventually resulted in the removal of the tie between land and water rights. The latter process has fundamentally changed the foundation for a number of traditional arrangements related to property such as valuation of irrigated land, collateral for farm lending, equity base for council rates, water rates and stamp duty, and the process has also raised a number of equity issues between active and inactive water users, and between present and future water users. The separation, and the extent to which it is implemented, also has various tax implications. The following sections will briefly discuss these issues.

3.1 Valuation of irrigated farmland

It is becoming more and more clear that water has the status of a chattel rather than a fixed part of irrigated farmland. Valuers, however, are still including water in the value of an irrigated property. Queensland has accepted the consequences and decided to take water out of the value of the property, in recognition of its new status as a chattel, but has not yet worked out how to implement this decision. The other states have so far not taken this step, but are aware of the inconsistency. The correctness of this practice was tested in the court recently, by some Victorian irrigation ratepayers, who were upset by increases in their rates associated with water rights, which are now worth \$700/ML. The Valuer General has argued that water rights have been included in valuations for many

decades, and that the introduction of water trading has made no difference; in other words, water rights are still legally attached to land (DNRE, 2001). The case was settled out of court, so no decision was made. However, the argument that water rights are still legally attached to land is not relevant for water licences in Victoria, or water entitlements in South Australia, New South Wales and Queensland.

To take water out of the valuation of irrigated farmland could, however, be more complicated than it looks at first glance. Research by Bjornlund (2001, 2002c) indicates the following complexities:

- Irrigation infrastructure, such as irrigation and drainage systems, farm layout, and permanent plantings and pastures, dependent on water for their ability to produce an income. If water is taken from water-dependent improvements, these improvements will lose their income producing capacity, and therefore will have little or no value. The question is, should the value of such improvements be added to the value of the water and be taken out of the valuation or stay with the land?
- Water actively supporting farm improvements, such as those just described, has a much higher value than unused water when traded as part of an irrigated property. What value should we then take out for valuation purposes?
- When water is used on permanent plantings such as for example vines or fruit trees, the value of water depends on the type of plantings and their quality, as well as the quality of the irrigation system. What is the implication of this for property valuation if we take the water out of the valuation process?
- Prices paid in the permanent water market are generally lower than the value of water when attached to land and actively used to support plantings and other farm improvements, while such prices are higher than the value of unused water attached to land.
- It could therefore be argued that prices paid in the permanent water market do not reflect the value of water attached to existing farm improvements. Such permanent water market prices should therefore not be used as the basis for separating land and water values when valuing irrigated properties for rating and taxation purposes. If that is the case, what then should be used as the basis for the separation?
- The link between water-dependent farm infrastructure and water values is not uniform across regions. The severity of this link depends on a number of issues, such as the capital intensity of the production, the time and investment that would be needed to change or improve such infrastructure, the ability of the production to rely on the purchase of annual allocations, and the ability of the land in that particular location to be put to a productive use without the presence of irrigation water. This is predominantly an issue of the adequacy of natural precipitation for alternative dry land crops.

More research is required to investigate the above issues, and to quantify the value of water when supporting water-dependent infrastructure, as well as the level of interdependency between the two asset groups. The research by Bjornlund (2001) was carried out in a period when water markets were still very immature, so some of the findings might not be valid as markets mature, and as buyers of irrigated farmland more fully incorporate the implication of water as a chattel in their pricing decisions when buying irrigated farmland.

At the moment, valuation practices vary across jurisdictions, and this in part reflects the legacy of differing legislation. While the states are accepting that land and water assets should be separated, they differ on the process of separation and are developing independent valuation methodologies to reflect

the separation in the valuation process. The following is a brief discussion of the present position within the four jurisdictions:

South Australia: Water licences are classed as personal property, and the value of an allocation is excluded from the value of rural properties for rating purposes. Where properties have existing access to a water source, or where it is possible for a non-irrigated property to gain access to a water source, the added value of the benefit is included in the property value. The South Australian Valuer general is currently reviewing existing methodologies to further separate the value of water entitlements from the value of irrigated farmland.

Victoria: Under current rating and taxing legislation, water rights are included in the value of land for rating purposes. The Victorian Stamp Duties Act, however, does recognise the personal nature of water rights, and excludes it from valuations for stamp duties purposes as discussed in section 3.3.

