

## **REGIONAL ADAPTATION IN A GLOBAL MARKET – THE CASE OF WATER INFRASTRUCTURE**

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**ABSTRACT:** Arid regions in Australia and the United States have adopted similar strategies to encourage settlement, and have experienced similar environmental and social problems as a result of implementation of those strategies. This article compares the development of irrigation infrastructure in the United States and Australia, using two small communities as case studies to highlight the temporal parallels up to the point at which Australian agricultural policy changed in the late 1960s and early 1970s. It considers the recent adoption by Australia of broadly market solutions to water resource management, and speculates on whether the United States will follow a similar route. It also tracks an evolving dissimilarity in farm policies during the same period: Australian farmers are subjected to market mechanisms in their domestic and export markets, whilst United States' farmers continue to be shielded from some of these pressures. The history of the development of irrigation in both countries indicates that there is a contiguity of issues and approaches; this article argues that a comparison of these histories provides a valuable assessment of the effectiveness of varying approaches.

**KEY WORDS:** Irrigation, regional development, water reform.

### **1. INTRODUCTION**

Australia and the western United States share a set of complex water management problems requiring resolution of competing interests, and a Federal system in which both State and Federal governments have interests in water. Water availability varies from prolonged drought to extreme flood (MDBA, 2009; Nicholls, 2004; cf Smith, 2004). Population expansion, naturally variable climates and an aging water infrastructure have concentrated attention on competing water uses and both jurisdictions have addressed problems of water transfer, typically to urban communities, both within and between catchments. Both Australia and the United States have

been compelled to redress consequences of historical water allocations on the environment in the context of rising consumptive demand.

A comparison will be made of two irrigation regions; Rochester, in Central Victoria, Australia, and Tumalo in Central Oregon, United States of America. Both are semi-arid inland regions which have a relatively small population base and are some distance from large urban centres. In both areas settlement, and later, irrigation, occurred as a result of aggressive government and private measures designed to settle inland regions. However, both share modern agricultural problems – a globalised sector, falling agricultural returns, rising inputs, increasing environmental regulation and compliance costs, and urbanisation.

This article examines the history of settlement and water conveyance, illustrating the close association of ideas in the American and Australian experience. The confluence of ideas has created a framework for a decline in agricultural fortunes, but there have been areas of social and political difference between the Australian and American experience. There is evidence of an increasingly ‘marketised’ environment for water, prompting its sale to urban communities, creating issues of ‘stranded assets’, and increasing infrastructure cost burdens on irrigators. Small irrigation districts are constrained by social, political and economic factors that render the user-pays model unlikely to succeed *for them*. In an economy in which commodity prices are not keeping pace with inputs and imports are artificially suppressed by subsidisation, small communities like Rochester and Tumalo are likely to continue their decline.

## **2. A TALE OF TWO TOWNS**

The precepts upon which Australia was settled drew upon American influences, and were affected by the participation of Americans, particularly in the development of the large irrigation schemes in northern Victoria (Rutherford, 1964, p. 88). These developments influenced the development of other parts of Australia. This is more than a coincidence of ideas. It manifests the tension between opening up the interior to settlement and the tendency of the bulk of the population to settle along the coast and in the cities (Keneley, 2001; Ingle Smith, 1998, p.143). There were varying motivations for closer settlement: social justice for selectors or returned

soldiers, incentives for army recruitment, increased revenue as a result of closer settlement, or 'homesteading' in the United States), or xenophobia (Keneley, 2001, Barr, 1999, p.45). Once settlers were on the land, it was expected, too optimistically, that they would become self-sufficient 'yeoman' farmers and not require government subsidisation or continuing commitment to infrastructure funding.

### ***Tumalo, Oregon***

Tumalo (previously Laidlaw) in central Oregon is located in the north central portion of Deschutes County, near Bend. It has a mean annual rainfall of 304 - 381 mm (12 - 15 in) and a mean maximum annual temperature of 15° C. The summers are generally quite warm, although the elevation moderates temperatures (Taylor, nd). Tumalo and Bend are classified as Dsb - Cold, with a dry, warm summer, but Deschutes is classified as Bsk (cold arid steppe) based on Peel *et al.* (2007).

The Federal *Homestead Act* 1862 first encouraged settlement by dry farmers around the 1880s, but the arid landscape requires irrigation for large scale agriculture. Currently the Tumalo Irrigation District serves around 155 square kilometres (60 square miles) with over 3 275 irrigated hectares (8 093 acres), serving 635 land owners (Tumalo Irrigation District, nd). The 2010 census showed its population to be 488 in the township itself (CensusViewer).

The early experience in the United States displays similar themes to those experienced in Australia, including State-sponsored settlement, attempts to leverage private funding of infrastructure and recognition of the economic and environmental costs of irrigation. A series of Acts providing Government subsidisation of the settlement of the western States, including the *Desert Land Act* in 1877 and the *Carey Act* in 1894, answered agitation for 'reclamation' of arid lands through irrigation projects. The elevation of President Theodore Roosevelt in 1901 gave further impetus to the development of the Jeffersonian ideal, and the *Reclamation Act* was passed in 1902. The Reclamation Service was established in that year, and in 1923 became the Bureau of Reclamation (US Department of the Interior, nd).

Oregon became a State on February 14, 1859. Measurement of water being appropriated did not occur for more than 45 years after that date (Bonney, 1964), but of course appropriations did occur - for irrigation, logging,

mining, mills, factories and municipal water supplies (Bonney, 1964). In 1891 use of water in the State for irrigation, livestock and domestic consumption was a declared public use (General Laws of Oregon, 1891 §1, p13). This made the use of water in a running stream a revocable, limited privilege to use public property dedicated to public use.

