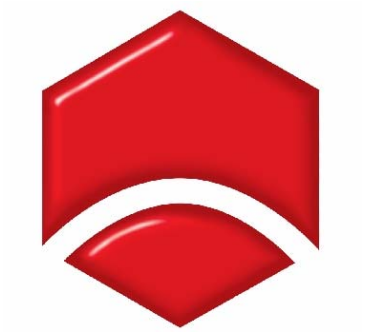
RURAL WATER USE AND THE ENVIRONMENT: THE ROLE OF MARKET MECHANISMS

SUBMISSION TO THE PRODUCTIVITY COMMISSION



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INTRODUCTION

Engineers Australia is the peak body for engineering practitioners in Australia representing all disciplines and branches of engineering. Membership is now approximately 75,000 Australia wide. *Engineers Australia* is the largest and most diverse engineering association in Australia. All *Engineers Australia* members are bound by a common commitment to promote engineering and to facilitate its practice for the common good. *Engineers Australia* is organised by Colleges and geographic regions. The Colleges exercise the learned society functions of engineering and often exercise this function through National Committees. One such Committee is the National Committee on Water Engineering which has established a sub-committee to examine issues associated with measuring water flows and usage. *Engineers Australia* welcomes this opportunity to provide input to the Rural and Regional Affairs and Transport References Committee's Inquiry into water policy initiatives.

Water property rights relate primarily to the irrigation sector of Australian agriculture. Irrigated agriculture is conducted on less than one percent of Australia's agricultural holdings, but contributes about 29% of total agricultural output[1] with a four-fold multiplier effect beyond the farm gate.[2] As the world's driest continent, dealing with the scarcity of water has long been part of the evolution of Australian settlement. Irrigation was a response to the variability of the Australian climate and the desire of Governments to encourage the settlement of inland Australia. The small property sizes and emphasis on intensive crops has been attributed to this Government involvement[3]. Nearly three quarters of irrigated agriculture is conducted in the Murray-Darling Basin and for this reason is the focus of this submission.

Irrigated agriculture in the Murray- Darling Basin evolved through the development of a series of distinct irrigation schemes owned and operated by Governments and by private arrangements. In addition, there are large numbers of individual farm water extraction operations, particularly in the northern part of the basin. Government direct involvement in irrigation schemes is now a thing of the past, but indirect involvement through a plethora of regulatory arrangements remains.

Water trading was initiated in conjunction with the imposition of a cap on water extraction for the Murray-Darling Basin in the mid-1990`s. The cap was a response by Governments to severe negative impacts of irrigation on river ecosystems and associated land and groundwater. Initially thought of as a mechanism for redistributing irrigation water within the cap, water trading is now understood to also relate to the balance between extractive and non-extractive uses for water.

The National Water Initiative of COAG in 2004 recognised that effective water use in agriculture would require major institutional, legislative and regulatory change, direct remediation of severely damaged locations, together with economic mechanisms to drive future developments. As has been the case in many microeconomic reforms in Australia, establishing a price mechanism for water was seen as a key reform element. Water pricing was broadly seen as operating in two ways. First, water prices charged to irrigators, by including provisions for the scarcity value of water, the full costs of storage and distribution, the costs of infrastructure and management overheads and

opportunity costs, were seen as realigning inputs and investments in a more coherent way. Second, water trading was seen as a way of reallocating water towards its most productive use and is increasingly being recognised as a way of compensating irrigators for increased environmental river flows.

Engineers Australia is disappointed that 11 years after first deciding to set full cost recovery rural water prices, so little has been achieved by COAG. There appears to be an overlay in discussions which suggests that the increasing appreciation of the value of irrigation water due to the steady growth in water trading is sufficient progress. Yet concern about the availability of water continues to grow while water use efficiency grows only slowly. No doubt there are gaps in the knowledge base required by reform, but given the substantial body of science, research and experience available, this hardly qualifies as a constraint.

