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SELECT COMMITTEE ON SALINITY

FINAL REPORT

December 2002

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Terms of Reference

A select committee has been appointed to inquire and report with the following terms of reference:

To examine:

(a) Business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas.

(b) The options for salinity management that are available to local councils, including but not limited to, planning instruments, building codes, urban water management plans, differential rating, development of local council expertise and resource-sharing between councils.

(c) Any barriers to adoption of salinity management strategies by local councils, and means to overcome the barriers.

(d) The adequacy of the Commonwealth's response and contribution to addressing salinity.

Chairman's Foreword

This is the final report of the Select Committee on Salinity. It addresses two of the Committee's terms of reference:

(a) Business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas.

(d) The adequacy of the Commonwealth's response and contribution to addressing salinity.

It must be recognised that addressing the problem of salinity, particularly dryland salinity, has only been high on governmental agendas since 2000.

The Commonwealth and NSW Governments responded quickly to the findings of the Murray Darling Basin Commission's *Salinity Audit* of 1999. The Audit shows that dryland salinity will increasingly be the major source of salinity in the river system and, unless addressed, will reverse the gains made by controlling irrigation salinity. The NSW Government held a state-wide Salinity Summit in March 2000 attended by parliamentarians and the community. The NSW Government Salinity Strategy released in August 2000 addressed many of the recommendations of the Summit. In May 2002, the NSW Government signed a bilateral Agreement with the Commonwealth Government under the NAP, whereby each party will provide $198M to address salinity in NSW.

The Select Committee on Salinity was established on 17 August 2000. The Committee, therefore, has the role of commenting on an area of Commonwealth and NSW Government which, in policy terms, is in the early stages of implementation and making suggestions for how it can be strengthened.

Salinity is a complex problem. Both the Commonwealth and NSW Governments have been rapidly developing a scientific understanding of salinity. However, new information which challenges current thinking and policy approaches will continue to emerge.

Whilst this report identifies many issues that should be addressed or further developed, it should be understood that it is easy to find such problems in a new complex area of policy, the implementation of which has been proceeding for under three years. The Committee's critique of Commonwealth and NSW Government policies should be understood in this context.

This report is also somewhat unusual in its scope. Business opportunities to address salinity cover a wide range of industry sectors including agriculture, forestry, aquaculture, energy, water management and minerals harvesting. All these areas have their own policies and bodies of legislation. It is not possible to cover each of these areas in detail. The report on business opportunities to address salinity provides an overview of the opportunities which, the Committee understands, at this point in time, to be the most commercially viable and to have an impact on salinity. The report also

identifies barriers to business opportunities and the role for the NSW Government in addressing them.

The key points here are the need for a clear mechanism through which the private sector can contribute to plans for the management of salinity and access funding to provide technologies and services.

Currently, most technologies which address salinity are marginally profitable and do not provide the same rates of return on investment as products and services which do not have an environmental objective. There is a need for a tax preferred investment fund to be established with assistance from the Commonwealth Government that can provide funding for commercial projects which have quantifiable environmental outcomes. This would make the technologies more attractive to private investors. It is also proposed that commercial technologies be eligible for environmental services payments where there are public benefits from their implementation.

This report also summarises a number of concerns from scientific and economic experts regarding the implementation of the NAP. Some key concerns are:

- Research and development of technologies is needed to provide changed land-use options which are technically and economically feasible.

- Greater recourse should be had to the cost-benefit analysis of catchment management plans to determine whether they are adequately justified on technical and economic grounds.

- Scientific collaboration across a number of disciplines is vital to understanding salinity. It is important that the funding of scientific research supports collaboration rather than competition and provides for a diversity of opinions.

- Governments are currently considering the use of market-based instruments to provide incentives to landholders to change their land uses to be more environmentally sustainable. At the same time they must also examine the range of incentives currently provided for unsustainable activities. A taxation expert claimed that these disincentives amount to tens of billions of dollars per year.

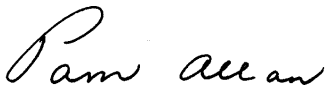
- There is a need for better data on salinity to underpin investment decisions, particularly mapping and other on ground investigations. There is currently a heavy reliance on modelling as it is much cheaper than mapping. Some witnesses are concerned that models based on a limited number of on-ground investigations may contain incorrect assumptions and errors which may affect the outcomes of investments.

The Committee now concludes its terms of reference. I have been pleased to Chair this Committee as all members have demonstrated a high level of concern about the impacts of salinity and have worked together in a bipartisan way to develop recommendations.

All members of the Committee believe that there is value in the continuation of the Committee in some form in the next Parliament to continue to oversight the development of this important whole-of-government policy.

I urge my Parliamentary colleagues to give due consideration to the recommendations of this report which I believe will strengthen the approach to salinity developed by the NSW and Commonwealth Governments.

I thank all members of the public who have taken the time to educate the Committee about the problem of salinity and its solutions. I would also like to thank members of this Committee for their diligence and the Secretariat for their work.



The Hon. Pam Allan MP
Chairman

Executive Summary

This report concludes the Committee's inquiries against its terms of reference. It examines:

> *Business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas; and*
>
> *The adequacy of the Commonwealth's response and contribution to addressing salinity.*

Term of Reference (d): The adequacy of the Commonwealth's response and contribution to addressing salinity

On 3 November 2000, a National Action Plan [NAP] for Salinity and Water Quality was endorsed by the Prime Minister, Premiers and Chief Ministers at the Council of Australian Governments. The purpose of the Plan is to identify high priority, immediate actions to address salinity, particularly dryland salinity, and deteriorating water quality in key catchments and regions across Australia.

The Action Plan is legally supported by the Intergovernmental Agreement on a National Action Plan for Salinity and Water Quality under which the Commonwealth, States and Territories, in July 2001, formally agreed to the NAP.

On 17 May 2002, a bilateral Agreement was entered into between the Commonwealth and New South Wales. One of its purposes is to provide for the establishment of a Commonwealth/ New South Wales Steering Committee to facilitate the delivery of the NAP in New South Wales. The priority tasks of the Steering Committee will be to make recommendations in relation to foundation funding and funding for priority actions, the adoption of an investment strategy for capacity building activities, the accreditation of catchment blueprints and development of partnership agreements with Catchment Management Boards.

Clause 37 of the Intergovernmental Agreement states that the Commonwealth's financial contribution of $700M over seven years for the implementation of this Agreement is to be matched by new State/Territory financial contributions. These arrangements are further particularised in cl.5 of the Agreement between New South Wales and the Commonwealth which says that each of these parties will allocate $198M over the life of this agreement for implementation of the NAP.

The NAP provides a commendable national focus on salinity and water quality issues. It provides an assurance of substantial funding that can be directed towards high priority immediate actions to address salinity and deteriorating water quality. Although it is too early to gauge the operational effectiveness of the NAP, the Committee's examination shows a number of areas where the action plan may be strengthened.

- *Lack of adequate scientific and technical knowledge to support NAP projects*

The NAP contains several important means of guiding and supporting management actions. These mechanisms will take time to develop and at this stage are not available to inform the contents of the catchment management blueprints which in important respects may be evolving without rigorous technical support or cost benefit evaluation.

The Committee recommends that a percentage of the NAP/NHT budgets be allocated to research and commercialisation of technologies for the improved management of salinity

recharge and discharge areas. This should include investment in supporting infrastructure and help with finance arrangements for new industries.

The inquiry identifies four functions that are vital to the involvement of the private sector in addressing the problem of salinity. They are to:

- serve as a clear entry point for businesses;
- allocate funding for research and commercialisation of technologies for the improved management of salinity recharge and discharge areas;
- broker innovative regional-scale projects in the States/Territories; and
- act as a link between a purpose-designed private investment fund (recommendation 13), private sector businesses, accreditors of environmental projects (recommendation 14) and catchment management boards.

These functions are not currently being performed by any NSW Government agencies. The Committee believes the most effective model would be a small unit which reports directly to the Natural Resource Management Ministerial Council.

The Committee recommends that a Commonwealth/States/Territories working party be established to

- develop an appropriate model for the body referred to;
- develop prescribed criteria for the assessment of proposals and
- determine the percentage of funding under the NAP/NHT that should be set-aside for this purpose.

The Committee recommends that the body referred to, be supported by an advisory council to assess proposals and advise on their priority. The advisory council should comprise a wide spectrum of industry groups and research organisations. The Committee has made suggestions on the criteria for assessment.

This model would engage all States and Territories in decision-making without the administrative costs of either establishing a new organisation at Commonwealth Government level or establishing a body in each State/Territory. There would be economies of scale in regard to administrative costs; opportunities to jointly fund and coordinate support of national industries of benefit to all States and a pooling of expertise. The Committee does not believe that it is appropriate to give these functions to any particular government department involved in natural resource management. Departments, by virtue of their functions, favour particular technologies and there are differences of opinion between them regarding the technologies which should be given priority support.

♦ *Need to target government funding*

Witnesses have clearly identified the need for investments to be very carefully targeted in order to provide public benefits for government expenditure. Sound investments need to be guided by good science and good economics. The Committee's discussions with witnesses identified concerns regarding the current policy on investment in land-use change. Witnesses believe that the NAP does not sufficiently target government spending, that implementation is proceeding without adequate research and technical support and that the science underpinning investments needs further development.

The Committee recommends that far greater recourse should be had to cost benefit analysis of catchment management plans at their inception so as to determine whether those plans and their associated investments are adequately justified on technical and economic grounds. The Committee considers such studies would allow funding to be more efficiently targeted and would highlight programs where further technical or economic input is required.

- *The need for greater cross-disciplinary scientific co-operation to understand salinity*

Another related issue involved in assessing whether investments in land-use change are cost-effective, is the degree to which the science that underpins it is developed. Some concerns have been expressed to the Committee that the current model of salinity is only a partial explanation of the causes.

Concerns have been expressed in evidence to the Committee that overly simplistic models are being used because there are too few scientific disciplines having input into addressing salinity.

Funding arrangements, which have the effect of narrowing the range of contributions to resolving the problem of salinity, are not in the national interest. This is because scientific research organisations are having to compete for funding which discourages collaboration. Until recently, the CSIRO was required to obtain 30 per cent of its overall funding from external sources. This meant that the CSIRO was competing with industry but had unfair competitive advantages as it received two-thirds of its funding from the Commonwealth Government. It was also unfair because CSIRO is seen as neutral and relied upon as an adviser to other organisations such as in assessing submissions for funding. This is a conflict of interest.

The external earnings target has been removed recently. However, if CSIRO does not maintain its external earnings at the current level, it will have to shed staff.

The Committee recommends that the Commonwealth Government monitor arrangements for funding of Commonwealth Government scientific organisations to ensure there is adequate cross-disciplinary contribution to understanding salinity.

- *Promotion of sustainable land use by economic instruments*

A strong case has been made for the improvement and expansion of the use of economic instruments such as taxation and other financial incentives to address salinity and other land use problems in Australia.

The Committee recommends that a Working Party of Commonwealth, State and Territory representatives be set up to identify the disincentives that exist for ecologically sustainable land and water use. This work would support the National Market-Based Instruments Pilot Program. Under this Program the Ministerial Council has allocated $5M to fund the Program to increase the use of market-based instruments.

- *Adequacy of current levels of mapping*

A number of concerns were presented to the Committee that current levels of mapping and other on-the-ground scientific investigations may be inadequate to make informed investment decisions. There is a concern about the reliance of the Commonwealth and NSW Governments on modelling which is based on a limited number of scientific

investigations. In NSW extensive studies have been done of some areas but there is a need for further studies to be done.

The Committee recommends that a working party of Commonwealth, State and Territory representatives examine ways to ensure that an enhanced mapping program and greater use of on-ground investigations underpin the NAP.

The Committee recommends that the private sector are provided with the opportunity to tender to provide mapping and other on-ground investigations.

- *Catchment Management Amendment Bill*

On 17 October 2001, the New South Wales Government introduced into Parliament the *Catchment Management Amendment Bill*. The object of this bill was to provide for the establishment of the Catchment Management Advisory Council and to provide for the establishment of catchment management boards and for the preparation of catchment management plans.

The former Minister for Land and Water Conservation said this legislation would give a coherent legislative base for catchment management and the necessary institutional and planning and monitoring mechanisms for integrated catchment management. The *Catchment Management Act 1989* has several inadequacies in terms of supporting the NAP. The first of these is that it does not give any statutory recognition to the term or concept of a catchment management board. The second problem is that the Act makes no provision for the development of catchment management plans or blueprints. The third problem that was to be addressed by the amending bill was to set out a list of functions for the catchment boards which reflected the functions contained in cl.7 of the Agreement between the Commonwealth and New South Wales.

The former Minister for Land and Water Conservation subsequently withdrew the amending bill, possibly for further consultation upon it. The situation therefore is that New South Wales is currently obliged to rely upon the existing provisions of the *Catchment Management Act* which as indicated by the former Minister have serious inadequacies in terms of implementing the NAP.

The Committee recommends that the current Minister for Land and Water Conservation re-examine the need to introduce legislative changes to the *Catchment Management Act* so as to ensure the adequacy of the Act to support implementation of the NAP.

- *Monitoring and Evaluation of Activities Funded under the NAP*

The bi-lateral Agreement between the Commonwealth and NSW contains detailed monitoring arrangements for outcomes under the NAP. The Committee recommends to the Commonwealth/State Steering Committee that these be strictly adhered to.

Term of Reference (a): business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas

The terms of reference require the Committee to identify two things. Firstly, whether a particular activity will have a significant impact on salinity and secondly whether it is cost-effective.

It needs to be recognised that addressing salinity has only been a high priority on the NSW Government's agenda since 2000. Whilst there is currently a rapid development of scientific understanding in this area, the answers to these questions are still complex and uncertain.

Part C of this Report examines issues in ascertaining whether public and private investment will have a significant impact on salinity and whether it is cost-effective. The Committee identifies a number of significant barriers to the private sector making a contribution to managing salinity. The Committee makes a number of recommendations to give the private sector the chance to contribute to the Commonwealth and NSW Government's plans to address salinity.

In Parts D and E the Committee uses the best available information to try to assess whether particular types of business opportunities will have a significant impact on salinity and would be economically viable. The extent to which any land-use change can address salinity is location specific. The Committee attempts to identify areas on the landscape where particular types of land-use change will be effective.

Part D examines business opportunities which may be effective in reducing the rate of recharge to groundwater. Part E examines business opportunities to make productive use of salinised land and water. Some of these opportunities also rehabilitate salinised land and remove salts from the hydrological system.

Part C

In order to be cost-effective, government investment in land-use change must produce public benefits which outweigh the costs. In other words, if the government is investing taxpayers' money into land-use changes on farms, the reduction in salinity must extend beyond the farm boundaries for there to be public benefits. The value of the off-farm benefits would also need to be greater than the costs. Off-farm benefits would include environmental benefits such as water quality and biodiversity, reduction or prevention of damage to towns and other infrastructure and reduction or prevention of damage to agricultural land.

If we are talking about encouraging private sector investment, the activity must make a net profit for it to be regarded as cost-effective.

- *Direct investment by the NSW Government into land-use change*

Scientific experts informed the Committee that the costs of reducing the rate of salinisation across the landscape of NSW are beyond the capacity of government to pay. In many areas groundwater systems are not responsive to change and the costs of reducing salinity can greatly exceed the benefits. For these reasons, many scientists and economists in this field believe that with the current level of funding available to address salinity, the most effective strategy is for the government to focus spending to reduce the rate of recharge in a few high priority areas. Witnesses believe that the NAP does not sufficiently target government spending.

- *Stimulating private sector investment in land use change*

If government funding needs to be targeted into relatively few high priority areas, it raises the question of what should be done for the rest.

The Committee supports the proposal by David Pannell, who is Associate Professor of Agricultural and Resource Economics at the University of Western Australia, that a percentage of the NAP budget be set-aside for research and commercialisation of

technologies such as perennial plants, aquaculture, desalinisation, salt harvesting and solar ponds which could be profitable and also assist in the management of salinity. This will get leverage of public and private funds across large areas.

In spite of a NSW Government commitment to business opportunities to address salinity, at this stage only $250,000 has been expended under the salinity budget in NSW for this purpose.

This Committee has examined a number of technologies to manage salinity in recharge and discharge sites. In some cases these technologies are a long way from commercialisation and require government support for research and development. However, in other cases, the technologies are in an early stage of commercialisation and are almost profitable or marginally profitable but do not provide rates of return on investment that are competitive.

Landholders also find it difficult to get loans from banks for establishing these new technologies, as they are not part of the established approaches in agriculture.

As Wayne Gumley, University Lecturer in the Department of Business Law and Tax at Monash University said:

> *One of the problems in this area is that we are dealing with a trade-off between private interests in running a business, be that primary production or any other business, as against the public interest in the preservation of the ecosystem as a whole and such things as clean water, clean air et cetera. So there has to be a certain level of intervention in the market by the government in that situation.*

The Committee believes that where there are public benefits from the use of such technologies that an environmental subsidy, commensurate with the level of public benefit should be paid by the NSW Government. Technologies that are productive and only require 'top up' funding are likely to spread the limited government budget further than payment for measures where the primary purpose is environmental.

The Committee recommends that the Commonwealth Government legislate the establishment of a new class of financial intermediaries that channel funds between investors and natural resource managers. That the fund be tax-favoured in order to be able to produce dividends comparable with alternative investments.

The Committee also recommends that the Commonwealth Government legislate to establish a system of accreditation to establish the environmental bona fides of commercial projects into which the funds are channelled.

- *Brokering integrated approaches to managing salinity*

Another area where a greater level of action is required by government to facilitate salinity business opportunities is in brokering and subsidising major projects with several parties that require an integrated approach. It is likely that many salinity businesses would be more effective if they were integrated into a multi-product or multi-service approach in a regional area. Some salinity businesses are in their infancy and require the development of a supply chain and marketing which requires coordination between industries in different sectors of the economy. Australian companies with products and services, which can address salinity, have found a willingness by governments to enter into trials but a slowness to commit to commercial projects.

Currently, no NSW Government departments have a clear role to broker high-level public/private partnerships for long term development of salinity business opportunities. The Department of State and Regional Development has undertaken some good work in analysing whether salinity businesses are commercially viable and providing small grants to support them. However, the Department's current role is limited to identifying short-term economic opportunities. As discussed earlier, the Committee has recommended that the Natural Resource Management Ministerial Council establishes a body which will facilitate private sector management of salinity, including brokering innovative regional-scale projects in the States/Territories.

♦ *Providing a point of access into government planning and funding*

One of the concerns to the private sector is that government agencies appear to have a point of entry to access NAP funding to carry out commercial projects whilst there is no clear mechanism for the private sector to compete for such opportunities.

The Committee believes strongly that the NSW and Commonwealth governments need to establish a fair and transparent mechanism through which the private sector can offer strategies for managing salinity and bid for projects.

The Committee supports the Department of Land and Water Conservation [DLWC's] suggestion that industry could form a catchment level group to provide input through a representative to the catchment management board. The Committee believes that DLWC should facilitate the establishment of such groups. However, it does not go far enough in establishing a clear mechanism through which the private sector can bid for, or propose, projects.

The business proposal may be at the local level or state-wide and there needs to be an agency which can act as an intermediary between businesses and catchment management boards. The agency would need to assess the scientific and commercial validity of projects and have the vision to see how various business opportunities could be linked into regional-scale projects for public and private sector investment.

As discussed earlier, the Committee has recommended that the Natural Resource Management Ministerial Council establish a body to:

- serve as a clear entry point into salinity management for businesses;
- coordinate scientific and economic assessment of business opportunities for their application to the salinity problem;
- broker innovative regional-scale projects; and
- act as a link between a purpose-designed private investment fund, private sector businesses, accreditors of environmental projects and catchment management boards.

Part D

This segment of the report encompasses the business opportunities for recharge areas. What may be derived from the options that are put forward is that no single business opportunity will prove a universal solution to salinity. It is likely that a mixture of options will yield the most favourable results in reducing ground water recharge. Forestry, Saltbush and perennial pastures demonstrate the highest potential for salinity mitigation in recharge zones of NSW. Combinations of these three opportunities will be suitable for most sites in

the landscape. However, at this stage, most of these options will yield only marginal profits to investors.

The NSW Government has already begun pilot projects under the Environmental Services Scheme in recharge areas to provide incentives for such land use changes. Further education and research into business opportunities with perennial plants will assist landholders to adopt them more broadly across the landscape. Protection of remnant vegetation, legislative reinforcement, improved agricultural management for salinity outcomes and further information dissemination of innovative technologies will improve profitability and increase the range of opportunities for recharge areas.

The protection of remnant vegetation is the first step in reversing degradation in recharge zones. This occurs under the *NSW Native Vegetation and Conservation Act* which protects biodiversity and native ecosystems. However, the Act currently has some adverse impacts on the management of salinity and requires review. Witnesses to the inquiry reported that land holders till land if it has been unused for nine years to avoid it becoming protected under the Act. This is a disincentive to the establishment of perennial plants and no-tillage farming which reduces recharge. Landholders require more certainty of management rights on areas that have remained unused for long periods or have adopted higher proportions of native plants in their current grazing systems.

The second step in reducing recharge lies in improved agricultural practices. Rotational grazing, perennial pastures, Saltbush, no-tillage farming and pasture cropping are preferred options to many land holders as they remain close to their current business and require less capital investment.

- *Rotational grazing*

Rotational grazing is essential for the successful management of perennial pasture plants. Overgrazing through keeping livestock in one field for long periods of time ("set-stocking") will kill the plants. Conversely, at certain times of the year perennial plants must be grazed intensively to prevent the plants becoming rank and overgrown. Rotational grazing can maximise pasture yields and expand the possibilities for perennial plants to be adopted into the grazing system without high capital costs or landscape change.

