

Report for
Australia China Environment
Development Program
Australian Water Policy
- Issues and Lessons Learnt

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1. Introduction

The **Australia China Environment Development Program** (ACEDP) is a five- year, AUD25 million Australian Government - AusAID initiative that aims to foster enduring partnerships between Australian and Chinese Government agencies, institutions and individuals engaged in national environmental policy development and implementation. The Program, which commenced in July 2007, will assist China strengthen its capacities for improved environmental governance by supporting high-level policy dialogue on the environment.

The ACEDP is a dynamic program, designed to respond to evolving policy priorities and emerging issues with an initial focus on **water resource management and river basin management**

Two national workshops in Canberra and Beijing in August 2007 will discuss national environmental policy priorities and explore opportunities for cooperation and policy dialogue. This paper has been prepared as background for the workshops to promote understanding and discussion on issues of mutual interest to partner organisations.

The paper highlights **key lessons from the last decade of Water Reform** in Australia and their potential relevance to China. Key challenges arising from the recent National Water Initiative are examined and **parallels drawn with the issues facing China**.

For the developing world, the burning issue is how to meet the, fast approaching, **Millennium Development Goal** of halving, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. In many developed countries the challenge is to ensure that living standards and environmental health are not compromised by increasing competition for a scarce resource. The growing threat of **climate change** has heightened the sense of public concern and urgency in countries like Australia, which already has one of the most unreliable rainfalls in the world. Increasingly, the two biggest global issues, Water and Energy, are becoming entangled as the search for new sources of water through re-cycling and desalination come, only with an increased energy and greenhouse gas bill.

