

## **“Sustainable Water & Land Management - An Australian Approach to a Key Global Issue”**

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### **ABSTRACT**

Water resource management in many parts of the world is fast approaching a crisis point. A key issue for all land and water administrators is unlocking a management approach that will balance the needs for the environment with the demand for new regional growth in sustainable irrigation and manufacturing development.

This paper provides an insight into an integrated approach to land & resource management by the Murray Darling Basin Commission unlocking community participation to address land degradation, increased salinity levels and rising water tables. It highlights a multi-disciplined approach to land & water resource management in the Murray Darling Basin and outlines a market approach to water resource management from a Victorian perspective.

# **THE SUSTAINABLE MANAGEMENT OF LAND & WATER RESOURCES FROM AN AUSTRALIAN AND GLOBAL PERSPECTIVE**

## **1 INTRODUCTION – INTERNATIONAL CONTEXT**

Population and economic activities are the main drivers of demand for water and water related services.

However the future structure of the world's water industry is rapidly changing affected by macro drivers such as development and technological change, income distribution and life style, globalisation and privatisation, our natural resource systems, environmental sustainability and last but not least our ever increasing social and political agenda.

The world population reached 5.9 billion in 1998 and its annual increment is thought to have peaked between 1985 and 1990 at about 87 million per year. Even so, the world population will continue to increase significantly over the medium term.

In 1950 5,000 large dams were constructed and by the mid 90's the world had witnessed the construction of over 45,000 large dams.

But will this trend continue?

As population growth contributes to increasing demands for water-related services, so does urbanisation. In 1998, 39 percent of the world's population was urban and the figure will probably reach 57 percent by the year 2020 and over 70 percent for 2050.

At the same time countries around the world, like Australia, are witnessing the ever increasing pressures on our water resources, influenced by the global drivers I have described above, but importantly in the context of water in an ever increasing scarce environment.

The following table highlights this issue in terms of water stressed countries around the world.

<b>Best Endowed</b>			
	Resources (km <sup>3</sup> /year)	% Withdrawals	
World	40,900		
Brazil	6,950	1	
Russia	4,498	8	
Canada	2,901	2	
China	2,800	14	
Indonesia	2,530	1	
USA	2,478	19	
Bangladesh	2,357	1	
India	2,085	18	
Venezuela	1,317	--	
Myanmar	1,082	--	
Colombia	1,070	--	
Congo (ex Zaire)	1,019	--	

<b>Water Stress: Countries with annual withdrawals over 25 % of the resource (around 1990)</b>			
Kuwait (no country resources)		Libya	374%
Saudi Arabia	164%	Yemen	136%
Israel	86%	Belgium	72%
Afghanistan	52%	Korea	44%
Spain	41%	Jordan	41%
Morocco	36%	Iran	39%
Singapore	32%	Italy	30%
South Africa	29%	United Arab Emirates	300%
		Egypt	97%
		Tunisia	53%
		Iraq	43%
		Madagascar	41%
		Pakistan	33%
		Germany	31%
		Poland	26%

*Table 1 Annual Freshwater Resources, Withdrawals and Stress*  
Source: Gleick (1998) and Raskin et al (1995)

The globalisation of the world economy has also resulted in business management and market based approaches being increasingly applied to water development and water management around the world. The following provides evidence of these trends:

Decreased or exhaustion of government and international financing for large public works, including dams;

- the corporatisation of previously public owned utilities and water systems, and the opening of the sector to private investments;
- the reduction of subsidies and increasing full pricing of water and energy;
- the creation of water and power markets; and
- the decentralisation of public infrastructures to local authorities or its handing down to users consortiums.

One of the areas where changes in governance and social agendas of the last three decades are more evident, is environmental sustainability. While the focus of new environmentalism range from global to local, one unifying concept is its plea to look at nature not as an array of replaceable inputs to the economic process, but as the very base of the long term human well being on earth. In the long run, the availability of ecosystem services, water supply, clean air, continued biodiversity and hospitable climates, is key to the ability of future generations to survive and flourish.

In response to the changing world environment and to the internal needs within the Murray Darling Basin we have started to manage water as a scarce resource. We have done this in the context of an integrated catchment management approach and amongst other things have put in place a unique system of tradeable water entitlements to facilitate economic and environmental improvements. This paper describes the environment in which these changes were created and what our aspirations are for the future.

An integrated approach to management of the Murray-Darling Basin commenced in 1985 and built on the arrangements for water sharing between the three southern states which commenced in 1915. This paper deals with the institutional arrangements such as water trading, the Salinity and Drainage Strategy and with natural resource management including community participation. In addressing these issues I do not propose to spend all of my time wrestling with definitions of what is meant by 'integrated', 'natural resource management', or present my definition of sustainability. Nevertheless, I want to outline the path the Murray-Darling Basin Commission and its Council are treading towards a more sustainable future in the Murray-Darling Basin. By necessity, this means that we have to take a more integrated approach in the way we deal with issues. The Murray-Darling Basin Initiative, involving the five jurisdictions of the Commonwealth Government, New South Wales, Victoria, South Australia and Queensland provides for integration of policies and programs at the political and bureaucratic level.