- *Perennial pastures*

Perennial pastures are a key opportunity that landholders can adopt readily that will bring deep rooting plants into the landscape and hence better recharge management. These plants introduce more "perenniality" into the landscape; tend to be more drought tolerant and provide valuable fodder in extreme conditions. In most instances the use of native species has shown good potential for wide scale adoption. This is one of the most attractive options for landholders as it departs little from their current agribusiness. It is simply a use of differing grasses in conjunction with rotational grazing that can yield a higher carrying capacity for the same amount of land while delivering an environmental benefit.

- *Saltbush*

The use of Saltbush has many positive outcomes for management of salinity. As a perennial native plant that is suitable for grazing and is tolerant of severe drought conditions, it fits well with current agribusiness activities. Saltbush roots extend to depths of up to three metres making it ideal for recharge applications. Although it is commonly regarded as an option for mild to moderately saline lands, due its salt tolerance, it grows most productively in non-saline sites. It demonstrates a high capacity to lower water tables

across the landscape and increase the carrying capacity of low productive areas. Current limitations are the price and quality of seed and difficulties in propagation of the plant. The capital costs of establishing Saltbush are prohibitive to some landholders. Some landholders have reservations about using Saltbush, as they are accustomed to annual farming techniques.

- *No-tillage farming*

No-tillage farming is an agricultural management technique that improves ground water management. By not ploughing after a harvest and leaving stubble in the ground, the organic content of soil is maintained. The organic matter holds moisture, releasing it slowly. Ploughing exposes the soil to wind and sun and the loss of organic matter allows rainfall to drain away quickly adding to recharge of groundwater systems. The moisture retention under no-tillage farming enables farmers to weather droughts better. In the current drought, several farmers have commented that if they had conventionally farmed, they would have no productive crop currently in the ground. A disadvantage is that disease can build up in the stubble.

- *Pasture cropping*

Pasture cropping is another agricultural management technique that retains organic matter and soil moisture, thereby reducing the rate of recharge to groundwater. Pasture cropping is a technique of establishing wheat crops directly into pasture. The wheat is then harvested before the pasture is required for grazing. This increases productivity with very little opportunity cost. This system is not widespread but may be adopted in areas where conditions are favourable. It requires careful management in timing of crops and livestock and is more successful in higher rainfall zones.

- *Forestry*

As discussed above, the use of perennial pasture plants is an ideal way of engaging farmers in managing salinity because it requires the least change and capital expenditure and can be applied broadly across the landscape. These land-use changes by farmers can be built on in the future, where necessary. As a business opportunity, forestry requires greater capital expenditure and change from traditional farming.

Forestry is an attractive option where it builds on existing infrastructure, resources, markets and coincides with salinity hazard zones. Some progress has been made with saline forest opportunities. However, until better measurement of other benefits from trees are included and further markets are developed for forest products it is unlikely forestry projects will move beyond being marginal in low rainfall recharge zones.

The development of markets is crucial to improving the marginality of most investments. Plantation forests, Oil Mallee and energy crops all remain stilted by the lack of a market and the high cost of freight. Markets for environmental services and opportunity for managed investment schemes are more likely to leverage private capital than the establishment of forestry by landholders in a single enterprise. All these opportunities need more certainty before investment on a larger scale will occur. The NSW Government should continue to encourage the Commonwealth Government to meet Kyoto Protocol objectives, particularly trading in carbon credits. Carbon credits would provide a market driver for the establishment of forests (under article 3.3 of the Protocol) and other perennial plants (under 3.4 of the Protocol) which can also be used to reduce salinity.

There is a strong need for a coordinated approach between Commonwealth and NSW Governments in the business approaches that reduce recharge to groundwater. Policies on taxation, bioenergy, carbon sequestration and their legislative frameworks require a joint approach. The Bilateral Agreement, under the NAP, endeavours to close this gap. However, there are many other barriers beyond funding in these areas that are limiting business opportunities that reduce recharge. Legislative change at both levels of government is needed to adopt a broad scale approach to improve recharge opportunities. Investors and landholders have been reluctant to invest in forestry whilst Australia's position on international carbon credits trading is uncertain.

Bioenergy is identified as a major potential market for plantings in low rainfall zones. It differs from most other renewable energy sources in that it has inherent energy storage, allowing electricity to be dispatched from the power plant. Bioenergy, like several other renewable energy sources, is generally more expensive than fossil fuel energy. Market incentives and production subsidies have often been used to initiate the renewable industry overseas. In addition, bioenergy receives indirect financial assistance wherever agricultural and/or forestry production is subsidised, as prevails in Europe and the USA. Development of these markets is yet to occur in NSW. Development of infrastructure and a legislative environment favourable to establishing energy crops is required to progress these opportunities further.

- *Paying landholders for environmental services*

Another possible business opportunity for landholders in recharge zones is being paid for the environmental services provided by perennial plants such as reduction in the rate of recharge, reduced run-off of nutrients, reduced soil erosion and increased biodiversity.

The NSW Environmental Services Scheme (ESS) is in its infancy and is intended to provide data on the environmental outcomes of different types of land use changes in differing landscapes. The scheme is designed to put a value on the environmental public benefit of a land use change and to value environmental services. Reduction in salinity is one environmental outcome being sought. The NSW Government hopes with market development there will be buyers for these services.

The progress of the ESS scheme includes comparison to standard land use changes. Some of the lesser-known opportunities are as yet to be included in the scheme. The options available to land holders will continue to increase as technologies improve and the success of trials by land holders dealing with problems on there own site comes to light. Encouraging information flow and providing mechanisms to support landholders willing to trial new opportunities will best initiate wider adoption and change.

- *Environmental Management Systems*

Establishing Environmental Management Systems [EMS] on farms to progressively improve the environment can be a business opportunity for farmers through obtaining higher prices for accredited produce and through better market access.

Australian State and Commonwealth governments are examining EMS as a possible approach to addressing environmental problems such as salinity at farm level.

In Europe EMS is market-driven and the environmental concerns being addressed relate to food safety, such as the use of pesticides. Many European supermarkets require suppliers to implement an EMS. However, suppliers are not receiving higher prices and have to absorb the costs of establishing such systems. Sainsbury's Supermarkets argue that it

continues to buy produce from British farmers which it could obtain more cheaply elsewhere, because consumers value food safety.

It is less likely that an environmental problem like salinity could be addressed through consumer driven approaches to EMS. Governments may need to play a larger role. It may be possible to link EMS to market based incentives.

- *Salinity credits trading*

Another future business opportunity is salinity credits trading. It is not yet clear whether it would be possible to develop a model that involved landholders. Currently, the only salinity credits schemes operate between States in the Murray Darling Basin and between participating industries under the Hunter River Salinity Trading Scheme. The latter regulates discharge of saline water into the Hunter River by mines and power stations.

Environmental Credits trading has evolved since the United States first started experimenting with rights-based policies for industrial emissions in the 1970's. Offset schemes were formulated to ensure that new facilities or industries do not increase the total level of gas emissions in a specified geographic region.

Australia is a long way from establishing a comprehensive salinity credits scheme. However, forests and other perennial plants used to sequester carbon could also be sited to reduce recharge to groundwater, producing multiple environmental benefits. The opportunity for salinity mitigation lies in the potential monetary value of carbon sequestered by vegetation, which may tip the scales on marginal investments to profitable solutions.

To date the most notable international trading model lies under the Kyoto Protocol. Under Article 3.3 to the Protocol a planted forest which is established after 1 January 1990 on previously cleared land will count as a carbon sink. The carbon dioxide sequestered in such a forest can be used to create carbon credits.

However, Australia's reluctance to ratify the agreement places NSW at a disadvantage in a trading sense, as it will make international investment in carbon offsets for Australia difficult.

Initiatives such as a plantation establishment program between the Tokyo Electric Power Corporation (TEPCO) and State Forests demonstrate the merits of such opportunities. State Forests, under the agreement, is establishing 1000 hectares a year of privately funded forest for a carbon offset.

Also the NSW Government is implementing an enforceable greenhouse benchmarks scheme for electricity retailers. The benchmark has been set as a five per cent reduction in per capita greenhouse gas emissions from 1989/90 levels by 2007. This is encouraging further market development for forestry within the state and places NSW on the forefront of Australia's carbon markets.

With further market development in bioenergy, environmental services and trading schemes, it is hoped to eventually turn marginal investments in salinity mitigation to profitable. While the opportunities in this report are not exhaustive they highlight the future direction and the need to develop structures to encourage further innovation and commercialisation

Part E

One of the key messages to emerge in this inquiry (discussed in Parts B and C) is that in many areas it will not be technically feasible or economically viable to reduce salinisation.

This means that governments will be forced to select some high priority areas where the value of the assets at risk, including environmental assets, are high, the landscape is responsive to change and the costs of recharge options are reasonable.

In other areas the community will need to live with salt. This does not mean writing off these areas. There are a number of uses of salt affected land and water which are potentially profitable. Some of these uses also rehabilitate the land and remove salts from the hydrological system.

In many areas it will be more cost-effective to rehabilitate saline land and water than revegetating large areas of land with perennial plants to reduce salinity. There are two reasons for this. Firstly, land in recharge areas is expensive because it is not affected by salinity and currently most options for revegetation cannot compete economically with traditional farming. There is, therefore, a high 'opportunity cost' in revegetating the land with perennial plants. However, traditional crops or pasture plants will not grow, or will perform poorly, on saline land, so alternative options such as salt tolerant plants may give farmers some economic return where previously there was little to none.

Secondly, rehabilitating saline land and water means targeting only the affected area whereas reducing recharge usually requires extensive revegetation of the catchment with perennial plants.

The *NSW Salinity Strategy* does address options for living with salt but the focus on this area is minimal compared with the focus on reducing recharge. The profile of discharge is certainly lower than in Western Australia. This is partly because NSW still has fewer discharge areas than in Western Australia. Policy in Western Australia recognises productive uses of salt affected land as a key focus. In contrast, there is a heavy focus in the Murray Darling Basin States on protecting water resources. Whilst this should remain a key focus, there is a need to develop a more coherent policy approach to salinised land in private ownership and assistance to country towns. Currently, off-setting the costs of salt interception schemes on the Murray Darling river system is the main driver of options for the productive uses of salinity in the Murray Darling Basin. Whilst this is clearly useful, it will not necessarily produce options which can be applied at farm scale.

Government support is necessary to further develop saline industries and to encourage farmers and other investors to adopt them. Without assistance the risks for investors may be too high to be acceptable. The justification for expenditure of public funding must be public benefit. This can be determined by the extent to which salinity is reduced and the commercial viability of the technology for farmers and other groups.

Part E of this Report examines business opportunities from salt tolerant pastures and forestry, aquaculture, desalination, salt harvesting and solar ponds for energy.

♦ *Salt tolerant pastures*

While none of these options currently has high commercial value because they require further development and support, salt tolerant pastures, saltbush and salt tolerant forestry have the greatest national potential because:

- they can reduce the impact of salinity over a large area;
- have the best commercial potential;

- are mainstream activities which means that there are large and well known markets (ie for meat, wool and wood);
- the infrastructure already exists (eg abattoirs for slaughter, refrigerated transport, wool production facilities, sawmills);
- the cost for farmers of changing to these enterprises is relatively low; and
- there is already a reasonable amount of information on how they are grown and managed.

Of these options, pasture plants and saltbush involve the least change for landholders and the least capital outlay. Mildly saline land has the potential to be very productive because the soil has higher levels of moisture than adjacent areas of non-saline land. Whole farm productivity can be improved by using pastures that are at their most productive in summer when other parts of the farm are too dry for pasture production to be maintained.

The main area of NSW that is both the source of salt and is affected by salinity is currently under non-saline pastures. This is the 550-750mm rainfall zone on the Western slopes of the Divide and the nearby cropping belt. Many discharge areas in NSW are also located close to streams and waterways so the use of salt tolerant pasture plants may have public benefits in reducing off-site impacts of water movement from saline lands.

Salinity is one of a number of environmental problems caused by poorly managed pastures and by no means the most economically costly problem for farmers. Other environmental problems are soil acidity, soil erosion and weeds. Salt tolerant pasture plants will provide permanent groundcover which can assist in preventing soil containing salts and nutrients entering waterways.

This is a key area deserving of government support and Part E contains a number of recommendations to assist in its implementation.

♦ *Salt tolerant forestry*

The development of salt tolerant trees provides the opportunity to extend forestry to low rainfall areas. Australia is not self sufficient in timber. Australia's trade deficit in forest products is $2 billion per year. The *Plantations for Australia 2020 Vision* of the *National Forests Policy* aims to triple the area of Australia's plantations to three million hectares. With normal trees there is usually only an economic return in higher rainfall areas (over 800mm). However, land in these areas is expensive and also becoming scarce with companies forced to pay increasingly high rental, lease or purchase fees. The benefit of salt tolerant trees is that they will grow productively in lower rainfall areas on saline land where the opportunity cost of land is much lower.

However, the establishment of forestry in these areas would require the development of new infrastructure such as sawmills. There would also need to be a business plan to develop new hardwood products and promote awareness of Eucalypts as a higher value timber product. None of the salt tolerant hybrids has yet matured and so the final quality of the timber is still uncertain.

Plantation forestry is not a particularly attractive option for landholders to enter into by themselves due to the high establishment costs and uncertainty of potential earnings. A more attractive option for landholders is to lease their land to a private forestry company. Investment in forestry may be attractive to patient capital such as superannuation funds because schemes which mature after many years have lower capital gains tax implications.

Forestry investments are usually a collaboration between investment organisations, companies that manage the forest and landholders. The land is leased from landholders. The benefit to landholders is the receipt of a long-term stable revenue with minimal or no management overheads. Landholders may also be entitled to a proportion of revenue from the plantation, depending on the particular arrangement.

- *Aquaculture*

Of the options for the use of saline water, aquaculture currently has the greatest commercial potential because there is a large established market for fish (it is a mainstream activity). The lack of suitable coastal sites for fish farming means that inland saline water is a valuable resource. Aquaculture does not remove salt from the water. Its chief public benefit is that it can off-set the costs of salt interception schemes. For this reason government support may be warranted for a full commercial trial of aquaculture using saline water.

- *Desalination*

The Commonwealth Department of Agriculture, Fisheries and Forestry have recently released *Economic and Technical Assessment of Desalination Technologies in Australia: With Particular Reference to National Action Plan Priority Regions (September 2002)*. The report concludes that currently desalination would probably only be economical in some remote rural areas where the costs of fresh water are particularly high. Some research is warranted to identify such areas. Desalination of groundwater may become an option in the future as the cost of the technology is decreasing and the cost of producing fresh water is increasing.

Geoprocessors Pty Ltd have developed a unique technology which desalinates water and produces marketable salts. This technology has been trialed in Wagga Wagga and Dubbo to remove salt from groundwater pumped from beneath the town. Pumping is protecting highly valuable assets but discharge of the saline water into waterways cannot continue indefinitely. The two Councils are therefore currently deciding whether to go ahead with a full commercial arrangement with Geoprocessors Pty Ltd. The technology could be applied to other country towns.

One of the barriers is the complexity of dealing with many different NSW Government departments with different interests and regulations over the use of water. A related issue is who owns the saline groundwater, and if treated, who owns the freshwater. NSW Government assistance is required to streamline approvals for desalinating the water and making productive use of the salts.

There need to be assessments of the costs of controlling or remediating salinity in country towns. The costs of a 'do nothing' scenario are essential as a baseline against which to measure the benefits of any proposals brought by the private sector to remediate salinity. Wagga Wagga is unusual in having this data available.

- *Salt Harvesting*

Salt harvesting has beneficial environmental outcomes in removing salt from the hydrological system and prolonging the life-span of evaporation basins used in salt interception schemes. Currently, the commercial viability of salt harvesting from saline groundwater is limited because most of the salts produced have a low value and the costs of transportation would eliminate any profit.

Salt harvesting becomes more economically viable when the salts are processed into value-added products. The mineral sands deposits in the Murray Darling Basin can be mined to extract minerals. This process does not require salts. However, these minerals can be further processed into a range of other products. This further processing uses chemicals which can be derived from saline groundwater. There is an opportunity to link the use of saline water from drainage and salt interception schemes with the processing of minerals into valuable products such as light metals.

This would depend on whether the companies involved choose to process the products within the Murray Darling Basin. These industries are potentially highly valuable but their establishment would involve significant government support, particularly in the establishment of supporting infrastructure such as road, rail, water and electricity. However, at this stage it is not clear how much salt this would remove from the hydrological system. Initially, NSW Government support may be required to support an evaluation of the quantity of salts that would be removed from the hydrological system through the production of chemicals to supply the mineral sands mining industry and other markets.

If significant public benefits are likely to accrue through the reduction of salt loads in rivers and prolonging the life span of evaporation basins, then the NSW Government should become a partner in the operations in the Murray Basin. This should occur through supporting companies establishing a salt industry to supply chemicals for processing minerals. Support is required to assist companies to meet market specifications at commercially competitive prices.

Further research is needed to determine the commercial viability of mineral extraction from saline groundwater and supply chain feasibility. There is a role for government in streamlining the approval process for salt harvesting and mineral extraction.

- *Energy*

A solar pond is a body of shallow saline water several metres deep that collects and stores heat from the sun. The technology is proven with at least 60 (mainly experimental) systems having been constructed around the world, mostly to provide process heat to industry. In Australia, RMIT University, Geo-Eng Australia Pty Ltd and Pyramid Salt Pty Ltd were awarded a $550,000 grant under Round 2 of the Australian Greenhouse Office's Renewable Energy Commercialisation Program. The project is to demonstrate and commercialise a system using a solar pond to generate heat for a range of industrial purposes.

The second stage of the project by RMIT and its partners is to generate electricity using the heat stored in the solar pond.

Further work is required to commercialise solar pond technology and expand the pool of expertise in Australia. Funding from the Federal Government's Renewable Energy Commercialisation Program has made the two year commercial trial at Pyramid Hill possible. Further Federal Government funding and support is vital for the commercialisation of the technology. Research is also needed to identify appropriate sites where a solar pond would be technically feasible and there would be both environmental and economic benefits.

- *Salt Interception Schemes [SIS]*

Salt interception schemes are large-scale groundwater pumping and drainage projects that intercept saline water flows in the rivers of the Murray Darling Basin and dispose of them usually by evaporation in large ponds.

These engineering works are paid for jointly by the Commonwealth and States Governments under the Murray Darling Basin Ministerial Council arrangements. The Basin Salinity Management Strategy (2001- 2015), recognises that to maintain the salinity target at Morgan in South Australia to 2015 a further reduction of 100 EC will have to be found by new engineering works. A new joint program of salt interception schemes totalling $60M capital works over seven years has been agreed by the Commonwealth and Basin States.

Ten schemes are being considered, of these two are in New South Wales. These are the Sunraysia Regional SIS Optimisation and Integration and the Billabong Creek SIS.

The Committee believes that salt interception schemes are an essential part of addressing salinity which allows the community to buy time whilst longer-term land management changes are made. In some cases, it may be more cost-effective to establish salt interception schemes than introduce major land-use changes, particularly where the groundwater system is not responsive as discussed in chapter 3. The Committee recommends that the NSW Government should continue to support construction of new salt interception schemes.