New South Wales: Water entitlements are excluded from valuations for rating purposes. Under The Water Management Act 2000, the right to water for irrigation has been split into two categories. Firstly, a User Licence, which attaches to the land and conveys a right for a property owner to apply a given volume of water to the land. These User licences are property specific and therefore included in property valuation. Secondly, Access Rights have been issued to existing holders of water entitlement, and these rights give access to a given volume of water, but no right to use the water. Access Rights are classed as personal property and are not included in the valuation.

Queensland: Once the resource operation plan has been approved and existing licences converted to tradeable allocations and thereby converted to personal chattel, the value of these will be excluded from the valuation of unimproved land. It is anticipated that the first Resources Plan will be produced early in 2003, and will centre on the Fitzroy River irrigators, with the remainder of the State's irrigators converted over a five year period. A twelve month period of grace will apply from the changeover to allow affected councils time to make any necessary adjustments to their rating systems.

3.2 Council rates

If it is decided to take the water out of the valuation of land for rating and taxing purposes, or if a successful court case similar to the one discussed above forces such a decision, it could potentially have significant impacts on the distribution of the rate burden. At present irrigation farmers pay much higher council rates than dry land farmers. This is considered by most people to be equitable, since farm incomes are much higher for irrigated properties. If water is taken out of the valuation process the value of irrigated farms will be reduced sharply. To maintain revenue councils will have to increase the percentage charged on all properties, which will shift the rate burden to dry land farmers and towns. The Queensland approach to avoid this is to get councils to use their ability to apply differential rates.

There is also evidence in Victoria that some irrigators are selling their entitlements in order to reduce their property value. This has the effect of reducing their council rates, and also to avoid the payment of some of the water rates payable to Goulburn–Murray Water (DNRE, 2001). In the future these irrigators will depend on the purchase of annual allocations to maintain production. These problems could be avoided if the land's ability to be productively irrigated could be used as the basis for valuation for rating and taxing purposes; in South Australia this is called commandable land. Also, the councils could use their powers to set differential rates to determine an equitable distribution of rates. At present some councils charge lower rates for farms, compared to town properties; if water is taken

out of the valuation of land, councils could decide that it is fair to charge a higher rate for properties with a capacity to be irrigated.

3.3 Taxation issues

The present tax system favors the use of the market for annual allocations relative to the market for water entitlements (Bjornlund 2002b). The transfer of an annual allocation is treated as an annual operations cost or revenue, that is, the cost can be deducted in tax the year of purchase, and the revenue can be offset against cost during that year or losses from past years. The transfer of a water entitlement is not deductible the year of purchase, and it cannot be depreciated, while the revenue of such sale is subject to capital gains tax. However, in many instances capital gains tax will not be an issue in the first instance, since most irrigators have owned their entitlements from before the introduction of capital gains tax in 1985 (DNRE, 2001). The fact that those farmers who sell generally have very low or negative farm incomes (Bjornlund, 2002d) has significantly increased the benefit for sellers of using the temporary market, since they pay low or no income tax on the temporary sale (Bjornlund 2002b).

However, this differential treatment is not any different from farmland and many other assets. The purchase of farmland cannot be depreciated, and the sale is subject to capital gains tax, while the lease of farmland is fully tax-deductible. The difference with water is that there is a significant policy pressure to facilitate the permanent reallocation of water as a precondition of achieving a more efficient and higher valued producing irrigation industry. It has also been argued that the low uptake of permanent trade has resulted in a loss or postponement of the potential economic benefits from trade (Marsden Jacobs, 1999). If policy markets are seriously concerned about this issue, it might be beneficial to introduce the ability to depreciate the purchase price of water entitlements. With the separation of land and water rights, however, this issue could be partly overcome, since it will now be possible to make leaseback arrangement and long-term leases, which will provide some of the same certainty as the purchase of water entitlements.

A separate issue here is stamp duty. Traditionally stamp duty was payable on the total purchase price on a property, both the land and water components. Since the introduction of markets in water entitlements, which do not attract stamp duty, some farmers have avoided stamp duty by selling the two assets under separate contracts. Since water is a significant part of the property value this could represent a considerable saving. This was tested in 1999, when John Elliot sold the property Madowla Park near Echuca. More than half the price, or \$4.5 million, was the water entitlements, which was sold separately. The State Revenue Office successfully challenged this in the Supreme Court, and the payable stamp duty was revised from \$80,000 to \$274,000. Since then, in November 2001, the State Revenue Office altered its position, saying that water rights would not be taken into account when assessing duty on a property transfer. The argument was that since water rights do not permanently attach to a specific parcel of land, they couldn't be said to enhance its value (DNRE, 2001). This somehow contradicts the Valuer General's argument in the recent court case referred to above, and it supports the argument for removing water entitlements from the valuation of land.

