

Management of  
**Dryland Salinity**

*Future Strategic Directions*



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In the context of developing a national policy for natural resource management

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# Preface

There is no doubt that the future management of dryland salinity in Australia represents a major challenge for the nation. Despite considerable progress in the past two decades, the problem is clearly worsening.

Within this context, the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) has identified the need for effective, coordinated State and Commonwealth action to address dryland salinity. ARMCANZ considered it should take the lead in this process and review the current national policy framework. The Standing Committee on Agriculture and Resource Management (SCARM) was subsequently asked to undertake this task and formed the Working Group on Dryland Salinity, under its Sustainable Land and Water Resources Management Committee.

This document contains the outcomes of the review of the current national policy framework on dryland salinity and outlines new strategic directions for the management of dryland salinity. The strategies and recommended approaches have drawn on, and are consistent with, strategic policy directions and actions proposed in the discussion paper for developing a national policy for natural resource management, also being developed under the auspices of a Commonwealth/State steering committee. The discussion paper, *Managing Natural Resources in Rural Australia for a Sustainable Future*, has been released for a four month consultation period and is seeking community views and ideas on future policies for natural resource management. Responses to the discussion paper, this paper and other reviews such as the mid-term review of the Natural Heritage Trust will inform government views on a future national policy for natural resource management.

The Murray Darling Basin Commission (MDBC) released the results of its *Salinity Audit of the Murray-Darling Basin* on 22 October 1999. The Audit release attracted considerable media attention and has successfully raised community awareness of the salinity problem. The Commission is using the Audit as the basis for a draft Basin Salinity Management Strategy that will be considered by MDB Ministerial Council later in 2000.

The Salinity Audit clearly identifies the severity and scale of the salinity threat to the Basin over the next 20, 50 and 100 years on the basis that there are no new management interventions, and identified where improvements in our understanding of the problem can be made. A significant finding of the Audit was that future salt exports will predominantly occur from dryland catchment sources, rather than irrigation-induced sources, as is presently the case.

Consistent with the natural resource management discussion paper, this policy framework recognises that dryland salinity should be addressed in an integrated manner with other land, water and vegetation degradation issues rather than in isolation and at the appropriate catchment and regional scale. Further, while this report can provide a broad approach to addressing dryland salinity, it does not suggest that the dryland salinity problem can be entirely solved or that we have all the knowledge required to develop solutions to the problem.

There is still a significant research and development effort required into dryland salinity processes and impacts. Accordingly, the approaches outlined in this framework will continue to be informed by findings and products of the National Dryland Salinity Program.

Whilst this new national framework addresses dryland salinity, there is still a significant issue relating to irrigation salinity, especially the ongoing cost impacts on high value export industries and the need for further investment in drainage infrastructure and improved irrigation efficiency. The national policy for natural resource management currently being developed will address both dryland and irrigation salinity.

The directions outlined in this document are the result of a fruitful collaboration across jurisdictions. The community, governments and industry must all work together in partnership with communities to ensure that the future management of dryland salinity achieves significant positive change.

At its March 2000 meeting, ARMCANZ endorsed the document in-principle as a resource document from which jurisdictions can draw in developing their response to dryland salinity.

March 2000

# **Agriculture and Resource Management Council of Australia and New Zealand**

The Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) consists of the Australian Federal, State/Territory and New Zealand Ministers responsible for agriculture, soil, water (both rural and urban) and rural adjustment policy issues.

The objective of the Council is to develop integrated and sustainable agricultural and land and water management policies, strategies and practices for the benefit of the community.

The Council is supported by a permanent Standing Committee, the Standing Committee on Agriculture and Resource Management (SCARM). Membership of Standing Committee comprises relevant Departmental Heads/CEOs of Commonwealth/State/Territory and New Zealand agencies as well as representatives of the CSIRO and the Bureau of Meteorology.

# Contents

<b>1. OVERVIEW</b>	<b>1</b>
<b>2. THE SCALE OF THE PROBLEM</b>	<b>7</b>
2.1 Scale	7
2.2 Impacts	7
<b>3. CURRENT APPROACHES AND ACHIEVEMENTS</b>	<b>8</b>
3.1 Current Approaches	8
3.1.1 Partnership Approach	
3.1.2 Natural Heritage Trust	
3.1.3 Catchment Scale Responses	
3.1.4 Data Gathering	
3.1.5 Technological Approaches	
3.2 Achievements to Date	9
<b>4. THE NEED FOR A NEW DIRECTION</b>	<b>10</b>
4.1 Emerging Opportunities	10
4.1.1 New Policy and Program Approaches	
4.1.2 Emerging Land Management Opportunities	
4.2 Significant Barriers to Change	12
4.2.1 The Scale of the Change Required	
4.2.2 Profitability of Alternative Land Uses	
4.2.3 Increasing Community and Industry Engagement	
4.2.4 Maximising Shared Investment	
4.2.5 Institutional Arrangements	
<b>5. A NEW STRATEGIC FRAMEWORK FOR DRYLAND SALINITY</b>	<b>14</b>
5.1 Key Principles for Success	14
5.2 Outcomes Sought From a New National Policy Framework	14
5.2.1 Maximise Leverage from Government Investment	
5.2.2 Minimise Social Impacts	
5.2.3 Maximise the Opportunities for Generating Benefits from Land Use Changes Required to Manage Dryland Salinity	
5.2.4 Maximise the Long-term Protection of Resources and the Environment	
5.3 Focus of the National Policy Framework	15
5.4 Institutional Arrangements	15
5.4.1 New Institutional Arrangements	
5.4.2 Roles and Responsibilities	
5.4.3 Integrated Whole of Government/Industry Approach	
5.5 Strategic Planning Framework	16
5.5.1 A Regional/Catchment Focus	
5.5.2 Focus on Improved Regional Catchment Planning	
5.5.3 Improved Dryland Salinity Management Plans	
5.5.4 Regional/Catchment Knowledge Strategy	

5.5.5	Capacity Building and Skills Development	
5.6	Investment Strategy	19
5.6.1	Partnerships in Investment	
5.6.2	Shared Investment	
5.6.3	Market-Based Mechanisms	
5.7	Managing Social Change and Industry Sector Adjustment	21
<b>APPENDIX ONE: Institutional Arrangements</b>		<b>22</b>
<b>APPENDIX TWO: Examples of Initiatives Undertaken by States to Address Dryland Salinity</b>		<b>23</b>
<b>APPENDIX THREE: SCARM Endorsed Principles for Shared Investment in Dryland Salinity</b>		<b>25</b>

# 1. OVERVIEW

Emerging evidence suggests that the situation with dryland salinity in Australia is worsening. The 2.5 million hectares of land currently affected may rise to around 15 million hectares over the next 30–100 years, resulting in significant environmental, social and economic costs.

However, significant progress has been made in the management of dryland salinity in the past decade and a half. Policy and program approaches have focussed on developing key partnerships between government and communities, increased knowledge and improved technological solutions, and most recently developed a focus on catchment level solutions. These approaches have generated localised successes, however the challenge remains to achieve rates of change in land management practices that can make a difference at a regional/catchment level.

The impacts of dryland salinity illustrate the social, economic and industry dimensions of natural resource management. Dryland salinity is just one of many symptoms of inappropriate land use and management. Other symptoms which are having similarly significant impacts include soil acidity, soil structure decline and loss of soil carbon, wind and water erosion and acid sulphate soils.

Land, water and vegetation degradation is most effectively addressed through a holistic approach within the wider natural resource management context. It is in this context that any approach to dryland salinity must be developed and implemented.

A number of key challenges face the future management of dryland salinity in Australia. On the one hand, emerging opportunities such as commercial plantations and farm forestry present important opportunities for integrating rural and regional development opportunities with changes in land and natural resource management to address dryland salinity. On the other hand, significant barriers to change, such as the lack of industry and community engagement and the scale of change required, still exist. A new strategic direction is required for the future management of dryland salinity in Australia.

This document lays down future strategic directions and a new national framework for the management of dryland salinity. The following table summarises the strategic directions and recommended approaches that comprise this new national framework.

## 1. Institutional Arrangements

Table 1 Institutional Arrangements

	<i>Strategic Direction</i>	<i>Recommended Approaches</i>
New Institutional Arrangements	<ul style="list-style-type: none"> <li>Dryland salinity needs to be addressed at a regional and catchment level within an overall Commonwealth, State/Territory and local government framework</li> </ul>	<ol style="list-style-type: none"> <li>That the Commonwealth, State/Territory and local governments agree to:               <ul style="list-style-type: none"> <li>regional/catchment approaches to planning, implementation and investment</li> <li>devolution of decision making to the appropriate level</li> </ul> </li> </ol>
Roles and Responsibilities	<ul style="list-style-type: none"> <li>Partnerships between Commonwealth and State/Territory government and key stakeholders including landholders, community, local government, statutory authorities, peak groups and industry</li> <li>Clear understanding of roles and responsibilities of key stakeholders</li> </ul>	<ol style="list-style-type: none"> <li>That roles and responsibilities are reflected in government program guidelines and clearly set out in regional management plans and negotiated partnerships between Commonwealth and State/Territory governments, local government and regional/catchment bodies</li> </ol>
Integrated Whole of Government Approach	<ul style="list-style-type: none"> <li>Planning, implementation and investment that addresses the interactions between economic, social and environmental outcomes</li> <li>Integration of natural resource management and rural and regional development outcomes</li> </ul>	<ol style="list-style-type: none"> <li>That ARMCANZ engage other arms of government to ensure the development of integrated policy across natural resource management and rural and regional development relevant to dryland salinity management</li> <li>That ARMCANZ establish processes to better engage those industries directly involved in and affected by the sustainable management and utilisation of our natural resources</li> </ol>

## 2. Strategic Planning Framework

Table 2 Strategic Planning Framework

	<i>Strategic Direction</i>	<i>Recommended Approaches</i>
A Regional/ Catchment Focus	<ul style="list-style-type: none"> <li>• Involvement and accountability of regional communities in decision-making on resource management in their region</li> <li>• Integration of social, economic and environmental outcomes</li> <li>• Setting priorities and realistic targets for resource management at regional, State/Territory and national level</li> <li>• Identifying management options and coordinating activities of groups involved in resource management</li> <li>• Monitoring the effectiveness of resource management strategies</li> <li>• Appropriate timing of interventions</li> <li>• Achieving consistency between national, State/Territory and regional planning processes</li> </ul>	<ol style="list-style-type: none"> <li>5. That State/Territory governments in partnership with the Commonwealth government commit to an integrated, community based, regional/catchment management and planning approach to the management of dryland salinity</li> <li>6. Development and implementation of regional/catchment scale investment arrangements as part of an increased emphasis on a regional/catchment management and planning approach</li> </ol>
Focus on Improved Regional/Catchment Planning	<ul style="list-style-type: none"> <li>• Importance of scale and level of planning and devolution of planning to the appropriate level</li> <li>• Integrated action planning at a catchment/regional scale that brings together natural resource management and rural and regional development outcomes</li> <li>• Regional/catchment planning that ensures realistic and achievable implementation and investment targets</li> <li>• Clearly defined and articulated roles and responsibilities</li> <li>• Importance of incorporating the concept of review and continuous improvement in planning processes</li> <li>• Closer linkages between regional/catchment and statutory land use planning</li> <li>• Focus on establishment of business action plans to implement regional/catchment plans</li> </ul>	<ol style="list-style-type: none"> <li>7. Establishment of an adequate framework for development and implementation of regional/catchment planning, which addresses broad natural resource management including dryland salinity consistent with the proposed strategic directions, and which ensures: <ul style="list-style-type: none"> <li>• a process of continuous improvement</li> <li>• decisions are made at the appropriate level and roles and responsibilities are clear</li> <li>• resources are continually targeted to priorities</li> <li>• effective linkages with initiatives to improve management skills, such as Property Management Planning</li> </ul> </li> <li>8. Promote cooperation and coordination on issues pertaining to dryland salinity between regional/catchment planning and statutory land use planning by local government at the regional level to ensure: <ul style="list-style-type: none"> <li>• regional/catchment strategies are coordinated with the statutory planning system of local government</li> <li>• regional strategic planning is undertaken as a joint process between catchment management bodies and local government</li> </ul> </li> </ol>
Improved Dryland Salinity Management Plans	<ul style="list-style-type: none"> <li>• Comprehensive review of existing dryland salinity management plans</li> </ul>	<ol style="list-style-type: none"> <li>9. Priority be given to national, State/Territory and regional/catchment level reviews of catchment and dryland salinity management plans that consider: <ul style="list-style-type: none"> <li>• new evidence and research on the effectiveness and efficiency of different options</li> <li>• the development of a regional/catchment management and planning approach</li> <li>• improved links with other regional planning bodies</li> <li>• continuous improvement</li> <li>• how decisions can be made at the appropriate level</li> <li>• targeting of resources to priorities</li> </ul> </li> </ol>