SUMMARY OF RECOMMENDATIONS

1. That a percentage of the budgets of the National Action Plan for Salinity and Water Quality and Natural Heritage Trust be allocated to research and commercialisation of technologies for the improved management of salinity recharge and discharge areas. This should include investment in supporting infrastructure and help with finance arrangements for new industries. (p.11)

2. That the Natural Resource Management Ministerial Council establish a body (in accordance with recommendations 3, 4 and 16) to allocate funding for research and commercialisation of technologies for the improved management of salinity recharge and discharge areas. (p.11)

3. That a Commonwealth/States/Territories working party be established to:

    - develop an appropriate model for the body referred to in recommendation 2.
    - develop prescribed criteria for the assessment of proposals; and
    - determine the percentage of funding under the National Action Plan for Salinity and Water Quality and Natural Heritage Trust that should be set-aside for this purpose. (p.11)

4. That the body referred to in recommendation 2 be supported by an advisory council to assess proposals and advise on their priority. That the advisory council comprises a wide spectrum of prescribed industry groups and research organisations. (p.11)

5. That the working party referred to in recommendation 2 consider the following criteria for the assessment of proposals:

    - efficacy for reducing salinity;
    - current commercial potential;
    - whether the market for the product or service is mainstream or niche;
    - whether the product or service can be applied broadly across the landscape;
    - where there is a high benefit-cost for actions taken in a particular location;
    - the extent of change and capital costs for landholders (where the technology is intended for use by landholders); and
    - status of knowledge on production and markets. (p.12)

6. That cost-benefit analyses of Catchment Management Blueprints are undertaken so as to determine whether those plans and their associated investments are adequately justified on technical and economic grounds. The Committee considers such studies would allow funding to be more efficiently targeted and would highlight the areas in which further technical or economic input is required. (p.17)

7. That the Commonwealth Government monitor arrangements for funding of Commonwealth Government scientific organisations to ensure that there is adequate cross-disciplinary contribution to understanding and addressing salinity. Funding arrangements which have the effect of narrowing the range of contributions to resolving the problem are not in the national interest. (p.22)

8. That a working party of Commonwealth State and Territory representatives be set up to build on the current National Market-Based Instruments Pilots Program by identifying the current disincentives that exist for ecologically sustainable land and water use. (p.24)

9. That a working party of Commonwealth State and Territory representatives examine ways to ensure that the National Action Plan on Salinity and Water Quality is underpinned by an enhanced mapping program and greater use of on-ground investigations. (p.31)

10. That the private sector be provided with the opportunity to tender to provide salinity mapping and other on-ground investigations under the National Action Plan for Salinity and Water Quality and Natural Heritage Trust. (p.31)

11. That the Minister for Land and Water Conservation re-examine the need to introduce legislative changes to the *Catchment Management Act* so as to ensure the adequacy of the Act to support implementation of the National Action Plan for Salinity and Water Quality. (p.32)

12. That the Minister for Land and Water Conservation ensures membership of each of the Catchment Management Boards include adequate representation from the industry sector. (p.32)

13. The Committee recommends to the Commonwealth/State Steering Committee set up under the bi-lateral agreement with NSW that the monitoring arrangements for the NAP be strictly adhered to. (p.33)

14. That the Premier advocates that the Commonwealth Government legislates the establishment of a new class of financial intermediaries that channel funds between investors and natural resource managers. That the fund be tax-favoured in order to be able to produce dividends comparable with alternative investments. (p.45)

15. That the Commonwealth Government legislates to establish a system of accreditation to establish the environmental bona fides of commercial projects into which the funds are channelled. (p.46)

16. That the body referred to in recommendation 2 have the following functions:

    - serve as a clear entry point for businesses;
    - allocate funding for research and commercialisation of technologies for the improved management of salinity recharge and discharge areas;
    - broker innovative regional-scale projects in the States/Territories; and
    - act as a link between a purpose-designed private investment fund (recommendation 13), private sector businesses, accreditors of environmental projects (recommendation 14) and catchment management boards. (pp.50 - 51)

17. That the NSW Government make article 3.4 plants under the Kyoto Protocol, such as Saltbush, eligible for greenhouse benchmarks for NSW electricity retailers by amending the NSW *Natural Resources Legislation Amendment (Rural Environmental Services) Act 1999* in Schedule 2 Clause (6A). (p.58)

18. That the NSW Government provide funding to support measurement of the amount of carbon sequestered by plants under article of 3.4 of the Kyoto Protocol. (p.58)

19. That if Saltbush under the current ESS pilot delivers significant environmental outcomes, then its use by farmers be encouraged through extension services in DLWC and NSW Agriculture in low rainfall zones of high salinity risk. (p.58)

20. That the NSW Government provides assistance to farmer networks to promote successful salinity mitigation strategies through practical demonstration and education. (p.58)

21. The Committee recommends review of the *Native Vegetation and Conservation Act* to avoid adverse outcomes for the management of salinity. (p.59)

22. That future pilot projects to measure environmental services include the use of no-tillage farming and pasture cropping to reduce recharge to groundwater. (p.60)

23. That in regard to salinity tree planting proposals that all costs associated with land procurement by Government agencies be considered including ongoing management, maintenance and fire protection under all types of arrangements. (p.64)

24. That the NSW Government establish specific bioenergy development positions in relevant NSW government agencies. (p.69)

25. That the NSW Government work with the Commonwealth Government to review the *Renewable Energy Regulation* to include trees in the definition of renewable energy crops and to amend the high value test on plantations. (p.69)

26. That the NSW Government take the initiative to set up a large-scale bioenergy demonstration project with stakeholders, in an appropriate area of NSW, such as the Murray Darling Basin, to develop and encourage bioenergy as a salinity mitigation measure. (p.69)

27. That the NSW Government take account of comments by the Policy Commission on the Future of Food and Farming about environmental services schemes in the UK and avoids the use of highly tailored schemes which have high administrative costs. (p.77)

28. That the NSW Government continue to encourage the Commonwealth Government to meet Kyoto Protocol objectives, particularly trading in carbon credits, as this provides a market driver for the establishment of forests (under article 3.3) and other perennial plants (under article 3.4) which can also be used to reduce salinity. (p.83)

29. That the NSW Government provides funding to the Cooperative Research Centre for Plant Based Management of Dryland Salinity to develop new salt tolerant pasture plants suitable for the diverse landscapes of NSW. (p.104)

30. That NSW Agriculture advocates that the Cooperative Research Centre on Plant Based Management of Dryland Salinity undertakes research on sheep production from Saltbush pastures aimed at filling current gaps in knowledge which are limiting its adoption by landholders. The Committee recommends that funding is provided from the salinity budget for this purpose. (p.105)

31. That NSW Agriculture advocates that the Cooperative Research Centre on Plant Based Management of Dryland Salinity undertakes research on Distichlis aimed at addressing gaps in knowledge which are limiting its adoption by land holders. That funding is provided from the salinity budget for this purpose. (p.105)

32. That NSW Agriculture reviews the contents of the Prograze Program to incorporate information on managing saltland pastures from the results of the Sustainable Grazing of Saline Lands Program and other research into saltland pastures. (p.107)

33. That education programs for farmers form part of any incentives offered by the NSW Government in future for establishment of saltland pasture systems. (p.107)

34. That if the Sustainable Grazing of Saline Land Program finds that there are significant off-farm environmental benefits from growing saltland pastures, that landholders be eligible for the Environmental Services Scheme to assist with the capital establishment costs of saltland pastures. (p.109)

35. That future pilot projects to measure environmental services include the use of salt tolerant trees to reduce the volume of saline agricultural drainage water. (p.115)

36. That the NSW Government, through its representation on the Murray Darling Basin Ministerial Council, advocate that the Murray Darling Basin Commission provide a funding contribution towards the expansion of the Inland Saline Aquaculture Research Centre in NSW. This facility needs to be expanded into a commercial scale demonstration site with a view to developing integrated salt interception schemes and inland saline aquaculture technology parks. (p.122)

37. That the EPA, DLWC, Department of Mineral Resources, Department of State and Regional Development and Local Government and Shires Association work together to streamline the process of approving desalination of groundwater in country towns and the productive uses of brine. (p.127)

38. That the NSW Government supports local councils to undertake an assessment of the costs of controlling or remediating salinity in country towns as a baseline against which to measure the benefits of any proposals brought by the private sector to remediate salinity. (p.128)

39. That the NSW Government works with local councils to identify how schemes which safely dispose of saline groundwater should be paid for, and to establish tendering processes as a point of entry for private entrepreneurs who can contribute to the management of salinity in council areas. (p.128)

40. That the NSW Government supports an evaluation of the quantity of salts that would be removed from the hydrological system through the production of chemicals to supply the mineral industry and other markets. If significant public benefits are likely to accrue through the reduction of salt loads in rivers and prolonging the life span of evaporation basins, then the NSW Government should become a partner in the operations in the Murray Basin. This should occur through supporting companies establishing a salt industry to supply chemicals for processing minerals. Support is required to assist companies to meet market specifications at commercially competitive prices. (p.139)

41. That the NSW Government continues to support the development of salt interception schemes. (p.145)

PART A

WHAT IS SALINITY?

1 WHAT IS SALINITY?

Naturally occurring salinity is part of the Australian landscape. Wind and rain weather rocks that contain salt, and carry salt from the ocean, depositing it on the landscape. Ideally, salt is slowly leached downwards and stored below the root zone, where it is safely stored, or out of the system. However, nature does not always take its course.

Human intervention in the Australian landscape, mainly in the form of land clearing and inappropriate land use (particularly the replacement of deep-rooted perennial plants and trees with large areas of shallow-rooted plants) have resulted in the watertable rising. When the watertable rises, salts stored in the landscape are mobilised.

Salinity is having a devastating impact on not only the nation's land and water resources but increasingly, its infrastructure.

There are three main types of salinity:

- dryland salinity;
- irrigation salinity; and
- urban salinity.

In 1998, the Prime Minister's Science, Engineering and Innovation Council estimated that costs of dryland salinity included $700M in lost land and $130M (annually) in lost production.[1]

1.1 DRYLAND SALINITY

Dryland salinity occurs when the watertable rises to within two metres of the surface. This is largely the result of human intervention in the natural landscape following European settlement, principally the wholesale clearing of land and the planting of shallow-rooted annual crops and pastures at the expense of perennial native vegetation. Crops and pastures use less of the rainfall that soaks into the ground, consequently increasing recharge to shallow aquifers. As a result, more water reaches the groundwater system and the watertable rises. From there, capillary action in the soil, transpiration by plants and evaporation at the surface draw up the saline water and concentrate the salt.

Once surface salt concentration reaches a certain threshold, some plant species will suffer and be replaced by salt-tolerant species. If left unchecked, surface salt concentration can reach levels that no plant species can survive, leaving the ground bare of vegetation, resulting in a 'salt scald'. Salt scalds act as the focal point for erosion to develop and spread, and for washing salt loads into rivers through run-off.

Unlike the impact of dryland salinity, that has a long lead-time, irrigation salinity problems (see below) manifested soon after the first irrigation systems were established. In turn, there is a more thorough understanding of the extent, causes and management options for irrigation salinity, that have been an integral part of the Murray Darling Basin Commission's [MDBC] activities for more than 20 years. National attention is now turning to dryland

[1] Walker et al., 1999, 127: EPA, State of the Environment Report.

salinity. The Natural Heritage Trust [NHT] reports that "*approximately 5.7 million hectares of Australia's agricultural and pastoral zone have a high potential for developing dryland salinity through shallow watertables*".[2]

Dryland salinity can be subdivided into three categories based on the distance between recharge and discharge areas. Local salinity may have a separation of only a few metres from the crest of the slope to the drainage depression or up to three kilometres. In intermediate cases, the separation is larger, typically five to ten kilometres, and may cover more than one sub-catchment. Regional salinity is associated with large distances, perhaps up to hundreds of kilometres with long, deep circulation depths independent of the local surface topography.

The extent of separation of recharge and discharge areas is therefore a major factor in who is affected by the salinity problem and has implications for the methods used to tackle it. In this report both recharge and discharge opportunities will be discussed but the content is focussed on dryland salinity.

1.2 IRRIGATION SALINITY

The significant difference between dryland and irrigation salinity is that application of irrigation water to land can exaggerate the leakage of surplus water past the root zone to groundwater (recharge) thereby increasing the rate at which the watertable rises. In addition, salts dissolved in irrigation water enter the land where insufficient leaching occurs to remove excess salts.

Major causes include over-irrigation of farm land, inefficient water use, poor drainage, irrigating on unsuitable or "leaky" soils, allowing water to pond for long periods and allowing seepage from irrigation channels, drains and storages. Irrigation water that is not used by crops and vegetation builds up in the soil sub-surface, causing the watertable to rise. As the watertable reaches the land surface, the soil becomes waterlogged.

Soil saturation is compounded by periods of heavy rainfall, poor drainage and poor irrigation practices. Waterlogged plant roots have limited access to oxygen and as a result, crop and pasture growth falls and plants eventually die or are replaced with more tolerant species.

Salinity problems in irrigation areas can be made worse by irrigators having to use water containing increased salt concentrations, drawn from rivers flowing from affected dryland areas. Saline water can damage irrigation infrastructure and it constrains the types of crops able to be grown.[3]

1.3 URBAN SALINITY

Urban salinity in towns and urban areas results from a combination of dryland salinity processes and over-watering of urban areas. Towns are often located in areas prone to salinity (such as plains, in valleys, or at the foot of a ridge), but the problem is exacerbated by urban activities adding seepage to the groundwater.

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2 Australian Dryland Salinity Assessment 2000

3 http://www.dlwc.nsw.gov.au

A high watertable can cause structural damage to homes and commercial premises. It can destroy infrastructure such as roads, underground telephone, water; electricity and sewage supply systems as well as vegetation in parks and gardens.

Removal of vegetation for urban development has increased the amount of water entering groundwater systems. Over-watering of gardens and sports grounds, disruption of natural drainage lines, leakage from water, sewage and drainage pipes, and septic tanks – all increase the amount of water entering the sub-surface zone.[4]

In NSW, the problem is of concern in Western Sydney, Wagga Wagga and in many other towns in Central Western and southern NSW. Including (in alphabetic order) Blayney, Boorowa, Canowindra, Condobolin, Cootamundra, Cowra, Crookwell, Dubbo, Forbes, Grenfell, Gunnedah, Harden-Murrumburrah, Junee, Lake Cargelligo, Leeton, Orange, Parkes, Queanbeyan, Tamworth, Wellington, Yass and Young among others.

1.4 CAUSES OF SECONDARY SALINITY

As explained above, salinity is a naturally occurring phenomenon in many areas of Australia. This might also be termed primary salinity. Elsewhere in the country, increasing salinity is often the result of particular land use practices, such as over-clearing, urban development, river regulation, irrigation or cultivation of crops and pastures. This is also known as secondary salinity.

The increase in salinity is partly explained by our predecessors' quite understandable lack of knowledge of Australia's natural resources. Early in the history of Australia's European settlement, the goal of government was to create wealth through development of Australia's apparently abundant natural resources. It is not difficult to imagine how ripe for the picking the Australian landscape must have seemed to European eyes. The sheer amount of land led the early settlers to value it cheaply, and thereby manage it as if the supply were inexhaustible.

Governments of the day provided incentives to clear trees, through conditions on leases and tax concessions. From the 1860s to 1960, leases and conditional purchases were issued in NSW on proviso that a certain percentage of tree cover was to be removed each year. Failure to meet the condition could mean forfeiture of the lease or purchase. It was not until 1980 that any remaining clearing conditions were removed from leases.

The typically long lead times between the practices that cause salinity and the manifestation of the problem and, conversely, remedial action and a palpable solution work against the incentive for farmers to radically alter their farming practices.

Subsidised water supplies were provided to encourage the growth of irrigation industries, that have had considerable benefits to the economy. If water users are not required to factor in the true cost of water, there is little incentive to use water efficiently.[5] What is more, in many cases the people causing the problem do not have to suffer its consequences; people living in discharge or downstream areas pay for the ill-conceived actions of their counterparts in recharge or upstream parts. In economic parlance, this is an externality.

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4 Ibid.

5 NSW Government, 2000, NSW Salinity Strategy

Since there appears to be nothing personal to be gained from changing their land management practices, the people causing the problem have little incentive to do so. At the same time, those who suffer may not be able to do anything to correct their situation; they depend on those upstream to act unselfishly.

Participants at the NSW Salinity Summit saw this situation as an example of market failure (a failure of the market to allocate resources to achieve the greatest possible good). They advised the Government to develop a special-purpose investment vehicle to attract private sector and other funds for salinity remediation purposes in both rural and urban areas.[6]
Areas at risk in NSW

The Natural Heritage Trust has produced some stark figures to highlight the extent of the salinity problem in Australia. By 2050:

- Some 17M hectares of Australia's agricultural and pastoral zone will have a high potential for developing dryland salinity through a shallow watertable, triple the current figure.

- Nationally, some 52,000km of major roads and 3,600km of railways will exist in regions mapped to have areas of high risk, up from 20,000km and 1,600km respectively.

- 20,000km of streams could be significantly salt affected.

- The 630,000 hectares of remnant native vegetation and associated ecosystems that currently lie within high risk areas are projected to increase by up to two million hectares

- Dryland salinity could cause damage to infrastructure and other community assets in more than 200 towns.[7]

Turning to NSW specifically, the figures are no less alarming:

- Large areas of the Western Slopes, the Hunter Valley and the Sydney Basin already have saline groundwater within two metres of the surface.

- Of the 152,000 hectares of land at risk from shallow groundwater within the Murray-Darling Basin, 93per cent is agricultural land

- Some research indicates that approximately 70-80per cent of all irrigated land in NSW is threatened by rising watertables.

- Watertables are rising at the greatest rate (100-500mm per year) in the southeastern parts of the Murray-Darling Basin.

By 2050:

- If prevailing patterns of land use and groundwater rise continue, NSW could have an area of up to 1.3M hectares at risk, a massive increase on the current (though probable conservative) estimate of 180,000 hectares.

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6 NSW Government op cit, 2000

7 Natural Heritage Trust, op cit, 2000

- Within the Murray-Darling Basin, areas affected by shallow watertables will increase by a factor of eight

- The area of agricultural land within the Murray-Darling Basin that is affected by shallow watertables will increase from the current 142,000 hectares to almost 1.2M hectares.

- Forecast scenarios indicate that areas of conservation and remnant vegetation affected by shallow watertables will increase by a factor of 12.

- Areas of forest affected by shallow watertables could potentially increase by a factor of 70.

- In-stream salt-loads are forecast to increase by at least a factor of two in most Murray-Darling Basin catchments, and in some catchments river EC levels will exceed international drinking water guidelines.

- An estimated 3,600 hectares of built-up areas within the Murray-Darling Basin will be affected by shallow watertables, an increase of about 400per cent on current levels.

According to the NHT, 180,000 hectares of land have shallow watertables or are affected by dryland salinity in NSW. More than 90 per cent occurs in the Murray, Murrumbidgee, Lachlan, Macquarie and Hunter river catchments. The Hunter and Hawkesbury-Nepean river catchments have the most extensive areas of existing dryland salinity or shallow groundwater of NSW coastal catchments.

Within the Murray-Darling Basin, the area predicted to be at risk would increase from approximately 152,000 hectares to 1.3M hectares by 2050.

Best estimates of rates of groundwater rise indicate that by 2050 rising watertables will occur in large areas of the Murrumbidgee and Murray catchments. By 2050, large areas of the Lachlan, Castlereagh and Macintyre catchments will also be affected.

If left unchecked, salt loads are predicted to increase for many catchments, the most significant increase being in the Lachlan, Murrumbidgee and Namoi rivers. Salinity in the Bogan, Macquarie and Namoi catchments are predicted to reach levels above the World Health Organisation's recommended limit for potable drinking water (800 μ/cm).

PART B

THE ADEQUACY OF THE COMMONWEALTH'S RESPONSE AND CONTRIBUTION TO ADDRESSING SALINITY

2 THE ADEQUACY OF THE COMMONWEALTH'S RESPONSE AND CONTRIBUTION TO SALINITY

2.1 BACKGROUND

On 3 November 2000 a NAP was endorsed by the Prime Minister, Premiers and Chief Ministers at the Council of Australian Governments. The purpose of the NAP is to identify high priority, immediate actions to address salinity, particularly dryland salinity, and deteriorating water quality in key catchments and regions across Australia.

The NAP was preceded by the release of a discussion paper[8] in December 1999 that had been prepared in recognition of the need to develop a national strategic policy framework for the long term management of natural resources in rural Australia. The responses to this were drawn together in a Steering Committee Report to Australian Governments. That report concluded that the key policy directions proposed in the discussion paper were appropriate and warranted consideration by governments in the future development of policy approaches to natural resource management issues.

While noting the strong public support that had been given to the directions of policy proposed in the discussion paper the Steering Committee said many submissions had expressed the view that the scope of the discussion paper was too narrow and that a national policy on resource management needed to encompass all sectors of the economy, not primarily the rural sector or agricultural production in particular.

The NAP is seen as building on this earlier work and taking guidance from it. The NAP is legally supported by the Inter-governmental Agreement on a National Action Plan for Salinity and Water Quality. The Preamble to the Inter-governmental Agreement states the NAP has the following key elements:

- targets and standards for natural resource management, particularly for salinity and water quality;
- integrated catchment/regional management plans developed by the community and accredited jointly by the parties, in the 20 agreed catchments/regions that are highly affected by salinity, particularly dryland salinity, and deteriorating water quality;
- capacity building for communities and landholders to assist them to develop and implement catchment/regional plans, together with the provision of technical and scientific support and engineering innovations;
- an improved governance framework to secure the Commonwealth-State/Territory investments and community action in the long term, including property rights, pricing and regulatory reforms for water and land use, clearly articulated roles for the Commonwealth, State/Territory, local government and the community to provide an effective, integrated and coherent framework to deliver and monitor implementation of the NAP; and
- a public communication plan to support widespread understanding of all aspects of the NAP so as to promote behavioural change and community support.

[8] Managing Natural Resources in Rural Australia for a Sustainable Future, 1999

On 17 May 2002, a bilateral Agreement was entered into between the Commonwealth and New South Wales governments. One of its purposes is to provide for the establishment of a Commonwealth/New South Wales Steering Committee to facilitate the delivery of the NAP in New South Wales. The priority tasks of the Steering Committee will be to make recommendations in relation to foundation funding and funding for priority actions, the adoption of an investment strategy for capacity building activities, the accreditation of catchment blueprints and development of partnership agreements with Catchment Management Boards [CMBs].

Clause 37 of the Intergovernmental Agreement states that the Commonwealth's financial contribution of $700M over seven years for the implementation of this Agreement is to be matched by new State/Territory financial contributions. These arrangements are further particularised in cl.5 of the Agreement between New South Wales and the Commonwealth which states that each of these parties will allocate $198M over the life of this agreement for implementation of the NAP.

The NAP provides a commendable national focus on salinity and water quality issues. It provides an assurance of substantial funding that can be directed towards high priority immediate actions to address salinity and deteriorating water quality. Although it is too early to gauge the operational effectiveness of the NAP the committee's examination shows a number of areas where the action plan may be strengthened.

2.2 LACK OF ADEQUATE SCIENTIFIC AND TECHNICAL KNOWLEDGE TO SUPPORT NAP PROJECTS

David Pannell (Associate Professor, Agricultural and Resource Economics, University of Western Australia) in a Working Paper,[9] states that the NAP package appears to be constrained in ways which will make it very difficult for it to be more effective against the salinity problem than previous government initiatives, such as the National Landcare Program and the National Heritage Trust. In each of these programs, he says, we have spent large amounts of money for little impact relative to the scale needed to address the salinity problem. Associate Professor Pannell argues that there are a number of fundamental problems in the hidden assumptions behind the government's various policy approaches and that the design of the latest policy package does not adequately account for the science, the economics and the social dimensions of salinity.

He says the first assumption is that we have available a range of viable treatments for salinity prevention that farmers can adopt and generate benefits in the long term that are sufficient to outweigh their costs in the short term. He says this is incorrect.