The first irrigation district was established in 1895. The Tumalo irrigation project had originally been managed by the Three Sisters Irrigation Company. Operating in the context of the *Carey Act* (1894), pursuant to which settlers could acquire 64.75 hectares (160 acres) of arid land if they irrigated 8.1 hectares (20 acres), the Company would finance water projects to serve land to farmers working on a Federal land grant. The State sought to administer the provisions of the *Carey Act* with no injection of public funds, so a self-sufficient project was attractive. The Three Sisters Irrigation Company claimed to have the capacity to deliver Tumalo Creek water to 4 047 hectares (10 000 acres) (Tumalo Irrigation District, nd). In 1902 the Columbia Southern Irrigation Company acquired the rights to Tumalo Creek's flow. In 1905 the State, using the figures provided by the company, certified that 4 719 hectares (11 660 acres) had been provided with sufficient water to raise crops, and Tumalo lands became the first of the *Carey Acts* patented to Oregon. However, the first 405 hectares (1 000 acres) to be settled had taken all available water and settlers formed the West Side Users Association to pressure the State Government to intercede (Tumalo Irrigation District, nd).

Under the prior appropriation doctrine, rights to water “attached and became vested in the order of time in which the water was applied to a beneficial use” (Bonney, 1964, p.297, citing *Hough v Porter* 1909). Whilst semi-arid States had initially adopted the common law of riparian rights they “switched to prior appropriation or dual appropriation-riparian systems in the late 19<sup>th</sup> century to promote irrigation” (Tarlock, 2000, p.881; Dellapenna, 1990, pp 51-55). Under the principle of prior appropriation, allocation of water rights occurs on the basis that the first person to put a specific quantity of water to beneficial use is allocated the right. “The user obtains a temporal priority, and in times of scarcity, the right to withdraw or pump water is curtailed in reverse order of the manifestation of an intent to appropriate’ irrigation” (Tarlock 2000, p.882).

Oregon's *Appropriation Act* of 1909 provided that “all waters within the

State may be appropriated for beneficial use” (General Laws of Oregon, 1909 ch 221). The Act set up the administrative superstructure for the regulation and control of the use of water – the Board of Control, later to become the State Water Board (Bonney 1964, p.296). However, for enforcement of priorities to work there must be information about use and streamflow, (Tarlock, 2000, p.882), and at the time of Tumalo’s settlement there were no limits or directions as to appropriations on a particular stream (Bonney, 1964, p.296).

The original privately funded irrigation company in Tumalo failed because the irrigation infrastructure was insufficient for irrigation requirements, and as a consequence irrigators could not sustain their mortgages and water fees. Around 1912 the State took control of the Tumalo project. Oregon appropriated *Carey Act* assistance to fund the Columbia Southern Irrigation Project to build a reservoir at Wimer Flat (Tumalo Irrigation District, nd). Around 1912, the railroad that had been expected to reach the town and revive its prospects bypassed it and was situated at Bend instead (Tumalo Irrigation District, nd). The projected population increase, which would have contributed to - and perhaps sustained - infrastructure costs, did not occur.

In 1914 a survey of the water resources of the Deschutes River and Central Oregon occurred. Waters of the Deschutes River were withdrawn for Bend township, and in 1929 Tumalo Creek was withdrawn from further diversion in acknowledgement of the recreational rights of the public (Bonney, 1964, p.298). In Tumalo irrigators agitated for more water and a water right. Between 1916 and 1925 they were issued irrigation bonds, purchased a storage right on the Deschutes River at Crescent Lake, and built a diversion dam on the Deschutes at Bend. They sought further colonization to help pay for infrastructure. However, the campaigns failed in the context of extremely low flows in the Deschutes and Tumalo Creeks.

The first adjudication of the Deschutes recognised 2 739 hectares (6 768 acres) of Tumalo lands as beneficially irrigated. However, the bond interest and operation and maintenance assessments remained unpaid. The Bureau of Reclamation recommended that government funds should not be expended on Tumalo lands (Tumalo Irrigation District, nd). Between 1935 and 1953 infrastructure continued to deteriorate, and the bondholders and the State were not repaid. In 1954 the Bureau of Reclamation agreed to rebuild the dam at Crescent Lake, with each irrigated acre obliged to repay the cost within forty years.

In 1953 the Oregon Legislative Assembly created the Legislative Interim Committee on State Water Resources. The committee was required to consider the various laws and authorities with responsibility over aspects of water resource management and make recommendations to address the uncoordinated laws. The increasing demand for water was noted as part of the Committee's findings, but it considered that Oregon had sufficient water resources for its future needs if water was appropriately administered. The State Water Resources Board was created in 1955 to meet the Committee's recommendation that a single agency administer a statutory State water authority (Bonney, 1964, p.303). The Board was to formulate the State water resources policy taking into account the policies that:

1. Existing rights and priorities were to be protected subject to the principle that all waters of the State belong to the public.
2. Water for human consumption should be protected.
3. Multiple use is to be preferred over single purpose uses.
4. Drainage projects should protect domestic supplies and wildlife.
5. Maintenance of minimum flows to support aquatic life and minimize pollution.
6. When proposed uses conflict, preference shall be given to human consumption and then to livestock (General Laws of Oregon 1955 ch.707 §10(3) summarised by Bonney, 1964, p.306).

The State Water Resources Board's inventory of projected demand recognised increasing demand from interstate. By comparison, in Tumalo irrigated farms are increasingly maintained by off-farm income. The district has continued to struggle with the cost of maintenance and improvement of infrastructure (Tumalo Irrigation District, nd).

The declining incomes of farmers in Tumalo are broadly consistent with international trends. However, unlike the trend in Australia, market reform to achieve competition outcomes has not been a priority. The Federal

*Agricultural Adjustment Act* of 1933, introduced in the context of drought and the Great Depression, reduced commodity supplies and raised prices paid to farmers by paying farmers to decrease the acreage planted in major commodities (Elliott, 2004, p.10). Commodity loans were introduced, enabling farmers to forfeit crops to the government, without repayment of the loan, if the floor price for the crop was not achieved on the market. These policies continued until the 1960s, and during the post World-War II period food aid exports also contributed to market protection. When global markets revived, protection continued in the form of two tier pricing systems that allowed farmers to export at world market prices, but subsidised domestic sales through direct ‘deficiency payments’ (Elliott, 2004, p.11). During the 1980s, the high American dollar, declining demand and increasing competition from the protected European farmers encouraged the adoption of export subsidies for American farm produce. The 1985 Federal *Farm Bill* used paid acreage set-asides to improve prices paid to farmers. The Export Enhancement Program was introduced in response to European subsidies. Non-recourse loans were replaced by marketing loans, under which “farmers could export stored commodities even when world prices were below the loan rate and the government would make up the difference” (Elliott, 2004, p.15).