Governments constantly remind Australians about the productivity and adaptability of Australian farmers. There is a certain inconsistency between this view and the reluctance to proceed with rural water reform. The Australian climate is changing and although this is characterised as long term, this needs to be weighed against the time needed to achieve water use efficiency.

THE COAG PROCESS

Around 1970, according to Freebairn, Australia moved to the point where the demand for water at near zero prices, on average exceeded the available supply.[4] Despite this a further two decades elapsed before concerted Government action was taken to do anything to address this. The decisions taken by the Council of Australian Governments (COAG) in 1994 were comprehensive[5]. Elements most relevant to this Inquiry include

- The adoption of pricing regimes based on consumption, full cost recovery, and the removal of subsidies.
- Separation of water property rights from land title and clear specification of title in terms of ownership, volumes, reliability, and transferability.
- That trading in water entitlements was to be used to maximise the contribution of water to national income and welfare, subject to social, physical and ecological constraints in catchments.

Subsequently, during the 1990`s there was significant change in all jurisdictions. Two part water pricing on a commercial basis in urban areas was substantially achieved. However, while the new prices typically covered costs, the opportunity cost of capital was not dealt with. There was significant legislative and institutional reform largely directed at separating regulatory and service delivery functions and on the formation of catchment authorities. Progress in respect of the release of water to the environment was slow, particularly in NSW. Separation between water and property rights was achieved in all States and Territories again with the exception of NSW. Within State trading in water became well established, but remained limited at

interstate level. There was significant progress in relation to the National Water Quality Management Strategy and consultation with stakeholders was better than in the past. However, progress fell short of what was envisaged in the 1994 COAG agreement.

This progress was achieved in the context of substantial National Competition Payments to the States and Territories. Following an assessment process which acknowledged that the original timetable had proven to be more ambitious than expected, the National Competition Council in 2001 recommended that over $1 billion be paid by the Commonwealth Government to the States and Territories over two years. A further $740 million was advanced in 2002-3. Many have seen these assessments as generous to the States and Territories.

Whatever the broader community reservations about progress on the 1994 COAG agreement, a great deal had been learned by those involved in the process and this was reflected in the 2004 COAG agreement which set up the National Water Initiative (NWI)[6]. The objective of the NWI was clearly stated as the realisation of optimum economic, social and environmental outcomes by implementing a nationally compatible market, regulatory and planning based system of managing surface and ground water. Specific actions were agreed under 8 headings, 4 of which are particularly relevant to this Inquiry. They are:

- Water access entitlements and planning framework.
- Water markets and trading.
- Best practice water pricing.
- Water resource accounting.

A key innovation in the NWI was agreement to create a National Water Commission (NWC) to oversight and co-ordinate the change process. Also important was agreement that the definition of key concepts be spelt out in a glossary of terms, objectives were articulated in greater detail and more clearly than before and an "achievable" timetable was set up. Prior to the National Water Initiative most of the progress achieved was at the institutional and legislative levels. Without minimising the importance of these achievements, there have not been significant on the ground changes in either urban or rural settings. Indeed, one of the hopes for the NWC is that greater pressure may be brought to bear on the States and Territories to confront issues leading to significant gains, including the negative influences of entrenched urban water monopolies impeding proposals which would result in essential reforms.

IRRIGATION WATER PRICES

Historically, water was seen as part of the land property right and available water was allocated largely on a first come, first served basis at close to zero cost. Infrastructure investments for increasing demand were provided by Government on "development" grounds with little economic content.[7] The 1994 COAG agreement included water pricing to recover *all* operational costs, but provided for transitional arrangements in

special circumstances. This decision was substantially applied to urban water use, but little changed in respect of rural water. The NWI agreements on water pricing were far more extensive and included the following provisions

- The economically efficient and sustainable use of water resources, water infrastructure assets and government resources devoted to water management.
- The generation of revenue streams to enable efficient service delivery.
- The facilitation of efficient functioning of water markets in rural and urban settings.
- To give effect to the principle of user pays and achieve price transparency in respect of water storage and delivery in irrigation systems and cost recovery for water planning and management.
- Avoidance of perverse or unintended pricing outcomes.
- Provide appropriate mechanisms for the release of unallocated water.