> *For farmers at least, the benefits from salinity prevention are usually not enough to outweigh the large up-front costs that farmers have to bear to establish large areas of perennials, not to mention the ongoing income sacrifice from the land on which they have been established.*[10]

Another commentator[11] makes the supporting comment that one of the ironies of the NAP is that it articulates no plan for the use of saltland, focussing instead nearly exclusively on

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9 SEA Working Paper 00/08

10 Ibid. at p.1

11 E.G.Barrett-Lennard, Saline agricultural systems? Western Australia must have a policy

issues concerned with salinity abatement. In common with Associate Professor Pannell he argues that the NAP must have a plan that engages farmers with salt affected land and researchers and develops profitable and sustainable industries for this resource.

Mr. John Verhoeven, Group General Manager, Landscape Investments DLWC was asked in his evidence to the Committee to respond to the concerns expressed by Associate Professor Pannell. He said:

> ***Mr VERHOEVEN:*** *If I could respond, the National Action Plan contains at least two elements which I believe address the issues raised by Professor Pannell. The first is capacity building and that is one of the core requirements of the National Action Plan, as it is in our catchment blueprint, for example. So in that respect the blueprints match up very well with the NAP. With the provision of sound and strong capacity building, this helps increase the skills of farmers, other natural resource managers, the community and Government agencies, as well as local government, and this helps all of those groups make better and more knowledgeable decisions about priorities and to help them even down at the farm scale negotiating trade-offs between different management actions they want carried out, right down to the paddock scale. It helps them assess information about conditions in their local areas and again helps them make decisions about the allocation of funds for specific actions. It helps determine the most appropriate existing service providers for implementation, so it will help farmers identify where they can go to if they are needing assistance to look at changing their particular management actions on-ground, and it helps all to be accountable for outcomes.*
>
> *The capacity building in its broadest central definition includes research and development, education and training, market based instruments, communication, monitoring, evaluation and salinity mapping. So I would agree with Professor Pannell that if there were no support and we were just asking farmers to change their practices overnight it would be a very hard ask. As I have indicated, certainly within the NAP and within our blueprints, one important catalyst to try to make this change is this importance placed on capacity building.*
>
> *The second area that we have already heard a little about is the use of the market based instruments such as those that have already been trialled in the salinity strategy pilot projects and those that are being looked at now in the Environmental Services Scheme. So I think those two examples show that there are measures that Governments can put in place to help farmers make the transition.*
>
> *A third area includes New South Wales programs such as the salinity reafforestation program which was unveiled recently by the Premier, and business opportunities being developed through the Department of State and Regional Development. These also aim to help address the issue.*[12]

Mr Verhoeven's response shows that the NAP contains several important means of guiding and supporting management actions. These mechanisms will take time to develop and at this stage are not available to inform the contents of the catchment management blueprints which in important respects may be evolving without rigorous technical support or cost benefit evaluation.

Dr Ken Archer, Program Manager, Pastures and Rangelands, NSW Agriculture said that NSW Agriculture is concerned that the on ground implementation of initiatives under the NAP is proceeding without adequate scientific and technical knowledge:

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12 Mr J Verhoeven, Transcript of Evidence – Public Hearing 27 September 2002 at p.26

A great deal is already known about the processes and potential solutions for salinity. However, the issues identified in the various strategies indicate that much more must be done to refine and extend our knowledge to provide a greater range of options and to more fully understand the economic, environmental and social implications of implementing control programs.

We cannot wait until all issues are answered, so we must proceed to implement change based on existing knowledge and available technology. As this is a long term issue, it is essential that the R&D be accelerated to provide an expanded range of technologies, skills and knowledge, for ongoing and future initiatives, in parallel with on-ground works based on current knowledge.

Some examples of implementing actions based on incomplete knowledge or lack of suitable techniques include:

- *understanding the hydrology of individual landscapes sufficiently to accurately determine where to plant pastures, trees or undertake other remedial activities, particularly to reduce deep drainage;*
- *lack of an adequate range of adapted pasture, tree and shrub species for use in both recharge and discharge areas for many environments, or to develop new market-based solutions and industries.*
- *lack of analysis of the economic and social implications of changes to farming and other practices required to address salinity.* [13]

As Associate Professor Pannell has stated some priorities are better addressed at State and National levels rather than catchment level. This is the case with research which is needed to underpin investment decisions and possible approaches to dealing with salinity. Dr Ken Archer of NSW Agriculture says that:

My current understanding is that funding for most activities will be delivered through the CMBs based on their individual needs and priority activities. Most emphasis is on delivering programs to implement on-ground changes in landscape practice to achieve outcomes related to salinity levels in rivers and so forth. NHT will also be available to address wider issues such as weed control, including weeds of environmental importance.

I also understand that there is no enthusiasm to specifically allocate funding for research, and in fact, research has not been given any specific allocation of funds in either statewide or catchment investment plans.

Under the Salinity Strategy, a comprehensive multi-agency Strategic Framework for Salinity Research and Development in NSW… has been developed and published by the Salinity Research and Development Coordinating Committee (SRDCC). However, many of the proposed activities are dependent upon gaining additional resources, hence the need for a specific allocation of funds to research, the expenditure of which could be oversighted by the SRDCC.

The Salinity CRC (of which NSW Agriculture is a partner) will receive about $22m over 7 years, but this is a large national program, and these funds are only sufficient for some of the core R&D programs. Again, further external funding is required to more fully address all of the issues identified in the CRC program.

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13 Dr Archer, NSW Agriculture, Answers to Questions Taken on Notice, September 2002

Other sources of funds include those provided by the Rural Industry R&D funding bodies, such as Meat and Livestock Australia (MLA), Australian Wool Innovations (AWI), Land and Water Australia (LWA), Grains Research and Development Corporation (GRDC) and others. These funding programs are providing additional resources, some being directed to the CRC and programs such as SGSL, which is funded by AWI, MLA and LWA.

While the level of these combined resources for R&D appear to be significant, the overall R&D needs identified through comprehensive planning activities, such as the State Salinity Strategy, Strategic Framework and CRC, will require much greater investment to address all high priority issues identified. Many of these programs could be funded if a relatively small proportion of the total NAP/NHT funds were also directed to this purpose.

Currently, it appears to be necessary for the Catchment Management Boards to identify the R&D needs, and for funding to be chanelled to R&D agencies through this process. While this had advantages in getting community input into determining priorities etc (which I fully support), it is not a process which will deliver comprehensive, efficient, effective and coordinated/integrated national or state based R&D programs to address all of the major issues.

I understand that the SRDCC has recently completed a "gap analysis" of research needs that have no identifiable priority areas for investment by the CMBs. That analysis should assist CMB's in drafting their local R&D investment priorities. … If the eventual process will require R&D to be developed through interaction and negotiation with individual CMBs, then we are prepared to do this, and in fact are doing so… The main problem appears to be a lack of recognition by those involved in deciding on investments of the importance of R&D to deliver on NAP/NHT outcomes.[14]

The Committee's *Inquiry into business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas* (see chapter 3) also identifies the need for a percentage of NAP/NHT funding to be allocated to the development of commercial technologies which address salinity. This Inquiry concludes that suitable proposals may be at the local, state-wide or national level and there needs to be an agency which can act as an intermediary between businesses and catchment management boards. The agency would need to assess the scientific and commercial validity of projects and have the vision to see how various business opportunities could be linked into regional-scale projects for public and private sector investment benefits.

The inquiry identifies four functions that are vital to the involvement of the private sector in addressing the problem of salinity. They are to:

- serve as a clear entry point for businesses;
- allocate funding for research and commercialisation of technologies for the improved management of salinity recharge and discharge areas;
- broker innovative regional-scale projects in the States/Territories; and
- act as a link between a purpose-designed private investment fund (recommendation 14), private sector businesses, accreditors of environmental projects (recommendation 15) and catchment management boards.

14 Ibid.

These functions are not currently being performed by any NSW Government agencies. The Committee believes there is a need to balance the establishment of a new independent organisation with the need to minimise administrative costs.

A new organisation is needed to perform these functions. The organisation needs to be independent from particular government departments which by virtue of their functions favour particular salinity technologies. The organisation also needs to be independent of particular industries, academic institutions and government organisations which would be competing for funding to develop particular technologies.

The Committee believes the most effective model would be a small unit which reports directly to the Natural Resource Management Ministerial Council. This Council is a Commonwealth/States/Territories organisation that oversights the NAP.

This model would engage all States and Territories in decision-making without the administrative costs of establishing a body in each State/Territory. There would be economies of scale in regard to administrative costs; opportunities to jointly fund and coordinate support of national industries of benefit to all States and a pooling of expertise.

RECOMMENDATION 1: The Committee recommends that a percentage of the budgets of the National Action Plan for Salinity and Water Quality and Natural Heritage Trust be allocated to research and commercialisation of technologies for the improved management of salinity recharge and discharge areas. This should include investment in supporting infrastructure and help with finance arrangements for new industries.

RECOMMENDATION 2: The Committee further recommends that the Natural Resource Management Ministerial Council establish a body (in accordance with recommendations 3, 4 and 16) to allocate funding for research and commercialisation of technologies for the improved management of salinity recharge and discharge areas.

RECOMMENDATION 3: The Committee recommends that a Commonwealth/ States/ Territories working party be established to:

- **develop an appropriate model for the body referred to in recommendation 2;**
- **develop prescribed criteria for the assessment of proposals; and**
- **determine the percentage of funding under the National Action Plan for Salinity and Water Quality and Natural Heritage Trust that should be set-aside for this purpose.**

RECOMMENDATION 4: The Committee recommends that the body referred to in recommendation 2 have a council comprising a wide spectrum of prescribed industry groups and research organisations which assess proposals and advise on their priority.

RECOMMENDATION 5: The Committee recommends that the working party referred to in recommendation 3 consider the following criteria for the assessment of proposals:

- **efficacy for reducing salinity;**

- **current commercial potential;**
- **whether the market for the product or service is mainstream or niche;**
- **whether the product or service can be applied broadly across the landscape;**
- **where there is a high benefit-cost for actions taken in a particular locaiton;**
- **the extent of change and capital costs for landholders (where the technology is intended for use by landholders); and**
- **status of knowledge on production and markets.**

2.3 SCALE OF CHANGE REQUIRED

A further fallacy of the NAP, says Associate Professor Pannell, is that by applying persuasion and peer pressure and by encouraging a conservation ethic we can encourage farmers to take on management changes on the scale that is needed. Associate Professor Pannell says that if the scale of change needed was much smaller this might be true but that it is completely unrealistic to expect farmers to bear the sacrifices involved in preventing salinity. To do so, he says, would cripple the economics of their farms.

2.4 NEED TO TARGET GOVERNMENT FUNDING

Associate Professor Pannell states that a further fallacy is that integrated catchment management and regional planning is the key to getting perennials widely planted on farmland.

> *Again, because we don't have perennial options that are viable on the necessary scale, no planning process, no matter how integrated or how catchment-based, is going to prevent much salinity.*[15]

He remarks that advocates of catchment planning seem to neglect the reality that real decisions about farm management are made by individual farmers, not by catchment groups.

Associate Professor Pannell lists three elements that should be given top priority for salinity funding. The first is for R&D to identify a whole suite of different perennials which are profitable in different locations, different environments, different soil types and different farming systems.

> *At present, investment in development of profitable perennials is probably the worst funded aspect of the salinity budget. At least for the time being, until we have developed more viable technologies, it should be one of the key funding priorities. Once we have the technologies, that will be the time to reallocate funding back towards the promotion, education, and awareness raising activities that we have spent most of the money on up till now. You could say that we have tackled the task backwards.*[16]

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15 SEA Working Paper, op cit., at p.2

16 SEA Working Paper, op cit., at p.4

The second priority he stresses is the need to invest in R&D to develop profitable uses for saline land and water. He notes that relatively little money has been invested in this area. The third priority he lists is the need for expenditures specifically targeted to protect particular public assets such as towns, rivers, water resources and nature reserves.

Witnesses have clearly identified the need for investments to be very carefully targeted in order to provide public benefits for government expenditure. Sound investments need to be guided by good science and good economics. The Committee's discussions with witnesses identified concerns regarding the current policy on investment in land-use change. Witnesses believe that the NAP on Salinity and Water Quality does not sufficiently target government spending, that implementation is proceeding without adequate research and technical support and that the science underpinning investments needs further development.

There is a high level of concern amongst scientists and economists that allocating funding to catchments will spread limited public funding too thinly and is not necessarily a good investment.

> *The NAP relies primarily on planning of investments at the regional/catchment level. While this may seem superficially attractive, there is cause for considerable concern about the over-reliance on this approach that is embodied in the NAP and about the way it is rolling out.*
>
> *Most of the regional bodies charged with undertaking the planning are not sufficiently well informed about the important implications of new scientific knowledge of salinity that has become available in recent years. The most important of those implications is that direct investments in treatments to prevent salinity need to be targeted much more narrowly and precisely than previously appreciated if public money is to be spent effectively. Many regional bodies are likely to fall into the trap of attempting to directly influence land use throughout catchments, with the result that much of the money they distribute will be wasted. This risk is exacerbated by the continued rhetoric about the importance of 'integrated catchment management', 'catchment scale intervention', 'landscape change' and so on. A vastly greater scale of public funds would be needed to achieve those outcomes via direct financial support, and recent analyses highlight the almost complete ineffectiveness of thinly spread financial support in achieving meaningful salinity targets. Further, rhetoric obscures that some of the more effective and efficient salinity investments will be at a relatively local scale, not over the whole catchment…*
>
> *Very importantly, a number of the most important and difficult decisions and management processes ought not to happen at the catchment or regional scale but at state or national scale. Examples include the allocation of funds among catchments and investment in R&D/industry development… There is a need for very careful targeting of funds **among** catchments which has not been sufficiently recognised. It is not clear how the allocation of funds among priority catchments is occurring, but I have concerns that the outcome will be nearer to a "fair" distribution rather than one based on good science and cost-effective expenditure of government funds.*[17]

Associate Professor Pannell provided some examples of situations where local scale intervention was more effective than catchment scale intervention. In Western Australia 50 towns are under threat from salinity. For six of these towns, detailed hydrological analyses have been done and reports have been published, including economics. In all cases,

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[17] Associate Professor David Pannell, Submission, 30 September 2002 at p.1

engineering works to reduce recharge within the town or groundwater pumping have been found to be the most cost-effective solution rather than catchment scale interventions such as tree planting.

At Lake Toolibin, the last freshwater lake in Western Australia, detailed hydrological studies have found the most important strategy to protect the lake is to pump out ground water which is rising in a palaeochannel underneath the lake and at risk of contaminating it with salt water. A diversion channel has been built around one edge of the lake to capture surface water flows coming off the catchment and divert it away from the Lake.

The point that Associate Professor Pannell is making is that catchment scale intervention is not always the most effective approach. He believes that the need to manage salinity under an integrated catchment management approach is reasonable but that this should not extend to spreading funding evenly across catchments. He says:

> *If not integrated catchment management, then what? The problem as I see it is that it encourages people to put the problem backwards. it is assuming you go for the catchment scale, whereas what we ought to be doing is starting with the assets that you want to protect and working from there; analyse the best methods of protecting those assets. It may be local, catchment scale or some combination.*[18]

Dr Beare made a similar point to the Committee. He does not believe that funding action in each catchment to meet the end-of-river target at Morgan in South Australia is a good investment.

> *Where we target our investment really matters. The next slide shows the return at the end of the valley of reducing salt loads by one tonne. What is the benefit downstream of reducing salt loads from a different catchment by one tonne? The top of the slide shows the northern part of New South Wales. You can see that if differs tremendously from the sorts of impacts of reducing salt loads in the bottom half. The pay-off from the end-of-valley target in the north is about one-third to a quarter or maybe 20 per cent of the downstream pay-off to the bottom.*
>
> *Why is that so? It is because by the time the water gets through the Darling, the Menindee Swamps and into the Murray River and starts impacting on the precious assets of the south most of the salt is gone-as is most of the water…*
>
> *The key message for New South Wales in all of this is that end-of-valley targets in the north will not necessarily serve the sorts of investments that New South Wales wants to make. It should think about targets within its catchments rather than necessarily what it is doing downstream. To get the right sorts of cost benefits from public and private investment and to improve the environment and environmental amenities, we must reflect the characteristics of the area that these targets are aimed at. Broad scale targets are good for getting the debate going and getting people focussed, but we cannot let the targets misguide our investments.*[19]

Dr Beare explained that the target of keeping salinity levels below 800 EC 95 per cent of the time can be met simply by taking action in South Australia. He believes that if a reduction of water leakage by five per cent was achieved in irrigation areas in South Australia, this would meet the target.

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18 Pannell; Transcript of Evidence, Public Hearing 8 April 2002 at p.4

19 Beare; Transcript of Evidence, Public Hearing 8 April 2002, at p.11

Dr Beare also believes that water use efficiency gains in the Victorian Mallee, Mildura and the Mallee area generally would have positive cost-benefits for public expenditure.

Dr Beare also believes that sourcing water from the Murrumbidgee for environmental flows to reduce salinity is not a good investment. He believes that a better investment would be to buy water out of the Loddon Barr Creek and Mildura.

Dr Beare also believes that the government should be looking at investments which have multiple environmental benefits rather than recharge control alone. He says that if the government was looking for a good investment which achieved multiple benefits then riparian vegetation would be a better investment than widespread revegetation in catchments.

> *We need to think about multiple benefits. For example, I think widespread revegetation in many areas is not the answer. However, I think riparian based vegetation- even though it may not have a tremendous impact on salinity-had the ability to produce all sorts of additional stream benefits in terms of reduced turbidity and reduced nutrient run-off, and potentially some salinity benefits also if well targeted. Wildlife corridors and biodiversity, and in some areas simply the environmental amenities of attractive areas that are nicely treed, need to be part of the investment profile to get us over the line and produce a positive return.*
>
> *In conclusion, I reiterate what I said at the beginning: if we do not take a focussed approach the costs will be quite substantial. With the sort of payback times and uncertainties we have, I do not think we will get a good return. We need to go into the landscape with good knowledge of the landscape—the best scientific knowledge we have at present—and make some sensible decisions. However I think we do not know the landscape well enough yet to make those decisions effectively. When we do we need to start targeting a whole suite of environmental benefits and not let salinity dominate our thinking.*[20]

Associate Professor Pannell is concerned that the current process of catchment management planning is driving decision-making on expenditure which is too rapid and too unfocussed. He quotes from an email he received from a NSW consultant in September 2002:

> *We are in resource planning over-drive here in NSW (native vegetation, water, catchment management targets) and all suffer from the shortcomings you mention. They are driven by political expediency, are trying to do everything NOW with an appalling lack of technical input and a process that has been captured by vested interests in many cases. The landholders on whom these plans impact do not have the time to contribute adequately to the process, the time to absorb what the plans mean and are generally fed up with the whole scene. The sensible notion that some environmental issues simply can't be addressed or must be given low priority is heresy to those calling the shots. Hence we end up with a plan full of general waffle, unrealistic targets, of unknown cost and benefit and with little hope of implementation. We are operating on the basis that anything perceived to be good for the environment must be good for society as a whole and trying to pollute that argument through monetary or (biophysical) quantification is the failing of short-sighted economists and scientists.*[21]

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20 Beare, op cit. at p.11

21 Pannell, Submission op cit.,

In the USA, the Colorado River Basin Salinity Control Program is also jointly Federal and States funded. The Program Manager, of the Salinity Control Program manages these funds in consultation with the Salinity Control Forum comprising three representatives of each of the Seven Basin States.

The approach to prioritise government investment in recharge control focuses explicitly on cost-benefits. Each year the government advertises requests for proposals [RFPs] which are tenders for $US2 – $10M projects to control salinity. The tenders come from the private sector and under the legislation must be assessed on cost per tonne of salt removed and the level of risk. Both financial and effectiveness risks are examined and a decision made on the trade-offs between costs and risks.

Proponents, rather than the Federal Government, bear the risk of cost over-runs through contractual limits on the Government's payments. If cost overruns occur the proponent has three options:

- terminate the project; or
- cover the overrun with their own funds or funds borrowed from the State; or
- reformulate the project costs and resubmit the project through the competitive process.

The projects are now 'owned' by the proponent not by the Bureau of Reclamation.

The Salinity Control Program has found that integration of on-farm projects under the UNITED STATES Department of Agriculture with the off-farm approach by the Bureau of Reclamation (managing the river system) has been the most cost-effective approach to reducing river salinity. *Progress Report No 20 on the Quality of Water in the Colorado River Basin* (January 2001) states:

> *Water conservation within irrigation projects on saline soils is the single most effective salinity control measure found in the past 30 years of investigations.*[22]

David Trueman, Manager of the Salinity Control Program, said that the integration of these programs was a key reason for the reduction in the cost of projects. Past projects averaged $US70 per tonne of salt removed whereas the new projects are averaging $US20 – $35 per tonne.

In the USA, gravity pressure sprinkler systems have been installed which use the pressure of water coming down the mountains. It is captured in piped delivery systems which drive the sprinklers. This is much more efficient than flood irrigation. In terms of the amount of salinity avoided, these projects in steep terrain are a third of the cost of continuing flood irrigation systems, costing less than $US100 per tonne. It has also been found to be cheaper to install piped delivery systems for stock water than continuing the use of unlined canals which mobilise salts in the soil.

In contrast, the process under the NAP currently lacks economic rigour. The Committee believes that this needs to be addressed.

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[22] at p.42

RECOMMENDATION 6: The Committee recommends that cost-benefit analyses of Catchment Management Blueprints are undertaken so as to determine whether those plans and their associated investments are adequately justified on technical and economic grounds. The Committee considers such studies would allow funding to be more efficiently targeted and would highlight the areas in which further technical or economic input is required.