The 8<sup>th</sup> round of multilateral trade negotiations conducted within the General Agreement on Tariffs and Trade (GATT) (the Uruguay Round) prompted the 1996 US Federal *Farm Bill*, which trended towards competition, but the decline in commodity prices prompted further protection and elements of the Bill were reversed within two years (Elliott, 2004, pp 12, 15). The trend against protection in both the Europe and the United States is partially linked to the high costs of maintaining the current system of protection, rather than the distorting effects of protection on world trade. Australia, with its much smaller economy, is not capable of providing similar levels of protection. The 2002 US Federal *Farm Bill*, whilst retaining some anti-protectionist elements, institutionalised other anti-competitive aspects. In addition, Congress reintroduced counter-cyclical payments in instances when commodity prices dropped below target levels (Elliott, 2004, p.17). The 2013 US Federal Farm Bill, the *Agriculture Reform, Food and Jobs Act* 2013 (S.954; 113<sup>th</sup> Congress) passed the Senate on June 10, 2013 and although it intends to cut spending, it will retain most subsidisation measures.

Despite protection of the agricultural sector, holders of agricultural water rights are experiencing significant pressure from a range of alternative uses. In addition to pressure from environmental use, American Indian Tribal uses, and hydropower, “rapid urban growth is forcing cities and developers to take a more aggressive role in water supply planning and acquisition as legislatures and courts impose new risk analysis mandates on them” (Getches and Tarlock, 2010, p.316). Unlike the Australian experience, however, the role of the Federal Government in the United States has diminished. As the Federal Government was the principle driver of reclamation era projects that encouraged development, the reversal of the supply augmentation trend also signals a shrinking Federal role (Getches and Tarlock 2010, p.318). Conversely, urban development is continuing in areas with naturally variable and unreliable water supplies, particularly in the western States. Reallocation of water from irrigation to urban uses

“increases the demand for water transfers, especially from existing to new uses ...[and] many of these transfers will be extremely controversial because they threaten to disrupt established economic and cultural patterns, stress ecosystems, and raise long-standing fears about the monopolization of water” (Getches and Tarlock, 2010, p.321).

Despite significant transfers to date, however, the United States has not implemented marketisation of water on the scale or with the political will experienced in the eastern States of Australia.

### ***Rochester, Victoria***

Rochester has a mean annual rainfall of 441.7 mm (17 inches) and a mean maximum annual temperature of 21.3°C (Australian Bureau of Meteorology, nd). It is part of an arid climate zone based on Peel *et al.* (2007), who assesses the climate as Bsk (cold arid steppe), abutting a temperate zone to the east of Rochester. Australian Bureau of Statistics figures for the urban centre level in 2011 had its population at 3 136 (ABS, 2011). The Rochester irrigation district supplies 1 733 irrigators with a volumetric entitlement of 170 601 ML. Until recently the Campaspe Irrigation District supplied a

further 162 irrigators with a volumetric entitlement of 18 112 ML. The Rochester district is part of the vast system of the Murray Darling Basin occupying one seventh of Australia's land mass. Water availability in this huge system is low and variable. Natural flows may be strong after seasonal rain, but low to non-existent in prolonged drought (Walker, 1985, p.117). River water quality is affected by salt leached from relictual marine deposits (Walker, 1985, p.120; Clark, 1983, p.124). Australian rivers carry a heavy washload (Walker 1985, p.119). These combined limitations have reduced the amenability of the land to settlement (Willmot, 1987).

Major rivers were first regulated to meet the demands for river transport, then to provide water supplies in urban and rural areas. This has social and economic benefits: river flows are no longer as low as they were previously during drought, and flooding does not occur as often during wet periods (Barr, 1999, p.51). Environmentally, however, the effects of regulation include the disruption of flows and sedimentation downstream due to the construction of dams, long term siltation and consequent aggradation upstream of dams, bank erosion in the first few years after regulation, and some indefinite sedimentary redistribution, salinity, reversal of peak flows (naturally peak flows are in winter; when regulated peak flows occur in summer), and the potential for temperature fluctuations and the transfer of biota due to inter-divisional transfers (Walker, 1985, p.112). Native species reliant on flooding or drought events have been compromised.

The Rochester Irrigation Area is serviced by Goulburn-Murray Rural Water Corporation, (trading as Goulburn-Murray Water), which is empowered to provide, manage and operate an irrigation district (*Water Act 1989 (Vic)* s.221), a water district (*Water Act 1989 (Vic)* s.163), and a waterway management district (*Water Act 1989 (Vic)* s.189). It operates water-related services across 68 000 square kilometres of Victoria, involving 70% of Victoria's stored water. Rochester is largely surrounded by irrigated farmland serviced by the Waranga Western Channel, sourced from the Waranga Dam, coming from Eildon Dam, all of which are part of the Goulburn System and administered by Goulburn Murray Water. The Rochester Irrigation District serves the irrigation properties around Rochester. Up until recently Campaspe Irrigation District farmers diverted from the Campaspe River, supplemented by irrigation transfer from Lake Eppalock to Campaspe Weir. Lake Eppalock is also a supplementary water supply for the City of Bendigo. Goulburn Murray Water is entitled to 82% of the capacity of Lake Eppalock,

and has primary management control of the dam, whereas Coliban Water (which manages the Bendigo water supply) is entitled to 18%. It is possible that the small size of the Campaspe system, along with the ease with which the water could be conveyed to urban use, made it a natural choice for closure, and the system was decommissioned over the 2010-2011 irrigation season (GMW, 2010).