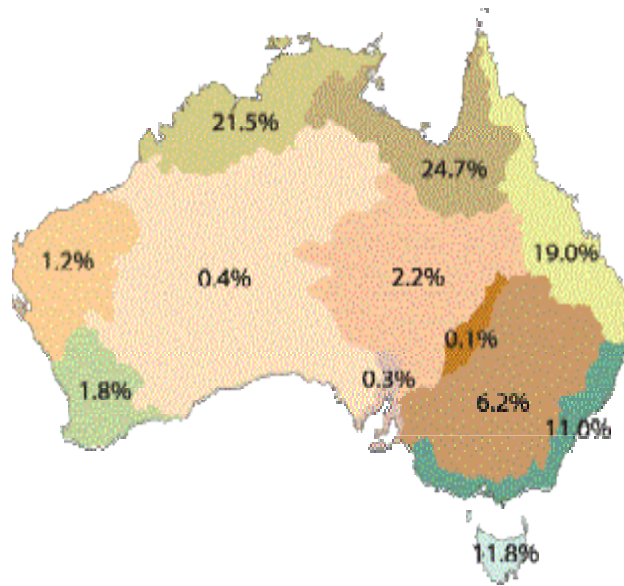


Figure 1: Percentage run off for Australian Drainage Basins

Source: NLWRA 2000

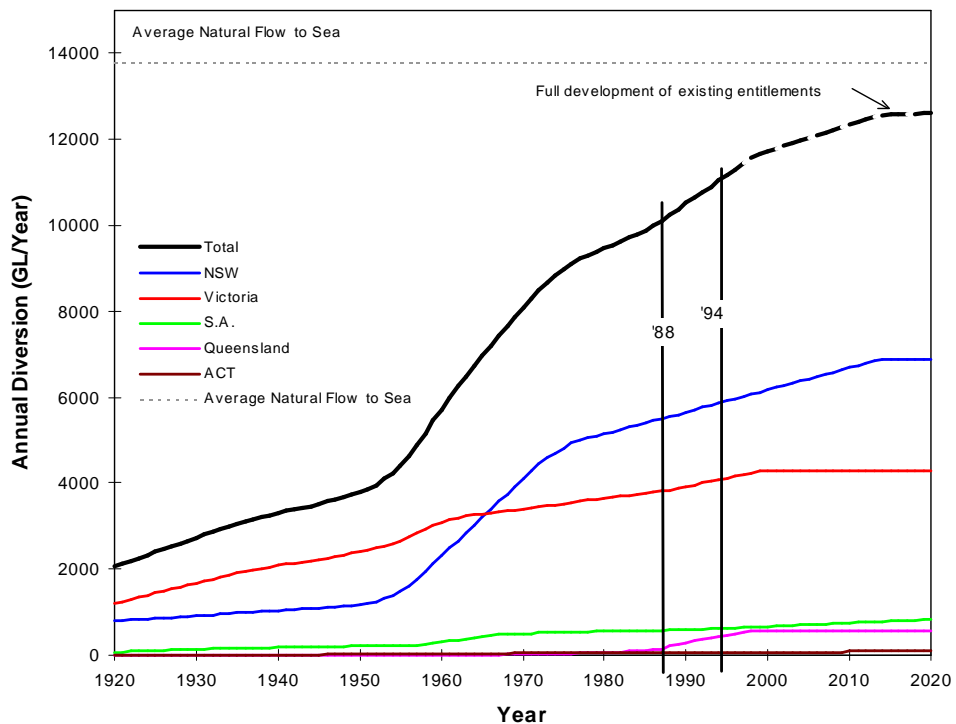


Figure 2: Murray Darling Basin Cap on Diversions

2. The evolution of water and catchment management policies in Australia

2.1 Key drivers for reform

Perhaps, because Australia has a relatively arid and variable climate, water has always been close to the national psyche. Accordingly, national and state governments have had a long preoccupation with water issues and infrastructure. Promises of drought-proofing and dams have been electorally important and campaigns to restore the Murray and Snowy Rivers reflect the icon status of these national water assets. Interestingly, despite the national importance of water, constitutional power for water management resides with the States and Territories and not the Australian Government. Disputes between the States over the resource have been generally resolved by intergovernmental agreements, such as, the **Murray Darling Basin Agreement, 1992**, which allocates the shares of water in Australia's most economically important basin between three States. The for-runner of this Agreement, the River Murray Waters Agreement, has been in operation for almost a century. The recently announced National Plan for Water Security heralds a further evolution of governance arrangements with the prospect of States and Territories transferring water management powers to the Commonwealth in the interests of a more national approach to the management of the Basin.

This step is consistent with the trend in recent years for the Australian Government to become more proactive in water reform using national funding programs and national competition policy payments as both carrot and stick in progressing reforms through the **Council of Australian Governments (COAG)**. These programs have generally been effective in accelerating the pace and direction of reform. This agenda has been paralleled by Natural Resource Management Reforms based on regional delivery through **Catchment Management Organisations** funded through bilateral agreements between each State /Territory and the Australian Government.

Three phases of water resource management can be distinguished in Australia:

1. **Development Phase (1900 - 1980)** – characterised by dam building for drought and flood control;
2. **Managing competition for resources Phase (1980- 2005)** – involving managing demand through allocation policy, regulation and restrictions, and
3. **Managing Risk and System Optimisation Phase (2005 - Present)** - managing risk through trade, system connectivity and multiple supply source strategies.

The key drivers of reform have been increasing competition for the resource due to irrigation development, responsible for 80% of resource use, and population growth together with the expanding ecological footprint of this rural and urban development, impacting on water quality, salinity, draining of wetlands and decline in water for the environment.

2.2 Forerunners of Community based Catchment Management

In the 80s and early 90s **River Improvement Trusts**, Salinity Management Groups and farmer conservation (Landcare) groups evolved into catchment based community committees. The **Decade of Landcare** heralded the increasing role of community leadership and the alignment of sustainable agriculture and environmental conservation during this period. This coincided with the recognition by governments that the growing enormity of the natural resource threats was beyond their capacity to fix

alone. The **command and control approach** that had been successfully applied to the industrial pollution problems of the 70's was clearly not going to work for the growing litany of **diffuse land and water management problems**. The 80's saw the birth of grassroots landholder groups brought together by the desire to tackle problems farmers knew they could not solve on their own. These community groups were driven by the realization that their land and water degradation problems posed a real threat to their livelihood. This coincided in the early 90's with the international focus on the concept of **sustainable development** aimed at win-win solutions to environmental problems.

2.3 The Murray Darling Basin Initiative

The history of the governance of water and catchment management in the Murray Darling Basin is a long and dynamic one, which is still evolving. The signing of the **River Murray Waters Agreement (1915)** was shortly followed by the formation of the River Murray Commission (1917), in response to disputes over access to the resource and navigation rights. There followed many decades of irrigation development and infrastructure investment. In the mid 80's concerns over increasing river salinities and the impact on Adelaide's drinking water supply and irrigation development downstream resulted in the formation of the **Murray Darling Basin Ministerial Council and Commission** with a broader brief under the Murray Darling Basin Agreement 1992 to:

"...promote and coordinate effective planning and management for the equitable, efficient and sustainable use of the water, land and other environmental resources of the Murray- Darling Basin."

As with other irrigation civilizations down through history, the root of the problem was lack of adequate surface and subsurface drainage infrastructure. This was triggered the insidious process of rising water tables, as inefficient irrigation practices and land-clearing lead to excessive recharge of groundwater systems. Irrigation salinity highlighted the logic and importance of 'the Catchment' (**River Basin**) as the natural unit for land and water management. Moreover, as communities grappled with understanding the causes and effects of salinity, salinity plans evolved into land and water plans and **integrated catchment management plans** to ensure all relevant catchment processes could be considered, including water quality, dryland salinity, soil and vegetation management, and river health.