2.5 THE NEED FOR IMPROVED SCIENTIFIC COLLABORATION TO ADDRESS SALINITY

Another related issue involved in assessing whether investments in land-use change are cost-effective is the degree to which the science that underpins it is developed. Some concerns have been expressed to the Committee that the current model of salinity is only a partial explanation of the causes.

Dr Creelman, Adjunct Associate Professor, Centre for Industrial and Process Mineralogy at the University of Western Sydney, states that the role of rock weathering and water-rock interaction have not been adequately examined. Many rocks as they weather release large quantities of salt.

> *All of you have probably seen milky quartz. That quartz is milky because it contains literally billions of tiny fluid inclusions. Those fluid inclusions have at least 20 percent by weight sodium chloride in them and other salts. … Now you weather or in some way break those down and you have a lot of salt being released into the landscape. Also where we have alteration of rocks due to hydrothermal fluids, which are in fact saline fluids, we have areas which now become salinised.*[23]

Dr Creelman believes that the link between the occurrence of salinisation and certain types of rock is not well explained by the rising groundwater model. He says:

> *My argument has always been that you have two very basic fundamental problems to explain which are not explained by this model and the first one is: Why is it that this salt seems to know where the geological boundaries are? If you put the salt scars down, they correspond to certain geologies. The second thing is: How do you explain the dominance in some areas of magnesium in saline water? That can only derive from basically volcanics that are weathering, more specifically probably basic volcanics, salty type material. Therefore, I think there is a very strong case for us to start looking further than just these rising water table cyclical salt type models.*[24]

Dr Creelman warns that we may not have the science right to guide our investments. He says in some areas humans play a major role in causing salinity and in other areas only a minor role. We need to recognise where efforts will succeed and where they will fail.

> *We give lip service to the notion that salinity is the greatest environmental threat we face. We also look to invest in the business of its remediation, yet we are scientifically not on firm ground. The causes of salinity are complex, and although the rising water table model may be the answer in certain areas, and the source of the salt cyclical salts, these ideas are not universally applicable. I contend that every area will be unique with respect to cause and effect, and further, some salinity is inevitable- the process is part of the rock cycle combined with desertification. Humans play a role in this process, but in*

23 Creelman, Transcript of Evidence, 26 September 2002 at p.17

24 Ibid. at pp.16 – 17

> *some cases it is minor; and in others it is major. We must be able to recognise where our efforts will succeed, and where they may fail. This surely is the basis of any investment strategy.*[25]

The Committee asked for DLWC's comments on this matter. The Department agrees with Dr Creelman that the groundwater rising model has limitations. However, the Department says that it does not rely upon the groundwater rising model in its own salt balance modelling to support salinity management in NSW. DLWC states that it has been relied upon at a national level.

Dr Creelman is concerned that overly simplistic models are being used because there are too few scientific disciplines having input into addressing salinity. Associate Professor Pannell says in *Loving, Losing and Living with our Environment* (Getting it Right Conference, Adelaide, March 2002) that effective salinity management requires a working knowledge of hydrology, agronomy, engineering, soil science, ecology, geology, psychology, sociology, economics and farm management.

Dr Creelman states that the way science is funded in Australia is stifling the debate. Dr Creelman says:

> *Despite salinity being recognised as a serious problem to the nation both in the rural and urban environment, the numbers of scientists involved in these problems has not been many, and those involved have been in the main from the ranks of the Water and Plant Industry related Divisions of the CSIRO. This has been appropriate and much good work has been done. A less benign result, however, has been the almost universal acceptance by the policy makers of a rising water table model for all instances of salinity…*
>
> *Currently CSIRO, and a limited number of others who come mainly from Canberra advise the Murray Darling Basin Commission. The Commission asks for submissions and uses CSIRO to vet the applications. CSIRO is also a recipient of these funds, funds that due to the organization's requirements to seek up to 60% of their total funding are critical to CSIRO survival. This is an invidious situation for CSIRO who are forced into serious conflict… CSIRO has become both the poacher and the gamekeeper in the Murray Darling, and this is not a situation that allows for diversity of opinion. We have got to the point where in the minds of media commentators anyone who questions the conventional wisdom is very suspect, and therefore not competent.*
>
> *We have reached the point where we urgently need to expand the number of scientific "players" in this "game". We urgently need to expand our view on this subject by encouraging workers from other fields…..The debate on this topic which is of critical importance to Australia must be widened, and more scientific work must be done so as to guide the policy makers and managers charged with seeking and applying solutions. We are presently in a purgatory of half-truths, and we must always remember that half-truths are dangerous, because we may have the wrong half. It is time for review.*

Review of CSIRO's external earnings target

The Commonwealth Government has, in fact, recently removed the requirement that CSIRO meet external funding targets. This was announced by the Commonwealth Minister

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[25] Dr Robert Creelman, Adjunct Associate Professor, College of Science & Technology, University of Western Sydney; Submission No. 48 at p.2

for Science, Peter McGauran MP, on September 13 2002.[26] Whilst this is an important step, it may not give rise to greater collaboration. This is because if CSIRO ceases to obtain high levels of external funding it will have to shed staff.

The CSIRO is the largest of the three science authorities in the Commonwealth Government's Education, Science and Training Portfolio. The *Review of the External Earnings Targets Policy Applying to CSIRO, ANSTO and AIMS*, by the Chief Scientist, Dr Robin Batterham provides the following explanation of the role of Commonwealth scientific authorities:

> *Each conducts long-term strategic research in the national interest, and provides research services and transfers research outcomes to industry and other clients in Australia and overseas.*[27]

However, the role of the CSIRO has been undermined by the introduction of a requirement in 1988 that it seek 30 per cent of its funding from external sources. This policy was intended to ensure that CSIRO created closer links with industry. In this regard the policy has been successful. However, the policy also brought about a number of unintended negative consequences. Concerns about these consequences have been growing and led to the Review.

Dr Robin Batterham, who conducted the Review, provides the following summary of these negative consequences:

> *The targets policy has:*
>
> - *encouraged short-termism in research planning, and unduly emphasised resourcing to applied research with revenue-raising potential at a cost to resources allocated to longer term strategic research;*
> - *skewed research service provision to larger firms in the more established sectors of the Australian economy that are able to pay for research services;*
> - *discouraged collaborations among research providers; and*
> - *led to sub-optimal research commercialisation outcomes.*[28]

There are a number of ways in which the external funding requirement impacts negatively on addressing salinity.

Disincentive to Collaboration

As discussed by Associate Professor Pannell and Dr Creelman, addressing salinity effectively requires collaboration across many disciplines. However, collaborating means sharing information which in turn means losing intellectual property rights and earnings. Dr Batterham, in the Review, says:

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26 Media Release, 74/02

27 Batterham, Review of the External Earnings Targets Policy Applying to CSIRO, ANSTO and AIMS, 2002 at p.6

28 Batterham, op cit., at p.8

> *Many submissions to the Review noted that the external earnings targets policy has inhibited or discouraged research collaborations. In a collaborative arrangement each participating organisation must share the revenue stream, and may need to share some or all of the intellectual property created through the project. These are not desirable outcomes for a research provider being asked to achieve its external earnings targets.*[29]

The Cooperative Research Program is an important mechanism through which scientists and industry are currently collaborating. However, the need to maintain external funding has had negative consequences on CSIRO's willingness to fully participate. Dr Batterham says:

> *The Review received submissions from several CRCs noting that CSIRO's participation has been conditional on restrictive arrangements concerning the nature of its contributions to the CRC, or IP [intellectual property] ownership, or the particular directions in research that the CRC may take.*[30]

The lack of collaboration reduces cross disciplinary research which in turn can lead to simplistic models of salinity being advanced. Investment of government funding into solutions based on simplistic models is likely to have poor outcomes.

So profound are these disincentives to collaborate that CSIRO commented in its own submission to the Review that the external earnings target led to a lack of collaboration between its own Divisions.[31]

Another negative effect of the need to obtain external funding, is that instead of conducting long term research in the national interest and transferring these research outcomes to industry, CSIRO is competing with industry for consultancy work .

The 30 per cent external earnings target is an average for the Organisation, not all divisions are able to achieve this as they are working in public good areas which do not attract private sector funding. As a result some divisions with a more commercial focus are required to earn up to 90 per cent of their funding externally.

CSIRO has unfair competitive advantages when competing with industry since it obtains two-thirds of its funding from Government. Also CSIRO is still regarded as being unbiased and relied on to provide advice to governments, in spite of its need to compete with the private sector for funding. This does not mean that CSIRO staff lack integrity, rather every discipline has firmly held beliefs about scientific processes which may only be part of the story. What is important is that the way science is funded encourages a diversity of views.

Complaints about unfair competition have come particularly from small to medium enterprises [SMEs]. These same complaints were made to this Inquiry by SMEs which offer salinity mapping and cloud-seeding services. Dr Battenham discusses the nature of these complaints in the Review:

> *Despite these challenges CSIRO considers that it has successfully implemented a strategy to maintain research relationships with SMEs, noting that during the 1990's interactions with SME's more than doubled. However, the perception exists among a number of SMEs that the targets policy continues to limit CSIRO's research service*

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29 Batterham, op cit, at p.10

30 Ibid.

31 Batterham, op cit, at p.44

> *provision. There are two strands to this: firstly, that the SME's lack of capacity to pay prevents assistance with product/technology development and secondly that the science authorities are retaining capabilities and knowledge for revenue generating purposes that put them in competition with SME providers of similar services in the private sector. In retaining information (for example spatial data) two submissions argued that the science authorities are acting contrary to their role as disseminators of public good information.*[32]

In regard to unfair competition, the Australian Spatial Information Business Association which includes, the Environmental Research and Information Consortium [ERIC] which offers salinity mapping services, submitted to the Review that:

> *Many of the companies whose interests ASIBA represents have bid for and lost projects to agencies such as the CSIRO, where CSIRO has either been the prime bidder or has been the exclusive provider of services to a third party bid.*
>
> *As long as government agencies are encouraged to mimic and compete openly with the private sector- performing work for other federal, state and local government agencies and even for that small portion of the private sector work placed to open tender- ASIBA and the companies in represents believes they will have a stranglehold on business opportunities and will stifle economic growth.*[33]

Dr Batterham acknowledges that:

> *The targets policy may have encouraged the retention of some expertise and information bases in the science authorities that otherwise might have been released into the public domain at an earlier point in time, or commercialised. The decision to retain capability may in some cases be related to a desire for a capacity to tender for consultancies on a fee-for-service basis.*[34]

The Commonwealth Government has recently responded to concerns about the effects of the external funding targets of the CSIRO. On 13 September 2002, Peter McGauran MP, Commonwealth Minister for Science, announced that the requirement for the CSIRO to meet external earnings targets will be removed.[35]

Removal of external funding targets is likely to increase CSIRO's own research on salinity. Dr Batterham says:

> *CSIRO is now going through a major transition under its new CEO, Dr Geoff Garrett. A new five year Strategic Plan is being formulated which will focus the Organisation more closely to research in areas of national priority. These areas are the "big issues" of our time- such as salinity, water resource management, new metals technology, nanotechnology, and genetic research. The removal of the external earnings targets policy will assist this transformation and refocussing process.*[36]

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32 Batterham, op cit, at p.42

33 Batterham, op cit, at pp.42-43

34 Batterham, op cit, at p.10

35 Media Release, Min 74/02

36 Batterham, op cit, at p.30

However, there are some concerns that the removal of external earnings targets will not completely resolve the problem of lack of collaboration or competition with industry. Dr Batterham acknowledges that if external funding levels drop CSIRO may have to shed staff:

> *Removal of the external earnings target may ease the extent to which the quest for funding is pursued, and may permit a return to a more balanced division between applied and strategic research and a more objective approach to the research directions to be pursued. But staff numbers may also be at risk as a result. Pressures on staff to earn revenues externally may also remain high in CSIRO if the Organisation's internal target setting process remains in place.*[37]

RECOMMENDATION 7: The Committee recommends that the Commonwealth Government monitor arrangements for funding of Commonwealth Government scientific organisations to ensure that there is adequate cross-disciplinary contribution to understanding and addressing salinity. Funding arrangements which have the effect of narrowing the range of contributions to resolving the problem are not in the national interest.

2.6 PROMOTION OF SUSTAINABLE LAND USE BY ECONOMIC INSTRUMENTS

A strong case has been made for the improvement and expansion of the use of economic instruments such as taxation and other financial incentives to address salinity and other land use problems in Australia.[38] An article by Wayne Gumley, lecturer in Business Law and Taxation at Monash University, examines the current application of economic instruments such as user charges; taxes; subsidies; and tradeable permits, to land use problems in Australia. It found that user charges for natural resources such as water and forests are generally inadequate and that this underpricing has contributed to many land use problems. The article argues there is a need for a move to full cost pricing for such resources.

The article also found that the use of environmental taxes as a disincentive for harmful activities has not been adopted to any significant extent in Australia. The article supports a focus on the raising of revenue through a broad environmental levy applicable to all taxpayers.

The article also found there are many entrenched subsidies in relation to the use of natural resources, which currently support traditional unsustainable land use patterns.

> *For instance, some tax concessions provided to primary producers, such as income averaging, trading stock valuation concessions and various forms of drought relief are often considered to be a fundamental cause of land and water degradation. By comparison remedial subsidies under the National Heritage Trust program are relatively small projects. It was concluded there was an urgent need for a comprehensive analysis of the overall mix of countervailing subsidies in this area with a view to re-orienting and restricting subsidies to the most sustainable patterns of land use. For example (eg. salt tolerant crops) rather than relatively unsustainable innovations (eg. new rice growing techniques).*[39]

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37 Batterham, op cit, at p.53

38 Wayne Gumley, Senior Lecturer in Law, Monash University: the Australasian Journal of Natural Resources Law and Policy, vol. 7, 2001

39 Gummley, op cit. at p.166

My Gumley's article also makes a useful examination of a range of specific taxation concessions relevant to sustainable land use. He concludes that the impact of federal tax reforms has been mainly negative.

> *The substantial tax reductions provided to transport, mining and agriculture will tend to further entrench existing environmental problems, and the removal of accelerated depreciation and new restrictions on deductions for fledgling agricultural and forestry ventures have made some important salinity responses more difficult. These factors support the conclusion that the present application of economic instruments to land use problems in Australia is inadequate and in some cases counterproductive.* [40]

Mr. Gumley believes there is considerable scope for improvement and expansion of the use of economic instruments to address land use problems in Australia. In regard to the NAP he said, in his evidence to the Committee:

> *With regard to market based instruments, the National Action Plan does endorse market based instruments, as most economists would and most government policy makers would, but I think it has to be recognised that this is still a very embryonic area, there is not a strong track record of market based instruments in Australia. Just recently there was an announcement by the Council of Natural Resources Ministers that $10 million will be available for market based instrument projects, and I imagine applications are being called for right now. So there is some very recent movement in that area, but I think the fact that they are still talking about pilot projects at this stage sends a bit of a warning that this is not going to deliver much in the short-term.*[41]

The Committee notes the caution given in a separate paper by Associate Professor Pannell[42] that the potential contribution of economic instruments in the case of salinity is probably fairly limited and that the development of them would need to be targeted with great care and selectivity to situations where market failure is clear and costly. However that writer also sees the need to further investigate and develop appropriate economic policy instruments for environmental management. In a submission on the NAP, Associate Professor Pannell said there appeared to be seriously inflated expectations about what these instruments could achieve and there was a need for real caution so that the advocates for these tools do not capture excessive resources for their implementation.

In his evidence Mr. Gumley responded to these remarks as follows:

> *I think that is unduly pessimistic. I have to accept, of course, that you are not going to solve the problems of the world with market based instruments, but we have a particular problem with regulation, neither can you solve the problems with government legislation, and the particular problem with legislation in this country is that it does not deal very well with diffuse sources, multiple sources of pollution, like catchments, where the problem contributing to salinity takes place on thousands of separate properties at an incremental level, each particular farmer is not doing anything gross, but incrementally they are all contributing, and then there is the problem of transboundary issues. We have so many levels of government in Australia and the State, and we have the Murray Darling Basin traversing several States. So there is a huge regulatory problem, and that is where market based instruments can cut across the impediments, because you can introduce*

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40 Gummley, op cit. at pp.166-167

41 Gumley, Transcript of Evidence, Public Hearing 26 September 2002 at p.6

42 Harry Potter and the Pendulums of Perpetual Motion: Economic Policy Instruments for Environmental Management

> *schemes that are more generally applicable. I would argue that we really have not seen a strong application of market based instruments in Australia, and the reason is because they can be powerful and they can hurt the status quo or existing interests in certain industries. So I do not accept that comment completely.*[43]

The NAP includes an arrangement to promote the further development and practical application of market based instruments. The Ministerial Council has allocated $5M to fund the first round of a National Market-Based Instruments Pilots Program with the object of increasing Australia's capacity to use market based instruments to deliver natural resource outcomes. There is potential for the allocation of a further $5M for a second round following progress evaluation of the first round.

RECOMMENDATION 8: The Committee recommends that a working party of Commonwealth State and Territory representatives be set up to build on the current National Market-Based Instruments Pilots Program by identifying the current disincentives that exist for ecologically sustainable land and water use.

2.7 PERVERSE SUBSIDIES

In their submission to the Committee the Australian Conservation Foundation [ACF] and the Nature Conservation Council of NSW [NCC] argue that priority consideration should be given to the removal of perverse subsidies, that is, direct and indirect incentives to behaviour that results in a loss of biodiversity or that counters ecologically sustainable development. They strongly submitted that such subsidies should be removed commensurate with the introduction of incentives for native vegetation conservation or other salinity management. Their submission, in common with the view of Mr. Gumley, supported the need for a comprehensive government study to into economic instruments:

> *Governments need to identify the economic and financial instruments, actions and public policy reforms (e.g. eco-taxes, levies, strategic investment, government-business partnerships, subsidies to 'top-up' market drivers, etc) required to trigger industry-wide change and catalyse the necessary private investment to repair the country and establish sustainable agriculture. the weaknesses and strengths of each approach should be addressed, including social equity impacts.*[44]

In his evidence, Mr Gumley said he wholeheartedly agreed that the Government should conduct a public inquiry into disincentives for ecologically sustainable land and water use.

> *This is an area where it is very difficult to get reliable data. However, if you look at the amounts of money being provided by the National Action Plan, the second point, the first bullet point. If you are talking about 300 million or so per annum as subsidies being provided under those schemes, I have seen estimates of the subsidy provided for water use and deforestation and other forms of natural resource use in Australia which extend to tens of billions of dollars per year. So it is simply dwarfed to throw that money into a tidal wave of economic incentives that are coming in the other direction to support the existing status quo. There is a real problem.*
>
> *There needs to be at least an inquiry to properly quantify the amount of public subsidy going the other way to support things like irrigation of cotton and those sorts of new*

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43 Gumley, Transcript of Evidence, op cit at p.7

44 Australian Conservation Foundation, Submission No. 24 at p.3

> *industries that have been developing. The current schemes are not sufficient. We do need new revenue schemes and we do probably have to look beyond traditional sources. We cannot expect the farmers to pay for the total cost of rectification when they are obviously contributing a lot to our national productivity. So we need to cast the net wider. Obviously direct polluters need to pay more, consumers also should pay more.*[45]

Adequacy of funding level

The ACF and NCC in their submission claim that the NAP is deficient in terms of the low funding level relative to the actual cost of the task at hand.

> *Federal and State Governments are proposing to invest $1.4 billion over seven years; a figure which falls well short of what is required to embark on a long-range effort to repair the country and promote sustainable land and water use."*

They believe that the Commonwealth, states and Territories should commit themselves to a scale-up of funding and that an examination should be made of the feasibility of an environmental levy, similar to the Medicare levy.

The ACF/NCC refer to a study they commissioned into the costs of halting and reversing the deterioration of the nation's ecosystems. They said that the results of this study[46] showed that an investment program in the order of $60 billion over ten years is required to begin to turn the current crisis around.

Associate Professor Pannell[47] criticises the approach taken by ACF/NCC:

> *Regardless of possible arguments about the merits of extremely large budgets being allocated to buy a comprehensive solution to land and water degradation in Australia the reality is that, for the foreseeable future, such an outcome will not occur. therefore the need to prioritize alternative investments in the environment is unavoidable.*

Associate Professor Pannell says that the core problem with the ACF/NCC approach is that it is based on the assumption that all environmental degradation is worth fixing. In many locations, he says, living with and adapting to some environmental degradation is, on balance, the best strategy for the community.

Ms Lautrec, Principal Policy Officer, for the Salinity Action Unit of the Cabinet Office, was invited, in the course of her evidence to comment on this matter.

> ***Mr. ANDERSON:*** *I would like to finish up with a question for Ms Lautrec. The Committee would like the views of the Cabinet Office on the adequacy of funding levels for the National Action Plan. In their joint submission the Australian Conservation Foundation and the Nature Conservation Foundation of New South Wales claim that the NAP is deficient in terms of low funding relative to the actual costs of the task in hand.*
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> ***Ms LAUTREC:*** *At this stage the Cabinet Office is unable to comment on the adequacies of the level of funding which has been provided, as arrangements for funding are still being bedded down with the Commonwealth. The NAP will be primarily implemented in*

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45 Gumley, Transcript of Evidence, op cit at p.8

46 Repairing the Country: National Investment in Rural Landscapes

47 Loving, losing and living with our environment

New South Wales through the catchment blueprints. Investment in the blueprints will be determined by the regional investment strategies, which are still being developed. Funding will also be provided for capacity building activities and a capacity building investment strategy is being developed for negotiation with the Commonwealth.