This very comprehensive set of arrangements was severely compromised by a failure to establish a timetable to achieve these reforms in the rural sector. This contrasts starkly with the provisions for urban water pricing which cover pricing for potable water, storm water and recycled waste water towards *upper bound prices* by 2008. *Upper bound prices* include provisions for opportunity costs of capital as well as normal full cost accounting provisions. Failure to set a rigorous timetable has proven to be an important weakness because old incentives remain in place and the burden of change is borne by direct intervention mechanisms and water trading.

Even so multi-part water structure service charges are the norm in Australia.[8] These typically comprise a fixed access charge and a variable consumption component. Despite the potential of such pricing structures to fully recover capital costs, rural infrastructure providers generally do not recover these costs. This is due to the use of renewal accounting which recovers from users a charge to cover the annualised cost of asset replacement and maintenance at *existing* service levels which are typically less than the cost of depreciation and the opportunity cost of capital.[9] Nor are there any inclusions in the charging mechanisms to cover storage and conveyancy costs. It should come as no surprise that when pricing mechanisms are so defective, that infrastructure suffers because irrigators have no incentive to do anything about it and infrastructure providers are starved of cash.

Engineers Australia believes that the COAG water pricing principles are well founded and should be applied as a matter of urgency to all water users in Australia, whether urban or rural. By not setting timetables to achieve these pricing principles for rural water Governments are signalling that these changes are not urgent and are tacitly indicating support for past practices.

WATER PROPERTY TITLES AND WATER TRADING

In its simplest form the objective of water trading is to redirect water to its most valuable extractive use. This is the sense in which water trading was considered in the 1994 COAG decision. The NWI goes beyond this and sees water trading also achieving a better balance between extractive and non-extractive use of water.[10] Effective water trading will depend on how water products (in effect water rights) are specified, how secure they are, how defensible they are and the transactions costs of participating in the water market.

The most comprehensive review of water rights in Australia was undertaken by the Productivity Commission (PC) in 2003.[11] Using criteria developed by the National Competition Council for its review of progress under the 1994 COAG agreement, the PC found significant variation between jurisdictions. To some extent variation was expected and the PC, and others[12], have emphasized that efficient water rights required sensitivity to different environmental conditions, different hydrological conditions and different community needs and standards[13] Even so it was difficult to reconcile why some water was included and other water not included in formal arrangements, why some jurisdictions allocated water rights as shares of available water, while others allocated by volume and some did both, some jurisdictions allocated water rights on a perpetual basis and others for limited time periods and why some jurisdictions maintained the connection between land and water titles in some cases. This complexity could hardly be described as conducive to commerce.

In the NWI, water property titles are called water access entitlements and are defined as “a perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan”[14]. In turn what was meant by “consumptive pool” and “water plan” was also spelt out. Indeed the agreement provides extensive detail of the outcomes expected from the establishment of water access entitlements and the associated planning framework, the actions expected from jurisdictions to achieve these outcomes, the characteristics of water access entitlements and the characteristics of the associated water plans. Arrangements were agreed on how to return over-allocated systems to sustainable levels and arrangements to prevent over-allocations occurring in the future, in particular, agreement was reached to include a range of water interception measures not presently regulated, such as farm dams above given thresholds, into the planning framework and the water access arrangements.[15]

In all fairness it is far too early to assess the value of the NWI in this area. Most key actions have timetables that specify implementation by end 2005 and later. Indeed implementation of measures to change land uses to intercept currently unregulated surface water flows is not due until 2011. What can be said, however, is that the precision of these notions requires corresponding precision in the measurement of water usage and water flows and so highlights the importance of water accounting.

Water trading can be conducted with seasonal water allocations or with permanent water access entitlements. Trade can occur within an irrigation district, between irrigation districts and between States. Most existing water trading occurs within irrigation districts in respect of seasonal allocations. There is some water trading

between irrigation districts, but within State boundaries. Interstate water trading remains minor even in temporary allocations.