The issue of stamp duty was raised in South Australia when trade was first introduced. The original policy statement specified that a transfer fee had to be paid. This fee was set to reflect the general stamp duty of 1% on transfer of land. Valuers at the time advised that the water entitlement added about \$150/ML to \$200/ML to the value of dry land. The transfer fee was therefore set at \$2/ML. The early transfers soon proved that the market placed a much higher value on water, with the most common price during the first year being \$330/ML, but in a range from a minimum of \$200/ML to a maximum of \$450/ML (Tuckwell, 1984). The national Duties Act 2000 should have settled this matter, by stating that duty is confined to land, buildings and goods, i.e. physical chattel and not personal

chattel (DNRE, 2001). In all instances, except for water rights in Victoria, water entitlements are now personal chattel, and the State Revenue Office in Victoria has now brought water rights into line with water licences in that state.

3.4 Security issues for financiers

The implications of the separation of land and water rights for banks and other lending institutions should be apparent. In its own right a mortgage on the land no longer gives the bank any hold over the water entitlement; this significantly increases the risk position of banks, since, as discussed above, most of the collateral value of irrigated farmland is represented by the water and not the land. The Australian Bankers Association raised this issue very early, when permanent trade was first introduced in South Australia. The banks sought the power to veto permanent transfers, in those cases where the transfer would significantly increase the exposure of the bank. This was not acceptable to the SA Government, as it would curtail the absolute discretion of the Minister. It was instead agreed that the authority would conduct a title search of all properties proposing to sell water, and it would then notify the banks with a registered mortgage, as well as other parties with a prescribed interest within 21 days of receiving an application to transfer water. Since trade could only take place with effect from the first of January or the first of July, and since the application had to be submitted at least three months prior to such a date, it was considered that the banks would be given sufficient time to sort out any issues with the irrigators prior to the transfer being affected (Tuckwell, 1984). This was changed with the Water Resources Act 1997, which requires parties with a right registered on the *licence* to give their written permission to the transfer (Bjornlund, 1999). In 2002, South Australia is planning to introduce a new electronic licensing system, the Water Information and Licensing Management Application (WILMA), which will further improve the recording procedures of prescribed interests. Within the Central Irrigation Trust, the sellers have to sign a statutory declaration stating all interests registered on the land, and must obtain their written consent to the transfer.

The other three states have had to deal with the same issue, and the Australian Bankers Association is still pressuring all Australian States to have entitlement registers, such that lenders can take a direct and secure hold over the water entitlement itself (DNRE, 2001; Parker and Went, 2002). In Victoria the intention to sell has to be advertised for 21 days, the seller has to sign a statutory declaration disclosing all those with an interest in the land, and must obtain their written consent. The *'authority must not approve any transfer unless it is satisfied that each person whom it knows, or ought to have known, to have an interest has consented'* (DNRE, 2001, emphasis added). The Act does however not provide the same protection for licence holders, but it has been argued that in practice the same procedures are being followed (DNRE, 2001). As the Rural Finance Corporation pointed out, in that respect we place *'heavy reliance on Goulburn–Murray Water to play by the rules'* (Richmond, 2002, emphasis added). These systems, however, still rely on interests registered on the land and not on the water entitlement. To provide for more flexible finance systems it will be necessary to be able to register interests in the water entitlement separate from the land title.

The new Acts in New South Wales and Queensland both provide for publicly available entitlement registers, and allowing parties with prescribed interest in a water entitlement to record such interests on the register (Boxall, 2000; Parker and Went, 2002). These registers in NSW do however not include irrigators within irrigation areas and districts such as Murray Irrigation Limited; the MIL follows much the same procedures as the one described for the CIT, and it is not possible to register an interest in the share to which the entitlement is attached.