Mr. ANDERSON: *We have to wait?*

Ms LAUTREC: *That is right.*[48]

The need for better data on salinity

A number of concerns were presented to the Committee that current levels of mapping and other on-the-ground scientific investigations may be inadequate to make informed investment decisions. There is a concern about the reliance of the Commonwealth and NSW Governments on modelling which is based on a limited number of scientific investigations. In NSW extensive studies have been done of some areas but there is a need for further studies to be done. DLWC believes that modelling can be used as a filter for determining which areas to map. However, other witnesses are concerned that models based on a limited number of on-ground investigations are generalisations which may contain significant errors.

In discussions with the Committee, Dr Creelman expressed concerns about the over-reliance on modelling:

Mr HICKEY: *So are you concerned about the amount of modelling versus mapping undertaken by the Department of Land and Water?*

Dr CREELMAN: *I am a very old fellow and therefore, as far as I am concerned, modelling is something that comes after you understand what you are doing. …*

Mr HICKEY: *But it is pretty hard to model until you have mapped as far as salinity is concerned.*

Dr CREELMAN: *Exactly. It is base data.*[49]

Mapping is very expensive and so making projections using models based on mapping in a limited number of areas is much cheaper. This does, however, rely on the causes and effects being similar in most areas. Dr Creelman does not believe this is the case:

I would like to see a lot more salinity mapping on a much better basis because I think cause and effect are not the same in every area, yet the National Action Plan to a degree has this tacit assumption that cause and effect is fairly well known. I claim it is not.

I think every area will have its own salinity story and, as I said before, if we go to Western Australia the rising water table cyclical salt, salt blowing off the sea, is perfect for that particular area, but it is not so good for western New South Wales. [50]

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48 Transcript of Evidence, Public Hearing 27 September 2002 at p.28

49 Creelman, Transcript of Evidence, Public Hearing, 26 September 2002 at p.22

50 Creelman, op cit., at pp.21-22

> *So I am not saying the model is wrong. I am saying we have got to be pretty surgical about what we think is cause and effect in an area. I think a lot of areas have to be studied in terms of their landscape fairly specifically. We are starting to do that now.*[51]

A number of other concerns were expressed to the Committee about the data on which decisions on investments are made.

Dr Young of the CSIRO informed the Committee that the water quality data on which models rely is too poor to predict how landscape changes are going to occur. He said:

> *One of the big problems we have is we do not have models that enable us to predict at the landscape scale how changes are going to occur….we find it very difficult at the moment to present an integrated overview, partly because the water quality data is so poor and the trends in water quality are so poor. What we have had to do is run scenarios on what happens if it gets one percent worse, five percent worse or ten percent worse.*[52]

Dr Beare of ABARE states that the model being used can identify theoretically where the greatest effects on salinity can be made by investments, however, the lack of on-ground investigations means that scientists do not actually know where such areas are on the landscape. He said:

> *We are looking at response times of aquifers that respond in 50 years and 100 years and the net benefits per hectare, depending on the underlying groundwater salinity of the region. You can see that in fairly close areas with an emerging problem and a significant amount of groundwater salinity you can go ahead simply on salinity benefits alone to find areas that have a payback. This is a hypothetical area- I can find as many of these areas as I want on my computer model. The trouble is that I don not know where any of them actually are, which I think is a pretty important problem. … Identifying where those areas are in the landscape is probably the biggest single piece of information that we need to know at present. We do not really know where the threat is and we did not necessarily know where we can take effective action. That is one of the biggest challenges that we face.*[53]

Dr Young stated that mapping data is poor, particularly in NSW and Queensland. He said:

> *Actually New South Wales and Queensland's data compared to other states is of very poor quality. It is mapped on 5K grids while most of the other States are down to hundreds of metres, identifying exactly where the problem is. This means that to get comparable national data you have to divide the NSW data by six and seven, which horrifies me. I do not have time to talk of the reasons why that is.*[54]

Concerns were also raised about the lack of testing of what the salts in the water are.

> ***DR CREELMAN:*** *When the people that are working mention salinity, my first question is: What sort? Seldom do I get an answer that satisfies me. In fact in 1994 at Sydney University we had a colloquium on this particular matter where the Murray-Darling*

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51 Creelman, op cit., at p.17

52 Mike Young, Transcript of Evidence, Public Hearing, 21 September 2001, at p.3

53 Beare, op cit. at p.10

54 Young, Transcript of Evidence, Public Hearing, 21 September 2001 at p.2

> *people presented and I shall never forget one of the audience took them to task. They said: Is it carbonate or is it chloride, tell me which one it is? At that stage they did not have an answer and I do not think they have much of an answer yet.*[55]

The NSW Government to a large extent, relies on electro-conductivity [EC] readings for, the amount of salts dissolved in the water. The lack of information about the type of salts in the water can have financial consequences for councils and other groups relying on the data.

Dr Mullette, Senior Consultant with Geoprocessors Pty Ltd, showed the Committee a picture of a new housing estate in Tamworth which is being damaged by salinity. In front of the houses is a drainage line. Salt is visible on the surface. Mr Mullette says that the way the NSW Government measures and maps salinity was not adequate to detect the problem because they rely on EC readings and do not measure the amount of salts dissolved in water:

> *It is not ordinary salt. It is, in fact, calcium carbonate, and normally people expect it to be sodium chloride, and the Government had said to the council that it was safe to build houses on this land, and, in fact, they have got a very high level of carbonate, which they never measured. All the salinity measures are made by conductivity and not by actual measure of mass of material in there. So they do not measure the dissolved carbon dioxide which forms the carbonate, and carbonates are twice the problem that sodium chloride is.*
>
> *…*
>
> [calcium carbonate] *is very damaging to concrete foundations. These houses, through here and down further, some of them are pumping water out from under their house to stay alive. One house was to be sold and it had been let for some time and they could hear frogs, and underneath the house it was full of water up to the air vents. So they have got a real problem.*[56]

One of the current problems is that a great deal of the mapping and modelling being undertaken is focussed on the needs of State and Commonwealth Government agencies in meeting end-of-river targets. The type of mapping and modelling undertaken is designed to answer particular questions and these questions depend on the needs of the agency asking them.

There does not appear to be a mapping program which is designed around the needs of other groups in the community who are dealing with assets under threat from salinity such as councils, industry and farmers. Whilst some of DLWC's mapping and modelling programs looks at farmland, it is not currently designed to provide advice to farmers about managing their farms.

The NSW Government in the *NSW Salinity Strategy* has a commitment to encouraging the private sector to be involved in addressing salinity. However, the data being produced on salinity does not meet the needs of industry. For commercial decisions there must be quality assurance on the data provided.

Geoprocessors Pty Ltd is a technology company trialling its SALPROC™ process to produce clean water and marketable salts from groundwater pumped out from beneath salinity-affected country towns. Its Director, Dr Arakel said:

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55 Creelman, op cit., at p.22

56 Mullette, Transcript of evidence, Public Hearing, 4 September 2002 at pp.4-5

> *There are some outstanding issues I think before you start looking at business. These are our views. Really you need hydrological information. You cannot justify a government department telling people that this land has low salinity risk because they made wrong measurements. This is totally unjustified. As you know, there are court cases, liabilities for Dubbo Council these days, and this will grow if government departments do not get their act together…..That is a critical issue, that we need hydrological valid information for informed decision-making. If the hydrological results are not valid then all other decisions made- commercial or environmental – can be wrong and risky.*[57]

Geoprocessors Pty Ltd advocates a national institute for water and salinity solutions which is independent of Government and can be held legally liable for the quality of the data it provides.

> ***Dr ARAKEL:*** *Because of problems with quality assurance, problems with whom to blame if it does go wrong, where to go to get valid information, I think it is very appropriate to have a national institute for water and salinity solutions, something which is national and attracts all the researchers, investigators, policy makers and economists together to look into solutions, not only research, but solutions, and that is why I put solutions up there. It is not only an R and D institute; it is a group of scientists, engineers, policy makers, economists, who have ability to think laterally and capability to deal with salination for the sake of this nation.*[58]

Dr Mullette of Geoprocessors adds:

> *Currently, all knowledge is held by Government. Nobody else can get in….If Charles Sturt* [University] *comes out with a result, do you know if it is any better than what the University of Western Australia has come out with. Somebody has got to make up their mind and you do need some independence, because you are going to get business involved in all this.*[59]

ERIC, a technology company which provides mapping using gamma-ray technology claims that the Airborne Electro Magnetic [AEM] mapping technology being supported by the Commonwealth Government does not meet the needs of land holders, industry and councils because it does not provide information for land-use planning and sustainable development. Robert Gourlay of ERIC states in his submission that:

- TEMPEST airborne electro-magnetics being developed and trialed by the Commonwealth and State agencies does not map salt in the surface 5 metres which is the information needed for land management.
- It is unreliable as the AEM signal can appear for reasons other than the presence of salt;
- It does not identify specific sources of salt in the landscape which is needed, for instance, in deciding where to plant trees;
- The salinity model used by governments is scientifically flawed because it assumes that ground-water rises vertically whereas it moves laterally;

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57 Arakel, Transcript of evidence, Public Hearing 4 September 2002 at pp.7

58 Arakel, op cit. at p.8

59 Mullette, op cit., at p.9

- Also the salt at deeper levels is tied up in clays and not responsible for salinity problems.

ERIC uses gamma ray data to map soil properties, including salinity. It is claimed that this is important because salinity maps must be integrated with other data such as climate, vegetation and other soil properties as well as land use information in order to inform management decisions and investment by landholders.

ERIC's technology maps sources or stores of salt and salt pathways in the surface five metres. Robert Gourlay told the Committee that large parts of NSW are already flown for gamma-ray, but AEM would require a whole new program of data acquisition.

Industry groups such as PepperTrees vineyards, and Councils such as Cootamundra Shire Council have contracted ERIC to provide the data they need.

ERIC states that the NSW Government should not put all of its salinity investment into AEM technology promoted by the Commonwealth Government without a comprehensive and independent assessment of alternative and cost effective solutions within industry. The NSW Government is currently involved in a trial of AEM in Upper Billabong Creek and has not yet committed to AEM technology.

In conclusion, there are three main points arising from evidence about mapping and scientific investigations. Firstly, the current levels of data are not adequate for making decisions about investment of government funds. Secondly, programs of mapping and investigations do not meet the needs of industry, councils or landholders and thirdly the current arrangements for funding science and technology make it difficult for the private sector to be involved.

RECOMMENDATION 9: The Committee recommends that a working party of Commonwealth State and Territory representatives examine ways to ensure that the National Action Plan on Salinity and Water Quality is underpinned by an enhanced mapping program and greater use of on-ground investigations.

RECOMMENDATION 10: The Committee recommends that the private sector be provided with the opportunity to tender to provide salinity mapping and other on-ground investigations under the National Action Plan for Salinity and Water Quality and Natural Heritage Trust.

2.8 CATCHMENT MANAGEMENT AMENDMENT BILL

The Agreement between the Commonwealth and NSW Governments under the NAP, sets out the roles and responsibilities of CMBs in relation to the natural resources and the communities of the particular board's area of operation. This detailed list of functions are not currently reflected in the role of the trusts (called boards) constituted under the *Catchment Management Act 1989*.

On 17 October 2001, the New South Wales Government introduced into Parliament the *Catchment Management Amendment Bill*. The object of this Bill was to provide for the establishment of the Catchment Management Advisory Council and to provide for the establishment of CMBs and for the preparation of catchment management plans.

The former Minister for Land and Water Conservation said this legislation would give a coherent legislative base for catchment management and the necessary institutional, planning and monitoring mechanisms for integrated catchment management. The

Catchment Management Act 1989 has several inadequacies in terms of supporting the NAP. The first of these is that it does not give any statutory recognition to the term or concept of a CMB. The second problem is that the Act makes no provision for the development of catchment management plans or blueprints. The third problem that was to be addressed by the amending Bill, was to set out a list of functions for the CMBs which reflected the functions contained in cl.7 of the Agreement between the Commonwealth and New South Wales.

The former Minister for Land and Water Conservation subsequently withdrew the amending Bill, possibly for further consultation upon it. The situation therefore is that New South Wales is currently obliged to rely upon the existing provisions of the *Catchment Management Act* which as indicated by the former Minister have serious inadequacies in terms of implementing the NAP

It is relevant here to note the remark by the House of Representatives Standing Committee on Environment and Heritage in their report[60] that it is important for States and Territories to streamline their legislative machinery to ensure that it conforms with, and is capable of, delivering outcomes consistent with national principles and targets.

RECOMMENDATION 11: The Committee recommends that the Minister for Land and Water Conservation re-examine the need to introduce legislative changes to the *Catchment Management Act* so as to ensure the adequacy of the Act to support implementation of the National Action Plan.

2.9 CATCHMENT MANAGEMENT BOARDS AND INDUSTRY

The New South Wales CMBs are all structured along the same lines with regard to the interests represented upon them. The Gwydir Catchment Management Board is typical. It contains representatives from nature conservation, primary producers, local government, state government and aboriginal interests. The Board does not have any industry representation even though a central ingredient of the implementation of new land use management targets will be the available market for the products. The representation reflects the interests required to be represented under s.22 of the *Catchment Management Act 1989*. Again, this was an area of the Act that was to be addressed in the withdrawn amending Bill. That Bill would have required representation on CMBs drawn from the existing interests plus not less than three representatives from *persons using or managing natural resources for production or other purposes*.[61] Even though this change was not implemented there would be nothing legally to prevent the current Minister of Land and Water Conservation adding that category to the membership of the existing boards.

RECOMMENDATION 12: The Committee recommends that the Minister for Land and Water Conservation ensures membership of each of the Catchment Management Boards include adequate representation from the industry sector.

60 House of Representatives Standing Committee on Environment and Heritage, Coordinating Catchment Management, *Report of the Inquiry into Catchment Management*

61 *Catchment Management Amendment Bill 2001,* Schedule 1 [23]

2.10 MONITORING AND EVALUATION OF ACTIVITIES FUNDED UNDER NAP

The Agreement between the Commonwealth of Australia and State of New South Wales contains detailed monitoring arrangements for outcomes under the NAP. In summary these are:

(i) the establishment of a Steering Committee to facilitate implementation of the NAP. The Steering Committee comprises representatives from Commonwealth and State and is supported by a Secretariat provided by the Cabinet Office.

(ii) a Natural Resource Management National Monitoring and Evaluation Framework is to be developed and approved by the Natural Resource Management Ministerial Council.

(iii) there will be monitoring and evaluation at three levels: (a) biannual report of progress in undertaking activities funded under the NAP; (b) best possible predictions of the effect of the activities on resource conditions; and (c) in the longer term, measurement of resource condition outcomes.

(iv) the parties to the bilateral Agreement will monitor progress towards meeting Catchment Targets in the Blueprints. The reports on progress will be publicly available.

(v) the State, in consultation with the CMBs will prepare an annual report on the implementation of the activities subject to joint funding under the NAP. This will be publicly available.

(vi) the State and Commonwealth will contribute equally to the resources required to implement the monitoring, evaluation and reporting systems. This will be overseen by the Steering Committee.

RECOMMENDATION 13: The Committee recommends to the Commonwealth/State Steering Committee set up under the bi-lateral agreement with NSW that the monitoring arrangements for the NAP be strictly adhered to.

PART C

BUSINESS OPPORTUNITIES CREATED BY SALINITY THAT CONTRIBUTE TO THE IMPROVED MANAGEMENT OF GROUNDWATER RECHARGE AND DISCHARGE AREAS

BACKGROUND ISSUES

3 ECONOMIC AND SCIENTIFIC ISSUES IN ASSESSING EFFECTIVE OPTIONS

The Committee has been established by Parliament to examine business opportunities that can contribute to the improved management of ground water recharge and discharge.

The terms of reference ask the Committee to identify two things. Firstly, whether a particular activity will have a significant impact on salinity and secondly whether it is cost-effective.

3.1 IS IT COST EFFECTIVE: PUBLIC AND PRIVATE INVESTMENT

If we are talking about government investment in land-use change such changes must produce public benefits which outweigh the costs. In other words, if the government is investing taxpayers money into land-use changes on farms, the reduction in salinity must extend beyond the farm boundaries for there to be public benefits. The value of the off-farm benefits would also need to be greater than the costs. Off-farm benefits would include environmental benefits such as water quality and biodiversity, reduction or prevention of damage to towns and other infrastructure and reduction or prevention of damage to agricultural land.

If we are talking about encouraging private sector investment, the activity must make a net profit for it to be regarded as cost-effective.

It needs to be recognised that addressing salinity has only been a high priority on the NSW Government's agenda since 2000. Whilst there is currently a rapid development of scientific understanding in this area, the answers to these questions are still complex and uncertain. As discussed, in the previous chapter many witnesses to the inquiry do not believe that scientific knowledge on salinity is at the stage where we can make accurate cost-benefit analyses of various options for remediating salinity.

3.2 WILL IT HAVE A SIGNIFICANT IMPACT ON SALINITY?

The Committee took evidence from a number of eminent agricultural and resource scientists in this field. They explained that location is a critical factor in determining whether land use change will have a significant impact on salinity. There are three types of groundwater systems local, intermediate and regional. The length of time taken by these systems to respond to changes of land-use varies widely. Associate Professor Pannell, Agricultural and Resource Economics, University of Western Australia explained this:

> *The next dimension on which things vary is responsiveness. New science that has become available in the past few years has emphasised that in different parts of the landscape, in different parts of New South Wales and other States, in some places you can go in and implement land-use changes and get a reasonably rapid response and a reasonably significant response in terms of prevention of salinity. In others, you can put the same intensity of response in and get almost no measurable response in our lifetimes.*[62]

Dr Beare identified steep areas and areas close to the river system as being the most responsive.

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62 Pannell, Transcript of Evidence, 8 April 2002 at p.2

> *In this system, probably the most uncertain, and one of the most key aspects is: How are our groundwater systems responding? ……That depends tremendously on where in the landscape you are….In the upper part of this [Macquarie-Bogan] catchment we are talking about an area that is fairly steep and has a lot of streams. We are talking about ground water systems which might respond, on average, within 50 years. But as we move down to the flat systems, ….these are very flat, large-scale regional systems, and we might not see ground water responses until something like 1,500 years……...So we are talking about potentially very, very long payback periods. It also means that there is potentially a lot of momentum in the system and, and a lot of things can get a lot worse before they get better.*
>
> *One of the principal things that determines the payback period, or the hydrological response time is how far away from the river you are. How much distance must this groundwater cover*[63]

Dr Young said that the most responsive areas are those with higher rainfall and that in areas where rainfall is low (500-1000mm per year) there are few opportunities for significant change.[64]

In NSW, steep areas on the Great Dividing Range are also high rainfall areas so the comments of Dr Young and Dr Beare largely coincide.

It is clear that the effects of land-use change on salinity vary widely and broad-brush approaches should be avoided.

3.3 COST EFFECTIVE PUBLIC INVESTMENT?

All of the scientists who gave evidence to the inquiry were clear that the cost of addressing salinity across the whole landscape is far beyond the capacity of governments to pay.

Associate Professor Pannell, Agricultural and Resource Economics, University of Western Australia said:

> *The simple truth of the matter is that with current budget availability we cannot even go close to buying a comprehensive solution to salinity so we really are forced into choosing some winners and losers. From the brief evidence I have already put to you it is my firm belief that to get the best bang for the buck in the salinity budget it would require us to focus the public dollars fairly tightly into some very high priority areas or else in ways that get high leverage…*[65]

Dr Beare from the Australian Bureau of Agricultural and Resource Economics [ABARE] said:

> *In terms of managing dryland and stream salinity in eastern Australia, the costs are extremely substantial. One of the examples is the National Land and Water Resources Audit, which suggested that we should revegetate 40 per cent of the Murray Darling Basin to get significant improvements in water quality and manage dryland salinity. The cost of that is so massive. Even if you were able to compensate farmers who would*

63 Beare, Transcript of Evidence, at p.9.

64 Transcript of Evidence, 21 September 2002 at p.3

65 David Pannell, Transcript of Evidence, 8 April 2002 at p.3

> *simply take the money and move to the coast or maybe to Sydney, you would not be able to compensate the underlying rural community in place in their regions. So the cost can be extremely substantial.*[66]

The scientists who appeared before this Committee wanted to get the message across to Members of Parliament that investments in land use change must be very carefully targeted because in many areas addressing salinity will not be cost effective. There are a number of reasons for this.

The costs of recharge control can outweigh the benefits

Mike Read, a resource economist, in an article *New Knowledge Means New Approaches to Solving Dryland Salinity* (www.agrifood.info/connections/2001) summarises the findings of his study undertaken for the National Land and Water Resources Audit. The study provides a cost-benefit analysis for large-scale recharge control using trees in four catchments in four States (Wanilla, South Australia; Lake Warden, Western Australia; Kamarooka, Victoria and Upper Billabong Creek, NSW). The study was commissioned in conjunction with scientific studies by CSIRO in the same catchments which formed projections about future extents of salinity, for scenarios with and without salinity control in each catchment.

The findings are that in three out of four catchments the costs of recharge control using trees outweighed the benefits. Only Lake Warden catchment, where the environmental benefits of treatment will be substantial, showed a net economic benefit over 50 years from implementing a 50 per cent reduction in recharge.

In Wanilla catchment unprofitable revegetation of about 70 per cent of the catchment would be needed to protect the eight per cent which is at risk of salinisation. In Upper Billabong Creek the impacts of salinity are not likely to be substantial enough to warrant the implementation of large-scale recharge control. Mike Read believes this would be the outcome of economic modelling of salinity measures in many of the catchments in the Murray Darling Basin.