A sense of the scale of trade can be obtained from the following. In 2001/02 the total amount of water diverted to irrigation in the Murray-Darling system was 10,960GL. Intra-state water trades in seasonal allocations that year were about 900GL (8.2%) and in permanent allocations they were about 90GL (0.8%). In contrast, interstate trades for the period 1998/99 to 2002/03 cumulatively amounted to 14.4GL.[16] These figures are relatively low and suggest that the potential of water trading may have been overstated by proponents. However, contained within these figures are examples which suggest that any problems are of a different nature and that the full potential of water trading has yet to be realised. Consider this example, in 2002/03, the seasonal allocation to the Murray Irrigation District was only 8% of the permanent entitlements, yet, through water trading, water usage was about 33% of the average usage over the previous 6 years reducing the impact of the drought below what might have occurred in the absence of water trading.

There are various reasons why water trading may be constrained. These include hydrological, environmental and distributional congestion issues, poorly defined water entitlements in terms of duration of time for which water rights exist and certainty and administrative and regulatory issues.

SOME UNRESOLVED ISSUES

The complexity of water rights in the Southern Murray system (in effect the Murray-Darling less the Darling component) has been examined by Tian Shi of the CSIRO[17]. This work found that there were a total of 438 types of water entitlement in place (132 in NSW, 191 in Victoria and 115 in South Australia), with 183 types relevant to irrigation. Given that water trading can occur in respect of seasonal or permanent allocations, this meant that there were 876 water products or 366 irrigation water products that could be traded. Water brokers use tradability matrices to differentiate between allocation pools and management zones and to discard impractical trades along water courses and within catchments. Such a process showed that some 3,700 possible trades were possible.

To put this into perspective there are around 14,700 farms in the Murray-Darling Basin overall with irrigated crops and/or pastures[18]and the numbers in the Southern Murray system are far less. The sheer number of trading options and the effort involved in identifying attractive trades is exceedingly confusing to many and represents a significant cost to trading.

The same research considered the opportunities for simplify the trading environment by:

- Adopting common language.
- Separating entitlement and allocation arrangements from use restrictions and obligations.

- Standardising tenure, trading restrictions and similar arrangements.
- Converting existing entitlements into one or more standardised entitlements.
- Rationalising zone boundaries along hydrological lines.

Tian Shi[19] illustrated the potential for rationalisation using a case study covering the northern Murray in Victoria and NSW. He showed that 24 existing trading zones could be rationalised to 22 and that 62 existing irrigation water entitlements could be rationalised to 10. This quite straight forward approach presents a significant improvement for irrigators contemplating water trading. *Engineers Australia* believes opportunities for simplifying water entitlements in this manner should be urgently addressed by State jurisdictions to reduce the transactions costs of water trading.

Incomplete consideration of hydrological characteristics in water entitlements can compromise the security and defensibility of water access entitlements. These include incomplete consideration of water flows between allocated stocks such as transmission losses and return flows from irrigation and the interaction between rainfall and major changes to land use.[20] Major land use changes can result in important differences in evapotranspiration rates, altering water yields and ground water recharge. For example, forested areas have higher evapotranspiration rates than grassland with the difference increasing as average rainfall is higher. Large scale reforestation has the potential to significantly reduce surface run-off and ground water stocks. Whether the potential remedy, inclusion of land use in downstream water entitlement definitions, is an improvement or not depends on measurement issues which can be high. In effect what is presented here is a trade off between compromising the integrity of water entitlements by not controlling land use, against the higher transaction costs associated with doing so.

A related concept is irrigation efficiency. The higher the rate of evapotranspiration the higher is irrigation efficiency. Perversely, higher irrigation efficiency reduces ground water returns to streams and so disadvantages downstream users[21]. Shifting land use from cropping to, say horticulture can lead to higher irrigation efficiency. Studies have shown that increasing irrigation efficiency from 80 to 90% in the Riverland of South Australia reduced ground water inflows to the Murray by about 22%. This highlights the importance of specifying net allocations in water access entitlements and the importance of correctly accounting for water flows.