Table 2 Strategic Planning Framework (continued)

	<i>Strategic Direction</i>	<i>Recommended Approaches</i>
Regional/Catchment Knowledge Strategy	<ul style="list-style-type: none"> <li>Improved information and knowledge that translates at an appropriate level</li> <li>Integrated information that addresses economic, social and environmental considerations</li> <li>Investment in decision support systems at the regional/catchment level</li> <li>Investment in land capability information at the regional/catchment level as modified by dryland salinity</li> <li>Better understanding of future scenarios</li> <li>Better utilisation of property management planning as an information and management tool</li> </ul>	<ol style="list-style-type: none"> <li>That Commonwealth and State/Territory agencies invest in improved knowledge and information at the levels of broad context, regions/catchments and individual properties</li> <li>That Commonwealth and State/Territory governments commit to the integration of economic, social and environmental information through the establishment of Regional/Catchment Information Support Teams and the provision of relevant and useable information to the community</li> <li>That Commonwealth and State/Territory agencies invest in regional/catchment decision support systems to inform the development and implementation of regional/catchment strategies</li> </ol>
Capacity Building and Skills Development	<ul style="list-style-type: none"> <li>Effective communication of the severity of the dryland salinity situation and options for action</li> <li>Education and communication strategies for landholders focussing on realistic approaches and options</li> <li>Communication of issues and responsibilities across rural and urban communities</li> <li>Appropriate utilisation of property management planning in relation to managing risks of dryland salinity</li> <li>Accessible and useable information</li> </ul>	<ol style="list-style-type: none"> <li>That ARMCANZ complements the Murray Darling Basin Salinity Communication Strategy through the development of an effective national community education program focussing on realistic approaches and options</li> <li>That Commonwealth and State/Territory agencies, in partnership with regional/catchment communities, develop complementary communication strategies for the promotion of dryland salinity awareness and management options, through such mechanisms as property management planning and other skilling initiatives</li> <li>That Commonwealth and State/Territory agencies work with communities to ensure realistic expectations regarding options, actions and outcomes through effective information and education</li> <li>That Commonwealth and State/Territory agencies facilitate assistance for skills and business development and planning to assist landholders assess options and adjust to new industries for example, farm forestry</li> </ol>

### 3. Investment Strategy

Table 3 Investment Strategy

	<i>Strategic Direction</i>	<i>Recommended Approaches</i>
Partnerships in Investment	<ul style="list-style-type: none"> <li>• New approaches to harness market forces and foster industry, community and landholder collaboration and investment in dryland salinity</li> <li>• New frameworks for government investment</li> <li>• The scale and timeframe of dryland salinity processes requires long-term and targeted investment by government and community</li> <li>• Science based mechanisms utilised to determine priorities and establish investment targets</li> </ul>	<p>17. That Commonwealth and State/Territory governments refocus and target their investment in dryland salinity towards broader regional/catchment scale projects that integrate rural and regional development and natural resource management outcomes in accordance with proposed strategic directions</p>
Shared Investment	<ul style="list-style-type: none"> <li>• Review of arrangements for shared investment consistent with the principles of the SCARM endorsed shared investment arrangements at Appendix Three</li> <li>• Engaging industry and urban and regional communities to enhance the resourcing of dryland salinity management</li> <li>• Generation of adequate levels of investment from the community and industry</li> <li>• Mechanisms that enable communities to determine levels of investment and to overcome issues of the geographical separation of cause and effect in dryland salinity</li> </ul>	<p>18. That the SCARM endorsed principles for shared investment are adopted for dryland salinity management (refer Appendix Three)</p> <p>19. That ARMCANZ request SCARM to explore:</p> <ul style="list-style-type: none"> <li>• broad mechanisms to enable communities to contribute to investment in dryland salinity management and natural resource management and protection</li> <li>• strategies to better mobilise industry investment and involvement in these activities</li> </ul>
Market-Based Mechanisms	<ul style="list-style-type: none"> <li>• Well developed market-based measures that contribute significantly to the achievement of greater landholder and industry involvement in dryland salinity management</li> <li>• Explore utilisation of an auction or tender based system to encourage uptake of works to address dryland salinity management and resource protection</li> </ul>	<p>20. That through the further development of the national policy for natural resource management, the Commonwealth and State/Territory governments:</p> <ul style="list-style-type: none"> <li>• consider the use of taxation and credit vehicles for promoting practices that address dryland salinity</li> <li>• in partnership with industry and regional/catchment communities, promote the development of Environmental Management Systems as an accreditation tool to encourage practices that address dryland salinity</li> <li>• explore opportunities and applicability of an auction or tender based system of grants and incentives to address land use changes for dryland salinity</li> </ul>

## 4. Managing Social Change and Industry Sector Adjustment

Table 4 Managing Social Change and Industry Sector Adjustment

	<i>Strategic Direction</i>	<i>Recommended Approaches</i>
Managing Social Change and Industry Sector Adjustment	<ul style="list-style-type: none"> <li>• Bring together information and options for addressing dryland salinity and industry adjustment with a view to establishing sustainable rural industries and communities</li> <li>• Strategies that address the social change and industry sector adjustment associated with the impacts of dryland salinity and the scale of change required</li> <li>• Proactive investment to minimise the social impacts of dryland salinity and maximise the ability of regional communities to respond positively to change</li> <li>• Recognition that land use change is going to require socio-cultural change</li> </ul>	<ol style="list-style-type: none"> <li>21. That government engages industry in collaborative projects to identify and promote alternative industries and changes in land use</li> <li>22. That government co-invest with other key stakeholders in education and awareness raising activities that promote options for change and address land use change</li> <li>23. That government co-invest with other key stakeholders in regional and catchment level adjustment strategies</li> </ol>

## 2. THE SCALE OF THE PROBLEM

### 2.1 Scale

From a national perspective, there are many gaps in our information regarding the current salinity risks and impacts. The Murray Darling Basin Ministerial Council Salinity Audit has estimated, through the Salt Loads Study, the amount of salt being mobilised to the land surface by two processes – being washed off the land surface and direct seepage from groundwater to rivers. Basin-wide this is predicted to increase from 5 million tonnes a year in 1998 to 10 million tonnes in 2100.

Most current estimates of the risk of dryland salinity rely on measurement of water table depths. Drawing on this technique, the Prime Minister's Science, Engineering and Innovation Council (PMSEIC) 1998 report on *'Dryland Salinity and Its Impact on Rural Industries and the Landscape'* notes that about 2.5 million hectares of land in Australia is currently affected by dryland salinity, with the potential for this to increase to about 15 million hectares over the next 30–100 years.

The present areas of high watertables in each State and the future predicted extent of high watertables are shown in the table below. This represents areas where waterlogging is likely to occur. Stored salts are also a necessary prerequisite for dryland salinity to occur.

The National Land and Water Resources Audit is currently undertaking a comprehensive assessment of dryland salinity across the States, based on measured trends in groundwater levels. Reports are expected to be available in July/August of this year.

Recent work for the National Land and Water Resources Audit by the Bureau of Rural Sciences has produced a national classification of groundwater processes that contribute to dryland salinity. This delineates the scale of groundwater processes contributing to salinity, and the corresponding scale of management activity required to control dryland salinity.

Considerable work is under way by State and Commonwealth agencies to develop tools for predicting the risk of dryland salinity. Developmental work currently being

undertaken by the Bureau of Rural Sciences, CSIRO, and the Australian Geological Survey Organisation is attempting to map catchment salt stores using remotely sensed data in the Cootamundra region.

A more detailed process in the north has produced a more accurate risk assessment for the Northern Territory. NSW has found that current depth to groundwater and concentration of salts in sediments are just as critical as the ratio of evaporation to transpiration.

### 2.2 Impacts

The PMSEIC report estimates the loss of agricultural productivity as a result of dryland salinity at \$130 million annually. The overall cost has been conservatively estimated at \$250 million per annum in agriculture, water quality, infrastructure and environmental damage with a direct economic impact. In addition, there will be major impacts in terms of degradation of environmental assets and social dislocation. Irrigation salinity will also continue to be a significant contributor to salinisation of land and river salinity.

Perhaps the greatest impacts will be on stream water quality and the environment. The PMSEIC report states that rising water tables and increased land and water salinity could have very serious impacts on native vegetation and biodiversity. In Western Australia, if the No Intervention Scenario is allowed to continue through to its ultimate extent, 50% of Nature Conservation Reserves and four future potable water sources will be adversely affected. In NSW, rivers in the northeast of the Murray Darling Basin will become unfit for drinking water. There is also a large cost from the impact of water logging and dryland salinity on the built infrastructure which includes urban roads, buildings, pipelines and rural roads.

Another significant impact of increasing areas of dryland salinity will be the increased frequency and severity of floods. A recent study in WA has shown that a doubling of the area of saline land in the Blackwood catchment would decrease the time of concentration and almost double the peak flow volume in a major flood event.

State	Area of High Watertables (millions of ha) <sup>1</sup>	
	Current (1998)	At Equilibrium
Western Australia	1.80	6.11
New South Wales	0.12	7.50
Victoria (MDB portion)	0.12	1.20
South Australia	0.40	0.60
Queensland	0.01	0.07
T O T A L	2.45	15.48

<sup>1</sup> The impact is expected to be felt over the next 30-100 years

## 3. CURRENT APPROACHES AND ACHIEVEMENTS

### 3.1 Current Approaches

Current approaches to the management strategies for dryland salinity are strongly focussed on the following:

#### 3.1.1 Partnership Approach

Current approaches to dryland salinity management recognise that all stakeholders must work together commensurate with their respective roles and responsibilities. At the Commonwealth/State level, the partnership approach is formalised through Partnership Agreements under the Natural Heritage Trust. Details of the current institutional arrangements between Commonwealth, State/Territory and local governments are outlined in detail in Appendix One.

The nature of the relationship between State government and catchment communities varies between States. In Victoria for example, Catchment Management Authorities are statutory bodies with defined powers and responsibilities under State legislation. Total Catchment Management Committees in New South Wales on the other hand, have an advisory relationship with the State government.

Partnership arrangements can extend to individual landholders. For example, in selected sub-catchments in Western Australia, sub-catchment groups have guaranteed access to catchment support teams in return for which individual landholders in the group are asked to enter into a partnership agreement describing how they will contribute to implementing the State's salinity strategy.