In Victoria, the political imperative to open the land to settlement was mediated by a series of Acts through the nineteenth and twentieth centuries. The characteristic of alienation of Crown lands from the earliest days of the Colony was the strong emphasis on settlement. After the separation of the Colony of Victoria from New South Wales on 1 July 1851, the New South Wales laws applying to the sale and occupation of Crown lands continued in force in the State of Victoria until they were altered by the new Victorian legislature. That didn't occur until the *Sale of Crown Lands Act* 1860 (Vic) (the *Nicholson Act*) (Survey Practice Handbook 1994, p.68) which enabled selection of allotments between 32.4 and 259 hectares (80 and 640 acres) at one pound per 0.4 hectares (one acre). However, this system of selection became less palatable as miners left the diminishing returns of the gold fields and turned to agriculture. The Act was amended by the *Sale and Occupation of Crown Lands Act* 1862 (Vic) (the *Duffy Act*) which sought to address this perceived weakness and make property available to "tenant farmers, farm labourers" in "defined and extensive districts, rather than in isolated or scattered portions" in larger allotments (Survey Practice Handbook, 1994, p.69). Conditions of the leasehold moieties were the requirement of cultivation of one-tenth of the area, erecting a habitable dwelling or enclosing the area with a substantial fence. These could be avoided, however, by immediate payment of purchase money, thus obtaining freehold. The *Amending Land Act* 1865 (Vic) (the *Grant Act*) sought to address the perception that the system thereby gave preference to affluent selectors. This required that land had to be held under leasehold, which could not be made freehold until after three years, and improvements amounting to the value of one pound per acre had to be effected (Survey Practice Handbook, 1994, p.70).

The *Land Amendment Act* 1869 (Vic) established a system of licensing for allotments of at most 129.5 hectares (320 acres). Conditions of fencing, cultivation and residence applied, and on satisfactory compliance the

freehold could be claimed by purchase. Licensing occurred through a system of public hearings at which evidence was submitted by applicants, and a recommendation made by a Local Land Board. The Act placed restrictions on further acquisition by those who had already obtained land, and placed a limit on disposal of further lands. Under the more liberal rules of the 1869 Act the population of the Rochester district grew, but the absence of reliable water beyond the rivers made farming tenuous.

The *Land Act* 1884 (Vic) provided for the division of remaining unalienated land into eight classes: pastoral lands, agricultural and grazing lands, auriferous lands, lands which could be sold by auction, swamp lands, State forest reserves, timber reserves and water reserves. Acreage and conditions of licences depended on classification. Alienation of State forest, timber reserves and water reserves was prohibited. Agricultural and grazing land, however, could be licensed in areas of, or not exceeding, 129.5 hectares (320 acres). Conditions included residence and improvements and liberalised the conditions for acquisition of agricultural lands. There were other region specific measures: the *Mallee Pastoral Leases Act* 1883 (Vic) and the *Mallee Lands Act* 1886 (Vic) made specific provision for the selection of the marginal Mallee lands. The *Settlement of Lands Act* 1893 (Vic) provided for the allocation of Crown lands for communities.

In 1898 the government of the day sought to remedy the “past recklessness, profligacy and extravagance [of land legislation which had] resulted in the creation of large estates” (Second Reading Speech on a Bill to amend the *Land Act*). They sought to “encourage closer settlement ...with the interventionist proposition of the home maintenance area” (Crase *et al.*, 2004, p.41) based on the proposition that a family required a certain amount of land to support themselves – depending on the nature of the land and the availability of water. The *Land Act* 1898 (Vic) subdivided the previously created classification of agricultural land into ‘good agricultural or grazing land’, ‘agricultural and grazing land’, ‘grazing land’ and ‘pastoral land’ (large areas). The size of agricultural blocks and the price reflected the variable land quality.

Water policy experienced parallel development, but Victorian water policy diverged from United States policy in significant ways. Its architect Alfred Deakin had travelled extensively in the United States and the recommendations of the Royal Commission on Water Supply which he chaired formed the basis of water administration in Victoria. The

Commission developed several innovations as a result of what were perceived to be weaknesses in the systems of the western United States.

At the inception of the irrigation schemes in Victoria, the private model was adopted for the development of infrastructure. The *Water and Conservation District Act 1880 (Vic)*, which was part of the platform of the re-elected O'Loughlen government, was a reaction to the state-wide droughts of 1877-81, and a recognition that the provision of secure water involved major infrastructure works. The Act provided that local councils could work together to plan water infrastructure, State approved schemes would be eligible for government loans. The United Echuca and Waranga Waterworks Trust was established under the provisions of the Act in 1882 and sought the creation of a channel along the lines of an abortive 1871 proposal for a North-Western Canal. The works of the trust included: the Goulburn Weir at Nagambie, started in 1887; the Waranga Reservoir, surveyed before 1890 but not commenced until the impact of a drought in 1902 prompted funding; and the construction of the Sugarloaf (Eildon) Weir just below the junction of the Goulburn and Delatite Rivers.

An 1882 amendment to the *Water and Conservation District Act 1880 (Vic)* was designed to apply the same principles to the development of infrastructure for irrigation. It enabled the formation of irrigation trusts, avowedly with the intention of preserving life and increasing agricultural yield and providing water security (Ingle-Smith, 1998, p.151).

By 1900 nearly ninety irrigation trusts had been formed in the Rochester district, including: the Campaspe Irrigation Trust, which was responsible for construction of Campaspe Weir; the Torrumbarry North Trust, formed in 1889 to pump water from the Murray to irrigate contiguous lands; and the Millewa Irrigation Trust, formed in 1890 to irrigate Ballendella, Bamawm and Millewa (Rochester Centenary Celebrations Committee, 1954). However, unlike the waterworks trusts the financing of these trusts were to be a local responsibility, with the purported effect of encouraging self-reliance, self-support and independence, and to discourage reliance on Government.

The irrigation trusts could not collect sufficient revenue to meet interest and maintenance costs and the infrastructure fell into a state of disrepair. Trusts borrowed heavily, and when the banks crashed in 1893 “they faced insolvency and a legacy of debt” (Barr 1999, p.8). Legislation in 1885

empowered the government to make loans available to them on the same terms as were originally allowed to the waterworks trusts. In 1899 the Turner government passed the *Water Supply Advance Relief Act 1899* (Vic), in recognition that the trusts would not become solvent (Barr 1999, p.8).

The Water Supply Department (later the State Rivers and Water Supply Commission) was formed in 1886. A report to the Government of the day recommended that the supply of water to the area along the lines proposed by the United Echuca and Waranga Waterworks Trust be regarded as a National Work. However, the Government had learnt from the experience of the trusts: to ensure the return on their investments, farmers would not have the choice to take the water or leave it. Water rights were fixed and were attached to the land, and a water right had to be paid for, whether the water was used or not. These principles have applied to the provision of irrigation water up until the *Water Act 1989* (Vic) largely constraining the creation of a market for water until recent reforms.

