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The Fluctuating Political Appeal of Water Engineering in Australia

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ABSTRACT: Like many nations, Australia has a mixed history with water engineering. For over a century the engineer was 'king' and water was harnessed as a vehicle for settling the harsh inland, creating wealth and building prosperity. By the 1960s it was becoming increasingly clear that this approach was not without its flaws. Mounting evidence of environmental degradation emerged in the 1970s and the trend towards fiscal responsibility in the 1980s subjected the engineering approach to even greater scrutiny. These events set the context for a series of water policy reforms that commenced in earnest in the early 1990s. Initially, the reforms favoured greater use of economic incentives and focussed attention on the ecological impacts of water management. In this environment, the status of the engineer was transformed from 'king' to 'servant'. However, the engineering profession was not to hold this status for long and the political difficulties of simultaneously dealing with the economics and ecology of water quickly became the rationale for reverting to engineering solutions. This paper traces these historical events and focusses specifically on the politically vexing issues that arise when water reallocation is attempted in a fully allocated basin.

KEYWORDS: Water policy, public policy, engineering, allocation, Australia

INTRODUCTION

Australia's water resources are highly variable in temporal and spatial terms. The expansive continental land mass covers tropical regions in the north to more temperate zones in the south while the inland is generally arid and frequently subject to droughts. These characteristics are not new and despite improvements in the knowledge of the fragility of water resources in this country, relatively little has changed in our approach to water 'management' in the 200 years since European settlement. Moreover, it could be argued that policy makers have learned comparatively little from the limitations that are inherent in a policy premised on subjugating an inconvenient hydrology.[1]

Against this backdrop, the engineering profession has dominated much of the thinking about water management. The influence of engineering has also resulted in a general population that now struggles to conceptualise the relationships between water users and the rudiments of water scarcity. Water engineers are often cast as being able to 'create water' and since so much of the related infrastructure is funded by the public purse the links between scarcity, costs and benefits remain less-than-transparent.

[1] For an excellent review of the historical attempts to control Australian hydrology see, for instance, Cathcart (2009).

The early status of engineers in water policy in this country was succinctly encapsulated in comments by the first Head of the New South Wales Colony's Water Conservation Branch, Hugh McKinney. McKinney (1887) claimed that "[n]o one is more entitled to be heard on the general principles of water supply of a country than an engineer". In this article we argue that the status of water engineers has changed little, apart for a brief policy episode between the mid-1990s and early 2000s when engineering 'fixes' were subjected to more serious scrutiny. We attempt to build this argument by tracing the historical 'developmentalist' ethos that was apparent until now and by outlining the more recent re-emergence of engineering solutions as the most politically acceptable means of dealing with water scarcity. Needless to add, we advocate for a more balanced approach to policy formulation, particularly one that gives greater consideration to the economic consequences of public sponsorship of engineering works.

The paper itself is divided into four additional parts. In the first part we outline the historical development of water resources in this nation and unravel the motivations that underpinned the period characterised by engineering zeal that ended in the mid-1990s. In the next section we describe the water reform process that followed and specifically consider three policy initiatives, namely, the Murray-Darling Basin Cap; the Water Reform Framework, and the National Water Initiative. We then trace the problems encountered in the implementation of this reform agenda and thus provide the backdrop to the resurgence of engineering as the most politically appealing 'solution' to difficult problems. In the final section we describe alternative policy options before drawing some brief concluding remarks.

HISTORICAL DEVELOPMENT OF WATER RESOURCES IN AUSTRALIA

Australia was first colonised by Britain in 1788 with the establishment of New South Wales. Over the next 40 years other colonies were proclaimed with Western Australia being the final jurisdiction to be decreed in 1829. British colonisation resulted in several trends, some of which continue to influence water policy formulation today. First, it brought an expectation that water resources should be relatively reliable and stable, as in the temperate surrounds of Britain. Second, there was originally a (largely flawed) perception that the riparian doctrine[2] was an adequate basis for managing water (Musgrave, 2008). Third, the subsequent failure of riparianism and the vesting of water in the various state jurisdictions in the early 20th century, when combined with autonomous colonial/state foundations, gave rise to powerful state-based water bureaucracies. Each of these was primarily charged with maximising the benefits of water development for the state and was accordingly less concerned about the management of the resource at a catchment scale.