However, the most important level at which integration is required is at the local and regional level, where agency and land owner representatives must combine across disciplines to tackle the natural resource problems that now face them. The Murray-Darling Basin Commission has developed and implemented a Natural Resources Management Strategy which recognises that the majority of the land is privately managed and successful long term change is dependent on a high degree of community involvement to both advise and carry out the necessary works and measures to address natural resources degradation. The Commission philosophy is that community participation is vital if sustainable resource management is to be achieved.

This paper provides some background to the Murray-Darling Basin Initiative, examines the issues which have been tackled to date within the Initiative, and looks at future options to enhance integration for the management and delivery of natural resource programs in the Basin.



Figure 1 - The Murray-Darling Basin

The Murray-Darling Basin covers 1.06 million square kilometres or approximately 1/7 of the total area of Australia and is equivalent to the area of South Africa (see figure 1).

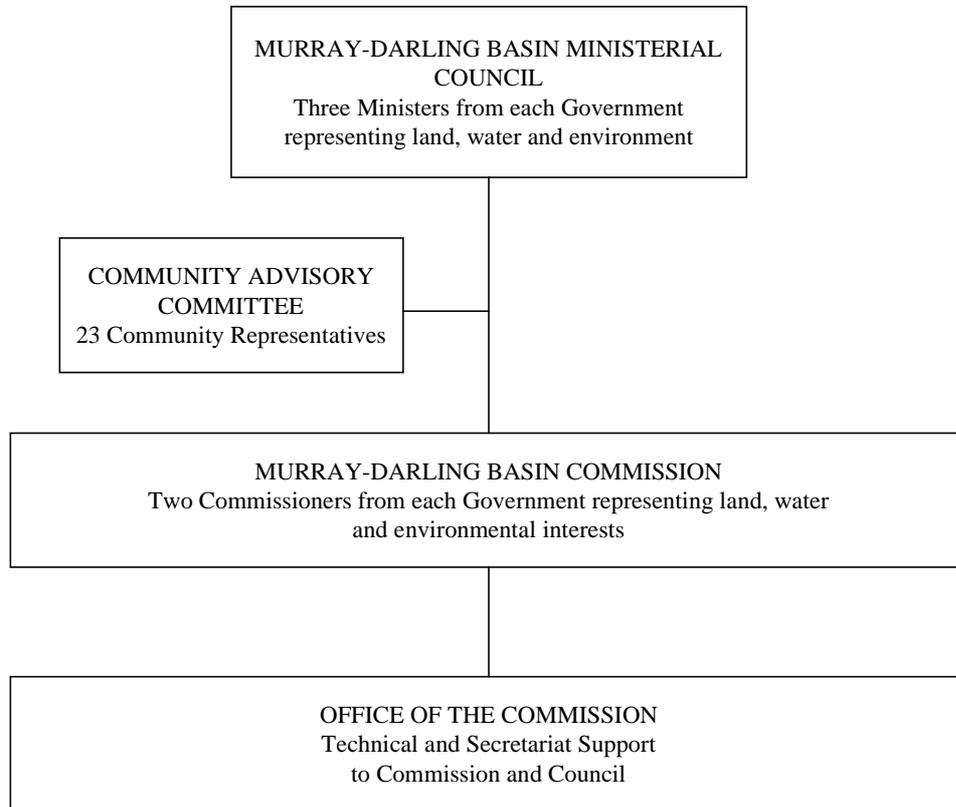
The Basin is Australia's most important agricultural region, accounting for approximately half of the nation's gross agricultural production. It contains or supports one quarter of the cattle herd, half of the sheep flock, half the crop land and almost three quarters of the irrigated land in Australia. The climate and topography vary dramatically from a mountain range along its eastern fringe to extensive flat, semi-arid to arid areas in the west. Significant areas of the Basin are degraded; with soil erosion, land and water salinisation, soil acidification and eutrophication of water ways and lakes becoming increasingly common.

It is clear that these problems need to be managed on a catchment basis if sustainable use of the natural resources of the Basin is to be achieved. The 1985 the Governments formed a Ministerial Council to coordinate and oversee the development of natural resources programs. The objective of Council is to *promote effective planning and management for the equitable, efficient and sustainable use of the water land and environmental resources of the Basin*. In 1988 an agreement was reached between three State Governments, and the Federal Government to facilitate joint management of the high priority natural resources issues.

## **2 MANAGEMENT STRUCTURE FOR THE MURRAY-DARLING BASIN INITIATIVE**

The critical development at the political and bureaucratic level over recent years has been the establishment of a management structure that enables matters of common interest to be developed, discussed, resolved and implemented. This management structure comprises three layers as is illustrated in figure 2.

Firstly, there is a Ministerial Council with representatives from the Federal and four State Governments. Each Government is represented on Council by Ministers representing between them the land, water and environment portfolios. The second layer is the executive arm of Council. This has two components: firstly, the Murray-Darling Basin Commission which has two representatives from each Government, representing land, water and environmental issues.



*Figure 2 - Management Structure for the Murray-Darling Basin Initiative*

Commissioners are usually the head of each agency, for example, the State Director of Water Resources. The Commission is supported by a technical executive, known as the Office of the Commission. The Office of the Commission carries out a number of statutory functions with regard to operation of the Commission's storages, sharing of water between the States and developing long-term natural resources management plans for the Basin's resources. The third component of the Initiative is a Community Advisory Committee. This Committee, which consists of both regional and special interest group representatives, reports directly to the Ministerial Council. The Committee's role is to advise Council of the effectiveness of the policies and programs being developed.