On-farm dams capture surface run-off before it leaves a property. Some States do not regulate on-farm dams while others do. A study of the Yass catchment[22] has shown that the number farm dams had increased from 491 in 1976 to 1402 in 1988, an increase in storage capacity of 3592GL, or 252%. The same work found that the reduced run-off was associated with a statistically significant reduction in stream flow of 1,700ML, or 8%. In NSW, where this example is located, there is a blanket limitation of 10% applying to the harvesting of overland flows. However, in many NSW locations, and in some States, on-farm dam activity is well below this cap and the scope for reductions in stream flows is considerable. Clearly, there is significant potential for up stream land holders to impact on available water stocks downstream, compromising the integrity of water access entitlements.

Based on the results of the Pratt Water Group study of water efficiency on the Murrumbidgee River, Meyer[23] refers to the importance of using water balances to realise water savings. This technique focuses attention on the scope for water savings from irrigation efficiency and water productivity. The key elements are;

- Conveyance efficiency; identify and remediate seepage losses in supply channels.

- Farm efficiency; identify and remediate on-farm seepage losses, on-farm storage and recycling of drainage water.

- Field efficiency; appropriate field delivery systems for irrigation water and matching crops to soil and groundwater depth and soil moisture monitoring.

- Water productivity; optimising crop water requirements and all agronomic inputs.

These techniques are fairly well understood, but their application requires capital investment for which there is little incentive. Meyer is convinced that "there is enough evidence to indicate that every irrigated crop and pasture can improve its median water productivity."[24] The focus of attention should be on the top two thirds of producers, relying on the increasing value of water to provide an avenue for the balance of producers to leave irrigation. Meyer had in mind the increasing value of water as a result of water trading which is somewhat less than the COAG principles.

Transmission losses also create difficulties for water access entitlements[25]. When there are considerable transmission losses, often as a result of evaporation from open transmission channels, down-stream users suffer as a result of lower volumes of water being available for allocation. In 2003/04 the Murray-Darling Basin Commission reported that system losses were 808GL, or 10% of allocated water, which is not much short of the total allocation to South Australia. This is because some water entitlements specify the rights to water at the farm gate. Irrigation supply companies often hold water allocations above the collective entitlements of its irrigators to cover these transmission losses. Harvesting transmission losses, for example, using closed pipes instead of open channels for the distribution of water will result in enhanced stream flows and improved circumstances for down stream irrigators. Transmission losses can occur on farm as well as off farm, and accordingly there are efficiency opportunities for irrigators in reducing on farm losses. In effect, this would be equivalent to the irrigators being allocated higher water access entitlements.

This discussion has highlighted the importance of two key issues. First, excessive types of water right are an impediment to water trading and urgently need simplification. Solutions are available providing there is a will to deal with this problem. Implicit in this argument is simplifying the administrative and regulatory environment which spawned the explosion in water rights products. Second, water plans are essential to enable planners and policy makers to adequately incorporate water hydrology in water access entitlements. The existence of predominantly within district water trading suggests a need to expand irrigators' knowledge beyond their immediate catchment area. There clearly is interplay between issues. *Engineers Australia* believes that these are not insurmountable problems. To the contrary the

problems and the relevant science are sufficiently well understood for resolution to be completed well ahead of the COAG timetable.

WATER ACCOUNTING

"Aggregating values of water associated with irrigation is a challenge."[26] Despite this and although implied throughout, there was not explicit reference to water accounting in the 1994 COAG agreement. Water accounting was clearly practiced in some form by the various jurisdictions and cross-jurisdictional organisations like the Murray-Darling Commission in the normal course of their work. The importance of water accounting is underscored by the discussion in the previous sections and the importance of protecting the integrity of the water access entitlement system. The general views of *Engineers Australia* members, particularly those associated with the National Water Engineering Committee are that Australia's water data collection and information systems are not particularly capable or accurate. A serious impediment to water trading is not knowing what is being traded.