Without a basin framework for resolving the question of the balance between the right to protect irrigation land through drainage and salt disposal to the River and the obligation to control the amount of salt discharged to protect down stream water users, and the environment, there could be no progress in implementing irrigation salinity plans. The **Salinity and Drainage Strategy**, agreed by the Murray Darling Ministerial Council in 1988, broke the impasse by defining a the economic optimum level of salt disposal which could be offset with cost effective salt interception schemes to achieve WHO standards for drinking water at Adelaide's water supply off-take at Morgan. The system of salinity debits and credits managed through regional salinity plans has had a major influence in directing new irrigation development to low salinity risk environments. The focus on salinity was again expanded to address dryland salinity and end-of-valley salinity targets of tributaries with the release of the "**Basin Salinity Management Strategy 2001**".

In the interim, extraction for irrigation development was growing at 100- 200 GL pa with the prospect of closure of the Murray mouth in dry years (**Figure 2**). These concerns culminated in a further landmark decision by the Council to **Cap diversions** in 1997 at 1995 levels of development. By 2004 attention had again turned to the plight of the river and wetland ecosystems along the Murray impacted by the overall level of extractions and the worsening drought. In response the Council took a "first step" decision in 2004

to invest \$500 M in recovering water for the environment, focussed initially on 6 icon sites. Unfortunately, difficulties in reaching consensus about project funding and issues to do with capacity to deliver on-ground works have delayed progress.

A further significant change to the governance arrangements for the Basin is now underway with the proposal of the Australian Government under the **National Plan for Water Security**, to reconstitute the MDBC as a Commonwealth Government Authority reporting to a single minister. The proposal by the Australian Government to take over responsibility for the management of the water resources of the Basin is clearly designed to cut through difficulties of consensus decision-making and to ensure a national perspective in addressing resource allocation and environment protection issues.

2.4 COAG Water Reform (1994)

Recent national water reforms in Australia emerged as one of a suite of reforms directed at progressing the nation's international competitiveness. Large outlays of public funds for sewerage backlogs and the growing public liability for aging metropolitan and rural water infrastructure, focused governments on the need to introduce more sustainable financing arrangements based on user pays. At the same time increasing competition between users was putting increased pressures on governments to address over-allocation and the degradation to rivers and wetlands caused by reduced environmental flows, salinity and other water quality problems. Water is critical for important food and agricultural industries, which underpin much export-oriented development in regional Australia. Water is seen as a competitive advantage for industry and the lack of a robust framework for allocation and re-allocation of rights was emerging as a barrier to efficient industry adjustment. In 1994 these drivers lead COAG to adopt a Water Reform agenda, with progress by States to be rewarded by significant competition payments by the Australian Government on the advice of the **National Competition Council (NCC)**.

The key elements of the reform agenda aimed to give greater emphasis to **protection of the environment**, on one hand, whilst creating a **free market in water trade**, which would encourage water to move to higher value uses and increase international competitiveness of the irrigation sector. In this regard, the framework set out requirements on jurisdictions to meet targets in legislative separation of land and water transactions, and to move to full cost recovery in water pricing, both for rural water supply and metropolitan water services. These reforms were linked to National Competition payments, based on annual assessments by the NCC.

2.5 The Regional Natural Resource (Catchment) Management Model

The national water reforms in the mid 90s were paralleled by growing awareness of catchment management problems and involvement of community groups and committees in development of catchment plans. It soon became clear that progress would be difficult without statutory status of these plans and formal institutional arrangements for governance and Resourcing of catchment bodies. Victoria was the first state to legislate for statutory Regional Catchment Organisations with responsibility for development and implementation of catchment investment plans. Other States including NSW and SA have adopted similar models. The original principals that underpinned the establishment of catchment management authorities in Victoria a decade ago are still relevant today: **Community Empowerment, Integrated Management, Targeted Investment, Accountability and Minimising Bureaucracy**. These reforms have been important in devolving responsibility to regions for natural resource management (NRM) decisions to ensure engagement of local communities and industries and input of local

knowledge. There are now 56 NRM regions across Australia recognised by the State and Commonwealth Governments for joint funding purposes.

2.6 Natural Heritage Trust (1997) / National Action Plan for Salinity and Water Quality (2001)

With the emergence of community based catchment management bodies developing strong business cases for investment in integrated land and water management plans the Australian Government set up the **Natural Heritage Trust** in 1997 to jointly fund these plans with matching contributions from States and Territories. A further initiative, the **National Action Plan for Salinity and Water Quality**, was funded in 2001 to specifically fund salinity and water quality programs in priority catchments.

A critical factor in obtaining community ownership for the implementation of catchment plans is striking the appropriate cost sharing arrangements between government and private investment. Whilst the “**beneficiary pays**” and “**polluter pays**” principles are a reasonable starting point the complex interaction between private and public good and historical responsibility for degradation are often not readily disentangled and a pragmatic approach to negotiating the right balance is often required. Nevertheless, the general experience with catchment plans is that every dollar of public investment is able to leverage around five dollars of private landholder investment.

In the next phase of Commonwealth NRM programs all funding will be consolidated under the NHT to enable more integrated investment in catchment plans.