### 3 ISSUES INHIBITING COOPERATIVE MANAGEMENT

Before significant co-operative action could be undertaken to deal with sustainable resource use there were two matters, affecting the distribution of wealth between the three States, which needed to be resolved. These matters concerned the distribution of the waters of the Murray-Darling Basin leading to the introduction of a cap or ceiling on the water taken from the streams in the Basin and the responsibilities for the cost of works and measures to address the increasing problem of rising River Murray salinity. The resolution of these issues is discussed below.

#### 3.1 Water Sharing

Prior to Federation in 1901, there were many inter-State disputes over the use of River Murray waters. Settlement and development was uncoordinated, as individual states pursued their own interests, with little regard to other states. Following Federation, and after protracted negotiation, which included numerous conferences and Royal Commissions, an Agreement to share the water resources of the River Murray was reached in 1914. This Agreement remained largely unchanged until the late 1980s.

### Storage Capacity in Major Dams

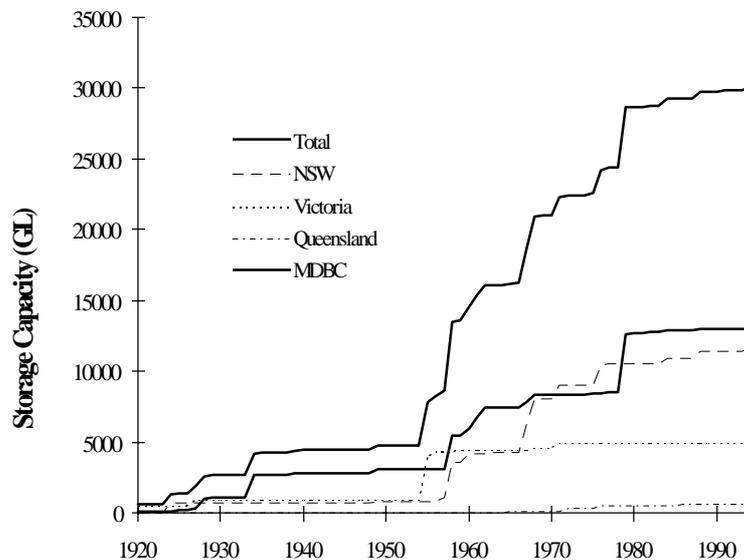


Figure 3 - Growth in Storage capacity throughout the Murray-Darling Basin

In recent years the use of the available water resources of the Murray-Darling Basin approached the sustainable yield of the catchment which resulted in increased pressure to better define ownership of the resource (or establish property rights) and to establish equitable sharing arrangements among the three States — particularly during extended drought periods. Figure 3 demonstrates the growth in storage capacity throughout the Murray-Darling Basin from 1920 to the present; and figure 4 shows the trend in annual diversions over the same period.

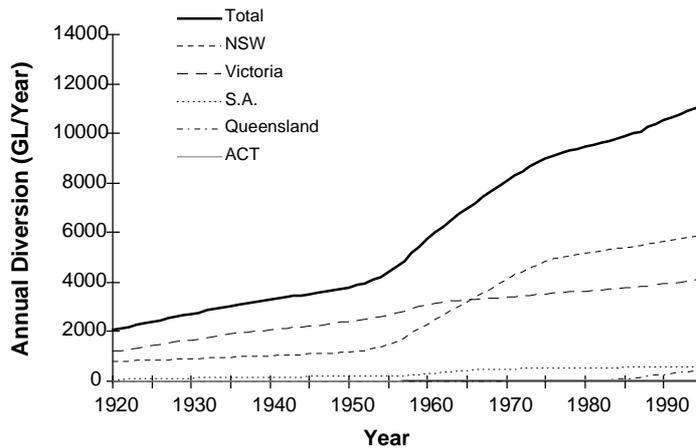


Figure 4 - Trends in annual diversion throughout the Murray-Darling Basin

Resolution of the water sharing issue was an important precursor to co-operative management of the Basin's natural resources. There is no more powerful stimulus than the distribution of wealth to focus the political, bureaucratic and community minds on issues. In 1989, following extended negotiations over a 15 year period, the Murray-Darling Basin Commission and Council agreed to a revised method of water sharing. A system of continuous water accounting was introduced. This method of accounting provides the necessary water security for individual States, while at the same time providing some increased flexibility to pursue resource allocation policies suited to their development requirements. The water accounting system includes provision to protect the security of the overall system by specifying reserve storage volumes which must be maintained under specific conditions. The system is based on continuous accounting for water used by the States, capacity sharing of reservoirs and also provides an opportunity for the States to trade water, should they so desire. The strength of this system of water accounting is that it defines the 'property right' of each State, taking into account previous agreements, the existing storage infrastructure, and recognising the massive seasonal variability of stream flows in the Basin. This system of continuous water accounting has provided a sound basis for future management of the shared water resources of the Basin, and has removed a major impediment to co-operative action.

In June 1995 the Ministerial Council (representing the Governments of Victoria, New South Wales, South Australia, Queensland and the Commonwealth) found that use was continuing to grow – not from the issuing of rights, but from activation of 'sleeper' licences as well as from higher take up of 'sales' and 'off quota' water.

This was because the system in place evolved at a time when water managers were trying to encourage development of the Basins water resources. As such the system rationed water during periods of shortage but was not effective for controlling use during normal non drought conditions.