Recharge control can have unforseen consequences

Dr Young explained that large-scale land-use change in one area can make salinity in other areas worse. For instance, planting forests will reduce recharge to groundwater over time but will often reduce surface run-off quickly with implications for river flows. This means that there could be less fresh water flowing into local rivers. Salinity in the rivers would increase until the groundwater system responded.[67]

Recharge control may produce limited public benefits

There are also questions about the extent of public benefits for government investment on farms. Mike Read says:

> *A common misconception of dryland salinity in Australia has been that it is typified by actions of particular farmers affecting mainly other parts of the catchment where salinity emerges, often long distances from the particular landholder (see for example, ABARE 1992). Such external effects represent 'economic externalities' and could justify government funding. The analyses that concluded that external effects were paramount*

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66 Beare, Transcript of Evidence, at p.8

67 Young, Transcript of Evidence, 21 September 2001 at p.3

were based on the view that there was a high degree of hydrological transmissivity such that changes in recharge at one location would benefit areas way beyond the area treated.

To the contrary, recent research has shown that the adoption of practices to reduce recharge mainly leads to benefits only for that land on which the treatment is implemented. For example, evidence of the limited area of benefits beyond the site of implementing works to reduce recharge comes from observations of extensive tree planting in Western Australia. George et al (1999) surveyed the effectiveness of tree planting as a salinity management measure at 80 sites in Western Australia and concluded that trees had little effect on the water tables beyond 10-30 metres from the planted area.

Important research by Coram (2000) undertaken as part of the National Land and Water Resources Audit's Dryland Salinity theme, has emphasised that such observations are not limited to Western Australia, and that the type of groundwater flow system for each sub-catchment influences greatly the scope of externalities of particular options for managing and controlling dryland salinity.[68]

3.4 ASSESSING COST-EFFECTIVENESS

Associate Professor Pannell says that in determining investments policy makers need to recognise the wide variability of situations in which salinity occurs. Four types of variation need to be recognised:

- the level of threat
- the value of the assets,
- the responsiveness of the groundwater system and
- the cost of making the change.

Level of threat

Associate Professor Panell sayst that with agricultural land the threat ranges from a bare salt scald through to completely unaffected. This is also true of other assets such as the environment and infrastructure.

Value of assets

The value of assets under threat from salinity varies widely. Assets include: agricultural land, infrastructure (towns, roads etc) and the environment (eg biodiversity, wetlands). Associate Professor Pannell says:

In general, in the case of say, infrastructure, you can find some very large values concentrated into small areas so potentially justifying large investments. In the case of agricultural land which is probably at the other end of that spectrum, quite a lot of agricultural land, although it is valuable for agricultural production, does not really compete very well with some of the concentrated values that are under threat in some of the other categories. (Pannell, transcript of evidence, 8 April 2002, p2)

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68 Read, op cit, p2

Response times of groundwater flow systems

As discussed above, Associate Professor Pannell says that some groundwater systems respond quickly and for others we will not see a response in our lifetimes. Associate Professor Pannell also says that the degree of intervention that needs to happen is generally high, even for the responsive systems.

Costs of change

Associate Professor Pannell says that the cost of change in many areas is very high.

> *In a relatively small number of areas the cost of making the change is virtually zero. There are profitable perennial species available that farmers could implement on areas where they would have a beneficial effect on salinity. But it has become much clearer in the past few years that especially in the low to medium rainfall zones those options are much fewer and far between than we would need to really handle the salinity problem. This interacts with the new knowledge about the intensity of treatment that we would need to put in place. If you just put in a few trees around the edges that sort of cost could be handled but if we are talking about revegetating 50 per cent or more of the landscape, that is a cost impost that farmers will not wear unless we are talking about commercial enterprises being put in place where salinity as a prevention is a by-product of that commercial activity.*[69]

Dr Beare provided an example of the costs of revegetation in the Macquarie Bogan catchment. Forestry is profitable in some areas of the catchment but outside of these areas a program of broad scale revegetation would be at an opportunity cost of $100-200 a hectare. This is because the land is worth $400-600 a hectare and farmers would make less money from forestry than from existing land-uses.

Associate Professor Pannell informed the Committee that there are a small number of areas where the public benefits of government investment in measures to prevent further salinisation are likely to be greater than the costs:

> *If we put that all together what have we got? We have a small number of areas where the situation is favourable for salinity management on all four of those dimensions. It may be possible to identify in a few cases where you have a high level of threat from salinity, high values at risk, relatively high responsiveness to management and relatively low cost. Those situations are obviously top priority for investment. Then there is a group of areas which have positive outcomes for maybe two or three of those dimensions which would be the moderate priority areas. But for most of the agricultural land, most of the rural landscape that needs to be treated if we were to completely eliminate salinity as a threat, they do not rate at all high priority compared to those top priority areas that are favourable on several of those dimensions.*[70]

Dr Young made the same point to the Committee:

> *A thing in point which is very important to understand is that the benefits are not uniform everywhere. ABARE modelling is looking at what are the benefits….making it quite clear that the value of one tonne take out of the river varies incredibly across entire Murray Darling Basin System, and we need to start thinking, if we are serious about solving this*

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69 Transcript of Evidence, 8 April 2002 at pp.2-3

70 Pannell, Transcript of Evidence, 8 April 2002 at p.3

> *problem, about where we are going to get a return on our investment, rather than running in everywhere and spending money and lots of areas will get nothing, quite a few areas will be worse off than if we had actually left it as it was and in some areas we can make big gains.*[71]

Conclusion

Witnesses have clearly identified the need for investments to be very carefully targeted in order to provide public benefits for government expenditure. Sound investments need to be guided by good science and good economics. As discussed in the previous chapter, the Committee's discussions with witnesses identified concerns regarding the current policy on investment in land-use change. Witnesses believe that the NAP does not sufficiently target government spending, that implementation is proceeding without adequate research and technical support and that the science underpinning investments needs further development.

3.5 PRIVATE INVESTMENT

As discussed earlier in this chapter and in the previous chapter, many scientists and economists in this field believe that with the current level of funding available to address salinity the most effective strategy is for the government is to focus on a few high priority areas. If government funding needs to be targeted into relatively few high priority areas, it raises the question of what should be done for the rest.

Associate Professor Pannell believes that a significant proportion of funding should be put into developing and promoting commercially viable land uses which reduce recharge and make use of salinised land and water. He believes this will get leverage of public and private funds across very large areas.

> *One reason why the R&D/industry development is so important is that the new science and economics has made clear the essential need to have a much finer targeting and prioritisation of investments in direct salinity management. This will leave most areas with little or no direct financial support. R&D/industry development together offer a way to provide support to the majority of areas that ought not to qualify for direct financial assistance in support of land use change.*[72]

Associate Professor Pannell is concerned that governments are placing unrealistic expectations on the use of market-based instruments to encourage land-use change. Associate Professor Pannell says that this assumes that suitable technologies already exist. He says:

> *There are underlying assumptions in the NAP that there already exists suitable technologies to deal with salinity over a large-scale. In reality, this is only true in a small minority of regions, which tend to be high rainfall regions. Viable options available for low to medium rainfall regions are very limited indeed. There is a pressing need to devote a significant proportion of the salinity budget to R&D and industry development to create completely new technological options that are far less costly to implement and maintain than existing options. Primarily, the new options should have a commercial focus, and be financially competitive with existing agricultural land-uses…*

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71 Young, Transcript of Evidence, 21 September 2001 at p.3

72 Submission at p.3

> *There has been some improvement in the level of investment in this area outside the NAP and quite independently from it (eg the CRC for Plant-Based Management of Dryland Salinity, new investments by several rural R&D corporations) but significantly more is needed.*
>
> *…*
>
> *My judgement is that between 10 and 20 percent of NAP funds should be allocated to well targeted R&D and industry development. Initially the emphasis should be on R&D, and later as new perennial plants become available, funds should be directed to development of industries around those plants. Importantly, within R&D there should be an emphasis on **development** (creation of new technologies) rather than **research** (measurement and understanding of the problem and of existing technologies) Industry development should include investment in supporting infrastructure and help with finance arrangements for new industries based on perennials.*[73]

The Department of State and Regional Development employed a Salinity Business Facilitator for twelve months to identify business opportunities. The following types of businesses were assisted through small grants:

- *native grass seed production;*
- *lamb production on old man Saltbush;*
- *extraction and marketing of sodium chloride and magnesium sulphate (salts)*
- *applying two separate technologies to address urban salinity involving the city councils of Wagga Wagga and Dubbo;*
- *producing compost from wasted materials to rehabilitate saline land; and*
- *research into suitable species for saline inland aquaculture.*[74]

However, Grant Stuart, the Salinity Business Facilitator found that most salinity business options currently lack technical or economic feasibility and require long-term support for further development. He said:

> *What we found was that in the initial list [of 17 potential salinity business options] that we had most of the ideas were based on technical feasibility, they were not actually based on too much economic rationale. So I just want to explore why…*
>
> *The biggest issue that you have in barriers to development of salinity business opportunities is the technical feasibility with agricultural production … when you are growing a plant with salty water or putting it into salty soil, you do not get the same results. It is usually higher cost in your production and it is usually lower yields. So the profitability is not there in agriculturally based businesses unless you are using salt tolerant plants.*
>
> *Some of the opportunities that we looked at had a lack of technical feasibility. Inland aquaculture is one. It is not proven up enough yet. It is the same with things like algae production. There are still technical barriers. Seaweed production on inland salty waters*

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73 Submission at pp. 2 – 3

74 Correspondence, Minister for Regional Development, dated 25 September 2002

> *is not proven up yet. Some of these projects to be feasible will be dependent on leverage funding…*[75]

The Committee strongly supports the proposal that a percentage of the NAP budget be set-aside for research and development of commercially viable technologies for the management of salinity. In spite of a NSW Government commitment to business opportunities to address salinity, at this stage only $250,000 has been expended under the salinity budget in NSW for this purpose.

This funding has supported one part-time Salinity Business Facilitator for a period of twelve months and seed funding to a number of salinity businesses. This sum was supplemented with $150,000 and an additional part-time staff member from the Department of State and Regional Development's own budget.

The Committee has recommended (see recommendation 1) that a percentage of NAP funding be allocated to research and commercialisation of technologies for the improved management of salinity recharge and discharge areas.

It needs to be recognised that industries, academic institutions and commercial arms of NSW Government are competing for funding for the development of technologies to address salinity. Even where NSW Government departments are not commercial arms of Government they hold particular views due to their specific functions and these views are often conflicting. For this reason, it is most important that a body which determines the allocation of funding for research and commercialisation of salinity technologies is independent of any particular government departments, industries and academic institutions.

The Committee has recommended (see recommendation 2) that the Natural Resource Management Ministerial Council establish a body to determine allocation of funding for salinity technologies.

3.6 LEVERAGING PRIVATE FUNDS

This Committee has examined a number of technologies to manage salinity in recharge and discharge sites (examined in detail in later chapters). In some cases these technologies are a long way from commercialisation and require government support for research and development. However, in other cases, the technologies are in an early stage of commercialisation and are almost profitable or marginally profitable but do not provide rates of return on investment that are competitive.

Grant Stuart, former Salinity Business Facilitator with the Department of State and Regional Development, told the Committee:

> *Further barriers- the financial attractiveness of these businesses is just not there. The returns on these businesses- most of them are agriculturally based. Why are investors going to put their money into something that is going to give them less than five per cent, whereas they can go down the road and invest into another industry and perhaps get more money out of it.*
>
> *We went around and saw a few venture capitalists, but the opportunities just do not meet the hurdle rates in terms of the returns. I mean venture capitalists are looking at 20-25*

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[75] Transcript of Evidence, 26 September 2002 at p.27

per cent return on investment and most of these businesses are never going to return that amount, so really you need to be able to look at alternative funding sources, patient capital, forestry, Hancock Plantations, big private investors like that, or superannuation funds. They are the types of people that you need to get interested in some of these opportunities.[76]

George Nixon, Director of Saltbush Grazing Pty Ltd has had direct experience of the difficulties of attracting investors into commercial ventures which manage salinity. He said:

Having directly invested a number of years of time and effort presenting a sustainable and financially rewarding Saltbush project to the corporate and private business community, a few key areas would need to be addressed to overcome the corporate image of rural Australia.

…

The bottom line is that investment houses, even ethical managed funds look for the best and safest return on their dollar and early exit system. Regardless of the need and importance of repairing an environmental problem, corporations are reluctant to voluntarily take the lead while other avenues of greater profits exist.[77]

A group of major businesses joined with the ACF to identify how to mobilise substantial private sector funds to address salinity. The study involved consultation with 1,000 stakeholders to obtain their views. Additional data was gathered through a national survey of farmers and other users of natural resources. The report prepared by the Allen Consulting Group identifies the following barriers to land managers investing in the environment.

Low rates of return

Traditional commercial resource use activities such as farming typically generate relatively low returns. There is a sense that investment in activities that repair or avoid the damage caused by traditional uses will generate even lower returns.

High Risk

In contrast, to routine business investments, investments in environmental projects are often viewed as being less well understood and entailing greater uncertainties. There is relatively little experience with commercial projects in natural resource management and investors find it hard to forecast the range of possible and likely outcomes.

Liquid

In contrast to investments in other areas, investors in natural resource management projects are likely to find themselves tied into a specific project developed over a long time frame with a long payback period. They are also often difficult to enter or exit in response to normal market forces and changes in circumstances.

Small Unit Size

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76 Grant Stuart, Transcript of Evidence, 26 September 2002 at pp. 25 – 27

77 George Nixon, Saltbush Grazing Pty Ltd, Submission No.39

> *Institutions are generally keen to invest in larger rather than smaller packets in order to spread transaction costs and facilitate monitoring and evaluation. It is not clear that more sustainable and commercial natural resource use activities would be of sufficiently large-scale to be attractive.*
>
> ***Few Existing Institutions***
>
> *Unlike investment in mining, manufacturing or even biotechnology, investors (and even users of funds such as farmers and foresters) find that there are few obvious ways to buy into more sustainable natural resource management. At present there are no listed companies that specialise in the area, there are few specific markets and there are very few fund managers that are readily accessible to the average investor (or user of funds. Existing institutions, such as commercial banks and others, very often find it hard to assess natural resource management projects.*[78]

The Allen Group argues that these impediments do not preclude the mobilisation of private funds to address environmental degradation. They cite education, health and aged care as other areas with significant non-government investment which also have low rates of return. The Allen Group argues that governments have intervened to combat similar problems in other policy areas.

Wayne Gumley, a taxation expert, also believes that government intervention will be necessary to make these ventures more attractive to investors. He said:

> *One of the problems in this area is that we are dealing with a trade-off between private interests in running a business, be that primary production or any other business, as against the public interest in the preservation of the ecosystem as a whole and such things as clean water, clean air et cetera. So there has to be a certain level of intervention in the market by the government in that situation.*[79]

Associate Professor Pannell sees the development of commercially viable technologies and the use of market-based instruments as separate approaches. However, Committee believes that where there are public benefits from the use of such technologies that an environmental subsidy, commensurate with the level of public benefits, should be payable to make them commercially viable to adopt.

Technologies that are productive and only require 'top up' funding are likely to spread the limited government budget further than payment for measures where the primary purpose is environmental.

The Allen Consulting Group proposes that the Government establishes a new class of financial intermediaries that channel funds between investors and natural resource managers. They outline the following functions of the proposed intermediaries:

- *providing equity finance to commercial projects or organisations that have a commercial mission that also entail environmental benefits or have the effect of raising sustainability;*

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78 Allen Consulting Group, Leveraging Private Investment, August 2001 at pp. 74-75

79 Gumley, Transcript of evidence, op cit., at p.3

- *generally providing finance on commercial terms, although by definition these equity vehicles would be seeking activities and projects that would otherwise be difficult to finance;*

- *raising funds from capital markets. Because vehicles of this sort would be investing in projects, which often generate below-market returns, they would need to be tax-favoured in order to be able to produce dividends comparable with alternative investments. Over time they would package investment products for investors which may include sustainable projects occurring nationally, and other assets such as salinity credits and carbon credits (such packaging would develop critical mass and investment diversification and hence reduce risk);*

- *injecting commercial and financial expertise acquired through experience with other projects and applied through representation on the board of investee companies; and*

- *dissemination of information on successful sustainable projects, raising awareness about investment opportunities and seeking co-investors to minimise risk.*[80]

Another key element of the proposal is that the Government would need to establish regulation to provide for the accreditation of businesses that wanted to access the concessional investment funding. This would be necessary to provide security to investors that the venture is a good one and environmentally sound. It would also ensure that tax concessions were only provided for investments which deliver the desired environmental outcomes. The Allen Consulting Group outlines the principles that would need to underpin an accreditation process:

- *Voluntary participation by landholders, who would only require accreditation if they were seeking access to investment funds that were underpinned by a government guarantee;*

- *The criteria for accrediting businesses must acknowledge the diversity of environmental businesses, and the varied state of natural resources while providing flexibility to landholders in integrated productive farming with improved environmental performance;*

- *The criteria for accrediting businesses must reflect the best available science and be closely tied to the achievement of desired environmental outcomes at a catchment/regional scale;*

- *The criteria for accrediting firms must cover the full range of environmental outcomes sought including salinity, water quality, biodiversity protection and carbon sequestration.*

- *The process of accreditation must be independent, credible, quality assured and at arms length from the regulatory regime.*[81]

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80 Allen Consulting Group, op cit. at p.101

81 Allen Consulting Group, op cit, at p.107

RECOMMENDATION 14: The Committee recommends that the Premier advocates that the Commonwealth Government legislates the establishment of a new class of financial intermediaries that channel funds between investors and natural resource managers. That the fund be tax-favoured in order to be able to produce dividends comparable with alternative investments.

RECOMMENDATION 15: The Committee also recommends that the Commonwealth Government legislates to establish a system of accreditation to establish the environmental bona fides of commercial projects into which the funds are channelled.

3.7 MAJOR PROJECTS REQUIRING AN INTEGRATED APPROACH

Another area where a greater level of action is required by government to facilitate salinity business opportunities is in brokering and subsidising major projects with several parties that require an integrated approach. Mr Stuart, former Salinity Business Facilitator with the Department of State and Regional Development, provided an example of such an approach in Israel. Mr Stuart showed the Committee a slide of Jojoba trees in Israel which are being watered with brackish urban wastewater from Beersheeba. A ring of salt is visible at the base of the trees. Local research developed genetically suitable trees; the local town put in the infrastructure to run the water out to the farms to cut the capital cost of getting the water there; and the town has been able to make a business out of disposing of saline water. At the same time, farmers have made an income from growing jojoba.

Mr Stuart believes that these types of projects could be undertaken in Australia where country towns like Wagga Wagga have saline waste water that they want to dispose of. He emphasised that integrated projects like those of Beersheeba are necessary in Australia. Mr Stuart said

> *These businesses would not be viable without two or three potential funding sources to get the water out there. You would be better off to grow that Jojoba with non-saline water on non-saline land, but because the water is already at the farm gate, it has made it attractive enough, and the research has been done on the genetics of the plants where they can get higher yields than anywhere else in the world because they have got the right varieties. So it has made it a business.*[82]

In contrast, Australian companies with products and services, which can address salinity, have found a willingness by governments to enter into trials but a slowness to commit to commercial projects.

Saltgrow, a subsidiary of Arthur Yates and Company, is part of a research syndicate which has bred Eucalyptus trees that are tolerant of saline soils, sodic soils and grow in low rainfall areas with high water tables. There are over 100 field trials in Australia which demonstrate the success of the tree. In spite of this, Saltgrow is finding it difficult to obtain any support from governments for commercial plantations which provide hardwood and reduce salinity. Robert Prince, General Manager of Saltgrow Ltd said:

> *Regarding our position, we have probably got more trees planted in real hard saline environments than any other group in the country and we are undertaking regular monitoring. We have undertaken timber and pulp and paper trials to identify market*

82 Grant Stuart, Transcript of Evidence, Public Hearing, 26 September at p.26

> *potential. We have made presentations to AFFA, Murray Darling Basin Commission, the Department of Land and Water Conservation, the Prime Minister's Office, the Federal Senate Agriculture Committee, the Department of State and Regional Development in New South Wales, presentations to New South Wales Ministers, presentations to local bodies and we have had discussions with catchment boards. We have talked with National Farmers Federation and have had discussions with Landcare and private investors and we are now talking with international agencies re development in Asia, because talking to those others over the last 18 months has not got us very far. There is a lot of talk but not much action at this point.*[83]

Geoprocessors is a company that has technology to remove all salts from water producing clean water and marketable salts. Geoprocessors has been involved in several demonstration trials, including with the Murray Darling Basin Commission and Dubbo and Wagga Wagga City Councils. These councils are currently considering a commercial arrangement with Geoprocessors. However, like Saltgrow, Geoprocessors is increasingly focussing on overseas markets as there appears to be a lack of willingness by Australian governments to commit to commercial ventures to address salinity. Dr Arakel, Managing Director said:

> *Our major clients at this stage are mineral processing and petroleum industries in Australia and overseas, mainly the Middle East. I just came back last week from overseas. In Oman we are doing a huge project for desalination.*
>
> *…*
>
> *We have just started realising that there has been too much talk in Australia, let's go and get the technology valued [overseas] and come back. Perhaps it will be, unfortunately, two or three times more expensive for Australians, but we have done our bit. I have spent 25 years over here and you can see the extent of our frustration with the whole thing here.*[84]

Bill Henty is an intellectual property and commercial lawyer involved in the commercialisation of technology and concepts and in mentoring entreprenerus to package those technologies and concepts to bring them to the market. He is involved with Stratum Environmental Technologies Pty Ltd , one of eight technologies with potential to beneficially impact on salinity that were exhibited in the Australian Technology Showcase. He says:

> *The fundamental flaw in the [NSW Salinity] Strategy is that there is no infrastructure which will provide the desired outcome of turning to account business opportunities.*
>
> *…*
>
> *The public sector of the salinity industry, it is suggested, has virtually no funds or authority to support private sector innovation, experiment, research, trials, models proposal presentations and/or other involvement. For the public sector to support the private sector it must be:*
>
> - *authorised*

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83 Robert Prince, Saltgrow, Transcript of Evidence, Public Hearing, 27 September 2002 at p.4

84 Arakel, op cit., at p.4

- *have the will.*[85]

Currently, there is no NSW Government department with a clear role to broker public/private partnerships for long term development of salinity business opportunities. The Department of State and Regional Development has not sought any further funding for salinity business development because long term business development is not the role of the Department.