Financiers have pointed out that such registers must be able to record priority between interests, have systemic efficiency (that is, dealing in water rights must be registered promptly at the time of lodgment, which is also the case for land transactions), and provide the ability for the holders of unregistered interests to lodge caveats protecting their unregistered rights (Boxall, 2000). Entitlement registers is not the only issue of concern for the use of water entitlements as collateral for loans on the cheapest possible terms. Lenders need to be ensured that the entitlement in water cannot be defeated, that the entitlement gives the borrower the long-term security of access to the water, that the lender has the ability to take possession of the water entitlement, if the borrower defaults, and that the lender has the power to sell the entitlement, either together with the land as a going concern, or as a separate asset (Boxall, 2000).

In this connection it is also important to point out that registers and procedures need to protect against fraud. Dealings in water now represent significant financial transactions. The recent review of the Interstate Permanent Trading Pilot Program revealed several transactions in excess of \$1,000,000 (Young et al., 2000). In Victoria, Watermove transacted annual water allocations within one trading region during the week ending 11 October 2002 at a total value of about \$1,000,000, and according to Bjornlund (2002e) Watermove only accounts for about 30% of trade. The Review also revealed an inconsistent registration of transfers between jurisdictions, and a lack of reconciliation of water registers between buying and selling authorities; this leaves the system open to fraudulent actions. As evidence of this, a licence administrator of one rural water authority in Victoria was taken to court in 2000, and later convicted and jailed for organising the sale of several parcels of water during the period from 1994–1998 which did not actually exist. Combined with another scam involving another person, rights now worth over \$1 million were fabricated (DNRE, 2001). A registration and trading system to overcome these concerns is currently being proposed together with a wider property rights structure and planning framework (Young and McColl, 2002; Bjornlund, 2000).

3.6 Equity issues

One of the major concerns associated with the introduction of water trading was how to deal with significant volumes of unused water entitlements in the system. This was particularly a problem in Victoria, NSW and Queensland, whereas in South Australia this issue was initially addressed in the 1970s, when unused entitlements were withdrawn. Pursuing economic development, state governments have historically been quite liberal in issuing new entitlements. Unused entitlements were factored in every year at the time that allocations were made, which gave active irrigators access to the water not used by inactive irrigators. When trade is introduced these unused water entitlements are likely to be activated, since holders of such entitlements, who have no intention of ever using them, will take this opportunity to sell the asset which previously had little or no value to them. To compensate for the resulting increase in use within a capped resource, water supply to existing irrigators, in the form of annual allocations, has to be reduced. This could be perceived as inequitable, since the holder of unused entitlements gets a windfall gain, while active water users have to buy entitlement on the market or buy annual allocations every year; many irrigators see this as a wealth transfer.

This issue was the subject of significant discussions in all states prior to the introduction of trade. The prevailing view was that it would be inequitable to cancel unused entitlements, since the entitlements have been capitalized into the value of the land. It was argued that the only person who received a windfall was the original owner, who was originally granted the entitlement, who then cashed it in the first time the property was sold. It was also argued that the water added value to a property even before trade, due to the potential for development that it held, and the ability to amalgamate entitlements. Furthermore, the process of reducing entitlements to actual use brought with it a complicated process

of determining what actual use is. All governments, except for South Australia, have therefore decided not to cancel or reduce unused entitlements; and this was also the recommendation of the independent audit group when proposing the MDB Cap (MDBMC, 1996)

It could however also be argued that irrigators who have invested a lot of money in infrastructure, with the intention of putting the water to beneficial use, as the governments have encouraged them to do, have a lot to lose when annual allocations are reduced in response to trade activating unused water. Research by Bjornlund (2001) suggests that when water is traded together with land it has a higher value, if it is used to support water dependent infrastructure, than if it is unused at the time; it was also found that buyers of irrigated farmland with insufficient water allocations paid less for the property. The research also found that prices paid in the market for entitlements far exceed the value of unused water, but are below the value of water supporting water dependent infrastructure. When annual allocations are reduced in response to trade activating unused entitlements, irrigators actively using their water have two management options: 1) they can buy annual allocations to compensate for the reduction, which will increase their risk exposure, increase annual production costs, and reduce the value of their property; or 2) they can buy water entitlements on the market to replace the reduction in annual allocations, and thereby incur a significant capital cost. On the other hand, holders of unused entitlements can now sell their entitlements and get a higher price than what the water was worth when attached to land. These findings suggest that the system of acknowledging unused allocations, while being politically opportune, creates a transfer of wealth from one sector of the farming community to another. This issue has had a profound impact on the perception and acceptance of water markets within rural communities (Bjornlund, 2002a) and has been a major driver of activities on both the market for annual allocations and for water entitlements; it has consequently caused many irrigators to be reluctant users of water markets (Bjornlund, 2002f).