#### 3.1.2 Natural Heritage Trust

The Natural Heritage Trust is a Commonwealth government initiative. Funding from the Trust supports some 17 programs, a number of which contribute to salinity management. The most significant include the National Landcare Program, Murray Darling 2001 and Bushcare programs. There are currently some 460 projects funded under all Trust programs nationally related to salinity management.

#### 3.1.3 Catchment Scale Responses

Recently there has been increased recognition that dryland salinity requires treatment at the catchment/regional scale. The establishment of appropriate institutional arrangements that both support and bestow responsibility for achieving catchment-scale outcomes and effective catchment/regional planning are important components of this recognition.

Such approaches are being pursued through the Natural Heritage Trust Partnership Agreements, although the extent to which programs focus on catchment scale outcomes varies considerably. The National Land and Water Resources Audit is developing a hydrogeological framework for salinity management based on the characteristics of different groundwater flow system types to assist in developing appropriate catchment responses.

#### 3.1.4 Data Gathering

Successful management of salinity requires a good knowledge of the processes contributing to dryland salinity including hydrogeology, soils, topography, vegetation, salt stores and groundwater levels. Research into new data gathering approaches, such as airborne geophysics and satellite imagery, has potentially advanced capacities in this area.

The National Land and Water Resources Audit is collecting data on the extent, current status and risks of dryland salinity as well as identifying the impacts of dryland salinity as it affects agricultural land, surface water salinity, infrastructure and areas of biological significance. Data is also required in relation to sociological and economic attributes of catchments since these issues strongly influence the adoption of improved management practices. Data gathering however, is time consuming and expensive and there are many catchments for which data remains limited.

#### 3.1.5 Technological Approaches

There are no quick fixes for dryland salinity, although technology plays an important role in the detection and management of salinity and assisting with living with salt.

##### *Detection*

Perhaps the most commonly used technology in the area of salinity monitoring and mapping is air photo and satellite data interpretation. These technologies are variously used to provide information on vegetation cover and condition, topography and area of salt affected land. The range of EM meters operated as either hand-held or vehicle mounted devices are important tools in salinity measurement. More recent research has looked at how airborne geophysical techniques involving airborne magnetics, electromagnetics and radiometrics can be used in salinity monitoring.

### ***Managing Salinity***

Technology associated with reducing the spread of salinity includes groundwater pumping and the development of alternative farming systems to maximise plant water use. Some examples of more sustainable farming systems include the development of oil mallee plantations, farm forestry development, deep-rooted perennial pasture establishment and improved crop rotations. All have some application with varying effectiveness and commercial feasibility depending on the situation.

### ***Living With Salt***

Technology associated with the use of salinised land includes the establishment of salt tolerant trees and pastures, development of aquaculture using saline water and mineral salt extraction. These technologies are being employed, or are under investigation, in various locations across the country.

State governments, CSIRO, the Murray Darling Basin Commission, other Commonwealth agencies, research and development corporations and universities are all involved in dryland salinity related research and development. Of these, the Land and Water Resources Research and Development Corporation (LWRRDC) has a key coordination role. LWRRDC has just launched Phase II of its National Dryland Salinity Program with the above partners.

## **3.2 Achievements to Date**

Perhaps the single greatest achievement in the battle against salinity has been the willingness of governments and rural communities to work together to address the problem. Excellent examples of such cooperation between governments and rural communities to address dryland salinity are the Victorian and New South Wales joint community and government partnerships addressing irrigation salinity through Salinity Plans and Land and Water Management Plans.

The landcare culture has spread throughout Australia and it is now common for rural landholders to build rehabilitation activities into their workplans. Similarly, governments have steadily increased the resources targeted at on-ground works, farmer education, research and rehabilitation planning.

Works to prevent or reduce salinity impacts now have three main targets – maintaining rural productivity, environmental preservation and protecting high value community assets. Numerous examples exist throughout Australia where farmland has been protected or rehabilitated through new farming practices and innovative water

management works. These localised successes are a primary catalyst in generating change in the wider farming community. The threat of salinity and the demonstrated effectiveness of some practices are gradually changing the farming culture in Australia.

The preservation of high value assets such as rural towns, drinking water supplies or conservation reserves usually requires intensive investment, through either engineering works or catchment controls. Examples exist where engineered drainage schemes, channel lining or surface water collection programs have proven successful in managing the impacts of salinity.

Clearing controls and catchment revegetation works may also work to protect high value assets. For example, the application of clearing controls and incentives for revegetation are indicating success in reducing salinity in the Wellington Dam in Western Australia. After two decades of controls, salinity in this important water source has now plateaued with an indication of an imminent decline, thus preserving an asset that was seriously under threat. At the same time, clearing controls and catchment revegetation play an important role in maintaining and improving flora and fauna conservation values in these impacted catchments.

Some of the current tools used to address the on-ground impacts of salinity promise to be successful when applied strategically and with a suitable intensity. However, the challenge remains to achieve rates of adoption that can make a difference at the catchment scale. In other cases, experience has found that some recommended practices will have a very limited effect, for example the use of perennial pastures in high rainfall zones.

Despite the large body of work in improving knowledge of dryland salinity and in successfully managing dryland salinity, there is also a growing understanding that salt must be accepted as a part of the landscape in some parts of Australia. In these areas, efforts are focussing on identifying the most appropriate land uses and water utilisation and protecting high value assets from dryland salinity. Saline aquaculture for fisheries and kelp production and harvesting of high grade salt for medical purposes are being trialed as means of utilising saline water in areas where land rehabilitation is impractical. In addition, zones of agricultural significance or high biodiversity are being protected through groundwater pumping. More examples, but by no means an exhaustive list, of initiatives undertaken by States to address dryland salinity are outlined in Appendix Two.

## 4. THE NEED FOR A NEW DIRECTION

The magnitude of the dryland salinity problem and the experience across Australia to date, indicate that significant change is required to better manage and live with dryland salinity. Key aspects in facilitating this change will be managing and accepting the social implications, better engaging private sector investment and the development of new industries suited to the changing rural environment. Within the context of these implications there are a number of emerging opportunities and significant barriers to change, that clearly demonstrate the need for a new direction and framework for the management of dryland salinity.

### 4.1 Emerging Opportunities

#### 4.1.1 New Policy and Program Approaches

New research from the Bureau of Rural Sciences (BRS) is suggesting that substantial gains in the management of dryland salinity can be achieved through new policy and program approaches. A technical advisory group (comprising members from BRS, Australian Bureau of Agricultural and Resource Economics, CSIRO, Agriculture, Fisheries and Forestry – Australia and Environmental Australia) to the Coordinating Working Group on Vegetation recommended the development of synergies between policies and programs designed to address dryland salinity, biodiversity conservation, industry development and greenhouse abatement.

The BRS has drawn together data relating to the seasonal patterns of rainfall and evaporation; forest cover and loss; land disturbance and commercial plantation potential. This data indicates potential benefits from integrating reforestation and plantation expansion with dryland salinity mitigation programs.

Replanting cleared land in regions with rainfall greater than 600mm has the potential to use annual rainfall where it falls, thereby reducing leakage that causes discharge problems elsewhere. Map 1 below, identifies the regions with tree growth potential for traditional commercial plantation species, based on monthly rainfall and temperature. In most cases such areas have at least 600mm annual rainfall. However, there are a number of other factors to consider in order to estimate the net suitable area for planting including soil type, topography and access to markets. The data presented in Map 1 only focuses on a small number of traditional plantation species grown for industrial wood production purposes. Presently there is little information available on the growth rates and potential markets available for growing trees in drier regions.

Combined with maps showing commodity production, socio-economic and socio-demographic data, this alternative land use approach highlights other important areas for policy development. In particular, there are 80 million hectares of agricultural land where rainfall exceeds evaporation for a significant proportion of the winter months, when evapotranspiration by introduced plants is at its lowest in the cooler climate zones. This land lies predominantly within the lower rainfall wheat/sheep belts of the southern states and therefore is not viable for commercial plantation development. These areas require the widespread application of alternative land uses and management such as perennial pastures to manage dryland salinity. Furthermore, in many instances the scales of the processes causing dryland salinity mean that the landholders who must implement such land use change are not those who will experience dryland salinity.

While further analysis of land use and land use change drivers is required, preliminary conclusions suggest the need for the integration of regional development and natural resource management policies and programs to stimulate industry and land use change in these areas. There is also clearly a need for a social component to dryland salinity management strategies.

#### 4.1.2 Emerging Land Management Opportunities

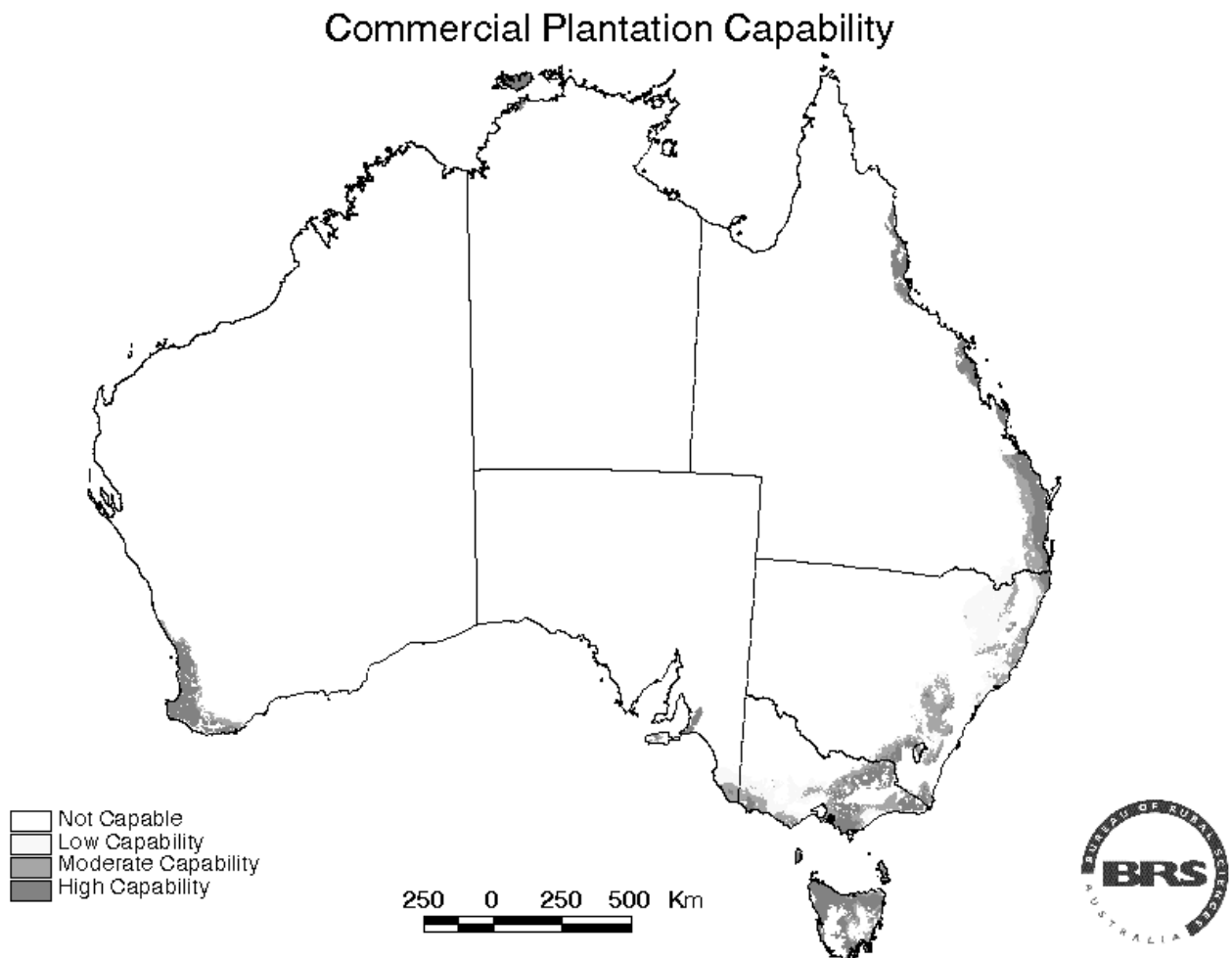
Whilst appreciating that watertables will vary with seasonal conditions, a range of opportunities exist for the future management of dryland salinity depending on the land type.