3. National Water Initiative (2004)

3.1 Pressures for further National Reforms

By 2004 pressures for further water reforms were emerging. Whilst intrastate water trade had generated some useful outcomes different water access arrangements in different states were presenting barriers to opening up interstate trade. Controversy over water planning approaches, particularly in NSW, designed to claw back water from irrigators for the environment was raising concerns by industry and banks about the lack of security attached to water access licences. Water planning processes had become cumbersome and protracted with little prospect of reaching agreement about how to re-instate over-allocated systems to sustainable levels of use without some form of compensation to users facing reduced entitlements.

Levels of extraction from the Murray Darling system had been capped in 1997, but public concern was growing for the health of this national icon. With the country three years in the grip of the worst drought in 100 years and growing concern about the future impacts of climate change, communities facing continuing water restrictions were becoming increasingly sensitised to water issues. In response to these pressures State Governments began developing new metropolitan water plans to identify new sources of water to meet demands of growing populations. With a scarcity of economic and environmentally acceptable dam sites, attention turned to recycling and desalination, together with more aggressive demand management programs.

3.2 Objectives and Principles

The National Water Initiative (NWI) Agreement was signed by COAG members in June 2004, with the exception of WA and TAS, which signed subsequently.

The objective of the Agreement is to implement “a nationally-compatible, market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes by achieving the following:

- » clear and nationally-compatible characteristics for secure water access entitlements;
- » transparent, statutory-based, water planning;
- » statutory provision for environmental and other public benefit outcomes, and improved environmental management practices;
- » complete the return of all currently over-allocated or overused systems to environmentally-sustainable levels of extraction;
- » progressive removal of barriers to trade in water and meeting other requirements to facilitate the broadening and deepening of the water market ,with an open trading market in place;
- » clarity around the assignment of risk arising from future changes in the availability of water for the consumptive pool;
- » water accounting which is able to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management;
- » policy settings which facilitate water use efficiency and innovation in urban and rural areas;
- » addressing future adjustment issues that may impact on water users and communities; and
- » recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource.

3.3 Property Rights

The underlying concept of the NWI is a transparent, science- based water planning system, linked to a secure system of access rights to water (property rights) which can be transferred/traded independently of land ownership. The dilemma for the NWI is how to establish a nationally compatible system of property rights which gives security to farmers and banks to invest in irrigation businesses whilst allowing for adjustments in the balance between consumptive use and the environment as new science becomes available about the status of the resource, and as community values about environmental protection versus economic development change.

The answer lies in establishing perpetual access entitlements as a share of a consumptive pool rather than a fixed volume. The size of the pool to be made available for consumptive uses, together with the share required for the environment, is determined through water sharing plans, which are reviewed every ten years. The question of who bears the risk of any changes in water sharing plans (resulting from climate change, new science or new policy priorities) has been dealt with by a cost sharing arrangement between State, Australian Governments and water users. These changes, together with perpetual access rights, create a bankable/tradeable asset in water to underpin capital investment in more sustainable and efficient irrigation technologies.

3.4 Water Allocation Planning

Australia's NWI builds on the earlier COAG reforms in expanding the use of the water market as the key mechanism for handling re-allocation of water between consumptive users, but goes further in defining a system of water planning and access entitlements to establish sustainable levels of use and allocate an appropriate share of the resource for the environment. The planning process involves assessing the environmental values of water dependent ecosystems to be protected and the socio-economic importance of industries and urban uses which rely on water use. An estimate of sustainable yield of the system is made based on best available science. Plans also include trading rules and environmental flow rules for regulated systems and extraction rules for un-regulated systems.

3.5 Water Trade

Since the introduction of the initial COAG reforms trade has largely been confined to the rural sector, responsible for around 80% of national water use, with urban and non-irrigation industries representing 12% and 8%, respectively. Until recently, trade has also been confined to within- state, and often, within- region trade, due to concerns over sovereignty and loss of economic activity. Nevertheless, trade has become an important feature of Australia's irrigation sector. Agreement has been reached to implement a system of tagged trade throughout the Murray Darling Basin. Initially limits will be placed on the annual extent of trade to enable a smooth transition and adjustment process. A new feature of trade is the entrance of governments purchasing water for the environment from willing sellers.

3.6 Water Accounting

Improved measurement of the resource is a major focus of the NWI. Measurement through metering of consumptive use to effective monitoring networks to measure river flows and groundwater levels are critical to sustainable management of the resource as well as protecting the integrity of property rights. Significant investment has been targeted, under the NPWS, for national water accounting activities to be lead by the Bureau of Meteorology (BOM).