The 2004 NWI expressly provided for the development of consolidated water accounts that can be reconciled annually, that consider both ground water and surface water, that consider land use change and that consider climate change and other externalities. The timetable for the development of robust water accounting was end 2006 and for the implementation of national guidelines on water reporting based on the new system of water accounts was end 2007.

On 29 June 2005 the National Water Commission (NWC) and the Australian Bureau of Statistics jointly hosted a National Water Accounting Workshop attended by broad representation of stake-holders. The proceedings of the workshop have been made available on the NWC web-site. The action plan developed offers considerable promise and emphasizes building on existing data and information systems. The plan shows broad participation by all State and Territory jurisdictions and key groups such as the National Farmers Federation, the World Wildlife Fund, the Australian National Committee on Irrigation and Drainage and the CSIRO to name a few.

Engineers Australia supports the incorporation of broad stake-holder involvement in the design of the national water resource accounting framework. Detailed implementation will require extensive experience, and the capacity to integrate water accounts with other major economic and social information in the context of water trading. The development of confidence in the accounting system will require a measure of independence from stake-holder interests. *Engineers Australia* believes that the ABS is best placed to assume responsibility for the detailed implementation of Australia's water accounts under the broad oversight of the NWC with input from other authorities, as appropriate. The importance of this work makes it vital that the ABS be resourced to undertake this work without any delays, and preferably ahead of the NWI timetable.

The National Water Engineering Committee of *Engineers Australia* is firmly of the opinion that Australia's data collection and monitoring arrangements are relatively primitive. Water trading, in such circumstances, is fraught with difficulties. Unfortunately, there is a sense that these are not glamour issues and so have not

received sufficient attention and support in the past. The National Water Engineering Committee has established a sub-committee to work on the issues and *Engineers Australia* believes that the present Inquiry needs to highlight this defiency and press to ensure that the NWI recommendations in this area are fully implemented and put into operation.

INFRASTRUCTURE IMPLICATIONS

The implications of transmission losses for the integrity of water access entitlements were considered earlier. Transmission losses are also important considerations in respect to environmental flows and reductions in rainfall due to climate change factors. The communiqué of the Murray-Darling Basin Ministerial Council on 30 September 2005[27] reported progress on 4 projects valued at $178.9 million and aiming to return 240GL of water back into the river system. The Ministers requested proposals for the balance of the target of 500GL over 5 years as soon as possible. Attachment 3 to the communiqué sets out a timetable for the achievement of the target. This seems to suggest that 500GL is somewhat optimistic and that about 300GL is a more likely estimate.

Two projects are responsible for 87% of the water saving[28]. One of these is the reconfiguration of Goulburn-Murray irrigation systems (145GL) and the bulk of the water saving is to be achieved by the creation of a new separate tradeable medium reliability water entitlement with legal status. This project shows the potential of appropriately designed water access entitlements and what may be achieved by extending this approach to other irrigation districts. About 25 GL is expected to come from reconfiguration of the irrigation water delivery system. The second project is the NSW Water Recovery Package B (62GL) which will deliver water savings of 48GL by replacing open transmission channels with a water delivery pipeline. The balance of the savings will come with the buy-back of water access entitlements.

The water savings projects mentioned above, are important in their own right, but there are also important messages here about the extension of this type of project to irrigation generally. In essence these projects show that environmental flows can be managed with minimal, if any, impact on irrigators water allocations. Assuming that the 25GL infrastructure related saving in the Murray-Goulburn project is from the recovery of transmission losses (and this is not entirely clear), savings from transmission will be about 73GL which is about 9% of the transmission losses reported by the Murray-Darling Basin Commission for 2003/04. Far from being optimistic the 500GL target for environmental flows may well be a considerable underestimate.