It is important to recognise that the level of salt accumulation depends not only on the depth of the water table but also on factors such as the salinity of the water, soil texture, soil profile structure, degree of water logging and micro-relief. Notwithstanding this, the following classes provide a broad indication of appropriate land uses based on depth of water table.

##### *Recharge Areas*

The greatest opportunities exist in the recharge areas currently dominated by low return grazing enterprises. There is considerable potential for farm forestry in 600mm plus rainfall regions due to the potential shortfall of industrial wood of 533 million cubic metres annually by 2010. Forest product income may, in the future, be augmented with carbon sequestration credits.

The Western Australian example of share farming blue gums for wood chip production demonstrates what can be



Map 1 Commercial Plantation Capability.  
 Note: The commercial plantation capability refers only to the physical properties of the forests and or plantations. While national parks are not included in the map this does not imply that all other land tenures might be planted or harvested.

achieved when government, industry and communities work together to develop profitable solutions to dryland salinity. Recent developments in oil production from mallee species add new investment possibilities, along with dryland pine such as Maritime Pine. This model could be followed in other areas using adapted species and provenances for which a market exists. In NSW, for example, a Farm Forestry Unit funded jointly by NSW Agriculture and State Forests is being established to explore options for the economic production of wood products.

Victoria has initiated a strategy to treble plantation development in the State, and significant private investment has been attracted in areas which will benefit salinity control. It is important that government assists in targeting recharge areas for the establishment of farm forestry industries if it is to assist in preventing dryland salinity. In

low rainfall areas on well drained soils, blue and oil mallee also present options depending on the price of fossil fuels and the levels of excise on alcohol production.

#### ***Land Already Salinised***

On saline land, managers must recognise that often the capacity for these areas to support productive agriculture is limited. However, in some regions land with water tables at less than 2m can successfully support halophytes and various native woody species, presenting opportunities for pasture production and possibly carbon sequestration. For some farmers, saltland agronomy is a management option that can be practiced immediately, requiring only moderate new investment and minimal change to conventional farming practices. Generally it offers significantly increased returns to landholders and sustains traditional

livestock industries. Nevertheless, these measures may only be prolonging the use of saline land rather than providing a long-term solution. The Productive Use and Rehabilitation of Saline Lands Group and the Grains

Research and Development Corporation have made significant progress in examining opportunities for use of these lands.

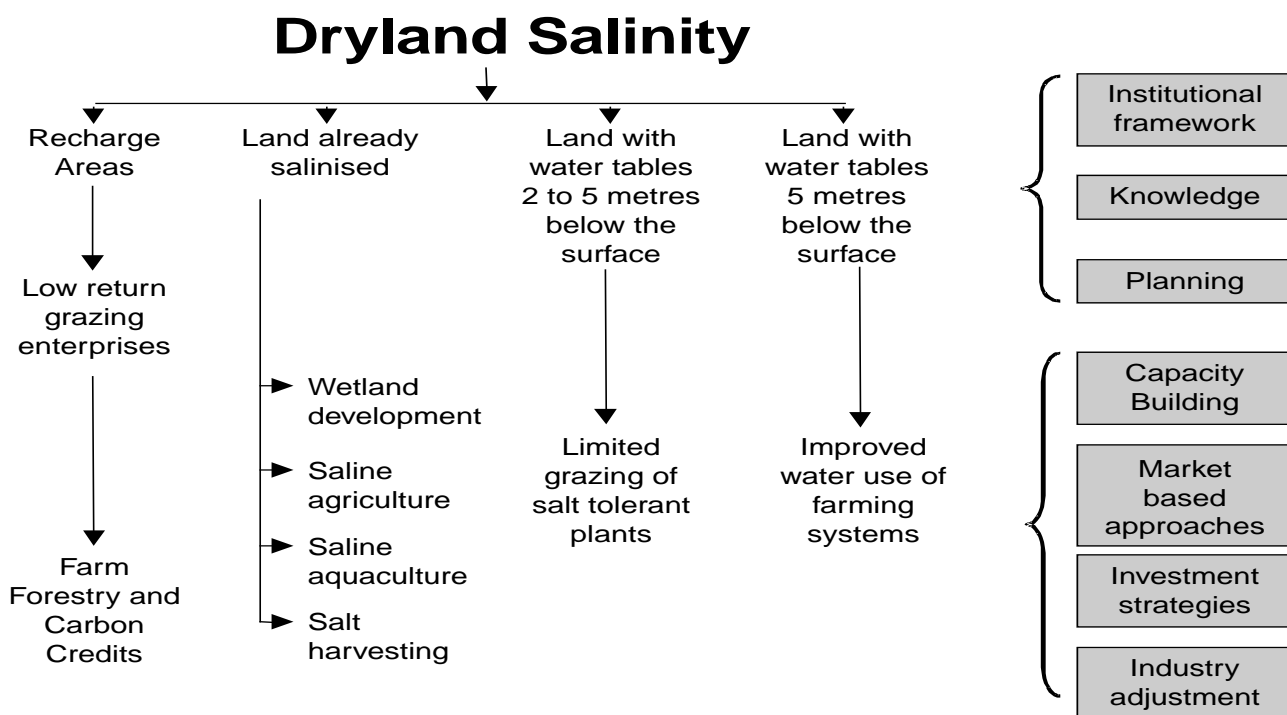


Figure 1 Summary of Dryland Salinity Management Options

In the longer term, opportunities for the use of land already salinised with water tables less than 2m may be limited to wetland development, saline aquaculture and systems of salt extraction. The formation of wetlands in these situations may also have advantages in terms of tourism.

**Land with Water Tables Between 2–5m Below Surface**

In the longer term, land that is degraded but can still grow salt tolerant species, such as salt bush and some perennial pastures, can be used profitably for grazing providing total grazing pressures are minimised. This class of land is often suitable for normal crop and pasture production but is at short-term risk of further degradation.

**Land with Water Tables Below 5m of the Surface**

Land at risk to salinity but with the saline ground water below the root zone of conventional crops can still be farmed as long as practices that intercept water before it drains to the watertable are used such as multiple cropping with greater use of summer crops. The concept of using water where and when it falls is a move towards more appropriate land use on these lands. Opportunities also exist for the use of trees on these lands in alley farming systems with intercropping. All these approaches give land owners

greater diversity in the products they produce and a resource base to exploit a range of market opportunities.

**4.2 Significant Barriers to Change**

The experience with salinity management across Australia indicate that several barriers remain which significantly reduce the effectiveness of the fight against salinity. These are summarised below.

**4.2.1 The Scale of the Change Required**

While some uncertainty remains in accurately predicting the scale of salinity impacts across Australia, it is inescapable that millions of hectares of agricultural land, important environmental values and many rural towns will be devalued. If vegetation management is to remain the primary tool in reducing salinity, the scale of the necessary revegetation works is enormous. Predictions of 60% to 80% revegetation being necessary in some catchments means that full implementation of the recommended controls is highly unlikely.

This then suggests that the area of land made unproductive due to salinity will continue to rise for the foreseeable future. Furthermore, the work already under way by many

landholders, while commendable, may prove ineffective at the catchment scale.

#### **4.2.2 Profitability of Alternative Land Uses**

Recent work undertaken in Western Australia estimates that around 50% of agricultural land badly affected by salinity may still have a productive potential. However, the technology for some saline farming options is underdeveloped and markets for the related products are immature. A similar, though better developed situation exists for those farms wishing to implement high levels of revegetation and avoid the need to move to saline farming systems.

Recent history in tree farming exercises shows that alternative systems offer a potential for profitability, though significant development work is required before new industries become self sustainable.

#### **4.2.3 Increasing Community and Industry Engagement**

The main forces for change have come from local rural community groups, individual farmers, Federal and State governments and a limited number of rural industries. Whilst there are some noticeable exceptions, few local governments, city communities or broader industry sectors have been seriously engaged in salinity action. This then means the resource base for investment is limited and due to the poor involvement of industry, the development of innovative productivity options and new markets are stifled.

Better engaging industry in developing new farming options and their associated markets is a critical factor in both reducing and living with some salinity.

#### **4.2.4 Maximising Shared Investment**

Several equity issues arise in the current efforts to reduce and manage salinity. Limited understanding by city communities means the problem is usually perceived as

being only associated with farming. This in turn influences government investment in resource protection and rehabilitation works as well as investment in research and development.

A degree of inequity also exists between those that will directly experience the impacts of salinity and those that, although using similar farming techniques, will remain unaffected by virtue of their location in the landscape.

It is inevitable that there will be winners and losers when it comes to salinity. This then increases the need for specific strategies aimed at managing the social impacts of increasing salinity and facilitating proactive adjustment to more sustainable land use options.

#### **4.2.5 Institutional Arrangements**

The growth of the landcare movement together with increased community responsibility for natural resource management has seen a valuable community-based infrastructure develop in Australia. Landcare and catchment or regional groups cover many of the areas where salinity problems have surfaced. However, many of these groups rely on government funding (such as the Natural Heritage Trust or specific State grants) to continue their work.

Many of these community groups are only starting to consider strategies to promote long-term self-sufficiency. In some cases this regional infrastructure is also complicated by the lack of clarity between Commonwealth, State, local government and community responsibilities. Existing boundaries of jurisdictions do not necessarily correlate with the natural resource boundaries of the catchment and groundwater systems that are driving dryland salinity.

Furthermore, the lack of a strategic approach to managing dryland salinity to date has meant that programs are not necessarily prioritised towards areas where there is a realistic chance of controlling dryland salinity.

# 5. A NEW STRATEGIC FRAMEWORK FOR DRYLAND SALINITY

## 5.1 Key Principles for Success

To be effective, a national approach to dryland salinity will need to be established within the context of the national policy for natural resource management. Such an approach will need to encompass the following principles for success:

- (a) An integrated approach that recognises both the importance and interdependence of economic, social and environmental factors and which leads to multiple benefits;
- (b) Robust partnerships with a clear understanding and acceptance of roles and responsibilities at all levels of government, industry and community;
- (c) Strategies that are based on realistic targets, appropriate management options, and cost effective timing of intervention;
- (d) A coordinated research and development effort that is multi-disciplinary and focussed on the decision-making needs of land and water managers at the catchment and property scales;
- (e) Promotion of decision making and implementation of strategies at a regional/catchment scale which recognise regional/catchment processes;
- (f) Strategies that are knowledge-based, maximise new land use opportunities and lead to community and investor confidence; and
- (g) A broadly based and effective communication campaign with a clear message that salinity is a whole of community problem, needing understanding and commitment for action.

## 5.2 Outcomes Sought from a New National Policy Framework

The national policy for natural resource management seeks to guide action to significantly influence the amount of land in the future that will have high water tables at equilibrium. Given current understanding of the key drivers for change, the future national policy settings for dryland salinity management need to meet the following challenges.

### 5.2.1 Maximise Leverage from Government Investment

Given the dimensions of the long-term investment required to achieve significant change in reasonable timeframes, government resources alone will be inadequate. New ways of

harnessing market forces and of leveraging industry and landholder investment in dryland salinity management will be required.