In the 1890s, water failed altogether, and the Australian constitutional conventions took place in the context of the ‘federation’ drought, which continued from around 1895 to 1903. Water was a significant issue, and the American experience was drawn upon in several respects – largely negative. In his analysis of the drafting history of s.100, Chief Justice French, cites Inglis Clark’s critique of the 1897 draft Constitution, which “referred to decisions of the courts of the United States establishing that Congress had power to legislate, under the commerce power in the United States Constitution, with respect to the use of all the navigable rivers as highways for commerce between those States or with foreign countries” (*Arnold v Minister Administering the Water Management Act 2000* [2010] citing Williams, 2005, p.706).

The experience of the federation drought prompted agitation for infrastructure to preserve water in periods of flood to deliver water beyond the immediate environs of the river in times of drought. A storage at Gunn’s Swamp (Waranga Lagoon) had been rejected in 1856 because of insufficient settlement in the area (Thomas 1979, p.30), but by 1910 the Victorian Government was actively pursuing an immigration policy, attracting settlers from England and America by issuing booklets advocating settlement in the Rochester and Cohuna Districts. The western States in America provided a model for closer settlement policy, and a number of expatriates helped form significant parts of the Australian system. The Chaffey Brothers, although

Canadian, had been instrumental in the Santa Ana River Irrigation Settlement in California, and tried to import this to the Mallee scrub around Mildura and Renmark, seeking Crown grants of land to replicate their success. American Elwood Mead became the first chair of the Victorian State Rivers and Water Supply Commission in 1907. He had previously been a State engineer in Colorado and Wyoming, and then worked for the Department of Agriculture in California.

However, even in the context of State advocacy for large infrastructure schemes, the need for closer settlement to fund infrastructure development was still experienced by smaller communities. ‘Closer’ settlement in Australia was first considered necessary by Governor Macquarie (1809 – 1821) based primarily on the view that large landholding discouraged genuine settlement (Connors, 1970). In Victoria early schemes involving dryland were administered by the Closer Settlement Board, later the Closer Settlement Commission. The State Rivers and Water Supply Commission administered irrigable lands: Closer settlement schemes followed each of the world wars as Soldier Settlement Schemes. The loss in 1913 to Bendigo of a direct rail link to Melbourne was seen as an attempt to make Rochester ‘subservient’ to Bendigo (Thomas, 1979, p.44). The dominance of urban interests in the development of infrastructure was reportedly a feature of development (Thomas, 1979, p.45).

The formation of the Rochester District Irrigators’ League was primarily motivated by the failure of water in 1914. This occurred when, against the advice of the then Chairman of the Water Commission, the channel from the Waranga Basin in the Goulburn system was extended to supplement supply to Loddon irrigators placing greater demands on Goulburn storages. The League sought the construction of further storages and the reposing of responsibility for water rights in the Commission. In these efforts the League was successful; the construction of Eildon was brought forward, and the Commission took on responsibility for water supply.

Agricultural policy in the period after the second world war was largely directed towards expanding production, with the objective of improving Australia’s balance of payments in the context of fixed exchange rates, which continued until the early 1970s (Miller, 1979, p.3). Measures adopted during that time, aside from water and land resource development schemes, included “a mixture of direct incentives to farmers (tax concessions, input subsidies

and investment allowances), ... and price support and stabilisation measures” (Miller, 1979, p.3). During this period the American influence continued. David Lilienthal, the Chair of the Tennessee Valley Authority was influential in the post-war development of rural policies, particularly those of decentralisation, regionalism (Steiner, 1983, p.446) and programs to enhance ‘grass roots’ development (Ekbladh, 2002; Voth, 1994-95). The Soldier Settlement Schemes were a feature of this policy, but Soldier Settlement Schemes after World War 1 are largely considered to have been a tragic failure. A Royal Commission concluded that returned soldiers were stymied by a range of factors, including the inadequate size of the blocks provided and their own lack of capital and lack of experience (*Royal Commission on Soldier Settlement* 1925). Nevertheless, the scheme was revived after World War 2, under the *War Service Land Settlement Agreement Act* 1945 (Vic). Dryland farms were allocated around Rochester, and new irrigated blocks were allocated in the Goulburn-Murray irrigation region.

Only a decade after the last soldier settlement schemes (*Royal Commission on Soldier Settlement*, 1925) and around the same time as the Rochester scheme, the process of mediated depopulation (‘rural adjustment’) began. This was part of a shift in policy direction in recognition that previous schemes which had been intended to provide income stabilisation were ineffective in achieving the policy goals to which they were primarily directed: although they may have stabilised commodity prices, they could not control the cost of input commodities and production variability. The Rural Adjustment Scheme was first formed in the 1960s, and sectoral approaches to rural depopulation and farm mergers to ameliorate rural poverty occurred: for instance, the *Marginal Dairy Farms Reconstruction Act* 1970 (Cth); *State Grants (Rural Reconstruction) Act* 1971 (Cth) and the *Rural Reconstruction Act* 1972 (Cth). Income Stabilisation Deposits were introduced with the objective of allowing farmers to stabilise their own incomes, and price policy shifted to “the more limited objective of reducing some of the uncertainty farmers face because of the prospect of substantial price declines” (*Royal Commission on Soldier Settlement* 1925). Rural Adjustment Schemes were intended to “assist farmers to adjust to changing economic conditions rather than attempt to fight against them” (*Royal Commission on Soldier Settlement* 1925). Attempts to integrate farm and regional policy were abandoned and regional policy was developed as an area separate from farm policy. The difficulties faced by farmers in relation to other, subsidised areas of the

economy were addressed by the Director of the Bureau of Agricultural Economics thus:

Efficient, justifiable farm policies are probably the most effective weapon for ensuring that the farmers' case against assistance being given to other sectors at their expense is heard. In the end, having the strength to cope with the forces of economic change is far more important to an industry's long run prosperity than the static benefits and costs of government subsidies and tariffs (*Royal Commission on Soldier Settlement*, 1925).