The Ministerial Council decided an upper limit, or cap, must be placed on use.

The cap has been defined a 'the volume of water that would have been diverted under 1993/94 of development'. This means, that in any future year we are allowed to take the volume of water that would have been taken in that sort of climatic year, supposing we still had 1993/94 levels of farm development, dams, delivery systems, and take-up of rights. The council has in fact put in place a unique system providing balance between significant economic and social benefits and the environmental uses of water.

The cap restrains diversion, not development. New developments under a system of water trading may still occur and are in fact promoted provided water is obtained by improving water use efficiency or by purchasing water from existing developments.

### **3.2 River Murray Salinity**

The other area in which there was significant intergovernment concerns was the sharing of the costs associated with River Murray salinity. Salinity levels in the lower reaches of the River Murray have been increasing over the last twenty or thirty years. These increases have resulted from:

- an increase in the diversion of fresh water from the rivers and streams of the Murray-Darling Basin. This diversion is currently averaging 10 500 000 ML per annum.
- an increase in drainage flows from irrigation areas which are becoming increasingly more salinised due to rising water tables
- an increase in groundwater flows to the tributaries and directly to the River Murray, resulting from the removal of the deeper rooted native vegetation from much of the catchment area.

The current cost of salinity to users of River Murray water of salinity is in the order of \$40m per annum<sup>2</sup>. Figure 5 illustrates the increase in River Murray salinity from about 60 EC units in the head works storages to about 800 EC as the River approaches the sea some 2 500km downstream.

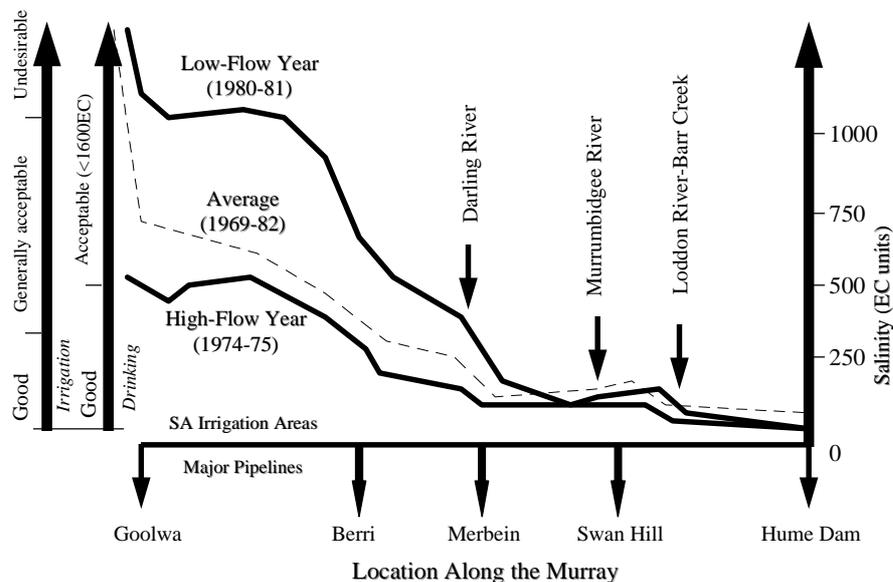


Figure 5 - Variation in salinity along the length of the River Murray

The issue that needed to be resolved was that the upper two States were the primary beneficiaries of the water diverted from the Basin, whereas the salinity consequences of that action are largely paid in the lower River. Prior to the establishment of the Murray-Darling Basin Commission and Council there was no clear strategy to determine an equitable solution to this issue. As a result there was continued friction at both political and agency levels between the States. This was graphically illustrated by South Australia (the State in the lower reaches of the River Murray), taking New South Wales to its Land and Environment Court in order to prevent them from allocating further licences to divert water from rivers within its component of the Basin. While the Court action had some advantages in that it focussed attention on the issue, it did little for harmonious relations between the States, or to promote the concept of integrated natural resources management in the Basin.

Murray-Darling Basin Ministerial Council, when it was formed, allocated its highest priority to the resolution of this issue. A Salinity and Drainage Strategy has now been developed and agreed by Government to resolve this issue. The key components and principles of the Strategy are discussed below.

#### 4 SALINITY AND DRAINAGE STRATEGY

The Salinity and Drainage Strategy is a component of the Commission's broader Natural Resources Management Strategy which is discussed later in this paper. The Salinity and Drainage Strategy provides a framework for joint government action to effectively manage the pressing problems of River Murray salinity and the waterlogging and land salinisation of the irrigation areas of the Murray and

Murrumbidgee valleys. These problems are a major threat to both the productive base and the conservation of natural resources of the Murray-Darling Basin.

Without intervention it is estimated that the area of high water tables (ie watertables within 2m of the land surface) will increase to 95 per cent of the total area irrigated within 50 years<sup>3</sup>. The Strategy provides a basis for tackling these problems by reducing river salinity and at the same time providing an opportunity to reduce waterlogging and land salinisation, through a range of land management schemes, some of which involve disposal of drainage water to the river. The resolution of these conflicting objectives is at the heart of the Salinity and Drainage Strategy.

The specific objectives of the strategy are to:

- ❑ improve water quality in the River Murray for all beneficial uses e.g. agriculture, environment, urban, industrial and recreation
- ❑ control existing land degradation, prevent further land degradation and, where possible, rehabilitate land resources, to ensure their sustainable utilisation
- ❑ conserve the natural environment.