Tasmania was the first colony to embark on irrigation development following the 1840-1843 drought. Other colonies followed in a similar vein responding to episodes of drought and flooding along with the mounting pressure from gold mining and pastoral development (Hallows and Thompson, 1998). These trends were most apparent in the states that occupy the Murray-Darling basin, particularly New South Wales, Victoria and South Australia. A key driver in many of these cases was an element of "climatic determinism" (Smith, 1998) coupled with an urgent need to shore up food supplies for the colonies and the widespread acceptance of similar 'solutions' in the US.

Musgrave (2008) divides the early developmentalist era into two broad phases – the first spanning from the mid-19th century to the early 20th century and the second being described as the "march to irrigation" which persisted unimpeded until the 1980s in most jurisdictions. In many respects, the episodes in Victoria helped shape much of what transpired in other states. Initially prompted by the 1877-1881 drought, the Victorian colony commenced a major engineering programme to develop water for irrigation regardless of a government inquiry that showed irrigation to be unprofitable. Seminal legislation was also formulated at this time, especially in the form of the 1886 Irrigation Act

[2] The riparian doctrine provides landholders with conditional rights to access and use water contiguous with their land.

crafted by Alfred Deakin. Influenced by the successes of irrigation witnessed in California, Deakin was keen to invoke closer settlement in the hinterland and saw irrigation as the vehicle for achieving this. The Irrigation Act established the initial steps to revoking riparianism and laid the groundwork for the state to play an active part in building dams and irrigation channels. The gifting of large parcels of land to the Canadian-born Chaffey brothers, who had earlier successfully developed irrigation communities in California, added additional impetus that flowed into South Australia, thanks to similar gifting arrangements with that colony. Notwithstanding this extraordinary largesse and optimism, the Chaffey brothers were forced to file for bankruptcy by 1894.

Rather than serve as a warning of the folly of attempting to tame nature to irrigate the vast interior these failures were followed by increased intervention by government agencies headed by engineering enthusiasts. For instance, Elwood Mead was appointed to head the State Rivers and Water Supply Commission in 1907. Mead ostensibly argued that the initial failure of irrigation arose from insufficient intervention by the state and the necessity for even greater engineering expertise. Accordingly, the activities of the State Rivers and Water Supply Commission were expanded to include those previously assigned to the (now defunct) irrigation trusts, once the debts of the trusts were absolved thanks to the public purse (of course). Musgrave (2008) notes that: Despite the failure of the trusts, the desirability of such activity was not questioned and the task was seen as being essentially technical and calling for the skills of engineers. Not surprisingly, the relevant public authorities were therefore dominated by an engineering and developmental culture.

The second phase of development primarily used the foundations established by the vesting of water in the state and the bureaucratic machinery assembled during the first phase to expand irrigation across the nation. Ward (2000) describes this irrigation expansion thus:

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

By the 1960s the absolute wisdom of engineering as a 'solution' and the largely uninhibited access to public funds for the undertaking of water supply and irrigation projects was coming under greater scrutiny. The notion of closer settlement[3] as a desirable social policy was also being questioned and environmental interests began to gain a voice in public affairs. Whilst these phenomena stalled public enthusiasm for irrigation, private irrigation continued in some regions, particularly where the profitability of new crops like cotton and rice was evident.

An important contribution at this time came in the form of Bruce Davidson's book *Australia Wet or Dry? The Physical and Economic Limits to the Expansion of Irrigation,* which was published in 1969. Davidson's thesis was that successful agriculture in an Australian context relied on exploiting the high ratio of naturally well-watered land relative to labour. Put simply, Australia had ample arable land

[3] Closer settlement is the term used to describe a public policy approach that promoted the intensification of agriculture in the inland. This included gifting returned soldiers relatively small parcels of land. Regrettably, most of these plots proved unprofitable and resulted in a life of hardship for many farmers.

suitable for dryland farming, erratic rainfall that made it costly to harvest water[4] and only modest supplies of labour. By way of contrast, irrigation required intense use of land, labour and water – in Davidson's view the faith in irrigation was clearly ill-founded.