During the 1980s and 1990s there was a collapse in international commodity prices (Rees and McGovern, 2004) and low farm incomes overseas were recognised as a policy problem in Australia. However, the prevailing agenda in Australian policy continued to be premised on microeconomic reform intended to enhance free competition. This was institutionalised by the national *Competition Policy Reform Act 1995* (Cth), based on intergovernmental agreements on Competition Principles, a Conduct Code and an Agreement to implement reforms. In 1997 the Rural Adjustment Scheme was radically overhauled, and a policy advocating reliance on market mechanisms was introduced, overtly raising 'the relative importance of efficiency over equity' (Barr, 1999) and reflecting a long term political ideology within government and the public service (Pusey, 1992). This was despite the 1995 ratification of the World Trade Organisation Agreement on Agriculture which "established a system of managed international trade for agriculture rendering irrelevant Australia's domestic policy direction based on a free trade agenda" (Rees and McGovern, 2004, p.2). In the water sector, this political ideology has been reflected in the corporatisation of water supply authorities and a pressure on supply authorities to obtain full cost recovery and to generate a return on capital (Reynolds and von Nessen, 1999, p.117).

### 3. THE LEGAL FRAMEWORK FOR WATER ADMINISTRATION IN AUSTRALIA AND THE UNITED STATES

Each of the States in the United States has the authority to determine how water will be allocated and administered (Amos, 2006, p.1241-42; Wood, 2008, p.247). Amos notes that “[s]tate control over waters originated under the equal footing doctrine which provides that the federal government, held in trust for the States, beds of navigable waters” (*Shively v Bowlby*, 1894). Upon entering the Union, title for the beds of navigable waters passed to the individual States for the benefit and trust of the people of the State’ (*Ill. Cent. R.R. Co. v. Illinois* 1892). Western States’ allocations occurred according to the doctrine of prior appropriation which “allows the first user, established by priority dates, to retain a right to water if it is used for a specific ‘beneficial use’. These beneficial uses are determined and defined by State law” (Wood, 2008, p.247). However, they would generally be agricultural, household or industrial use. Environmental uses were not initially regarded as beneficial use, although in some cases this has been altered by case law or legislation. Other States had little water law aside from the riparian doctrine arising in common law, however, modern patterns of settlement have contributed to water scarcity and disputes with neighbouring States over water resources (Dellapenna, 2004, p.305). Federal rights to water in the United States can arise when the federal government “reserves or acquires land for some particular purpose, [and] a certain amount of unappropriated water necessary to achieve the purposes of the federal land designation is implicitly reserved” (Wood 2008, p.248). Federal reserved rights generally ‘trump’ State prior appropriation rights (Wood, 2008, p.248). This is generally the case because the priority date for a Federal reserved right is the date the Federal reservation was established. It is possible that the state prior appropriation right may be senior to the Federal reserved right.

In Australia, the legislative power over water and the environment lies primarily with the states. Having the advantage of the experience of the United States’ approach to water administration, delegates to the Australian Constitutional Conventions considered reposing legislative authority for water in the Federal Government. It was argued that water should be conceded to the common use of the nation, rather than to the exclusive use of a State (for instance, *Official Report of the National Australasian Convention Debates (Third Session)*, 1898, p.33). However, the Australian Constitution

emphatically reposed power over water in the States, and by s 100 minimised Federal intervention.

Victorian water law was developed following a Royal Commission on Water Supply chaired by Alfred Deakin. His extensive enquiries into different models of water management, particularly in the United States of America, prompted the Royal Commission to make the recommendation that “[i]t is essential that the State should exercise supreme control of ownership over all rivers, lakes, streams, and sources of water supply, except springs rising upon private lands” (*Royal Commission on Water Supply* 1885). The Royal Commission also recommended that the State should dispose of water to those desiring to irrigate, to encourage the greatest possible utilisation of the water on the largest possible area, but that there should be unity of title to water and land (see generally Clark and Renard, 1970). The *Irrigation Act* 1886 (Vic) was based on these premises and the premise that the rights of individuals and the State should be properly defined so that costly litigation would be avoided (Clark and Renard, 1970, p.487). Thus, the original legislation and subsequent Acts vested water in the Crown in right of the State (Rochford, 2004). However, in irrigation districts the State allocated water rights to land according to formulae which altered depending on the settlement priorities at the time and the capacity to trade in water existed only insofar as the land was traded. The statutory rights of a Victorian irrigator, therefore, had features common to those in other States: a conditional right to access water, rather than an ownership right, grants for certain users for designated use, defined either by the amount of land to be irrigated or by a volumetric entitlement, generally tied to the land, capable of suspension during periods of water shortage, and generally not tradeable. The duration of the licenses varied both within and between States (Garry, 2007).

The Victorian administrative arrangements for water could not, however, survive the federalisation of water resources developing alongside an increasingly homogenous water policy. The dominant tendency of water management over the past few decades has been the continuation of the national competition policy reform to introduce market mechanisms to the administration of water resource management (Rochford, 2008).

Homogeneity of water administration was the inevitable consequence of State and Federal government endorsement of Productivity Commission Reforms. In addition, the Commonwealth, States and territories have entered

into several key pieces of water related agreements, including the National Water Initiative and the Council of Australian Governments Water Reform Framework 1994. Inter-jurisdictional agreements are given effect by State legislation. In addition, States have committed to the Murray Darling Basin Commission Cap on Diversions from the Murray-Darling Basin. The Federal government also can – and does – exert significant influence through funding arrangements. The payment or non-payment of tranche payments as part of Council of Australian Governments (CoAG) agreements and the availability of Federal funding for major infrastructure works are typical negotiating tools.

Despite its limited Constitutional authority, the Federal government can exert legislative power over water through more circuitous means and has done so with the *Water Act 2007* (Cth). Section 11 has the effect that if any provision of the Act which would contravene the restrictions in s. 99 – on interstate trade – and s.100 of the Constitution it is to be interpreted so that it does not do so. In addition, States have referred their powers to the Commonwealth pursuant to paragraph 51(xxxvii) of the Constitution, and the *Water Amendment Act 2008*, detailing amendments pursuant to that referral, deal with, inter alia, the requirement for a Basin Plan to deal with critical human needs, state water sharing arrangements, water market rules and water charges, including charges for infrastructure.