3.7 Water Pricing

The advent of trade has established a market price for water access rights of between \$600- \$1600 per ML, depending on the level of security, for permanent trade. Prices for temporary trade vary greatly depending on climatic conditions and overall levels of allocation in a particular year. By comparison annual charges for rural water are around \$50 per ML, representing the costs of distribution and storage, including operation and maintenance costs and depreciation on assets. In this sense, the price of the resource itself is free, i.e. there is no resource rent recovered by governments. Whilst rural water charges are usually levied through a two-part tariff with a fixed service charge and a volumetric component, it is the market price of water, which drives irrigation efficiency, not annual charges.

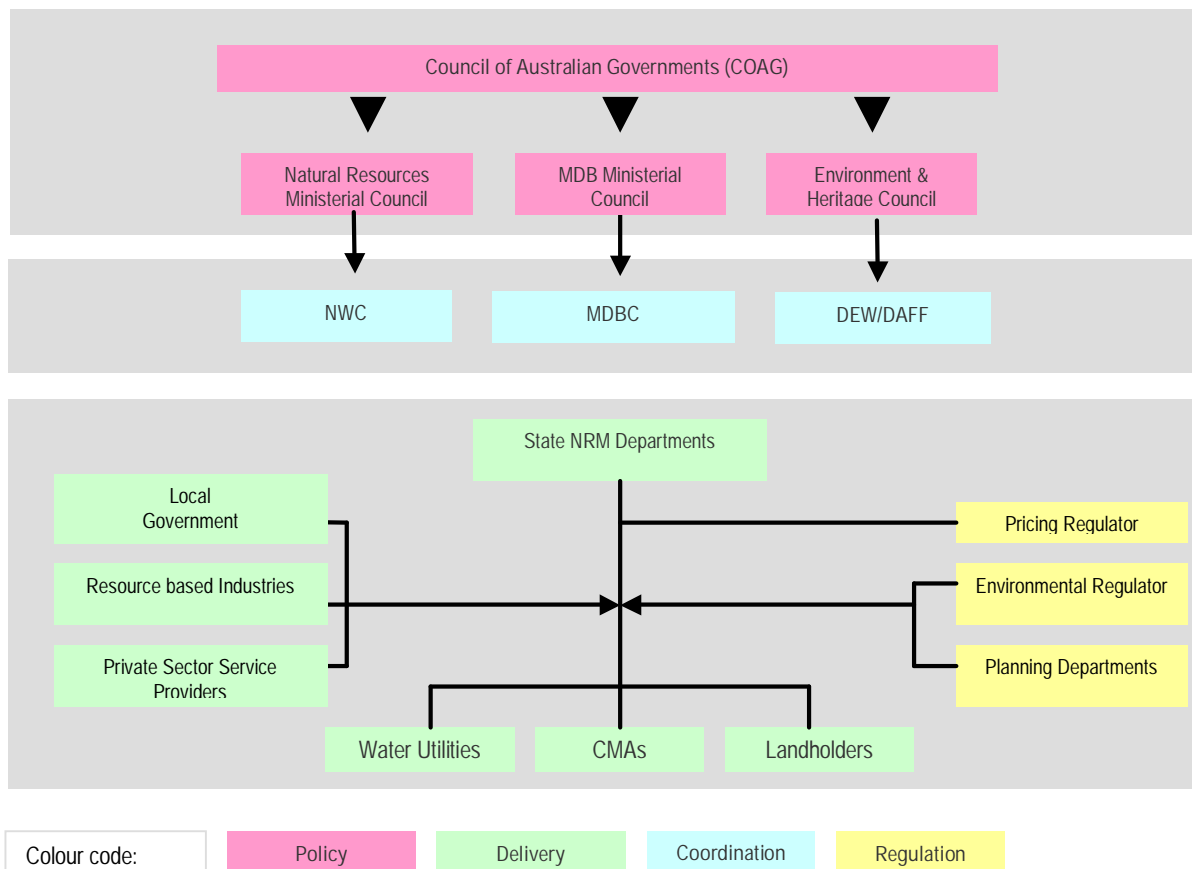
4. Water Governance

4.1 Legislative Frameworks

Water governance in Australia is complex with all levels of government involved from national, state, to local government). Under the **National Water Commission Act (2004)** the NWC monitors progress of all jurisdictions in implementing the National Water Initiative on behalf of the Council of Australian Governments (COAG). The Murray-Darling Basin Commission (MDBC), and Murray-Darling Basin Ministerial Council (MDBMC) operate under the Murray Darling Basin Agreement (1992) as an unincorporated joint venture between four States and the Commonwealth. Each State has its own water legislation covering water allocation planning, licensing and compliance, together with the operation of water supply and wastewater authorities, generally in the form of **State Owned Enterprises** or Corporations.

Under COAG (1994) reforms governments were encouraged to separate policy, service delivery and regulatory roles in different organisational entities. Environmental and pricing regulation are generally governed by separate bodies, operating under separate pieces of legislation. Local Government has some water supply, wastewater and stormwater management functions and operates under State legislation. Most aspects of Natural Resource Management other than Biosecurity are the subject of State Legislation as is the responsibilities of Catchment Management Bodies, although not all regional NRM bodies have a statutory basis. With the exception of Irrigation Companies in some States, Water utilities remain in government ownership.