4. CONCLUSION

The last twenty-five years have seen a total reversal of traditional relationships between land and water assets. Water used to be appurtenant to land and not a tradable commodity. Water has now been separated from land by legislation and separate markets are operating both for the long-term water entitlements and for the annual allocations attached to these entitlements. This development has had profound implications for the property industry within such areas as property valuation, property lending and the use of land and water assets as the base for rates, taxes and stamp duty. There is also likely to be some equity implications with respect to the impact of this development on the value of properties with used and unused entitlements, with the latter group gaining at the expense of the former group.

The valuation profession has to come to terms with how to deal with this new state of affairs. Valuations for rating and taxing purposes are still taking place with water forming part of the total asset even though it is a private chattel. Queensland has taken a policy decision to change this, but has not yet found a way to implement it. The Valuer General in Victoria has just come through a court case arguing that water rights are still legally a part of land in Victoria, and therefore should be included in the value of property. At the same time the State Revenue Office in Victoria has recently ruled that since water rights do not permanently attach to a specific parcel of land, they could not be said to enhance the value of the land. So as of November 2001 stamp duty is not payable on the water component of a property transfer.

If a decision is taken to exclude water from the valuation of land, how are we going to implement that? Research indicates that the value of water, when attached to land and supporting water dependent infrastructure, can have a much higher value than what is paid in the permanent market. Also, used and

unused water has different value when attached to land, especially in highly capital-intensive productions and in areas with low natural precipitation and, consequently, very few alternative dry land uses. Unused water attached to land under these circumstances has a much lower value than the price paid in the market for water entitlements. It has further been found that within such areas the value of a property is determined by an interactive relationship between the volume of water entitlement and the quality of the plantings on which it is being used and the irrigation system used to apply it. A better understanding of these relationships is needed to develop suitable methods for removing the value of water from the valuation of irrigated farmland.

5. REFERENCES

- Bjornlund, H. (1999): *Water Trade Policies as a Component of Environmentally, Socially and Economically Sustainable Water Use in Rural Southeastern Australia*. Thesis submitted in fulfilment of the requirement for the degree of doctor of philosophy, University of South Australia, Adelaide.
- Bjornlund, H. (2000): To regulate or to market – striking the balance for sustainable water use. *Proceedings from the joint Water and the Law symposium*, Adelaide 18 October, 11–17.
- Bjornlund, H. (2001): *Water Policies and Rural Land Values*. Paper presented at the 7th Pacific Rim Real Estate Society Conference, Adelaide January. URL: <http://www.business.unisa.edu.au/prres>
- Bjornlund, H. (2002a): The adoption, perception and impact of the new water policy paradigm within two Australian States. *Proceedings from the World Bank conference Irrigation water policies: micro and macro considerations*, Agadir, June 15–17. URL: <http://www.worldbank.agadirconference.com>
- Bjornlund, H. (2002b): What Impedes Water Markets? *Proceedings from the 4th Australasian Natural Resources Law and Policy Conference: Water Law and Policy*. Sydney 24–25 October.
- Bjornlund, H. (2002c): *The Land/Water Market price Relationships*. Paper presented on the Valuation of Irrigation Property and Water Right Seminar held by the Australian Property Institute and the Department of Natural Resources and Environment, Melbourne, October.
- Bjornlund, H. (2002d): The Socio-economic structures of irrigation communities—water markets and the structural adjustment process. *Journal of Rural Society* 12(2), 123–147.
- Bjornlund, H. (2002e): Water Exchanges: Australian Experiences. *Proceedings from the conference Allocating and Managing Water for a Sustainable Future: Lessons from Around the World*. Natural Resources Law Centre, University of Colorado, Boulder, June 11-13 2002 CD-ROM.
- Bjornlund, H. (2003): Farmer participation in markets for temporary and permanent water in southeastern Australia. *International Journal of Agricultural Water Management* (forthcoming)
- Bjornlund, H. and McKay, J. (1998): Overcoming the Introspective Legacy of Tradeable Water Entitlement Policies in South Eastern Australia. In Just, R. and Netanyahu, S. Eds. *Conflict and Cooperation on Trans-Boundary Water Resources*. Kluwer Academic Publishers, Natural Resource Management and Policy Series, 315–332.
- Boxall, A. (2000): Security Issues for Financiers. *Proceedings from the 1st Australasian Natural Resources law and Policy Conference – Focus on Water*. Canberra 27–28 March
- Burchmore, J. (2000): The Development of New Water Legislation for NSW – A Policy Perspective. *Proceedings from 1st Australasian Natural Resources law and Policy Conference – Focus on Water*. Canberra 27-28 March, 147–151.
- Checchio, E. and Colby, B.G., 1988: Refining the Water Transfer Process: Innovations for Western States. In Shupe, S.J. Ed. *Water Marketing 1988 - The Move to Innovation*. Denver: University of Denver College of Law, Chapter 3, 1-32.