By the 1980s the collective appeal of the economic, environmental and social arguments against irrigation and dam building more generally had largely halted irrigation expansion, at least those components that relied on government support. This period was also characterised by a general trend towards fiscal conservatism, with governments worldwide reducing their direct involvement in a range of economic activities. Notions of cost-recovery became more commonplace and the application of a benefit-cost analysis became standard practice, at least for large government expenditures. This established the background for a range of water-specific reforms in the 1990s. We now turn to these.

COAG, THE NATIONAL WATER INITIATIVE AND THE CAP

We noted earlier that there was a general trend towards fiscal conservatism at this time. In Australia's case, an important component of this was the development of a National Competition Framework. This approach was premised on the view that greater competition was required to improve national economic performance and that numerous constraints which inhibited growth should be excised. This national approach was used to convince state governments of the benefits of introducing competition in a variety of settings.

Attention turned to water specifically in 1994 with the formulation of the Water Reform Framework. State governments were encouraged via the Council of Australian Governments (CoAG) to participate or else run the risk of being excluded from competition payments provided by the federal government. The upshot of this approach was that states agreed to develop state-based responses that met national standards for water management. This covered pricing reforms with the removal of cross-subsidies and, if necessary, making clear any other form of support. Jurisdictions were also committed to progress towards full cost recovery. Systems of water allocation were to be made consistent and volumetric with the nexus between water and land broken to facilitate water trade. More importantly in the context of rural water supply and in the case of the present discussion, the framework committed all jurisdictions to the principle "that all future investment in new schemes or extensions to existing schemes be undertaken only after appraisal indicates that it is economically viable and ecologically sustainable" (CoAG, 1994).

Another important component of policy at this time was the acceptance by the states that drew water from the Murray-Darling basin that water extractions needed to be capped to preserve some level of environmental integrity and to protect the reliability of supply to the various claimants to water. The 'Cap' was originally proposed as an interim measure in 1995 but moved to a permanent footing for the states of New South Wales, Victoria and South Australia in 1997. In most jurisdictions the 'Cap' is set to limit extractions to a level equivalent to that which would attend the 1993-1994 level of irrigation development (MDBC, 1998).

Somewhat frustrated by the rate of progress, the federal government pushed for a more ambitious series of water reforms a decade later in the form of the National Water Initiative (NWI). The 2004 NWI concentrated heavily on better specifying water rights, in part because the activation of water markets as part of the earlier reforms had revealed several deficiencies on this front. Of particular concern was the overallocation of extraction rights in the form of various licenses.

In the earlier reforms, states were required to unbundle land and water rights and put in place mechanisms for the trading of the latter. However, through the enthusiastic phase of water 'development' a variety of different forms of entitlement had been specified, ranging from statutory claims with a clear history of use through to vague expectation on the part of current and potential

[4] For instance, Smith (1998) notes that Australian water storages need to be about double the sise of dams elsewhere in the world to produce the same mean level of reliability. The economic consequences of this for irrigation are significant.

irrigators. The broad approach accepted across the Murray-Darling basin was to validate three main forms of claim against water: 1) statutory claims with a history of use, 2) statutory claims with no history of use and 3) non-statutory claims but with evidence of a history of use. The upshot from this was that the claims against water in the Murray-Darling basin now exceeded the agreed Cap on extraction. Moreover, the availability of a water market now meant that water that had not been previously 'used' (i.e. what were euphemistically referred to as 'sleeper' and 'dozer' rights) was subsequently sold and activated. Perhaps ironically, the water market that had been so heavily promoted by economists as the vehicle for encouraging reform played a significant part in exacerbating the overallocation problem. These events set the scene for the re-emergence of engineering as the most politically acceptable means of addressing this issue; a matter described in more detail in the following section.

THE RISE OF ENGINEERING TO SOLVE OVERALLOCATION

Quiggin (2001) has argued that a number of strategies were available to deal with the difficulties associated with overallocation of water in the Murray-Darling basin. First, water rights could be purchased by the government, thereby allowing willing sellers to reduce their claim on the resource and shoring up the entitlements of other claimants, including environmental interests. Second, water rights could be allowed to degrade over time. For instance, most rights are subject to the conditions specified in water- sharing plans and the life of the plan (usually around 15 years) would provide an opportunity to specify water claims at a more sustainable level. Third, rights could be re-specified to require rights holders to deliver an 'efficiency dividend' over time. In this instance, farmers might be required to reduce their claim on the resource by progressively installing more 'water-efficient' technologies. Finally, public investments could be undertaken to reduce the call on water through the deployment of 'water- efficient infrastructure' that would purportedly use less water to deliver the same quantum of productive output.