Figure 3: Key Elements of Australia’s Water Governance Framework



4.2 The Role of the Commonwealth

The Commonwealth Government has a national policy leadership role coordinated by the Minister for Environment and Water Resources, supported by the Department of the Environment and Water Resources and the National Water Commission (NWC). Under the National Plan for Water Security It is proposed that the States will transfer water management powers to the Commonwealth to manage the Murray Darling Basin, through a new Commonwealth Statutory Authority.

The Commonwealth Government has a significant funding role in Natural Resource Management through programs such as Natural HeritageTrust (NHT), National Action Plan for Salinity and Water Quality (NAP), National Plan for Water Security (NPWS) and National Water Initiative (NWI).

4.3 The Role of Ministerial Councils

The Council of Australian Governments (COAG), comprises the Prime Minister, State Premiers and Territory Chief Ministers and the President of the Local Government Associations. In 1994 the COAG agreed to establish a Water Reform Framework which aimed to implement efficient and sustainable

reform of the Australian Water Industry through bringing about a more competitive and integrated national market and more efficient and effective arrangements for the delivery of water management. COAG has more recently endorsed the NWI. The **Natural Resources Ministerial Council and Environment Protection and Heritage Council**, also provide a forum for relevant State and Commonwealth Ministers to coordinate national policies and programs.

4.4 The Role of States and Territories

State and Territory governments have constitutional responsibility for water and land management and develop and implement State water and catchment management policies and programs. States and Territories have different departmental and water utility arrangements. In WA, for example, the Department of Water Resources is responsible for policy and planning and the Water Resources Corporation for delivery of water services to users. In Victoria, by contrast, the Department of Sustainability and Environment has policy responsibility for the sector and there are many regional rural, and non-metro urban water supply authorities and nine CMAs. Melbourne Water is the bulk supply and waterway management authority for the Melbourne metropolitan area and three retailers are responsible for distribution and sewerage.

4.5 The Role of Local Government

Local governments are responsible for the delivery of domestic water supplies in many regions and are also responsible for stormwater management, sewerage and septic works and flood control and management. Local governments have enforcement powers for development consent conditions and unauthorised land-use and also planning through zoning of land use and statutory controls on all privately managed open space. In parallel to implementing their own local water and natural resource management plans, local governments also implement state government planning instruments such as State Environmental Planning legislation.

4.6 The Role of Regional Natural Resource Management Bodies

Catchment Management Authorities and regional NRM bodies have an increasingly important role in the management of water and natural resources due to their capacity to incorporate social, economic and environmental objectives of catchment stakeholders into integrated catchment management plans. Regional water and NRM bodies are the interface between Federal and State governments and water users and landholders in specific regions. These bodies are responsible for monitoring and reporting to State and Territory governments, their progress towards meeting regional catchment targets.

4.7 The Role of the Private Sector

Due to increasing pressure on water supplies and resources in Australia, combined with a trend of under-investment in water infrastructure over the last few decades, the role of the private sector in water management is becoming increasingly significant. The private sector has been increasingly active in the financing the provision of utilities and infrastructure such as roads, however private sector involvement in water management has so far been predominantly through consultancies and outsourcing design, construction and operation of water supply and wastewater systems. With the contraction of water skills within government the private sector is increasing being called on to play a bigger role in providing water planning and policy advice. A key issue for governments is to further define the role of the private sector

in the provision of water and wastewater services as well as improving the efficiency of water management in Australia.

5. Integrated Catchment Management

5.1 Catchment Planning

Irrigation salinity planning gave special impetus to the logic of ‘the Catchment’ as the natural unit for land and water management. In particular, the importance of coordinated group action to implement local and regional drainage schemes was a key driver of community based catchment planning and action. Moreover, as communities grappled with understanding the causes and effects of salinity, salinity plans evolved into land and water plans and integrated catchment plans to ensure all relevant catchment processes could be considered, including water quality, dryland salinity, vegetation management and river health. Catchment Plans are the responsibility of **Catchment Management Authorities** and represent the long- term vision of the region for the sustainable development and use of its resource base, together with investment priorities for actions to protect key environmental assets and regional production. The plans must set out realistic targets and performance measures for catchment condition and management responses, as well as strategies to build community and industry participation and capacity.

5.2 Monitoring Catchment Health

Water quality and river health are powerful integrating measures of catchment health including vegetation cover, salinity and soil erosion. A **National Land and Water Audit** was released in 2000. This confirmed the seriousness of the condition of our catchments. Further work under a subsequent cycle of the Audit is focused on measuring the effectiveness of investment in catchment plans through the NAP/NHT programs.