Investment sharing arrangements should also ensure that the off-site effects and environmental costs of inappropriate land use are taken into account.

### 5.2.2 Minimise Social Impacts

In the medium to long-term, dryland salinity has the potential to significantly impact on the livelihood of primary producers and rural and regional communities. The severity of the impact will vary significantly from property to property and across regions. A proactive investment is required to assist adjustment and redevelopment and thereby avoid significant social costs, minimise social hardship and reduce the impacts of market failure.

### 5.2.3 Maximise the Opportunities for Generating Benefits from Land Use Changes Required to Manage Dryland Salinity

A number of the alternative land uses that have the potential to minimise the adverse affects of dryland salinity also promise increased economic and environmental benefits. For example, in high rainfall areas, commercial plantation and farm forestry provides an economically attractive option for struggling sectors of the wool industry. Changes in landscape from broadacre agriculture to alternative land uses involving revegetation will also contribute substantial benefits in terms of greenhouse response and environmental values. These changes in landscapes also have the potential to positively impact on tourism development.

### 5.2.4 Maximise the Long-term Protection of Resources and the Environment

It is important to recognise that whilst it is necessary to pursue economic responses to salinity, whenever possible, the nature of dryland salinity is long term and gradual. Significant resource degradation and loss of natural heritage has already occurred. The objectives of the national policy for natural resource management should include long-term, intergenerational conservation of soil, water, vegetation and biodiversity resources and natural heritage generally.

In achieving these objectives, a National Policy Framework for Dryland Salinity will need to address weaknesses in

institutional arrangements to achieve a coordinated response, more effective engagement of industry players, proactive models to facilitate socio-cultural change, and appropriate strategies to more effectively target investment at the regional/catchment scale. It will be important for this framework to complement other national natural resource management and industry development policies and strategies.

### 5.3 Focus of the National Policy Framework

A number of key barriers and opportunities confront the management of dryland salinity and the development of a strategic national policy framework. The scale of the change required combined with issues around the profitability of alternative land uses, a lack of industry engagement and difficulties in investment sharing and institutional arrangements create significant barriers which impact on the effectiveness of strategies to manage dryland salinity. However, there are significant opportunities for accelerating the development of new industries, such as commercial farm forestry, oil mallee production, aquaculture, minerals and through promoting carbon credits, nature conservation, tourism and increasing awareness in urban areas.

Given the barriers and opportunities confronting the management of dryland salinity, the national policy framework has been focussed on four key areas – improved institutional arrangements; a strategic and integrated planning framework; a targeted investment strategy; and managing social change and industry sector adjustment.

## 5.4 Institutional Arrangements

### 5.4.1 New Institutional Arrangements

**Strategic Direction:**

- Dryland salinity needs to be addressed at a regional and catchment level within an overall Commonwealth, State/Territory and local government framework.

Given the scale and range of issues associated with dryland salinity, a new framework is required that creates effective linkages between all levels of government and regional communities. It is generally acknowledged that dryland salinity needs to be addressed at a regional and catchment level. This needs to occur within an overall Commonwealth, State/Territory and local government framework. These three tiers of governments need to develop regional approaches to program development and resourcing that facilitate integrated regional and catchment level strategies for implementing integrated land, water and vegetation management responses to dryland salinity.

The key focus for identification of resource management issues and action needs to be at a regional and catchment

level. This enables tailored solutions which take account of local conditions and community aspirations. It also facilitates the direct involvement of landholders and regional communities in understanding the issues and trade-offs and enables ownership and commitment to actions.

**Recommended Approach:**

1. That the Commonwealth, State/Territory and local governments agree to:
  - regional/catchment approaches to planning, implementation and investment; and
  - devolution of decision making to the appropriate level.

### 5.4.2 Roles and Responsibilities

**Strategic Directions:**

- Partnerships between Commonwealth and State/Territory government and key stakeholders including landholders, community, local government, statutory authorities, peak groups and industry
- Clear understanding of roles and responsibilities of key stakeholders

Strategies for the management of dryland salinity have focussed on partnerships between government and key stakeholders. The roles of Commonwealth and State/Territory governments have been reasonably clear and national coordination has occurred through a range of inter-governmental consultative arrangements. However, the roles of the associated regional stakeholders including landholders, community, local government, statutory authorities, peak groups and industry, require some clarification and a better understanding if a more coordinated approach is to be achieved.

Landholders and other members of the community have largely been engaged with dryland salinity issues through support for small projects through State natural resource management programs, the Natural Heritage Trust and Landcare processes and programs. While this approach has been successful in raising awareness of dryland salinity issues, it has been unable to deal with some of the ambiguities associated with issues of responsibility for the off-site impacts of dryland salinity and achievement of regional scale impacts. There is a need to better define the roles and responsibilities taking account of the spatial separation between the causes and the effects of dryland salinity. In light of these issues, there is a need to review arrangements for shared investment and to engage urban and regional communities in enhancing the resourcing of dryland salinity management and resource protection.

There has been a lack of engagement of industry and local government with the issues of dryland salinity and a general lack of clarity concerning their roles. There is a clear role for local government to work at the local level to develop

linkages between catchment and statutory land use planning. There is an important role for industry in working with government to generate and support the development of new industries such as commercial farm forestry. There is also potential for government and industry to develop partnerships for investment in activities such as greenhouse and salinity credits.

**Recommended Approach:**

2. That roles and responsibilities are reflected in government program guidelines and clearly outlined in regional management plans and negotiated partnerships between Commonwealth, State/Territory and local governments and regional/catchment bodies.

**5.4.3 Integrated Whole of Government/  
Industry Approach**

**Strategic Directions:**

- Planning, implementation and investment that addresses the interactions between economic, social and environmental outcomes
- Integration of natural resource management and rural and regional development outcomes

Given the scale and range of the issues associated with dryland salinity and the number of policies and programs in existence to address these, an integrated whole of government approach is imperative. Economic, social and environmental outcomes all need to be considered in the development of plans and their implementation. The outcomes of rural and regional development have considerable overlap with those of natural resource management and require integration across policies and programs.

**Recommended approaches:**

3. That ARMCANZ engage other arms of government to ensure the development of integrated policies across natural resource management and rural and regional development relevant to dryland salinity management.
4. That ARMCANZ establish processes to better engage those industries directly involved in and affected by the sustainable management and utilisation of our natural resources.

**5.5 Strategic Planning Framework**

A key issue regarding the management of dryland salinity centres on the mechanisms and framework for planning, and the need for effective planning at a catchment level. The scale and level of coordination of planning required to address dryland salinity clearly call for a more coherent framework in which policy and strategy feed and inform planning at every level. Key aspects of such a framework include the horizontal and vertical integration of planning

to ensure that decision making is devolved to the appropriate level; a focus on an integrated regional catchment model; and integrated action planning that is clearly focussed at the regional level.

The scale of change and high level of coordination now clearly required to effectively address dryland salinity calls for the development and implementation of more sophisticated mechanisms and frameworks for management and planning. Such an approach must enable a focus on addressing the specific issues and problems concerned with dryland salinity, while also recognising that it is only possible to address dryland salinity within a broader context of land and water management and social, economic and environmental objectives.

**5.5.1 A Regional/Catchment Focus**

**Strategic Directions:**

- Involvement and accountability of regional communities in decision-making on resource management in their region
- Integration of social, economic and environmental outcomes
- Setting priorities and realistic targets for resource management at regional, State/Territory and national levels
- Identifying management options and coordinating activities of groups involved in resource management
- Monitoring the effectiveness of resource management strategies
- Appropriate timing of interventions
- Achieving consistency between national, State/Territory and regional planning processes

A framework for the effective management of dryland salinity within the context of land and water resources requires:

- the involvement and accountability of regional communities in decision-making on the land and water resources within their region;
- the integration of economic, social and environmental objectives for the management of land and water resources within a catchment to establish a set of management goals, priorities and targets for dryland salinity that are shared by the regional community. Costs and benefits of objectives should be considered to produce the most favourable outcome;
- coordinating the activities of groups involved in land and water management within a catchment towards the shared goals, priorities and targets. These include both public land managers, private landholders, water authorities, waterway managers, local government, Landcare and other community groups; and
- monitoring the effectiveness of management strategies.

A regional catchment management and planning approach provides the capacity to do this. It is an approach that offers

the most effective mechanism for governments to form partnerships with regional communities to fulfil their common objectives for the natural resources under their stewardship. A regional catchment management and planning approach to dryland salinity is based on the following five key principles – community empowerment, integrated management, targeted investment, accountability and administrative efficiency.

Investment, planning and management of dryland salinity has to date, tended to focus on assistance and incentives for community groups or landholders to undertake localised ameliorative actions. However, recent salinity projections clearly show that incremental change at the local level will not adequately deliver the changes at the landscape level that will be necessary to address dryland salinity issues effectively.

Regional catchment management and planning approaches offer a broadly integrated framework for the management of dryland salinity, within a broader context of land and water management and landscape change. This approach will facilitate community involvement and focus efforts on targeted outcomes and priority areas.

**Recommended Approaches:**

5. That State and Territory governments in partnership with the Commonwealth commit to an integrated, community based regional/catchment management and planning approach to the management of dryland salinity.
6. Development and implementation of regional/catchment scale investment arrangements as part of an increased emphasis on a regional/catchment management and planning approach.

**5.5.2 Focus on Improved Regional Catchment Planning**

**Strategic Directions:**

- Importance of scale and level of planning and devolution of planning to the appropriate level
- Integrated action planning at a catchment/regional scale that brings together natural resource management and rural and regional development outcomes
- Regional/catchment planning that establishes realistic and achievable implementation and investment targets
- Clearly defined and articulated roles and responsibilities
- Importance of incorporating the concept of review and continuous improvement in planning processes
- Closer linkages between regional/catchment and statutory land use planning
- Focus on establishment of business action plans to implement regional/catchment plans

The scale of change and high level of coordination needed to effectively address dryland salinity requires the

reconsideration of existing planning frameworks. Within the context of integrated catchment management and planning, there needs to be consideration of clearly defined roles and responsibilities, the scale and level of planning, the importance of continuous improvement and adaptive management and closer linkages between catchment and statutory land use planning.

A system of policy and planning is required which devolves decision making to the appropriate level through a focus on integrated action planning at a catchment and regional scale. Regional/catchment plans must focus on clearly defined and articulated roles and responsibilities as well as the actions and contributions of each of the stakeholders in implementing the plans. This should be supported by property management planning at the farm level and through the establishment of business action plans to implement regional/catchment plans. It is also important that government and the community incorporate the concept of review and adaptive planning as a process of continuous improvement that requires ongoing investment, rather than as a static one-off process. Government and communities must ensure that decisions are made at the appropriate level and resources are continually targeted to priorities.

In order to address dryland salinity effectively, there is a clear need to improve linkages between catchment planning and statutory land use planning by local government at the regional level. There are clear links between regional/catchment planning and statutory land use planning in terms of their legislative framework, overall objectives and the land management issues they deal with. Both are concerned with the sustainable use, management and protection of land and water resources and as such have areas of common interest and overlap on issues such as dryland salinity. To improve the management of dryland salinity, regional/catchment strategies must be coordinated with the statutory planning system of local government. Regional strategic planning regarding dryland salinity

should be undertaken as a joint process between catchment management bodies and local government.