Perhaps not surprisingly it was the last of these alternatives that was most enthusiastically accepted by policy makers. The political appeal of subsidising engineering 'fixes' stems largely from the information and incentive components of such a programme. On the one hand, irrigators (the largest claimant on the resource) are unlikely to resist the support of the state for infrastructural upgrades and, on the other, the overall level of understanding about such matters amongst taxpayers is modest, at best. Thus, spreading the costs of this policy across many, relatively ill-informed voters whilst appeasing the minority most likely to lose from an alternative policy ensures that low political costs attend such an approach.

Faced with the difficulty of overallocation and an accompanying desire to expand the federal government's influence over water affairs, Prime Minister Howard announced *The National Plan for Water Security* in 2007. The basic thesis of the Plan was that the federal government would invest $10 billion over 10 years in the Murray-Darling basin on the proviso that basin states referred their powers over water to the federal government. Poignantly, $6 billion of the proposed investment was to be in the form of engineering works that would 'modernise' irrigation and purportedly 'save water'.[5]

The Howard government was defeated later in 2007 but this was not enough to modify the general direction of water policy. After being elected, the Rudd government announced its water policy in April 2008 – *Water for the Future*. A central component of the policy was a commitment to euphemistically modernise irrigation using public funds. Amongst the most prominent projects in this context is the Northern Food Bowl Modernisation Project (NFBMP) in Victoria. The largest expenditures embodied in the NFBMP relate to engineering works in channel irrigation districts. Public support for the works was earlier criticised by the Victorian Auditor General's Office on several grounds. For instance, it was noted that "the upgrade costs (reported in the plan) represent the lowest level of rigour and were, at the time,

[5] The extent to which many of these projects are consistent with the rudiments of water accounting remains problematic.

based on a preliminary study by a stakeholder group (the Food Bowl Alliance)" (Victorian Auditor-General, 2008). The Auditor General was also critical of the potential for notional water savings and was particularly concerned that earlier engineering estimates of 'water savings' were "**lower** than those published in the food bowl steering committee's final report in November 2007" (original emphasis, Victorian Auditor-General, 2008).[6]

To understand why the enthusiasm for the NFBMP did not seem to match the value of the engineering works per se, it is worth noting that until 2008 Victoria had resisted approaches from the federal government to refer its powers over water. However, having been assured of $1billion of direct Commonwealth support for the NFBMP the Victorian government agreed to cede control of water, in line with the original intentions of the Commonwealth 2007 Water Act.

These events set the stage for similar claims for federal support for public investment in engineering works in other jurisdictions. In 2008, New South Wales was offered $1.358 billion primarily to be spent on initiatives in irrigation. Poignantly many of these were described as being "at the conceptual planning stage" (CoAG, 2008). Similarly, $610 million is to be expended to "upgrade irrigation infrastructure" in South Australia and Queensland is to receive $510 million from taxpayers with the caveat that about half is to assist with the "roll-out [of] community level irrigation planning and infrastructure investment" (CoAG, 2008). By the completion of the CoAG meeting in July 2008, around $4.3 billion had been committed to irrigation, primarily in the form of engineering and infrastructural projects. Clearly, these events are in stark contrast to the aforementioned commitments made in 1994 "that all future investment in new schemes or extensions to existing schemes be undertaken only after appraisal indicates that it is economically viable and ecologically sustainable" (CoAG, 1994). Put simply, the most recent policy episodes are reminiscent of the era when governments ignored the economic and hydrological realities of this country and attempted to justify all manner of water engineering projects on the basis that it was akin to 'nation building'.

It is worth briefly noting the major political factors that have prompted the return to favour of subsidised engineering solutions in water management, even though history would suggest they have been found wanting for most of the last century. Having established regional communities on the basis of irrigation, governments have found it difficult to effectively counter the 'stranded assets' argument offered by some influential irrigators. In essence, this argument hinges on the notion that any contraction in irrigation activity would leave those remaining in the industry to carry an unacceptable financial burden – in the form of the ongoing costs of maintaining irrigation infrastructure. This argument has been extended to include a range of community assets from schools to hospitals and roads. Governments have been slow to recognise that this is little more than rent seeking by an industry lobby and is counter to conventional approaches to structural adjustment within an industry suffering declining terms of trade. The upshot is that it is easier for governments to subsidise irrigation infrastructure than to deal seriously with the endemic problems confronting agriculture.