The majority of catchments classified in the poorest condition were also identified as priorities under the NAP for Salinity and Water Quality. The assessment determined that a significant proportion of catchments (15-25%) are likely to continue to decline due to the long-term nature of environmental processes and degree of change in the catchment. The assessment also demonstrated that spatial pattern and variation in catchment condition can be described by a few indicators, including: change in vegetation cover, native vegetation fragmentation, sediment and nutrient inputs into rivers, change in catchment hydrology and land use intensity. Monitoring is critical in providing the feedback loop to enable adaptive management and to assist in effectively target investment under the plan.

5.3 Engaging the Community

Community engagement in water resource planning has been a critical requirement of Australia’s reforms. Whilst it must be based on best available knowledge about implications for aquatic ecosystems, the decision about the share of the resource to be allocated to the environment versus consumptive uses is fundamentally a judgement for Government. The NWI requires that this decision only be taken after extensive consultation with all stakeholders through a community based planning process. The aim is to allocate sufficient water to the environment to protect key environmental assets and the sustainability of the resource whilst balancing the socio-economic costs and benefits. Indigenous cultural issues also need to be considered.

In a number of states CMA’s are becoming the logical focus for coordination of community engagement on water plans. Water planning should be part of integrated catchment management so that review of

water plans is part of a process of assessing the overall performance of catchment management programs. This is important because river health is not just a matter of environmental flows, but also a function of water quality, riparian vegetation and many other aspects of catchment condition. Accordingly, increasing emphasis is being placed on catchment health to assist in evaluating the effectiveness of water allocation plans. Under the NWI the costs of this monitoring and water resource measurement, and accounting generally, are being progressively incorporated into water user charges.

5.4 Capacity Building

The National Water Commission has recognised that building human capacity and technical skills are key challenges that need to be addressed in order to deliver effective water policy reform in Australia. Results from the NWC's Water Survey highlighted that the water industry must act now to strengthen the capacity of water managers from regional catchment entities to managers of major urban supplies. The NWC is currently proposing a possible Working Group tasked with the goal of developing a national strategy to further develop human capacity and attract more expertise to the water sector. Capacity is also a key issue in relation to catchment management, both in terms of the organisations and landholders.

6. Lessons from ten years of implementation

6.1 National Plan for Water Security (2007)

In response to the severity of the drought which is impacting large parts of Australia, the Commonwealth Government proposed a \$10 billion, 10 point plan to improve water efficiency and address over-allocation of water in rural Australia. The National Plan for Water Security calls for significant change to the governance arrangements of the Murray-Darling Basin including the transfer of powers from the riparian states of the MDB to the Commonwealth Government. The Plan will also aim to accelerate the implementation of the NWI through addressing over-allocation of water combined with the requirement to modernise irrigation infrastructure in rural Australia.

6.2 Planning for Climate Change

The apparent steep changes in rainfall over the last half century, together with the heightened threat of climate change is challenging water planners to build significant contingencies into future water supply strategies. Some experts are advocating planning for more than 20% reduction in rainfall and more than a 40% reduction in runoff. Increasingly the **embedded energy costs** are being measured in new water projects.

6.3 Benefits of Water Markets

Water trading schemes and interstate trials have been in place in northern Victoria, in the Murray Darling Basin, for over a decade. A range of studies provides the basis for valuable insights into the socio-economic drivers of trade and the industry, community and environmental consequences of trade. Experience with intrastate trade and the pilot-trading program in the southern Murray Darling Basin has indicated a range of benefits, including:

- » Water moving from lower value uses, on flood irrigated pastures, in the Kerang region to higher value horticulture uses, in Sunraysia and the Riverland.
- » Using temporary trade as drought mitigation strategy
- » Easing structural adjustment, particularly following dairy deregulation
- » Water moving from high salinity risk areas to low salinity risk areas

6.4 Portfolio (diversification) approach to Water Security Risks

Major cities in Australia, including, Brisbane, Perth, Adelaide, Melbourne and Sydney are increasingly adopting a portfolio (diversification of sources) approach to managing risks to future water security, combining strategies for managing demand with investment in a diversity of supply side options, including **climate independent options such as desalination and recycling**.

6.5 Future Directions

With growing populations, the deepening of the drought and the threat of climate change, metropolitan and regional urban water authorities are looking at alternate sources of supply including purchase from irrigation regions. With the negative community reaction to use of recycled water for indirect potable use,

many inland cities have few other alternatives. Even in coastal centres, the energy costs of desalination need to be traded off against the pumping and treatment costs of accessing inland irrigation supplies. Whilst the concern by irrigation communities at the potential loss of water and its productive capacity from irrigation regions to cities is understandable, the total amount of water required by urban communities is very small compared to levels of irrigation use. Thus the future is likely to see more **interconnections between urban and rural supply systems** and more innovative approaches to managing system supply risks. This is already happening in Victoria with the augmentation of Bendigo's supply with irrigation water from Goulburn Murray Water and proposal to link the Goulburn –Broken System to Melbourne. As with other forms of trade between different irrigation districts care will need to be taken to minimize the impacts of stranded assets and **industry and community adjustment**.