#### **4. THE MARKET PARADIGM**

The market paradigm remains dominant in rural water provision in Victoria, as in the rest of Australia. The ubiquity of market mechanisms in Australian natural resource management is a result of the dominance of ‘co-operative federalism’, with a recent segue into ‘financial federalism.’ According to this approach, Federal and State governments commit to a program of reform mediated by payments from the Commonwealth government to compliant States. The overall tenor of reform as it relates to irrigators has been the introduction of market mechanisms by which, theoretically, water will move to the most efficient use (ENRC, 2001, p.221), although the effectiveness of market mechanisms to deliver these goals is the subject of debate (Warner and Gerbasi, 2007; Trawick, 2003).

In recent years the State has been attempting to reduce irrigation infrastructure through a variety of mechanisms. There are several reasons for

reduction of services. The most potent justification is the over-allocation of water from rivers and the resulting environmental damage. However, the environmental problems have been overshadowed by increasing urban consumptive water use and a long period of reduced inflows in catchments servicing both irrigation and non-irrigation areas. There are a number of other reasons for reduction of the extent of irrigation infrastructure: it is expensive to maintain, and on a user pays basis, on various costing models, water delivery to irrigators cannot compete on a market basis with water delivery to urban areas.

The introduction of a market for water has developed to a reasonably advanced state in Victoria, (Hughes and Gebbies, 2000, p.47; Bjornlund and McKay, 2001; Dumsday and Fraser, 1996). The market reforms, following Coase's case for voluntary market solutions for public goods (Coase, 1960), are based upon a system of property rights, an open and fair bargaining framework based on complete information, and an adjudication process.

The first of the key market-enabling shifts that has occurred over the past three decades has been the separation of water from land to enable water to be traded separately. More recent Victorian legislation has made alterations to the fundamental connection between water and land. In relation to northern Victorian water authorities, unbundling of water products has occurred. As a result of the provisions of the *Water (Resource Management) Act 2005 (Vic)*, which amended the *Water Act 1989 (Vic)*, existing water rights in declared irrigation districts were converted into water shares, delivery rights and water-use licences. It is possible for the irrigator to trade the actual water share, but the infrastructure access fee would still be payable, unless the irrigator surrenders it, paying a termination (exit) fee which was originally set at a fixed multiple of the infrastructure access fee. This is intended to ameliorate the burden on the remaining irrigators to sustain the infrastructure, but it constitutes a serious burden on the property and a potential disincentive to property buyers.

The largest irrigation water supplier, Goulburn-Murray Water, imposed 'basin pricing' strategies in 2007, with the intention of recovering from customers the cost of water harvesting and storage services (GMW, 2008). Separate registration of water share details was enabled on 1<sup>st</sup> July 2007. Water Rights shown on registers as being associated with particular land as at that date became separately tradeable as water shares. The reforms have

reposed in irrigators an altered form of water entitlement. What was previously called a ‘water right’ now amounts to a set of ‘unbundled water products’.

Reconfiguration of irrigation infrastructure was part of the structural adjustment built into the Victorian strategy for governing water resource use. Infrastructure was ‘rationalised’ through a number of mechanisms, including upgrading or piping channels, repairing leaks, improving on-farm infrastructure and replacing defective water meters. During the implementation of reconfiguration strategies, pressure arose to demonstrate water savings through the reconfiguration process, in order to return water to rivers. Subsequently the continuing drought necessitated more aggressive political responses to the threat of water shortages, particularly in urban communities, increasing pressure to find water savings which could then be ‘transferred’ to urban authorities. In addition to reconfiguration, a modernisation program was implemented in some districts, replacing open channels with piped systems or lined channels, replacing Dethridge meters with Magflows or Flume Gates, and in some cases implementing total channel control. Many irrigators were amenable to negotiated reduction or privatisation of infrastructure, or closure of infrastructure altogether. Irrigators wishing to adapt to increasing water shortages by exiting the industry are able to do this by accepting a negotiated settlement. This process is partially funded by ‘water savings.’ Some of the modernisation proposals may have the effect of bringing all irrigation infrastructure back to the ‘trunk’ – in other words, maintaining and modernising main channels, and privatising the pods, or even the trunks. This will effectively circumscribe areas of irrigated agriculture to those clustered around the main channels. However, the modernisation programs have coincided with piping projects which aim to deliver water to urban centres in other catchments. The ‘superpipe’ which feeds water from the Goulburn system to the goldfield towns of Bendigo and Ballarat was followed by the ‘Foodbowl’ Modernisation Program (Northern Victorian Irrigation Renewal Program – NVIRP) which diverts water from the Goulburn Valley to Melbourne through the Sugarloaf pipeline. This politically sensitive project was intended to supplement Melbourne water supplies (Hunt and McKenzie, 2007, p.1; Hunt, 2007, p.3; Kerin, 2007, p.19; Kleinman, 2007 ), but is premised on ‘saving’ water through infrastructure investment, thus creating ‘new’ water. The Productivity Commission notes that:

“water ‘savings’ associated with indirect purchases can be illusory. That is, measures to reduce system losses actually divert water from other beneficial uses, elsewhere in the system, that rely on return flows ...Transferring entitlements out of the system based on illusory water savings can therefore ‘double up’ losses in return flows” (Productivity Commission, 2008, p.78).

The Victorian Auditor-General has also criticised the expedition with which aspects of the project have been carried out, finding that decisions to invest \$AU2 billion in irrigation projects were poorly informed (Auditor-General’s Office, 2010). The Audit examined the planning processes for both the Foodbowl Modernisation Project and the Sugarloaf Pipeline, and found that the projects were commenced prior to the completion of a business case, that there was little management information to enable the projects to be assessed, and that processes had not been developed to determine whether the projects were meeting objectives. The Report did not assess the outcomes of the two projects, which are to be the basis of a later Audit.

There are a range of potential third-party effects of these processes such as the reduction in return flows that will be particularly relevant in water diversion to Melbourne, out of the Murray-Darling system altogether (Productivity Commission, 2008). However, the major projected outcome of these reforms will be the ‘exit’ of water from some irrigation districts or parts of irrigation districts. This has already been indicated by the imposition of different rules for the ‘backbone’ infrastructure and non-backbone infrastructure. The ‘backbone’ as currently conceived is clustered around the main carriers and channels and spurs off the main carriers which have a minimum ‘delivery share’ attached (NVIRP nd). Those channels and ‘pods’ which do not have the required delivery share will have to ‘connect back’ to the backbone on a ‘connections program’ the techniques and costs of which are negotiated on a channel by channel basis.