- Cleary, D. and Gill, J. (2001): The NSW Water Management Act 2000. *Conference Proceedings 3rd Australasian Natural Resources law and Policy Conference – Focus on Water*. Sydney 22–23 March, 145–153.
- Colby, S.B., McGinnis, M.A. and Rait, K., 1989: Procedural Aspects of State Water Law: Transferring Water Rights in the Western States. *Arizona Law Review*. 31(4), 697-720.
- Council of Australian Governments (1994): *Communiqué*. Meeting of COAG in Hobart 25 February 1994.
- Cummings, B.A. (1990): Water Transfer: The New South Wales Experience. In Pigram, J.J. and Hooper, B.P. Eds. *Transferability of Water Entitlements*. Proceedings from an International Seminar and Workshop, The Centre for Water Policy Research, Armidale, NSW, July, 183–200
- Curd, V. and Schonfeldt C. (1990): Water Transfers: The South Australian Experience, in Pigram, J.J. and Hooper B.P. Eds. *Transferability of Water Entitlements*, Proceedings of an International Seminar and Workshop, The Centre for Water Policy Research, Armidale, NSW, July, 201–211.
- Department of Water Resources (1986): *Irrigation Management Study*. Report No. 13, Water Resource Management Report Series.
- DLWC, Department of Land and Water Conservation (1999): *A White paper. A proposal for updated and consolidated water management legislation in New South Wales*. Sydney, DLWC.
- DNRE, Department of Natural Resources and Environment (2001): *The Value of Water – A guide to Water Trading in Victoria*. Melbourne DNRE.
- Fenwick, T.D. (1984): Transferable Water Rights: A Queensland Viewpoint. *Proceeding of the joint AWRC and AAES Seminar on Transferable Water Rights*. Melbourne Australian Government Printing Service, Canberra
- Fenwick, T.D. (1990): Water Allocation, and Transfer Practices in Queensland. In Pigram, J.J. and Hooper B.P. Eds. *Transferability of Water Entitlements*. Proceedings from an International Seminar and Workshop, The Centre for Water Policy Research, Armidale, NSW, July, 215–221.
- Langford, K.J. and Foley, B.E. (1990): Transferable Water Entitlements: Victorian Perspective. In Pigram, J.J. and Hooper, B.P. Eds. *Transferability of Water Entitlements*, Proceedings of an International Seminar and Workshop, The Centre for Water Policy Research, Armidale, NSW, 201–214.
- Marsden Jacob (1999): *Water Trading Development and Monitoring*. Report to the Department of Land and Water Conservation. Camberwell, Victoria, Marsden Jacob & Associates.
- MDBC, Murray–Darling Basin Commission, 1997. Media Release - Ministerial Council reports on diversion Cap. Canberra, MDBC.
- MDBMC, Murray–Darling Basin Ministerial Council (2002): *The Living Murray*. A discussion paper on restoring the health of the River Murray. Canberra MDBMC.
- MDBMC, Murray–Darling Basin Ministerial Council (1998): *Review of Cap Implementation 1997/98*. Report of the Independent Audit Group. Including Responses by the Four State Governments. Canberra MDBMC.
- MDBMC, Murray–Darling Basin Ministerial Council (1997): *Review of Cap Implementation 1996/97*. Report of the Independent Audit Group. Canberra MDBMC.
- MDBMC, Murray–Darling Basin Ministerial Council (1996): *Setting the Cap – Report of the Independent Audit Group*. Canberra, MDBMC.
- MDBMC, Murray–Darling Basin Ministerial Council (1995): *An Audit of Water Use in the Murray–Darling Basin*. Canberra, MDBMC.
- Morgan, T. (1990): Water Transfers: An Irrigation Industry Perspective. In Pigram, J.J. and Hooper B.P. Eds. *Transferability of Water Entitlements*. Proceedings from an International Seminar and Workshop, The Centre for Water Policy Research, Armidale, NSW, July, 237–241.