The Strategy strikes an equitable balance between the competing needs of river protection and land management. This balance is derived from an economic evaluation of a range of feasible river protection and land management schemes, together with their environmental effects. It is not possible in this paper to describe the extent of those investigations, however, they are detailed in reference Murray-Darling Basin Ministerial Council<sup>4</sup>.

The Strategy sets in place a framework which enables a collaborative effort to tackle these urgent problems and also provides each State with a clear guidance of its obligations and rights. Within this framework, States are able to pursue their internal land and water management programs. The rights and responsibilities of the States are defined by the following key elements of the Strategy:

#### **4.1 Baseline Conditions**

- ❑ Current salinity levels are to be adopted as the baseline for evaluating responsibility for all future actions which affect river salinity
- ❑ Each State will be responsible for its future actions which affect river salinity

#### **4.2 Initial Program**

- ❑ Changes were made to the operation of the Commission's reservoirs that resulted in a 28 EC reduction in river salinity. The 28 EC is represented as the 10 year average of salinity as measured at a town called Morgan in the South Australian reach of the river (refer figure 5). It is used as a useful reference point for measuring salinity as it reflects the economic and environmental consequences of changed river salinity.
- ❑ The three States and Commonwealth will jointly fund cost effective salt interception schemes to reduce river salinity by 80 EC.

- The upper States may increase river salinity by up to 15 EC (average salinity at Morgan) as a consequence of joint funding of the salt interception program.

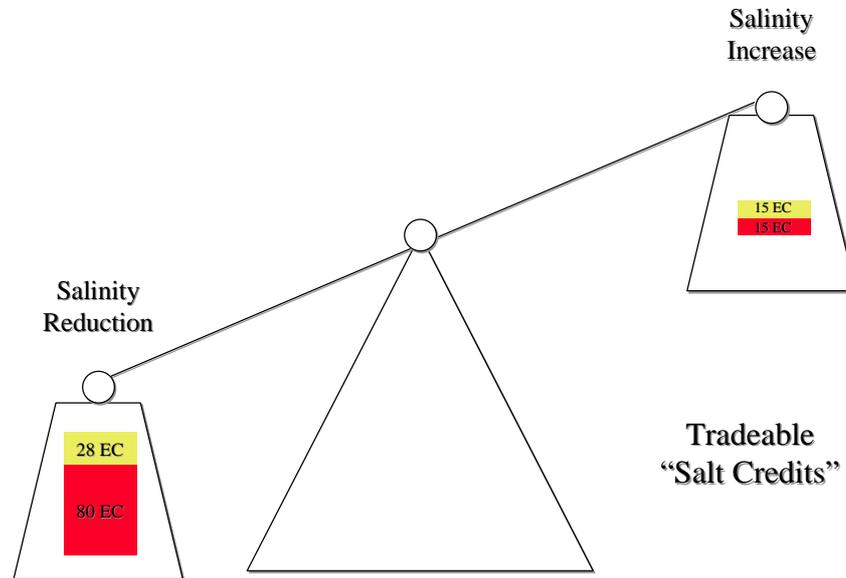


Figure 6 - Balance Between Salinity Reductions and Salinity Increases

### 4.3 Future Program

- Beyond the joint program of works, States have the option of contributing to the cost of any further schemes that are identified and will receive a salinity credit in proportion to the cost.
- River salinity improvements obtained by any other action in one of the States will be credited to that State

### 4.4 Administration

- The strategy is embodied in a Salinity and Drainage Agreement and is administered by the Murray-Darling Basin Commission
- The 15 EC salt credit available to each State is a tradeable right between the States.

The net result of implementing the Salinity and Drainage Strategy will be to reduce River Murray salinity by up to 20 per cent in those reaches of the river where salinities are currently high enough to result in a decline in crop yields. The allocation of salinity credits (15 EC to each of the States), or the right to add more salt to the River Murray within prescribed limits, will enable the States to drain their high value irrigation land. The balance between the salinity reductions and the salinity increases are represented in Figure 6.

As the salinity credits are small in relation to the total demand for salt disposal, each State must pursue an appropriate land and other management strategy to reduce the amount of salt that needs to be disposed of. Since the implementation of the Salinity and Drainage Strategy there has been a significant advancement in the development of community-based integrated resource management plans for irrigation areas. This trend will continue as communities become aware of the significance of their problems and the limited opportunities to address them by transferring them to downstream communities.

## **5 NATURAL RESOURCES MANAGEMENT STRATEGY**

The Natural Resources Management Strategy is the cornerstone of the Murray-Darling Basin Commission and Council's efforts to sustain the natural resources of the Murray-Darling Basin. The Strategy, which was developed over a period of four years, involved a significant consultation phase both within state and federal agencies and with the wider community. The building block for the Strategy was an assessment of environmental resources of the Murray-Darling Basin. This was completed in July 1987 and contained an assessment of the status and options for improved management of these resources<sup>5</sup>.

This study was followed by further work to develop an integrated approach to natural resources management. However, early attempts to develop an integrated strategy failed because of the lack of a delivery mechanism. That is, there was no structured way for the government to deliver an integrated program to the community. A failing with many strategies has been that, while they are able to articulate the right aspirations for the management of the resource, they are not able to deliver the product on ground. In the Murray-Darling Basin the majority of land is freehold and for any strategy to be effective it must be able to provide this group in the community with the knowledge and resources to improve the management of the natural resources under their control. Community involvement and commitment are the key to successful natural resources management.