An additional factor noted earlier is the limited understanding of these matters amongst the tax-paying community. This covers several dimensions but includes lack of knowledge about hydrological rudiments[7] and a spurious belief that any contraction in irrigated agriculture in Australia would threaten domestic food security. There is also a long-standing cultural affinity with agriculture, and the nobility of agrarian pursuits is not always seriously questioned (see, for example, Botterill, 2006). A related dimension to this problem is the blurred distinction between agriculture and natural resources management. For example, many urban Australians regard the well-being of farmers as analogous to

[6] It needs to be noted that a range of other reforms have occurred in Victoria. For instance, what was formerly regarded as 'sales water' (i.e. a low security right that was available in only wet seasons and was not tradeable) has been converted to a tradeable right but set at lower levels, thereby limiting the overall extractive claim on the resource.

[7] Most taxpayers do not understand the volumetric measures used or how this relates to their own water consumption. As a result, Australian politicians usually describe water in terms of the 'equivalent volume as Sydney harbour' or 'the amount of water in an Olympic swimming pool.'

better management of natural resources despite empirical evidence to the contrary (see, for example, Pannell et al., 2006).

ALTERNATIVE APPROACHES AND CONCLUDING REMARKS

The renewed political enthusiasm for engineering in Australian water management is of concern for two main reasons. First, the call on the public purse and the extent to which such projects would pass a conventional benefit-cost analysis is problematic. In a recent review of the programmes undertaken in the Murray-Darling basin, Lee and Ancev (2009) provide insights to the quantum of public funds dedicated to these recent policies and earlier programmes. Notwithstanding that some components of their analysis pertain to wider natural resources management programmes (e.g. The Natural Heritage Trust), engineering projects to address overallocation of water make up the lion's share of the $25 billion in expenditure. When assessing the outcome of this expenditure Lee and Ancev (2009) note that "in spite of the substantial expenditure, this has not produced the envisaged restoration of overallocated river systems". Moreover they observe that "investment decisions appear to be without strong justification". They offer additional insights by providing indicative estimates of the costs of alternative policy choices, particularly repurchasing water from irrigators. On the basis of these estimates the 'engineering alternative' would appear to have cost taxpayers between three and five time more than a buy-back programme (Lee and Ancev, 2009).

The second objection to the engineering approach to addressing these problems relates to the hydrological background to the projects themselves. Whilst intuitively appealing (from a political perspective at least), most endeavours to save water via 'water use efficiency' projects are plagued by failure, usually because of the flawed consideration of scale. This issue has been frequently cited (see, for example, Perry, 2009) and hinges on the fact that water purportedly 'saved' in one place within an overallocated catchment was usually providing benefits at another site. In this context engineering works do not 'save water' per se – they merely have the effect of redistributing water in space and time. Thus, such engineering projects are not only more expensive than the alternative policy approach of repurchase but also do not work in addressing wide-scale overallocation unless accompanied by other policy measures.[8]

Notwithstanding these problems, the enthusiasm for employing engineering solutions in political circles shows no signs of abating. Political leaders continue to pronounce the benefits of water engineering and borrow from the lexicon of earlier eras when quizzed about the rationale for such projects (see, for example, Wong, 2009). 'Nation building' is again on the rise and engineering firms are queuing up with projects that can be launched with a fanfare and a ribbon-cutting ceremony. The recent slowdown in the global economy has also provided fertile ground, insomuch as federal and state governments are now justifying engineering projects on the basis of the employment spinoffs from such work (see, for example, Fielding, 2009).

As we have indicated, there is more than a small sense of déjà vu that attends these events. Engineering dominated water affairs in Australia for over a century and was only briefly constrained for a decade by greater attention to economic and ecological consequences. Regrettably, this most recent journey 'back to the future' seems likely to persist and leave the next generation of economists and ecologists bemoaning the narrowness of this approach.

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[8] For a comprehensive review of this phenomena see Crase and O'Keefe (2009).

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