The increasing alternative water uses, the costs of maintaining water infrastructure, the pressures of ongoing reform, and successive droughts will have an impact on irrigation districts, some of which will consider it more rational to trade their permanent water supplies altogether. The decommissioning of the Campaspe Irrigation System is an illustration of this. A survey of farmers indicated that 75% would “exit irrigation, after

struggling through zero percent water allocations for four of ... five years” (Little, 2010). Those choosing to exit would “transfer their water shares to the Federal Government, terminate all delivery shares and receive an adjustment payment” (Little, 2010).

## **5. LESSONS FOR THE UNITED STATES**

The deployment of market mechanisms to mediate natural resource management issues is well-advanced in Australian jurisdictions, and in its application to water policy it has the capacity to deliver substantial changes to rural communities over the next few years. As the pool of available water is reduced, and water allocations are thus diminished, the capacity of irrigators to justify the purchase of a reduced entitlement to maintain their farming enterprise becomes increasingly limited. Efficiency offsets for those acquiring water entitlements cannot deliver the benefits of the increased costs. Thus, water will move to the more efficient user – the party or program that can build and maintain the infrastructure and sell the water at a price which will justify the purchase. Governments are relying on the invisible hand of the market to deliver efficiency gains.

Marketisation of water resource management is also one of the tools to be employed in the United States. The incentives to make environmental and technological advances in irrigation delivery had only recently begun to emerge and there has been recognition that artificially suppressing the price to irrigators of their water was resulting in a lag in innovation and that “over time, existing uses will experience increasing pressure – in the form of prices, regulation or incentives – to increase irrigation efficiency” (Commission on Geosciences, Environment and Resources 1996, p. 172).

It has also been noted that States would have to establish mechanisms to facilitate the voluntary transfer of water (Commission on Geosciences, Environment and Resources 1996, p. 172) and that water now used for agriculture would have to shift to ameliorate environmental conditions (Commission on Geosciences, Environment and Resources 1996, p. 177). Tarlock notes that competing interests that must be accommodated within the water allocation regime include “large and growing cities, traditional consumptive and non-consumptive users, Native American claims, and the restoration of degraded aquatic ecosystems and the maintenance of healthy ones” (Tarlock 2000, p.884). The tendency towards predominantly market-

mediated transactions in water appears to be set. However, this will meet with the pressures characteristic of the Victorian experience – the problems of stranded assets, diminishing rates bases, infrastructure decline, rising maintenance costs, and the increasingly beneficial (in market terms) transfer of water to the more affluent municipalities. Glennon notes that “[b]etween 1987 and 2005, there were 3 232 sales or leases of water rights in the twelve western states, involving a staggering 31 million acre-feet of water [25 142 GL].” He notes that although the largest number of transfers is between farmers, the largest amount of water is transferred from farmers to cities.

[T]he water for new demands ...will mostly come from agriculture, because farmers use 70 to 80 percent of each state’s water. ...The economic value of this water for municipal and industrial uses dwarfs the value of the same water to farmers (Glennon 2009, pp 273, 276).

He notes that the reason that irrigation remains unviable in the market for water is the very low cost of food comparatively. However, he asserts that a market for water will not exacerbate the problem shared by most agricultural communities, and specifically those in the United States and Australia, because farmers adjust to using less water by becoming more efficient.

However, as in Australia, irrigation infrastructure in the United States is aging and expensive. Although farming is subject to a higher level of subsidisation in the United States than in Australia, the ongoing decline in commodity prices and the decline in rural population are likely to continue, reducing the necessary revenue base for both private infrastructure providers and public utilities. Accordingly problems of stranded assets, declining rate bases and increasing costs are likely to be experienced with the marketisation of water resources in the United States.

## **6. CONCLUSION**

Water policy in Australia is history in the making. It is also the product of history and provides historical lessons. The history of irrigation development in Australia and in the United States illustrates the following commonalities:

1. Both Australia and the United States attempted private infrastructure development without success, because of the inability to sustain infrastructure revenue in periods of drought and because of the necessity for large infrastructure projects in highly variable climates;
2. Infrastructure development has enabled expansion of irrigation to marginal areas. This has been considered by some to be problematic because of the reducing contribution of agriculture to the national economy – a particularly dominant view in Australia, but also asserted in the United States – however, agricultural production from these regions was of critical importance at various times in both countries’ histories, and to a degree still is;
3. Infrastructure development has other benefits, such as flood mitigation and non-consumptive use, such as tourism;
4. Marketisation of the water sector is a dominant paradigm in both Australia and the United States, although in Australia it currently has most purchase;
5. Low commodity prices and falling returns in the agricultural sector have been a theme across both systems – and across the world. To a degree falling rural incomes have been ameliorated by government assistance; however, in Australia assistance has been virtually eliminated. Federal drought assistance has been criticised as being ‘wasted on inefficient farmers’ (Gray 2008) and the Productivity Commission has argued that Australian farmers are able to manage drought without assistance (Productivity Commission, 2009). Government recognition of the inherent variability of the Australian climate (Hennessy *et al.*, 2008) and assessment of the social impact of drought (Commonwealth of Australia, 2008) has resulted in a commitment to the restructure of drought relief to provide assistance to manage risks. A pilot drought relief scheme has been instituted in Western Australia (DAFF nd).

6. The reducing value of agriculture to the economy in both countries makes government assistance problematic, and reduced government assistance diminishes capacity to pay water costs;
7. Reduced return per volume of water because of falling commodity prices makes transfer of water to other uses – particularly urban use – attractive.
8. Reduced water in an irrigation system threatens remaining users' viability because of the problems of stranded assets and increasing per-capita costs on infrastructure maintenance.

The market solution appears to be an attractive alternative because it allows water to be reallocated to other uses, some of which are critical, and many of which are currently suffering from water scarcity. However, the history of infrastructure development indicates that privately maintained infrastructure, particularly on the scale necessary in Australia and the United States, is unviable.

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