The Commission and Council adopted this premise and set about developing a strategy which would empower the Community to address local issues in a coordinated and integrated way. Each individual community's action would be a component of the action necessary to improve overall natural resources management in the Basin. The matters and issues considered in reaching this position are discussed below.

### **5.1 Problems Identified**

The problems identified in the Environmental Resources Study<sup>5</sup> and given priority for attention in the Natural Resources Management Strategy<sup>6</sup> are:

- ❑ rising salinity levels in soils and streams
- ❑ deteriorating quality of water supplies
- ❑ land degradation, for example, soil erosion and acidification
- ❑ decline and loss of native vegetation
- ❑ loss of native habitats
- ❑ over-commitment of, and competing demands for, water supplies

- ❑ cultural losses (for example, Aboriginal heritage sites).

## **5.2 Strategic Aims**

To address these issues, the following strategic aims were developed for the Strategy:

- ❑ prevent further degradation of natural resources
- ❑ promote sustainable user practices
- ❑ ensure appropriate resource use planning and management
- ❑ ensure a long term viable economic future for the Basin's dependents
- ❑ minimise adverse effects of resource use
- ❑ ensure self-maintaining populations of native species
- ❑ preserve cultural heritage
- ❑ conserve recreation values
- ❑ ensure community and government co-operation.

The sheer size of the Basin and its problems means that community and government must co-operate in their efforts to achieve these strategic aims. The essentials of the Strategy are that it:

- ❑ relies on the community to lead and participate in the planning and implementation of onground works and measures and to adopt natural resources management practices consistent with sustainable use
- ❑ provides a coordinated framework for community led action supported by government
- ❑ identifies responsibilities of the community and government at both Basin and regional levels
- ❑ seeks to accelerate action through a program of works and measures and community education
- ❑ provides a mechanism for ongoing planning and review of policy and legislation

The Strategy does not contain a solution for every resource issue, it provides a framework within which such issues may be addressed.

## **5.3 Community Action**

The Strategy provides for the implementation of onground works and measures to be largely the responsibility of individuals and communities. It provides for the recognition or establishment of community groups under the generic heading of 'Communities of Common Concern' (CCC). The CCC concept is flexible to cover the range of resource issues that need to be addressed. Some community groups will be small while others will form to tackle larger and more complex issues. The fundamentals for community involvement in the Strategy are for the community to:

- ❑ identify local natural resources issues which need management/intervention
- ❑ enlist government support funds to complement its own resources for its activities, through the funding program which supports the natural resources management strategy and any other source
- ❑ develop and implement action based management plans for its locality

- ❑ promote the adoption of improved management practices
- ❑ communicate to government its aspirations and concerns for the management of natural resources at the local, regional and Basin-wide level.

To support the community-led action, coordinated government action is required to service the needs of the community in the following areas:

- ❑ community education and information — community understanding of the key issues is necessary to support and encourage landholder activity
- ❑ policy and legislative framework — government will encourage preferred management practices and discourage inappropriate ones using legislative powers as necessary
- ❑ research and investigations — to initiate the necessary research and investigations to support the community effort
- ❑ to monitor and review implementation of programs to address resource degradation — a common basis for identifying, assessing and monitoring resource degradation is required. This will enable the degree of success of the various community groups to be assessed.

The arrangements for the development of community action plans are shown in Figure 7. There are 29 areas where detailed community actions plans have been completed or are nearing completion. There are also over 1000 Landcare Groups working in the Murray-Darling Basin.

These groups work to improve the management of their area by sharing knowledge, carrying out demonstration work and facilitating community involvement. If they need a more detailed plan because of the significance of the issue confronting them, then they move to the arrangement shown in Figure 7.