**Recommended Approaches:**

7. Establishment of an adequate framework for development and implementation of regional/catchment planning, which addresses broad natural resource management including dryland salinity, consistent with the proposed strategic directions, and which ensures:
  - a process of continuous improvement;
  - decisions are made at the agreed responsibility level and roles and accountabilities are clear;
  - resources are continually targeted to priorities; and
  - effective linkages with initiatives to improve management skills, such as Property Management Planning.
8. Promote cooperation and coordination on issues pertaining to dryland salinity between regional/catchment planning and statutory land use planning by local government at the regional level to ensure:
  - regional/catchment strategies are coordinated with the statutory planning system of local government; and
  - regional strategic planning is undertaken as a joint process between catchment management bodies and local government.

**5.5.3 Improved Dryland Salinity Management Plans**

**Strategic Direction:**

- Comprehensive review of existing dryland salinity management plans.

There is a need for a comprehensive review of existing catchment and dryland salinity management plans. Such a review should be undertaken in view of new evidence and research on the effects of different options for managing dryland salinity, the development of a regional/catchment management and planning approach and improved links with other regional planning bodies. Dryland salinity management plans should be reviewed in light of a continuous improvement model that ensures decisions are made at the appropriate level and resources are continually targeted to priorities.

**Recommended Approaches:**

9. Priority be given to national, state/territory and regional/catchment level reviews of catchment and dryland salinity management plans that consider:
  - new evidence and research on the effectiveness and efficiency of different options;
  - the development of a regional/catchment management and planning approach;
  - improved links with other regional planning bodies;
  - continuous improvement;
  - how decisions can be made at the appropriate level; and
  - targeting of resources to priorities.

**5.5.4 Regional/Catchment Knowledge Strategy**

**Strategic Directions:**

- Improved information and knowledge that translates at an appropriate level
- Integrated information that addresses economic, social and environmental considerations
- Investment in decision support systems at the regional/catchment level
- Investment in land capability information at the regional/catchment level as modified by dryland salinity
- Better understanding of future scenarios
- Better utilisation of property management planning as an information and management tool

Information to support the planning and implementation of actions to address dryland salinity needs to be accessible at an appropriate scale. There is a need for information that translates in a meaningful way from a national/state/territory context through to regional/catchment information and individual property levels. There is a need for strategies to improve access to information at all levels. Landholder knowledge regarding dryland salinity could be greatly enhanced through utilisation of property management planning as a vehicle to disseminate information about scenarios and options in a regional context.

Information needs to be integrated in a manner that recognises the linkages between land, water and vegetation processes and the potential interactions between elements. It is also important that environmental information is integrated with economic and social considerations to support the development of holistic approaches and options. The ability to project future scenarios in relation to dryland salinity will be important in guiding investment decisions.

Provision of this range of information requires investment in improved knowledge and information, the coordination of existing effort, linking information users with information providers and the application of smart tools. The development of tools such as decision support systems will allow industry, government and the community to assess natural resource information and provide a basis for informed decision making about land capability and the

development of alternative land use proposals, within the context of future dryland salinity scenarios.

**Recommended Approaches:**

10. That Commonwealth and State/Territory agencies invest in improved knowledge and information at the levels of broad context, regions/catchments and individual properties.
11. That Commonwealth and State/Territory agencies commit to the integration of economic, social and environmental information through the establishment of Regional/Catchment Information Support Teams and the provision of relevant and useable information to the community.
12. That Commonwealth and State/Territory agencies invest in regional/catchment decision support systems to inform the development, and implementation and monitoring of regional/catchment strategies.

**5.5.5 Capacity Building and Skills Development**

**Strategic Directions:**

- Effective communication of the severity of the dryland salinity situation and options for action
- Education and communication strategies for landholders focussing on realistic approaches and options
- Communication of issues and responsibilities across rural and urban communities
- Appropriate utilisation of property management planning in relation to managing risks of dryland salinity
- Accessible and useable information

As the complexity of land management and the economic environment increases, the capacity and skills of those in agriculture and resource industries to manage issues such as dryland salinity as an integrated part of their business and land management practices must also increase. Many landholders lack the information and need encouragement to assess and make decisions about the future sustainable management of their properties in the light of dryland salinity. The property management planning approach, which encourages and assists farmers and their families to undertake integrated farm business planning and to manage their natural, human and financial resources, has great potential to achieve this.

A key issue in encouraging informed and responsible decision-making and practice among landholders dealing with dryland salinity is that of awareness of the problem and options for action. While the salinity strategies of the last decade have most certainly contributed to raising awareness of the issue of dryland salinity, the development of new information, predictions and future scenarios requires an effective communication campaign to landholders. Substantial benefits could also be gained through the coordinated promotion of consistent and accurate information regarding the nature and extent of the dryland

salinity problem, and well-targeted, realistic options for action to landholders. Communication and education strategies must extend beyond rural communities alone to engender understanding and a sense of responsibility and commitment in regional and urban communities.

**Recommended Approaches:**

13. That ARMCANZ complements the Murray Darling Basin Salinity Communication Strategy through the development of an effective national community education program focussing on realistic approaches and options.
14. That Commonwealth and State/Territory agencies, in partnership with regional/catchment communities, develop complementary communication strategies for the promotion of dryland salinity awareness and management options, including the development of Best Management Practices through such mechanisms as property management planning and other skilling initiatives.
15. That Commonwealth and State/Territory agencies work with regional/catchment communities to ensure realistic expectations regarding options, actions and outcomes through effective information and education.
16. That Commonwealth and State/Territory governments facilitate assistance for skills and business development and planning to assist landholders assess options and adjust to new sustainable industries, for example, farm forestry.

**5.6 Investment Strategy**

**5.6.1 Partnerships in Investment**

**Strategic Directions:**

- New approaches to harness market forces and foster industry, community and landholder collaboration and investment in dryland salinity
- New frameworks for government investment
- The scale and timeframe of dryland salinity processes requires long-term and targeted investment by government and community
- Science based mechanisms utilised to determine priorities and establish investment targets

In order to achieve the significant levels of change required within reasonable timeframes, it is not feasible to rely on government resources alone. There is a clear need for new approaches to harness market forces and foster industry, community and landholder collaboration and investment in dryland salinity management.

A key future approach to generating investment in the management of dryland salinity lies in fostering collaborative projects between industry, government and catchment or regional groups. Government has an increasingly important role to play in fostering this collaboration. Current approaches to dryland salinity management have tended to focus on individual landholders

or Landcare groups. Community based organisational arrangements have an ongoing and fundamental role to play in managing dryland salinity, however the need to generate collaboration across industries and communities suggests a shift in focus to broader scale projects.

There is a clear role for government in generating a framework for investment in larger scale collaborative projects. Key criteria for these projects include that they be:

- grounded in a strong regional approach and operate at a catchment and/or regional level;
- made through an investment framework that is underpinned by sound scientific understanding and cost/benefit analysis;
- collaborative in nature and foster the involvement of key stakeholders, particularly catchment groups, industry, local government, community and landholders;
- integrate natural resource management and regional development outcomes; and involve shared investment mechanisms and clearly specified and agreed outcomes and targets.

It is envisaged that projects would address issues such as land use change, changing practices within a landscape or industry context, and systems for training site evaluation and business planning to generate change into new enterprises.

A focus on larger scale collaborative projects that act at regional catchment levels will complement and extend the approach of the Commonwealth Advancing Australian Agriculture (AAA) Initiative. The AAA package promotes the importance of planning at regional community levels and the importance of business and farm level planning. A focus on broader scale projects that engage stakeholders at catchment/regional community and industry levels allows for an approach to the management of dryland salinity that integrates the business and regional planning focus with rural and regional development initiatives at an appropriate regional level and scale. This approach will also capitalise on the outcomes of the National Land and Water Resources Audit.

#### **Recommended Approaches:**

17. That Commonwealth and State/Territory governments refocus and target their investment in dryland salinity towards broader regional/catchment scale projects that integrate rural and regional development and natural resource management outcomes in accordance with the proposed strategic directions.

### **5.6.2 Shared Investment**

#### **Strategic Directions:**

- Review of arrangements for shared investment consistent with principles of the SCARM endorsed shared investment arrangements at Appendix Three
- Engaging industry and urban and regional communities to enhance the resourcing of dryland salinity management
- Generation of adequate levels of investment from the community and industry
- Mechanisms that enable communities to determine levels of investment and to overcome issues of the geographical separation of cause and effect in dryland salinity

Given that public or private investment alone will not be sufficient to address dryland salinity, there is a need for government at all levels to develop a framework for shared investment in the management of dryland salinity. As key stakeholders, it is important that government find mechanisms to engage industry, landholders, the general public (rural, regional and urban) and all levels of government in shared investment.

In determining its share of investment, government will need to consider a number of factors. The public good role of government in the management of dryland salinity must be considered, as it contributes primarily to activities from which the community benefits. Private beneficiaries, both existing and future, should also be expected to pay for activities which provide this benefit. Government must also consider mechanisms to generate adequate levels of investment from community and industry. In the case of the community, there is also a need for mechanisms that enable communities to determine levels of investment and to overcome issues of the geographical separation of cause and effect in dryland salinity and other factors resulting in market failure.

#### **Recommended Approaches:**

18. That the SCARM endorsed principles for shared investment are adopted for dryland salinity management (refer Appendix Three).
19. That ARMCANZ request SCARM to explore:
  - broad mechanisms to enable communities to contribute to investment in dryland salinity management and natural resource management and protection; and
  - strategies to better mobilise industry investment and involvement in these activities.

### 5.6.3 Market-Based Mechanisms

#### **Strategic Directions:**

- Well developed market-based measures that contribute significantly to the achievement of greater landholder and industry involvement in dryland salinity management
- Explore utilisation of an auction or tender based system to encourage uptake of works to address dryland salinity management and resource protection

In the past, policy instruments such as subsidies and grants have been applied with mixed success in achieving the targets of salinity management plans. However, governments are not always in a position to provide the level of direct incentives that may be needed to change land use and practice at the scale that is required to address dryland salinity. Market-based measures, if they can be successfully developed, may contribute significantly to changed land use and the adoption of more suitable practices and achieve greater landholder and industry involvement in dryland salinity management.

A number of options exist with regard to market-based mechanisms. Carbon, salinity and salt credits are potential tools that can be used as effective levers for the land use changes that are required to address dryland salinity. The use of accreditation and industry based measures such as Environmental Management Systems to reward best management practice can assist in encouraging the sustainable management of dryland salinity and provide potential marketing benefits for the agricultural sector. Rate rebates, differential rating and tax concessions are also potentially useful measures that could be utilised through partnerships between different levels of government.

The selection of appropriate market-based mechanisms must be based on a number of factors. Key criteria include: contribution to structural change; removal of the need for ongoing investment; encouragement of integrated practice; and a focus on areas of maximum impact.

A key issue to consider in the development of market-based measures is the potential for the market to fail to maximise environmental quality where market prices communicate little or no information about the environmental effects of producing or using a product. The environmental harm, a 'cost' in economic terms, remains 'external' to the market, that is, it is not reflected in the market price. In order to correct this 'market failure', mechanisms are required that can put a price on environmental 'externalities'. An auction or tender based system of grants and incentives for the management of dryland salinity has the potential to enable this 'cost discovery' through stimulating the market to allocate prices. This is clearly an area worthy of investigation

by government as a potential tool for the future management of dryland salinity.

#### **Recommended Approaches**

20. That through the further development of the national policy for natural resource management, the Commonwealth and State/Territory governments:
  - consider the use of taxation and credit vehicles for promoting practices that address dryland salinity;
  - in partnership with industry and regional/catchment communities, promote the development of Environmental Management Systems as an accreditation tool to encourage practices that address dryland salinity; and
  - explore opportunities and applicability of an auction or tender based system of grants and incentives to address land use changes for dryland salinity.