- NRM, Natural Resources and Mines (2002a): *Overview Report and Draft Plan – Border Rivers Draft Water Resource Plan*. NRM, Brisbane.
- NRM, Natural Resources and Mines (2002b): *Overview Report and Draft Plan – Moonie Draft Water Resource Plan*. NRM, Brisbane.
- NRM, Natural Resources and Mines (2002c): *Overview Report and Draft Plan – Warrego, Paroo, Bullo and Nebine Draft Water Resource Plan*. NRM, Brisbane.
- NRM, Natural Resources and Mines (2002d): Evaluation of the permanent Water Trading Trial in Mareeba. Water Trading Discussion Paper. NRM, Brisbane.
- NRQ, Natural Resources Queensland (1999): *Exposure Draft Bill and Explanatory material (Water Allocation and Management) Bill*. NRQ, Brisbane.
- Parker, S. and Went, Y. (2002): Security over land and the Water Act 2000. *Proceedings from 4th Australasian Water Policy and Law Conference*. Sydney 24-25 October.
- Pigram, J.J.; Delforce, R.J.; Coelli, M.L.; Norris, V.; Anthony, G.; Anderson, R.L. and Musgrave, W.F. (1992): Transferable Water Entitlements in Australia. A report to the Land and Water Resources Research and Development Corporation.
- Randall, A. (1981): Property Entitlements and Pricing Policies for a Maturing Water Economy. *The Australian Journal of Agricultural Economics*. 25(3), 195–220.
- Rice, T.A. and MacDonnell, L.J., 1993: *Agricultural to Urban Water Transfers in Colorado: An Assessment of the Issues and options*. NRLC Research Report Series, Natural Resources Law Center. Boulder: University of Colorado.
- Richmond, P. (2002): Watertight security: A Lenders Perspective. Paper presented on the Valuation of Irrigation Property and Water Right Seminar held by the Australian Property Institute and the Department of Natural Resources and Environment, Melbourne, October.
- RMCWMB, River Murray Catchment Water Management Board (2002): *Water Allocation Plan for the River Murray prescribed Watercourse*. RMCWMB.
- Sitarz, D., 1993: AGENDA 21: The Earth Summit Strategy to Save Our Planet. Boulder: Earth Press.
- Sturgess, G.L. and Wright, M. (1993): *Water Rights in Rural New South Wales. The evolution of a property rights system*. CIS Policy Monographs 26, St. Leonards, NSW, Centre for Independent Studies.
- Tan, Poh-Ling (1999): Water Licences and Property Rights: the Legal Principles for Compensation in Queensland. *Environmental and Planning Law Journal* 16(4), 284–289.
- Thomas, G.N. (1984): Transferable Water Rights: A Horticultural Industries perspective – The Riverland Example, *Proceedings from the joint AWRC and AAES Seminar on Transferable Water Rights*, Melbourne. 65–84.
- Tuckwell, H.T. (1984): Transferability of Water Rights in South Australia, *Proceedings from the joint AWRC and AAES Seminar on Transferable Water Rights*, Melbourne. 65–84.
- World Bank, 1993: *Water Resources Management*. A World Bank Policy Paper, Washington: World Bank.
- World Commission on the Environment and Development, 1987: *Our Common Future*. Oxford University Press, Melbourne.
- Young, M.D. and McColl, J.C. (2002): *Robust Separation. A Search for a generic Framework to simplify registration and trading of interests in natural resources*. CSIRO Land and Water, Policy and Economic Research Unit, Adelaide.
- Young, M.; Hatton McDonald, D.; Stringer, R. and Bjornlund, H. (2000): Inter-State Water Trading: A TwoYear Review. Report to the Murray Darling Basin Commission, Adelaide CSIRO Land and Water.

Fig 1. Courtesy of URL: <http://www.nativefish.asn.au/ozrivers.html>

Fig 2. Courtesy of URL: <http://www.mdbc.gov.au>