## Arrangements for Development of Community Action Plans

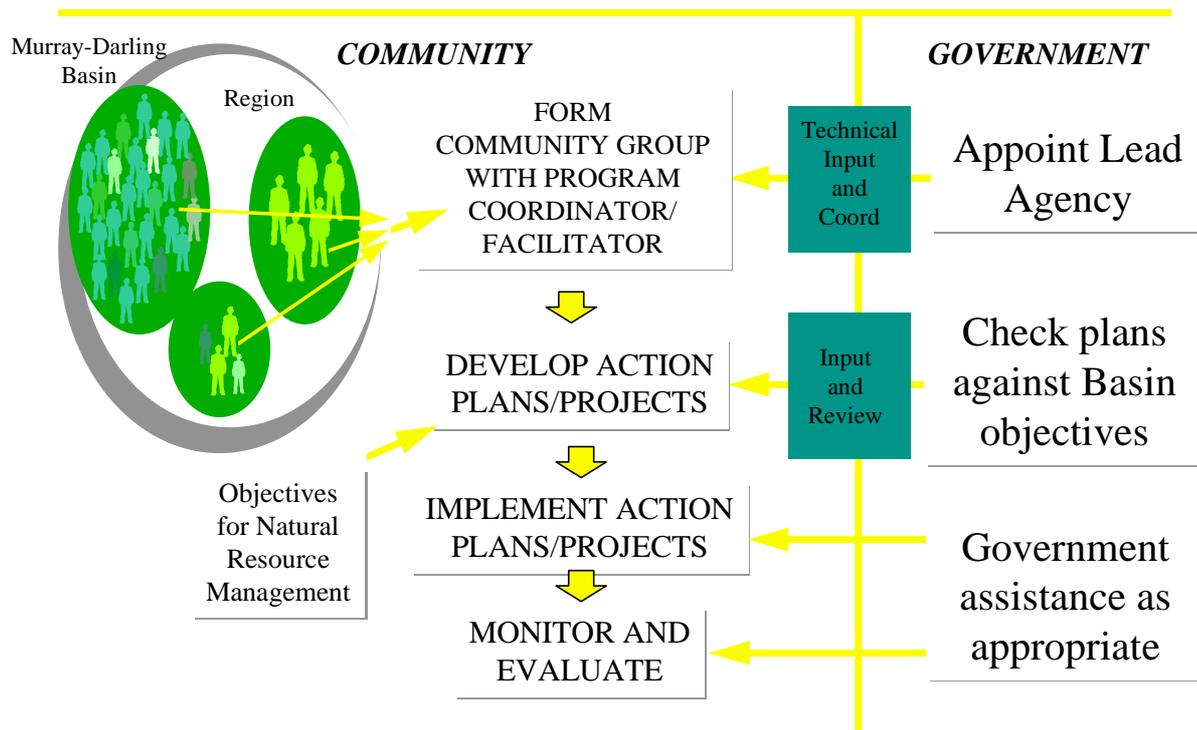


Figure 7 - Arrangements for Development of Community Action Plans

### 5.4 Managing the Strategy

Any strategy requires two key elements for success: one is a delivery mechanism; and the second is the resources to support change. The Natural Resources Management Strategy has been supported by a funding program. Funds are provided for knowledge-based activities and for onground works and measures. Approximately 40 per cent of the funds are directed to the knowledge based activities and 60 per cent to the onground works.

#### 5.4.1 Knowledge based activities

Knowledge based activities principally deal with applied research and investigations required either to implement onground works or measures or to develop Basin-wide policy initiatives.

The following areas are considered for funding in the knowledge based category:

- ❑ aquatic and riverine management
- ❑ groundwater management
- ❑ land and vegetation management
- ❑ salinity and drainage
- ❑ cultural and historic site management
- ❑ native flora and fauna management
- ❑ education and information.

#### 5.4.2 On Ground Works

The programs for on ground works are developed by various community groups and are submitted for review by catchment or regional committees before being considered by the Commission. Guidelines for funding various works and measures are provided to the community. There is an expectation that the program will only fund those works and measures for which there is a perceived community benefit. The majority of funding for works must come from individual land owners.

In the 1994-95 financial year, the total program amounted to about \$22m with \$8m going to the knowledge based component of the program, and \$14m to the onground works and measures.

## **6 THE MOVE TO TRADEABLE WATER ENTITLEMENTS**

### **6.1 Comprehensive System of Water Entitlements – A Victorian perspective**

Victoria's comprehensive system of water entitlements is based on a bulk entitlement program which deals directly with the allocation of water to authorities and the environment and provides a comprehensive framework for the trading of surface water entitlements.

The Victorian *Water Act* 1989 is the legislative framework which enables water entitlements to be clearly defined and provides the statutory basis for environmental allocations.

Water may be allocated through the bulk entitlement provisions of the *Water Act* 1989 or via the licensing provisions. In each case clear tradeable volumetric entitlements to water are established.

Bulk entitlements replace the previous ill-defined bulk rights to water and define the relationship between the Crown, bulk entitlement holders, users, and the environment.

The process by which bulk entitlements are established is complex, with some systems requiring up to three years of public consultation with stakeholders before the entitlement is finalised. Once established, bulk entitlements are explicitly available from a specified location and source; have an exclusive share granted to the authority and no other authority; are tradeable; and are enforceable at law through proper monitoring and policing arrangements.

The bulk entitlement program ensures secure water property rights, separate from land title, are in place. The program also enables the provision of water for the environment, either by establishing bulk entitlements for the environment or by imposing conditions which specify an environmental flow regime on entitlements held by other authorities. This program has reached the stage where flow sharing arrangements at approximately 70% of the diversion sites across the State have been negotiated and agreed with stakeholders. At the vast majority of sites this has resulted in improved environmental outcomes. Formal bulk entitlements are being progressively granted and regulatory systems, to monitor and manage the entitlement system, including water trading, are being implemented.

Licensed diversions from unregulated waterways are not included within the bulk entitlement regime. Instead the Minister has the power to issue licences. This power has been delegated to the rural water authorities. The licences provide a tradeable entitlement to water. Licensed diversions on unregulated waterways account for approximately 5 percent of water diverted.

#### 6.1.1 Water Trading

In terms of water trading, both licences and water rights have been temporarily transferable since 1989. Victoria introduced permanent transfers of water rights in 1991/92 and now has an active water market which enables water to move to its highest value use.

With the Victorian *Water Act's* sound property rights system in place, water trading is already starting to play an ever-increasing role in agricultural production. In 1997/98 many irrigators only coped with the low allocations of water by turning to the water market. This prompted record levels of water trading with permanent transfers up to 20,000ML and temporary transfers of up to 250,000ML.