## 5.7 Managing Social Change and Industry Sector Adjustment

#### **Strategic Directions:**

- Bring together information and options for addressing dryland salinity and industry adjustment with a view to establishing sustainable rural industries and communities
- Strategies that address the social change and industry sector adjustment associated with the impacts of dryland salinity and the scale of change required
- Proactive investment to minimise the social impacts of dryland salinity and maximise the ability of regional communities to respond positively to change
- Recognition that land use change is going to require socio-cultural change

A new strategic policy framework for dryland salinity must address the social change and industry sector adjustment associated with the impacts of the problem and the scale of change required. In particular, this framework must address issues of generating and managing change in land use and farming systems; facilitating adjustment between industries; and minimising the socio-economic impacts of dryland salinity.

The scale of change required to manage dryland salinity will have a significant impact on the practices and livelihood of primary producers. Government must engage industry in collaborative projects to identify and promote alternative industries and changes in land use. Education and awareness raising activities can be utilised to promote options for change and begin to address the socio-cultural issues that surround land use change. There is also a role for government in assisting adjustment between industries and minimising the impacts of change on primary producers. Government can play an important role in directing resources to regionally based adjustment strategies that will minimise social hardship, foster cultural change and promote regionally relevant change. A proactive investment is required to minimise the social impacts of dryland salinity

and maximise the ability of regional communities to respond positively to change.

**Recommended Approaches:**

21. That government engages industry in collaborative projects to identify and promote alternative industries and changes in land use.
22. That government co-invest with other key stakeholders in education and awareness raising activities that promote options for change and address land use change.
23. That government co-invest with other key stakeholders in regional and catchment level adjustment strategies.

# APPENDIX ONE

## Institutional Arrangements

	<i>Roles and Responsibilities</i>	<i>Key Response Mechanisms</i>
National Coordination	<p>Strategic coordination between jurisdictions on matters of agreed common concern is achieved through inter-governmental consultative arrangements including:</p> <ul style="list-style-type: none"> <li>• Council of Australian Governments (COAG)</li> <li>• Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)</li> <li>• Australian and New Zealand Environment Conservation Council (ANZECC)</li> <li>• Murray Darling Basin Ministerial Council (MDBC)</li> </ul>	
Commonwealth Government	<p>The key roles for the Commonwealth in natural resource management issues such as dryland salinity encompass:</p> <ul style="list-style-type: none"> <li>• national leadership to develop and catalyse coordinated and integrated approaches to public investment across jurisdictions</li> <li>• leading the development of better management principles, tools and systems, for example, market-based measures</li> <li>• improving the knowledge base through strategic R&amp;D</li> <li>• articulating, disseminating, demonstrating and refining best-practice approaches</li> <li>• improving incentives, especially in areas of Commonwealth responsibility such as taxation measures</li> <li>• ensuring the wider Australian community is well informed about the issues</li> </ul>	<p>The Commonwealth's key response mechanisms include:</p> <ul style="list-style-type: none"> <li>• International Conventions</li> <li>• Natural Heritage Trust (NHT) Partnership agreements and funding arrangements</li> <li>• development of national policies and strategies</li> <li>• support for research and development</li> <li>• provision of incentives</li> </ul>
State Government	<p>The key roles for State governments in natural resource management include:</p> <ul style="list-style-type: none"> <li>• provision of research and technical support services</li> <li>• establishment of legislative frameworks</li> <li>• articulating, disseminating, demonstrating and refining best-practice approaches</li> <li>• pursuing the development of better management principles, tools and systems, eg market-based measures</li> <li>• implementing national strategies</li> <li>• establishing effective catchment/regional institutional arrangements</li> </ul>	<p>The State's key response mechanisms include:</p> <ul style="list-style-type: none"> <li>• legislative powers</li> <li>• research and monitoring programs</li> <li>• provision of technical support (including catchment characterisation)</li> <li>• provision of incentives</li> </ul>
Local Government	<p>Key roles for local government relevant to natural resource management include:</p> <ul style="list-style-type: none"> <li>• cooperation with catchment management bodies</li> <li>• facilitating local industry involvement</li> <li>• statutory land use planning</li> <li>• local support to community salinity management groups</li> <li>• provision of local incentives</li> </ul>	

## APPENDIX TWO

### Examples of Initiatives Undertaken by States to Address Dryland Salinity

#### New South Wales

A Cabinet Sub-committee has been formed to address salinity, chaired by the Minister for Agriculture, Minister for Land and Water Conservation, Mr Richard Amery. This Sub-committee will report back to the Premier with a comprehensive plan of action by June 2000. In association with this, NSW Government will host a Salinity Summit in Dubbo in March 2000. The Department of Land and Water Conservation is to convene an Interdepartmental Working Group on Salinity charged with the development of a State Salinity Strategy to support these initiatives.

An important undertaking has been the signing of a Memorandum of Understanding between the Minister for Forestry and the Minister for Agriculture, Minister for Land and Water Conservation concerning the need for a coordinated approach for the expansion of new planted forests in the efforts to help manage dryland salinity.

These initiatives are in addition to existing NSW Agriculture programs supported by Salt Action and a range of industry funding bodies.

#### Queensland

##### **Salinity Initiatives in Vegetation Management:**

The Queensland Government has adopted a broad-scale tree clearing policy under the Land Act (1994) for leasehold land that, among other purposes, aims to prevent land degradation and maintain ecological processes. Under the policy, applicants for tree clearing permits must demonstrate that dryland salinity or rising water tables will not occur as a result of the proposed clearing activities.

Similar requirements will apply to freehold land when the Vegetation Management Act (1999) is proclaimed.

##### **Salinity Initiatives in Land and Water Management:**

Property level Land and Water Management Plans are required by users of irrigation water purchased either at auction or from other users. These water users must demonstrate that their land and water management practices will not result in rising water tables or the development of salinity either on the property or in lower landscape positions.

##### **Salinity Risk Assessment for Potential Irrigation Developments:**

As a component of feasibility studies for new water storages within Queensland, an assessment of the potential for watertable salinity or stream salinity is required. Department of Natural Resources (DNR) undertakes a risk assessment of the hydrological impact of the storage and proposed irrigation areas.

##### **Murray Darling Basin (MDB) Salinity Audit and the National Land and Water Resources Audit (NLWRA):**

DNR is undertaking catchment scale salinity risk assessments as a component of both the MDB Salinity Audit and the NLWRA (Theme 2 – Dryland Salinity). This work provides a framework for prioritisation of high-risk catchments that will require further investigation as part of the new vegetation management initiative.

#### Western Australia

The Western Australian Government released a 30-year Salinity Action Plan in December 1996 and is currently redrafting its strategy, which will be released in early 2000.

The State Salinity Council of Western Australia consists of representatives from over 20 community and government stakeholder groups that work together to address salinity. The Council reports to the Cabinet Standing Committee on Salinity Management, which is chaired by the Deputy Premier.

Work has been undertaken in Western Australia to develop several different types of commercial forest species. In addition, considerable effort in Western Australia has gone into developing productive systems for salt-affected land and results show that farming such land can be cost-effective.

#### South Australia

##### **Planning and Strategy**

The Soil Conservation Council of SA is current leading a process to develop a new State Dryland Salinity Strategy and short term Action Plan. A broad focus is being taken with active involvement of stakeholders representing regional planning, agriculture, the environment, water quality, local government and infrastructure management interests.

##### **Implementation**

##### ***The Upper South East Drainage and Flood Management Plan:***

This major works program is currently under construction in the Upper South-East Region of SA. It will reduce the

impacts of salinity and waterlogging on agricultural land through the construction of an extensive series of deep drains. Accompanying initiatives in revegetation – *Salt to Success* and saltland agronomy are being implemented to more productively utilise the reclaimed land. There is also a focus on improved wetland management, which includes the use of some of the drainage water through the *Wetlands WaterLink* initiative. When fully operational over the next ten years, the plan will permanently lower groundwater over the majority of the 260,000 ha of land currently affected by dryland salinity. The plan has direct costs of \$24 million which are being shared between the Commonwealth, State governments and local landholders.

#### ***Catchments Back in Balance***

This lauded, NHT funded, extension program works to increase the adoption of strategies to better manage dryland salinity and rising watertables. The program provides the direct professional assistance of a catchment hydrologist and a saltland agronomist to local communities to enable them to produce technically competent Salinity Action Plans. It then helps organise the support services required for successful implementation of the plans.

#### ***Local Action Planning***

There is a growing trend towards Local Action Planning for salinity management, typically incorporating technical and economically derived cost sharing arrangements to reflect both the private benefits and local and wider public benefits of on-ground works. An excellent example of this can be found in the Coorong and Districts Local Action Planning which aims for a 50% reduction in recharge across the region.

#### **Mapping & Monitoring**

##### ***National Land & Water Resources Audit***

A range of projects to meet the requirements of the NLWRA, including:

- Assessing the impacts of dryland salinity on South Australia's water resources
- Assessing the mapping and monitoring techniques used for dryland salinity
- Determining the economic costs of dryland salinity associated with agricultural land use in SA

##### ***Mapping of Salinity in South Australia***

Primary Industries and Resources South Australia recently completed a comprehensive mapping of the State's agricultural regions for dryland salinity. This will be an essential local planning tool and will provide a sound benchmark for assessing both the future spread of dryland salinity and the benefits of remedial actions.

#### **Research & Development**

##### ***Using Saline Resources for New Farming Systems and Industries***

PIRSA has just commissioned a new NHT funded project to examine new productive uses for salt affected land. This will include the evaluation of new plant species, farming systems and alternate land uses such as aquaculture and salt farming.

##### ***CSIRO Division of Land & Water (Adelaide)***

Various areas of research leading to a better understanding of dryland salinity processes. Key projects include:

- Floodplain salinity and impacts on riparian vegetation
- Stream salinisation risk assessment
- Consequences of rising and falling saline watertables on soil physical and chemical properties
- Manuals for land use planning and assessment of dryland salinity and waterlogging

## APPENDIX THREE

### SCARM Endorsed Principles for Shared Investment in Dryland Salinity

This paper provides a discussion on general principles for shared investment decisions for natural resource management activities. Such activities may aim to accelerate achievement of sustainable natural resource objectives, may have diffuse or unspecified beneficiaries or may be needed because of diffuse or unspecified impactors<sup>1</sup>. It is not intended that this paper cover specific cases of attributable cost-sharing related to consumptive use of natural resources, such as water pricing, where specific costing arrangements have been developed by COAG.

The long-term health of the nation's natural resource base and its conservation of environmental values can only be achieved through wide implementation of sustainable natural resource management practices. This outcome will require considerable investment by stakeholders, based on a clear understanding of the roles and responsibilities of all parties. Partners may include individuals, groups, the community, industry and all levels of government, who will need to jointly share both the benefits and the costs. A focus on partnerships is essential to achieve the protection and sustainable use of the nation's natural resources.

While the term 'cost-sharing' has often been used to denote joint investment, a more appropriate term may be "shared investment" which gives equal emphasis to costs and benefits. Furthermore it can encompass any sort of resources commitment – not limited to a financial cost – that will result in a benefit for more than just one individual or group. The term 'cost-sharing' only describes the division of funding contributions to the action between the partners whereas "shared investment" in this paper is a wider term that recognises there are many factors considered in making investments, including in-kind work, education, R&D and planning. Shared investment applies to a number of policy instruments to encourage improved natural resource management, not just to on-ground works, although there has traditionally been an emphasis on on-ground works.

SCARM, in considering cost-sharing, now more precisely termed shared investment, in terms of government investment into on-ground works, in particular for NHT projects, agreed on five major categories of principles: (i)

duty of care; (ii) beneficiary and impactor pays; (iii) government contributes for public benefit; (iv) economic viability/social impacts and environmental impacts; and (v) policy, planning and monitoring, research and investigations. This paper will provide a discussion on these principles, but will also offer some direction for shared investment in broader terms, when government may not be part of the partnership agreement.