Engineers Australia periodically reviews Australia's infrastructure assets to evaluate their adequacy for current and anticipated purpose. The 2005 rating for irrigation infrastructure was C minus and though this was an improvement relative to the 2001 rating, the state of rural infrastructure was on the whole assessed as largely inadequate, inefficient and unsustainable[29]. The condition of irrigation assets as assessed by the ratio of depreciated value to replacement value is highly variable ranging from a low of 14% in Western Australia to 78% in Tasmania. Queensland does best of the mainland States at 71% and was rated as generally fit for its current

purpose. The jurisdictions associated with the Murray-Darling system rated poorly with Victoria at 61%, South Australia at 41% and NSW and the ACT at 27%.

A variety of studies have demonstrated strong positive relationships between investment in infrastructure, economic growth and employment.[30] A key problem is the lack of funding for infrastructure projects. In this regard it is disappointing to *Engineers Australia* that more of the $500 million agreed by governments to achieve improved environmental flows in the Murray River has not been allocated to irrigation infrastructure improvements, particularly to projects which would reduce transmission losses. It is equally disappointing to *Engineers Australia* that obviously defective infrastructure pricing systems have been allowed to persist. Irrigation agriculture is a vital contributor to the Australian economy and, just as has been the case in other sectors of the economy, reform should highlight the opportunities for improved efficiencies and productivity rather than facilitate outmoded, entrenched attitudes.

CLIMATE CHANGE

Australia's average temperature rose by 0.7 degrees Celsius between 1910 and 1999, with most of the change occurring from 1950 onwards. The CSIRO projects that by 2030 average annual temperatures will be between 0.2 to 2.0 degrees higher over most of Australia. It is expected that the range of warming will be greatest in spring and least in winter. There will typically be more summer days with temperatures over 35 degrees and fewer winter days below zero degrees. Summer and autumn rainfall is likely to be more variable and winter and spring rainfall is likely to be less. The CSIRO believes that "changes in average rainfall can affect the frequency of wet and dry seasons. Their modelling suggests that south-west NSW will have springs about 10% dryer and summers about 15% wetter and this will be accompanied by a doubling of the number of extremely dry springs and extremely wet summers.[31]

The submission does not intend to review projections of climate change. The brief summary in the previous paragraph simply highlights the fact that significant climate change is likely over the next 25 years and this will complicate the management of Australia's agricultural and water resources considerably. There is the strong potential for greater climate variability, less stream-flow and changes in amount, and the timing, of rainfall.

Adaptive management is often suggested as the most appropriate way forward in circumstances where precision in forward projections is lacking. This is, in all probability, how climate change will proceed. Dealing with uncertainty is difficult, but not impossible. It requires an acceptance of change, and its direction, and an acceptance that scientific investigation, while rich in information, is not necessarily complete. For some this lack of complete "evidence" signals that concerns about remediation of land degradation, the elimination of wasteful practices and environmental flows in Australia's rivers are misplaced.[32] Others argue that climate change is a normal characteristic of the planet's history and future climate change is inevitable.[33]

Engineers Australia accepts the scientific basis of projections for future climate change and its association with atmospheric accumulation of carbon. Adaptive management works better with more information, but the lack of complete information is not a reason for business as usual. *Engineers Australia* is concerned that the pace of reform has been too slow, and indeed, shows evidence of a lack of resolve to proceed with water reform in agriculture. *Engineers Australia* believes that the changes which would flow from the reform process would much more adequately prepare Australian agriculture to deal with a changing climate and that further delay will simply complicate what is expected to be a difficult problem.

Dealing with climate change impacts on water availability will require up to date information on rainfall and runoff. *Engineers Australia* is the publisher of ***Australian Rainfall and Runoff***, initially published in 1987 and reissued in modified form in 1997. This publication is widely used for water planning in Australia. It is also a major source document for flood estimation and setting flood lines. The National Water Engineering Committee of Engineers Australia believes that ***Australian Rainfall and Runoff*** now needs urgent revision. This process is underway and the views of users are being sought by a Review Team through seminars organised through local chapters of *Engineers Australia*.