Water trades may occur through direct farmer to farmer transactions, through a water broker or via a water exchange. In response to requests from its customers, Goulburn-Murray Water established a water exchange dealing in temporary transfers in September 1998. The exchange handles temporary transfers across all northern Victoria. It accounts for about 10 percent of the water traded but plays a very important role in providing price information to the market.

As water markets are already operating successfully for a large part of the State, the main issue that needs to be considered is whether the metropolitan industry's structural arrangements would enable gains from water trading.

The Water Reform Unit, together with the Department of Natural Resources and Environment, has established a Tradeable Water and Entitlements Project to carry out this study.

While temporary interstate trade has been possible since 1995, Victoria is an active participant in the MDBC's pilot project, confined to high-security licences between Nyah and the Barrages, which has now processed 27 permanent interstate trades. Victoria is keen for the project to be expanded and is currently working with its interstate trading partners, through a MDBC working group, in an effort to resolve cost recovery and security of supply issues which need to be addressed before the project can be extended.

#### 6.1.2 Water for the Environment

The Victorian *Water Act 1989* requires the Minister to consider the environment when making water allocation decisions.

As discussed above, the bulk entitlement program enables the provision of water for the environment in regulated systems either by establishing bulk entitlements for the environment or by imposing conditions which specify an environmental flow regime on entitlements held by other authorities.

This method of providing water for the environment has been successful to date because the negotiation between stakeholders, undertaken as part of the bulk entitlement conversion process, ensures that environmental managers, irrigators, water authorities and other groups have been consulted and agree before the entitlement is finalised.

There is recognition by the irrigators of their dependence on healthy rivers to sustain their business and therefore, of the need to provide water for the environment.

It should be noted that in 90% of these negotiations, some improvements to environmental flow regimes were achieved. For example, the environmental flow regime specified in conditions on the bulk entitlement held by Goulburn-Murray Water for Lake Eildon provided an increase in minimum daily flows from 120ML/day to 250ML/day and a flushing flow of 80 000ML in November for wetland watering.

On unregulated rivers, not covered under the bulk entitlement program, the management of diversions will be undertaken through the development and implementation of streamflow management plans (SMPs). SMPs will establish environmental objectives, immediate and, where necessary, long term environmental flow provisions, mechanisms to achieve long term environmental flows provisions, rostering rules, trading rules, and rules covering the granting of any new licences.

River Restoration Plans (RRPs) will be developed for rivers where the environmental provisions made through the Bulk Entitlement process are considered to be insufficient to meet environment objectives. RRP's will build on the current environmental provisions. They will set clear environmental objectives, set priorities for any additional water, identify mechanisms to provide additional water, identify complementary instream and riparian habitat works that will maximise environmental gains and establish agreed cost sharing for implementation.

In addition to the bulk entitlement conversion process, SMPs and RRP's, there is the opportunity for any further water rights that are required for environmental purposes to be acquired through market mechanisms with cost sharing to be determined by government. Conversely, where there is an entitlement for the environment it can be, and in some cases has been, traded temporarily.

Both the bulk entitlement program and the provision of water for the environment highlight that significant investment in administrative arrangements, including technology, metering, telemetry, etc commensurate with managing a very valuable finite resource is required before the benefits of the COAG reforms can be realised.

### 6.1.3 Groundwater

Victoria controls the extraction of all groundwater through a rigorous statutory volumetric licensing process. The construction of all groundwater bores including production and investigation bores is also subject to a licensing process. Licensed drillers must construct all groundwater bores.

Victoria has identified over 50 groundwater management areas in the State where there is a potential for groundwater development or where groundwater development has already occurred.

The sustainable yield of the aquifers in these Areas has been quantified, as has the volume of groundwater allocated to users. Within these areas a Permissible Annual Volume (PAV), which is the optimum level of allocation, has been set to reflect the sustainable yield of the aquifer.

Victoria's groundwater management regime is based on sustainable development through the establishment of community driven Groundwater Management Plans. The need to develop Groundwater Management Plans is determined by demand on the resource. When resource commitments reach 70 per cent of the PAV, groundwater community management groups are established and more intensive management is triggered.

Victoria has developed an Implementation Program, detailing the priority work programs for bulk entitlement conversions, Streamflow Management Plans, River Restoration and Groundwater Management.

## **7 THE FUTURE**

Co-operation and co-ordination between individuals, communities and governments is crucial if Natural Resource Management on an integrated catchment basis is to be a success. The Natural Resource Management Strategy has been in operation for four full years and all those involved have been heartened by the community acceptance and enthusiasm for the concept. However, the Strategy is a dynamic initiative and needs to be progressively refined and refocussed as priorities change and knowledge is improved.

In developing any natural resource program, the overriding consideration must be service delivery and a recognition of the fact that resolution of the current range of natural resource issues in front of us will take many decades to address. There is no short-term program or policy response to the range of problems that confront us. We must establish mechanisms that enables stable long-term support to be provided to communities. While this may not be attractive to bureaucrats and politicians who want a quick fix or another glittering initiative, it is nevertheless the fact.

The future is integrated natural resource management, the Community is currently demanding it, the challenge is to deliver it.

## **8 CONCLUSION**

In summary, I believe that the Murray-Darling Basin Initiative is a successful example of Integrated Catchment Management working on a very broad scale towards a sustainable future. The factors that will aid the success of the initiative are:

- A stable institutional framework
- A sound knowledge base
- Integration across:
  - natural resource issues
  - jurisdictions
  - research/policy/implementation
- Strong community participation

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