There have been different perceptions about the role of government in natural resource management and mitigation of environmental degradation. Some consider that government has an obligation to fund natural resource management actions, even if there is a large private benefit. However, in many cases there is insufficient reason for government to become involved in providing financial assistance at all, and in cases where government should be involved, the ratio of government assistance to private investment, and the length of time that government assists, may differ according to severity, extent and significance of problems.

It is important to determine what needs to be undertaken in terms of achieving the sustainable management of natural resources and biodiversity conservation. This will mostly be achieved through changes in management practices, of which on-ground works<sup>2</sup> is only a part. Simply focusing emphasis on on-ground works can create a remedial works program culture dealing with symptoms rather than causes. Therefore, on-ground works, and the shared investment principles relating to them, need to be considered along with the range of other instruments available to both government and the community, such as education, training, information transfer, regulation, planning, incentives, research and adjustment; many of which are largely funded by government.

It must also be recognised that it is not possible to prescribe allocations of investment shares for any particular type of activity as circumstances differ across regions and should be determined on a case-by-case basis. However it is expected that for particular regions, simple fixed rates may be used for a range of activities from time to time to avoid unwarranted complication of small projects.

1. Impactors is a term that encompasses both positive and negative effects on the environment. The term 'polluters' has been used in the literature, particularly relating to 'polluter pays' principles. 'Impactors' is being used in this paper due to its broader definition, and covers the term 'polluter' as well.

2. On-ground works comprise activities such as those that reclaim salt-affected land; diminish soil erosion; efficient on-farm water use/management; reduce pollution of waterways; improve soilcondition; and conserve and improve ecosystems and biodiversity.

The first section of this paper provides a mechanism to determine whether government should be a partner for any particular action. It is important at the outset of any action to identify the investment partners, and often government will not be involved. The second section of the paper outlines the shared investment principles that can be used to help determine the allocations of investment shares, if required, to any identified parties, whether government is a partner or not.

## I. Should government invest in the proposed activity?

### 1. When government investment is relevant

There are situations where government investment in community activities is relevant. These situations are usually:

- Where applying regulatory or legal solutions alone may not be cost-effective and joint investment in the short-term may be preferred.
- Where government contributions can facilitate a faster change in management practices towards a more sustainable system.
- Where additional investment is required to further improve an on-site or off-site environmental value, when the on-site benefits may be insufficient to make the investment attractive to the resource user.

However, the general approach in considering in the first instance whether government should invest in a project should be:

1. To determine who has the responsibility within the scope of the project for improved resource management.
2. To determine what is the minimum time-bounded government intervention that would be required to bring about behavioural change to meet public expectations.
3. To determine what the most appropriate instrument would be to ensure behavioural change.
4. To determine whether a financial subsidy would be the most appropriate instrument, and the best means for its delivery.

### 2. Shared investment by government is not relevant where:

#### (i) A duty of care applies

Landholders and other resource users have a duty of care to take all fair and reasonable measures to ensure that they do not damage the natural resource base.<sup>1</sup> In many circumstances, this legal or moral requirement will cause

landholders to pay all costs associated with on-ground works because such works are part of their duty of care. Such expenditure is a requirement of their stewardship role and no funding support or compensation need apply to these investments. In these situations the role of government is often in education, research and advice to support and raise landholders' awareness of their duty of care.

Where a landholder or their manager employs exploitative or damaging practices that are inconsistent with a duty of care, then such users should be responsible for making good any damages incurred as a result of their actions, be those damages on-site or off-site. If it is cost-effective and feasible technically to trace quantifiable off-site damage to a specific source, then the full cost of ameliorative works should be borne by the polluting firm or landholder (impactor pays principle). In these situations the role of government is to regulate, advise and police exploitative management, rather than co-fund the activity.

Additionally, it needs to be recognised that poor enterprise viability or management is not a justification for governments to substitute public funds for landholder funding of remedial works.

#### (ii) Private benefits are sufficient incentive

Where the land user invests in on-ground works that provide site-specific financial benefits sufficient to make the investment attractive, then investment by government is not applicable.

#### (iii) There are more appropriate approaches

In some cases governments have preferable investments. It may be more desirable for government to use legal, regulatory or market-based solutions to generate environmental amenities than to invest in remedial activities. These legal, regulatory or market-based solutions will be aimed at indirectly achieving on-ground outcomes.

#### (iv) There are too few benefits

Sometimes the environmental benefits are insufficient to justify significant expense by government and others in

1. 'Duty of Care' has been defined as the common law duty of care, which applies to everyone who may harm another as a consequence of his or her actions. Duty of care applies to harm that might be caused to both a) those who are living at present; and b) those who are yet to be born. Essentially resource managers should have a duty to take all 'reasonable and practical' steps to prevent their actions causing foreseeable harm to the environment. Landholders are 'stewards of the land' and land is only held in trust for subsequent generations. The duty is about preventing harm being caused or about to be caused to the environment. While Duty of Care in the context of natural resource management has limited statutory backing in Australia at present, this may change in the future along with the common understanding of its meaning.

supporting the activity. Occasionally the proposed activity may be technically flawed or other off-site changes may significantly reduce the generated environmental benefits. Furthermore, government may not choose to invest when the proposed actions do not reflect government priorities.

## II. Shared investment principles

### 1. The first group of principles are of direct concern to government, and are the overarching principles that determine whether an activity should be considered eligible for government funding.

- Government only contributes to activities or parts of projects where there are significant public benefits. Users, both existing and future, are expected to pay for activities that increase their wealth or the income stream they can expect to receive.

*Note:* Public benefit alone may not be sufficient reason for government investment, particularly in cases where there is a clear responsibility – duty of care – for particular activities. Public benefit is a condition of government funding, not a purpose.

However, there are situations where improvement in environmental amenity bestows significant public benefits such as protection of rare or endangered flora or fauna and public funding may be applicable. There are also cases where market incentives result in under-investment in knowledge about environmental conditions or less than socially optimal generation of environmental amenity. In these cases, there may be a clear role for public funding, rather than sole reliance on private funding.

There may also be special circumstances whereby governments can undertake strategic investment, even where the resulting benefits may be localised or mainly private. These circumstances may be where public funding forms part of community education that informs people as to the private and public benefits of the proposed activities. Such public funding needs to be known not as a policy precedent that then applies to every new activity but rather as a catalytic once-off or demonstration-type activity.

While certain activities, such as the development of farm-forestry enterprises, shows a clear private benefit, government may contribute towards the cost of undertaking research and investigations into such potential enterprises, in order to reduce the risk to the private individual and encourage diversification, if and to the extent it is anticipated that net public benefits will accrue.

*Note:* Public benefits include such things as improved water quality, reduced expenditure by governments on repairs to public assets damaged by land and water degradation and enhanced conservation of biodiversity. Public benefit also includes recreational use of natural resources. Social perceptions that recreational uses of resources are free tend to be reinforced when the general public has not transparently shared the cost of managing the resources. The broader contributions of government need to be recognised.

One test for the extent to which a public payment should be made is the extent to which the proposed payment would increase land values. If the result is payment for work to provide public benefits that can not be provided profitably by private entrepreneurs, then there may be no increase in land value as a result of the proposed cost-sharing arrangement.

- Government should, in general, contribute to works only up to a level sufficient to trigger the necessary investment towards self-correcting, self-perpetuating natural resource management systems that operate effectively.

Public funds should not be applied in such a way that they substitute for the responsibility of others nor weaken others' perception about their own resource management responsibilities.

- Before government will contribute to any land, vegetation or water management activity, the activity must be technically sound, produce outcomes consistent with identified priorities, and the benefits must justify the costs. In considering costs and benefits, economic, social and environmental factors all need to be adequately considered.

### 2. The second group of principles should be used by both those preparing projects and those assessing them.

- All natural resource users and managers have a duty of care not to damage the natural resource base. Users should be responsible for making good any damages incurred as a result of their actions.
- Where polluters or impactors can be identified, the full cost of the impact prevention and control attributable to them, including the cost of required activities, should be borne by them (impactors pays principle).

*Note:* Governments should have workable regulations in order to enforce remedial actions on polluters when off-site impacts are quantifiable.

User-pays systems should be established to regulate the use of resources such as water in order to recover the full cost of managing these resources.

The full cost of providing services to specific identifiable impactors or beneficiaries should be recovered by way of charges to them.

- In cases where the work being undertaken will not benefit the landholder(s) or resource users, particularly a lack of financial benefit (in the form of production or potential future capital gain), it is appropriate for beneficiaries to reimburse private individuals for the cost of actions over and above those generally expected of a private resource user in the region. This beneficiary-reimburses principle ensures that the public pays for public benefit in a manner that does not entitle a person to withhold opportunities to realise these benefits from the public. This may come in the form of a subsidy or tax rebate from public funds.

*Note:* Beneficiaries fall into two categories, and should pay according to the potential level of benefit that the on-ground works will provide.

- Direct beneficiaries are landholders (public or private) whose potential income and/or capital value will be increased as a result of the activity.
- Indirect beneficiaries are those who will enjoy qualified benefits, such as improved biodiversity, recreational benefits, etc.
- There should be no public money invested in a project that will be dependent on continued subsidy or public payment, unless there is a clear and inalienable responsibility for government in addressing the issue.

*Note:* There may, however, be some cases where government has taken an ongoing role in natural resource management, for example in the management of parks.

### **3. The third group of principles should be used at the local level when developing the mechanisms for shared investment appropriate for the proposed activities.**

- In situations where the cause of a natural resource problem and all the beneficiaries of its control are located in the same district, attempts should be made to first resolve investment sharing within the local community. Local government rates are an example of a mechanism that may be considered before any external resources are sought. At best, shared investment should be based on empirical evidence regarding the technical merits, financial viability and social and environmental impacts

of the proposed activity. In some cases governments will be already contributing through field, survey or monitoring data upon which judgements about likely benefits and costs can be based. Such activity, supported by government, may be desirable where great uncertainty exists over the extent of environmental damage that may emerge if ameliorative action is not supported by the community. In these cases provision of government funds to generate information may trigger wider support and funding from local and regional landholders who become more fully aware of the benefits (or losses avoided) of undertaking the proposed activity.

- Regional or catchment planning often identifies the major environmental and social issues affecting that region or catchment. These plans should describe a preferred investment-sharing regime applicable for a time to that area worked out on the basis of the flow of benefits, responsibilities and costs. Intended activities should be consistent with these plans. The development and acceptance of a regional or catchment plan should be a condition of government funding, and plans should not be developed for the purpose of receiving such funding. Having a plan does not guarantee government funding.
- The process of negotiating shared investment and monitoring outcomes should involve all stakeholders. In sharing costs, the process of arriving at the shares of cost is important in its own right. If the process is based on inadequate or unfair representation of specific views then dissatisfaction with the process may jeopardise the establishment of the activity or further collaboration in environmental improvement.
- To maintain commitment of contributors, feedback is essential. Both government agencies and companies are stewards of public or shareholders contributions and need to appropriately account for their use of these funds. How effectively and efficiently the funds are used needs to be subject to scrutiny. Hence, investment-sharing arrangements need to include a requirement to report on and monitor the outcomes from the investment. For example, ex-post analyses will form a check on the assumptions or claims of those initially involved in cost negotiations and will discourage inflated claims as to the size of environmental or financial benefits associated with the activity.
- Due recognition should be given to labour or other in-kind contributions from landholders when the input into the project is above the expected land management activities of the property. This input should be considered part of the landholders' contributions.