Water quality is the next frontier in water management. As NWI reforms generate best practise in water quantity management through water sharing plans, property rights and trading, water quality will become increasingly an issue. Treatment of recycled water to a quality fit- for-purpose and substitution for drinking water currently used for non- drinking water uses is a case in point. Other issues include minimising urban treatment costs through improved catchment management. We do not yet have the right economic instruments in place to ensure the optimal investment in catchment management works to minimise water quality problems at source compared to expensive engineering and treatment costs at the point of use.

Despite the pace of reforms of recent times, there is still much work to be done in all jurisdictions to fully implement these reforms across the rural and urban sectors. The areas requiring further work include:

- » Clearly defining and characterising secure water access entitlements and making initial allocations of these entitlements;
- » Returning over-allocated systems to sustainable levels of extraction in an equitable and consistent manner;
- » Providing sound frameworks and rules for water trading to enhance and develop water markets for further economic development while delivering socially and environmentally desirable outcomes;
- » Delivering innovative solutions to encourage private sector involvement in water;
- » Robust and reliable systems for water accounting;
- » Further restructuring of the water sector to ensure organisations of effective size, capacity and a competitive environment;
- » Training the new water engineers, scientists, operators and policy makers;
- » Ensuring sufficient resources are provided to programs to deliver NWI objectives.

7. What can China take from Australia's reform lessons?

Key lessons from the past decade of reform in Australia of potential relevance to China include:

- » A secure framework of **property rights in water**, separate from land is important to underpin private investment and a market in water
- » A robust **water accounting framework** is essential for sustainable management of the resource, including metering for all users and surface and groundwater monitoring networks to measure the status of the resource
- » Strong regulations are required to ensure **compliance of users with water licence conditions** and protection of the environment and other users
- » **Water allocation plans** need to define water available for environmental needs and the pool available for consumptive uses
- » **Groundwater and surface water** need to be treated as interconnected systems
- » A portfolio approach to managing **water supply risk** needs to encompass multiple strategies for augmenting supply, including **climate independent sources** such as desalination and recycling, as well as managing demand
- » Effective management of land and water management problems requires a **whole of catchment approach** with clear governance arrangements at the regional, State and National levels
- » Engagement and **capacity building of landholders** is critical to achieving sustainable outcomes at the catchment scale
- » Government funding programs should **focus on large integrated projects** consistent with **science based** catchment investment plans

8. Conclusions

Water reform in Australia over the last decade has focused on providing a secure legal framework for allocating water for the environment and consumptive uses. This has been necessary to resolve the conflict arising from growing competition for a limited and often unreliable resource. Despite the importance of water to environmental values and the national economy only recently have steps been taken to put in place a national approach to measuring the resource. There is still a great deal we do not know about the availability of the resource and environmental requirements. The legacy of historical over-allocation is proving costly and difficult to remedy. Whilst benefits are already evident from the developing market in water this depends on having a regulatory framework in place to protect the environment and third parties. Australia's regional model of Natural Resource Management is now generating on-ground results but has exposed significant capacity and resource constraints. The whole – of- catchment approach is critical to effective targeting of resources in treating the causes, rather than the symptoms of environmental degradation. Despite the inter-jurisdictional tensions in the Murray Darling Basin some significant reforms have been achieved. In many cases the barriers to progress are problems with governance and institutional settings rather than technology and science.

China is also approaching levels of over- commitment of its water resources in some aquifers and river basins, and is experiencing water quality and other catchment problems. Desertification, salinity, flooding, blue-green algal blooms, pollutant loads in waterways are all symptoms of emerging environmental problems. Many of the issues being faced by China would seem to be amenable to the type of reforms being pursued in Australia, albeit customized to the specific community and environmental circumstances of the country. Combined with the right regulatory framework a water market is an efficient and equitable mechanism for reallocation of the resource over time, in response to changing industry, community and environmental needs. Integrated Catchment Management efforts supported by government investment and statutory catchment bodies have the potential to effectively engage rural communities in tackling environmental problems. The Australian experience shows that water and catchment management reform requires active participation of all levels of government and is a prolonged journey.

The ACEDP can play an important role in sharing technological and policy solutions to the pressing problems of water security and environmental protection. Areas for fruitful collaboration include:

- » Water Accounting systems and metering technology
- » Water and Energy audits
- » Irrigation modernisation and water use efficiency
- » Water pricing
- » Modelling hydrology and catchment processes
- » Conjunctive use policies for surface water and groundwater
- » Recycling and third-pipe and grey-water re-use technologies
- » Water sensitive urban design

Australian water agencies will derive considerable benefits from witnessing the scale and pace of water infrastructure and technology advances in China. China can look to Australia as a test bed for many governance and regulatory models for running a market based water economy

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