A major issue to be resolved in the revision process is overcoming the expenses which will be incurred by the Bureau of Meteorology in preparing for, and then running, specially designed computer compilations of rainfall data. Indeed, the timetable for the review process generally will be determined by the availability of funding. *Engineers Australia* believes that the Committee could significantly assist the process by recommending to the Government that revision of Australian Rainfall and Runoff becomes an integral component of plans for water accounting and budgetary support commensurate with the importance of more efficiently using Australia's water resources.

ENGINEERS AUSTRALIA VIEWS

Engineers Australia believes that the COAG water pricing principles are well founded and should be applied as a matter of urgency to all water users in Australia, whether urban or rural. By not setting timetables to achieve these pricing principles for rural water, Governments are signalling that these changes are not urgent and are tacitly indicating support for past practices.

Engineers Australia believes that excessive numbers and types of water rights are an impediment to water trading and require urgent simplification. Solutions are available providing there is a will to deal with this problem. Implicit in this argument is simplifying the administrative and regulatory environment which spawned the explosion in water rights products. *Engineers Australia* is also of the view that water plans are essential to enable planners and policy makers to strengthen the integrity of water access entitlements. The concentration of water trading to within district trading suggests a need to build irrigators confidence in water access titles beyond their immediate catchment area. There clearly is interplay between issues, but *Engineers Australia* believes that these are problems for which the relevant science is well

understood and resolution should be targeted for completion well ahead of the COAG timetable.

Engineers Australia believes that much of Australia`s water accounting arrangements are relatively primitive and leads to further uncertainty impeding water trading. This work has not received sufficient attention and support in the past and *Engineers Australia* believes this Inquiry should use its good offices to ensure that NWI recommendations are fully implemented and resourced.

Engineers Australia supports the incorporation of broad stake-holder involvement in the design of the national water resource accounting framework. Detailed implementation will require extensive experience, and the capacity to integrate water accounts with other major economic and social information in the context of water trading. The development of confidence in the accounting system will require a measure of independence from stake-holder interests. *Engineers Australia* believes that the ABS is best placed to assume responsibility for the detailed implementation of Australia's water accounts under the broad oversight of the NWC with input from other authorities, as appropriate. The importance of this work makes it vital that the ABS be resourced to undertake this work without any delays, and preferably ahead of the NWI timetable.

It is disappointing to *Engineers Australia* that more of the $500 million agreed by governments to achieve improved environmental flows in the Murray River has not been allocated to irrigation infrastructure improvements, particularly to projects which would reduce transmission losses. It is equally disappointing to *Engineers Australia* that obviously defective infrastructure pricing systems have been allowed to persist resulting in an inadequate irrigation infrastructure system. Irrigation agriculture is a vital contributor to the Australian economy and this could become even more valuable by eliminating entrenched inefficiencies.

Engineers Australia accepts the scientific basis of projections for future climate change and its association with atmospheric accumulation of carbon. Adaptive management works better with more information, but the lack of complete information is not a reason for business as usual. *Engineers Australia* is concerned that the pace of reform has been too slow and indeed shows evidence of a lack of resolve to proceed with water reform in agriculture. *Engineers Australia* believes that the changes which would flow from the reform process would much more adequately prepare Australian agriculture to deal with a changing climate and that further delay will simply complicate what is already expected to be a difficult problem.

Engineers Australia believes that a revised ***Australian Rainfall and Runoff*** will be a key element in planning for climate change and ensuring that Australian water accounting proceeds on the most informed basis possible and warrants support from this Inquiry.

ENDNOTES

[1] Alan Moran, Property Rights to Water, Effects on Agricultural Productivity and the Environment, IPA Backgrounder, June 2003, Vol. 15/3, p2
[2] Irrigation, www.mdbc.gov.au/education/encyclopedia/irrigation.htm
[3] Op cit, p3
[4] John Freebairn, Principles and Issues for Effective Australian Water Markets, IPA Conference, Establishing Australia`s Water Markets, Melbourne, 9 August 2004
[5] See www.coag.gov.au
[6] Op cit
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