> *….our business model is essentially about helping the business through the constraints to it getting up without necessarily putting in a huge amount of money. There are some programs that we do run and there are examples of businesses that we have helped with salinity business opportunities, where we have been able to provide small amounts of money to overcome some constructed development. But talking about the infrastructure here [Beersheeba] that is much larger leverage funding than we have within our capacity to do.*[86]

The Committee discussed this matter at length and finds that there is not an existing NSW Government organisation which could appropriately take on the role of brokering high level public/private partnerships to establish integrated regional projects to address salinity.

A number of witnesses in their submissions raised the issue that there is no clear point of entry into government policy and planning processes for businesses that can address salinity. Dr Arakel, for instance, states:

> *There is no immediately obvious point of entry for technology providers and developers to the planning process to bring their wares before the planners. Neither is there any entry point for private entrepreneurs to make proposals to remediate salinity or protect the private and public assets from salinity risks.*
>
> *Those outside this government-oriented process know little of what is being planned and it is difficult for them to find a way in. Commenting on a final document does not really help. Involvement is needed, Further, with few exceptions action plans have become general not specific, there are few identified problem areas where work needs to be done immediately. This clearly indicates that risk and efficiency of solutions or protection measures have neither been addressed adequately nor prioritised properly.*[87]

The Committee supports these comments. There needs to be a clear point of entry for businesses that have products and services that can contribute to the Government's plans to address salinity. The relevant agency would need to be capable of making a scientific and economic assessment of the usefulness of these products and services in meeting government salinity targets.

The relevant agency would also need to have a broad vision of how various products and services could be integrated into a project on a regional level. One example is that saline water in council areas could be used for aquaculture, the water could then be desalinated and piped to an irrigation area where it is sold for microirrigation. All the stakeholders could contribute financially to the solution.

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85 Submission

86 DSRD, Transcript of Evidence, 26 September 2002 at p.27

87 GeoProcessors Pty Ltd, Submission at pp2 –3

Another example is the need for an agency to work with all the relevant industries involved in establishing a supply chain for inland saline aquaculture or saline forestry. These type of projects are unlikely to happen without government intervention because the transaction costs of negotiations with numerous beneficiaries would be high.

3.8 THE NEED FOR A MECHANISM THROUGH WHICH THE PRIVATE SECTOR CAN BE INVOLVED IN SALINITY PLANNING PROCESSES

Another area of concern is that currently catchment management plans have little industry involvement. The Allen Consulting Group also raises this issue. They state:

> *A broad observation made by the researchers was that most government programs and a good deal of private sector involvement to date has focussed on grant or funding arrangements. While investment is often discussed and the need to access private sector resources is frequently recognised, there is very little analysis about how to obtain genuine investment in more sustainable land use.*
>
> *There are often calls for greater 'investment' in the environment when what is really meant is that government gives away more public funds for this purpose. If large volumes of private sector investment are to be leveraged into repairing the country, institutional frameworks need to be put in place to facilitate the establishment of investment vehicles capable of attracting such investment funds.*[88]

Catchment management investment plans are a misnomer. They do not involve private sector investment and have no financial cost-benefit analysis. Mr Verhoeven of the DLWC informed the Committee that the NSW Government is working on identifying environmental outcomes from a range of land use changes. He said that currently the NSW Government does not have suitable information to make a business case for every potential project. However, he stated that rigorous business cases have been made for the salinity reafforestation program and land and water management plans.

To some extent this is a "chicken and egg" argument. It appears that where industry has been involved in the process, it has been possible to make a business case for certain projects.

One of the concerns to the private sector is that government agencies appear to have a point of entry to access NAP funding to carry out commercial projects whilst there is no clear mechanism for the private sector to compete for such opportunities.

Mr Prince, General Manager of Saltgrow Ltd, informed the Committee that his company have had to approach catchment management boards individually and submit proposals whilst State Forests has been able to gain $100M in funding for a forestry project outside of this process. Mr Prince said:

> *I cannot see how you can have the referee playing in the same game. You have the regulator out there trying to be the instigator on the ground. From private industry point of view, when we were asked to go through the local catchment boards, make a submission at the ground level to get community involvement in your project and get support for it and work your way up through the process that has been put in for NAP funding, to find out that a $100 million is taken out of the NAP funding and given to State*

88 The Allen Consulting Group, Repairing the Country, Levaraging Private Investment, August 2001, at p.3

Forests with no recourse back through the normal program, does not sit well with private investment.[89]

The Committee believes strongly that the NSW and Commonwealth governments need to establish a fair and transparent mechanism through which the private sector can offer strategies for managing salinity and bid for projects.

Mr Verhoeven of DLWC has suggested that industry could form a catchment level group to provide input through a representative to the catchment management board. The Committee believes that this is a positive suggestion and that DLWC should facilitate the establishment of such groups. However, it does not go far enough in establishing a clear mechanism through which the private sector can bid for, or propose, projects.

The business proposal may be at the local, state-wide or national level and there needs to be an agency which can act as an intermediary between businesses and catchment management boards. The agency would need to assess the scientific and commercial validity of projects and have the vision to see how various business opportunities could be linked into regional-scale projects for public and private sector investment benefits.

This chapter has identified a number of functions which are not currently being performed by any NSW Government agencies and which are vital to the involvement of the private sector in addressing the problem of salinity. A new organisation is needed to perform these functions. As discussed earlier, this organisation needs to be independent from particular government departments which by virtue of their functions favour particular salinity technologies. The organisation also needs to be independent of particular industries, academic institutions and government organisations which would be competing for funding to develop particular technologies.

However, the Committee believes there is a need to balance the establishment of a new independent organisation with the need to minimise administrative costs. Accordingly, the Committee has recommended (recommendation 2), that the Natural Resource Ministerial Council establish a body to allocate funding for research and commercialisation of technologies for the improved management of salinity recharge and discharge areas. This body would be a small unit which reports directly to the Natural Resource Management Ministerial Council. This body should also have the functions identified in this chapter as necessary for the involvement of the private sector.

<u>RECOMMENDATION 16</u>: The Committee recommends that the body referred to in recommendation 2 have the following functions:

- **serve as a clear entry point for businesses;**
- **allocate funding for research and commercialisation of technologies for the improved management of salinity recharge and discharge areas;**
- **broker innovative regional-scale projects in the States/Territories; and**

89 Prince, op cit., at p.8

- **act as a link between a purpose-designed private investment fund (recommendation 13), private sector businesses, accreditors of environmental projects (recommendation 14) and catchment management boards.**

PART D

BUSINESS OPPORTUNITIES ON RECHARGE SITES

4 BUSINESS OPPORTUNITIES ON RECHARGE SITES

4.1 INTRODUCTION

In NSW, the greatest proportion of salinity abatement strategies are geared towards recharge sites. Recharge projects such as forestry, perennial cropping and pastures are aimed at intercepting water before it enters the ground water system and to utilise this water before it transfers to a discharge site. To achieve a significant reduction in recharge, substantial land use change will be required.

While exploring the potential opportunities there are a number of key questions:

- Where on the landscape will it work?
- Is this area a priority?
- At what rate will it reduce ground water levels and for what distance?
- Is there a reasonable expectation that private sector investors will make a net profit?
- What is the rationale for government investment?
- Is there likely to be a net public benefit?

There is still much debate over the ways in which these questions may be measured as discussed in the previous science chapter. Many opportunities are put forward in this chapter however, there is still a great deal of research and development ahead to prioritise these options. Explicit answers to salinity management questions are unlikely to be answered accurately or precisely in the short term. However, the answers so far provide decision makers with a guide that will continue to improve as understanding increases.

It is hoped initially to slow the rate of landscape deterioration before any productive reversal will occur. In many cases, land holders will need to adjust to “live with salt”. This is particularly likely in areas of marginal agricultural production that experience dryland salinity. As increasing salt in the landscape occurs, business opportunities for discharge management will continue to develop as discussed in Part E of this report. The business opportunities for recharge areas is covered in this chapter.

4.2 INITIAL STEPS

Management and protection of remnant native vegetation is the first step in working towards a landscape which leaks less rainfall into the groundwater system. Native vegetation, over a substantial part of a catchment, provides optimum recharge control as most salinisation is the consequence of water balance change that has followed land clearing.

The DLWC administers the *Native Vegetation and Conservation Act* which protects remnant vegetation that will contribute to the positive use of ground water recharge. By controlling land clearing and maintaining the current vegetative cover as a baseline, further ameliorative measures can take place. However, there are a number of concerns about the

implementation of this Act as it affects agricultural business systems. The further development of recharge opportunities can assist in improving the ground water situation.[90]

4.3 NON-WOOD PLANTS

Development of revegetation across the landscape will be one of the main objectives to any salinity abatement schemes. As a result, replacement of trees can be an obvious response. While trees have been identified as effective in lowering water tables there are many applications where their suitability, due to high establishment costs, is unsuitable to economically marginal agricultural systems. Many non-wood, deep-rooted perennial plants have also been found to reduce rates of recharge. These plants are often closer to agriculture systems that currently exist and may not be regarded by land holders as too great a departure from their current farming systems. They are therefore more likely to be adopted.

It is widely accepted that the vegetation in the 500 to 700mm rainfall zone of Eastern Australia needs to include a greatly increased degree of perennially if rainfall is to be used more effectively and the problems associated with dryland salinity reduced. More of the landscape needs to be covered by deeper-rooting plants with an extended growing season. The solutions are likely to include various combinations of trees, shrubs and herbaceous pasture plants in the landscape. In some cases it will be achieved through the strategic planting of tree lots, in other cases it may be rows of trees or shrubs with pastures in between. In arable farming areas deep-rooted perennial pasture plants are likely to be sown in phased rotations with crops.[91]

4.4 AGRICULTURE

One of the greatest impacts on salinity can be made through improved or changed agricultural systems that remain as close as possible to current agronomy. This is due to the sensitivity of land holders towards change. As farmers are accustomed to agricultural market structures, the adoption of completely new management and technologies becomes a quantum shift from current practices. The challenge for governments to gain wide-scale land use change, is to identify in the short-term systems that remain close to current practices yet mitigate salinity. On the basis of this notion, perennial cropping and pastures have demonstrated the most promise. Reluctance by landholders to adopt forestry options has been due to uncertainty of markets and high initial capital investment. Agricultural options appear more attractive in the immediate future.

As adjustment to new systems occurs, the economic viability of alternative systems increases and may further contribute to the better use of ground water management. This progressive development of salinity measures is more likely to prove successful than a single wide-scale adoption of all salinity mitigation options.

4.5 GRAZING AND PASTURES

To remain as close to agricultural systems as possible but deliver a positive salinity outcome, the improvement of pasture management for salinity mitigation should be one of

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90 Daryl Cluff, Stipa Native Grasses Association, Transcript of Evidence, Public Hearing 27 September 2002

91 Brian Deare, Transcript of Evidence, 8 April 2002

NSW's first steps. Current available options for deep-rooted perennial pasture plants fall into three groups:

- Introduced temperate grass species;
- Native grasses; and
- Herbaceous temperate legumes.

Introduced grasses

Considering the wide range of environments, soils and land uses that require revegetating, the range of herbaceous plants currently available is relatively small. In addition, many of the current pasture species are restricted in the range of soils in which they can be grown with soil acidity and waterlogging rendering many current species unsuitable. Introduced grasses that are suitable for recharge sites include phalaris, cocksfoot and demeter fescue. Soil acidity reduces the distribution of phalaris while lack of summer drought tolerance restricts the area that can be sown to fescue. New perennial grass cultivars are required that are more summer active than existing grasses but still have a reasonable degree of drought tolerance for long term persistence.

Native Grasses

Although native grasses have shown considerable promise and can be effective in improving water use and reducing recharge, seed is difficult to obtain, prohibitively expensive and establishment techniques for many species have yet to be perfected. Reintroducing native grasses is consequently a very expensive exercise and not an option for most farmers. Better management and rejuvenation of existing remnant native pasture resources is the most likely pathway by which native grass species will contribute to improving perenniality of the landscape, at least in the short term. This is particularly the case in non arable steeper sloping landscapes where introduced exotic species are either uneconomic due to the high cost of inputs or practically not feasible.

Herbaceous Legumes

Of the herbaceous legumes, lucerne is the only widely grown perennial and plays an important role in arable country, particularly when grown in phased rotation with crops. Lucerne has proved to be highly effective at lowering water tables and reducing deep drainage and has the capacity to make a major contribution to improving water use in the landscape. It is the only perennial legume available to address rising watertables and associated salinity in a pasture-crop rotation and will use water from suitable soils at depths to two metres and below.[92] Once established, lucerne has good drought tolerance but will lay dormant during extended dry periods. During those periods stock should be removed.

It's greater use is restricted by it's susceptibility to waterlogging, acid soils and uncontrolled grazing. Lucerne requires a high level of grazing management to persist satisfactorily.[93]

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92 Department of Agriculture, Western Australia, *Lucerne on the Landscape*, Farmnote 2000

93 Brian Deare, Submission to the Committee

4.6 GRAZING MANAGEMENT – CELL OR ROTATIONAL GRAZING

While there are a number of salt-tolerant, deep-rooted perennial pastures suited to recharge conditions, their success is likely to stem from a more intensively managed grazing system. Greater partitioning of land and rotational management (also known as cell grazing) will lead to better utilisation of pasture on recharge and saline sites. The improved productivity often stems from the increased capacity a perennial pasture will provide by allowing remaining highly productive annual exotic pasture during late season to regenerate until the new season starts.

The main establishment costs of rotational grazing systems are additional fencing and water access for cattle on each separated pasture. Greater utilisation of pasture occurs as each portion is better grazed as sheep and cattle are not able to over-graze a preferred portion of field while leaving the rest. This system is not a new concept. It is the better division of land into smaller portions that are aggressively grazed, that is what experts advocate. The importance of allowing pasture recovery time is what is promoted.

The other main driver for pastures that mitigate salinity is to introduce more "perenniality" into the landscape. Perennial grasses use more rainfall. They also tend to be more drought tolerant and can provide valuable fodder in extreme conditions. In most instances the use of native species has shown good potential for wide scale adoption. This is the most attractive option for land holders as it is little departure from their current agribusiness. It is simply a use of differing grasses in conjunction with rotational grazing that can yield a higher carrying capacity through intensive management for the same amount of land.[94]

4.7 SALTBUSH

Through many submissions and evidence provided to the Committee, it is apparent that Saltbush may have many positive outcomes for management of salinity. As a perennial native plant that is suitable for grazing and is tolerant of severe drought conditions it fits well with current agribusiness activities. Saltbush roots extend to depths of up to three metres making it ideal for recharge applications. While it is detailed as a solution to saline lands (discharge areas) it demonstrates a high capacity to lower water tables across the landscape and increase the carrying capacity of low productive areas. This is due to its perenniality. It provides fodder during late summer and periods when feed becomes scarce such as in drought. This provides flexibility to the land holder to "spell" annual pastures and provides contingency during hardship. Further benefits of this plant are detailed in the discharge section of this report.

It is raised as a recharge opportunity as it will grow most productively in non-saline sites while it is often suggested as a discharge opportunity for mild to moderately saline sites. Evidence suggests that it may also be established using seed however, under careful establishment conditions. This may reduce establishment costs and enable widespread adoption on a catchment scale. Grazing Management Systems have a proposal before the Commonwealth for potential establishment of 100,000ha of Saltbush.

Concerns are held by land holders that the quality of stock may be reduced due to grazing of Saltbush however, when utilised in a rotational grazing regime where grazing is for short periods of time little effect is noticed. Andrew Sipple, Managing Director, Grazing Management Systems is grazing his stock solely on Saltbush. To help drive this from a

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94 Di Bentley, Transcript of Evidence, 8 April 2002

marketing perspective, his business is developing a network for selling Saltbush fed sheep-meat from farms that have planted Old Man Saltbush, and this product is called “Drover's Choice”.

Current limitations raised by several witnesses were the quality of seed, difficulty of propagating the plant and reservations by land holders accustomed to annual farming techniques. Capital investment is also prohibitive to some land holders as it can be relatively expensive to establish. However, these barriers can be overcome through better valuation of the environmental benefits gained that would offset the high establishment costs of the perennial plant. Better understanding through demonstration of the benefits of perenniality would assist its adoption as the plant requires no further cultivation or annual establishment. Methods for direct seeding may also be adopted where high establishment costs for seedlings may make Saltbush prohibitively expensive.

Colin Seis and Daryl Cluff of Stipa Native Grasses Association, indicated they have not been supported in encouraging adoption of this new agribusiness within both DLWC and NSW Agriculture. Funding for projects encouraging Saltbush establishment have not been forthcoming. It has been difficult for the private sector to convince government extension services to promote the development of large-scale Saltbush projects.

Deutsche Bank, in a submission to the Committee, were concerned about the eligibility of Saltbush as a carbon sink under the NSW greenhouse benchmarks for electricity retailers. It is claimed that Saltbush is a useful alternative to trees in the sequestration of carbon. Business opportunity exists where there is a salinity hazard on marginal agricultural lands. The inclusion of Saltbush as a carbon-offset would assist establishment costs. There is a need for amendment to the NSW *Natural Resources Legislation Amendment (Rural Environmental Services) Act 1999* in Schedule 2 cl.(6A).

Submissions also pointed out the need to measure the amount of carbon sequestered by Saltbush. This will be required to determine exact levels of carbon stored within the plant. It has been suggested that the NSW Government support the measurement of these and other perennial plants that are eligible under article 3.4 of the Kyoto Protocol.

There is a significant opportunity to encourage carbon sequestration on productive agricultural land because perennial pasture species can be grazed whilst storing carbon in their roots. The cost of establishing and managing perennial plants, other than trees, is much lower than that of planted forests. Perennial shrubs and grasses may be grown on soils and in low rainfall areas, which would be unsuitable for trees. As the opportunity cost of salt-degraded land is low, the interest of farmers and investors in this option is likely to be high.

Robert Vincin of Emission Traders International has put forward to the Committee that Saltbush has many advantages over trees in storing carbon much sooner. Saltbush has demonstrated capacity to lower groundwater tables and potentially rehabilitate land. However, Saltbush has not been counted towards off-sets in NSW which has been exacerbated by lack of progress with the implementation of Article 3.4 under the Kyoto Protocol.[95]

[95] Sources: Briefing on Deustche Bank representation, submission by the Select Committee on Salinity to the Ministry of Energy and Utilities

RECOMMENDATION 17: The Committee recommends that the NSW Government make article 3.4 plants under the Kyoto Protocol, such as Saltbush, eligible for greenhouse benchmarks for NSW electricity retailers by amending the NSW *Natural Resources Legislation Amendment (Rural Environmental Services) Act 1999* in Schedule 2 Clause (6A).

RECOMMENDATION 18: The Committee recommends that the NSW Government provide funding to support measurement of the amount of carbon sequestered by plants under article of 3.4 of the Kyoto Protocol.

RECOMMENDATION 19: The Committee recommends that if Saltbush under the current ESS pilot delivers significant environmental outcomes, then its use by farmers be encouraged through extension services in DLWC and NSW Agriculture in low rainfall zones of high salinity risk.

4.8 EDUCATION

A number of submissions have pointed out that improved techniques in management need to be disseminated amongst land holders. The need for education and displaying "champion projects" that demonstrate the merits of improved systems and successful salinity abatement projects is likely to lead to broad-scale adoption and leveraging private funds. "Farmers teaching farmers" was a theme picked up by the Committee highlighting the importance of land holder initiatives.

Government assistance in facilitating education and information about profitable pasture systems, rotational grazing and no-tillage cropping, can lead to broad landscape change. Some programs already exist for farmers as a series of protocols for development of Saltbush. They include helping farmers with site selection, planting, monitoring growth, introducing holistic management principles for the land holders and tying it all together in an education package. This has been encouraged by many private farm industries as there seems minimal government involvement. Land holders will often "do it themselves" if there is a system that increases productivity while delivering a positive salinity outcome. These networks can assist land holders to help themselves. Assisting education programs is also a preferred option for government as opposed to direct funding or subsidies for projects. Education facilitates grass roots action and may better leverage private investment.[96]

RECOMMENDATION 20: The Committee recommends that the NSW Government provides assistance to farmer networks to promote successful salinity mitigation strategies through practical demonstration and education.

4.9 LEGISLATION

Under the various sections issues dealing with legislation are discussed. One of the key issues is that all legislation needs to work in a direction of delivering positive outcomes for salinity.[97] This may lead to complex legislative frameworks especially in conjunction with establishment of new environmental market structures. Clear Commonwealth and State

[96] Andrew Sipple, Grazing Management Systems, Transcript of Evidence, 26 September 2002

[97] Gumley, Transcript of Evidence, 26 September 2002

government rules and guidelines will need to be in place to inspire confidence in investment. Regulation and involvement in legislative development will need to be managed carefully to develop a rigorous comprehensive framework for salinity control. The challenge will be to keep up with technological developments in environmental understanding and valuation of environmental benefits.

Stipa suggested, in their submission, [98] that the *Native Vegetation and Conservation Act* needs to be amended. Currently, the Act has adverse outcomes on the adoption of native grasses on farms. Farmers are concerned about increasing the portion of native perennial grasses in their pastures to reach levels higher than 50 per cent as these grasses are then protected under the *Native Vegetation and Conservation Act*. As a result, they avoid using native grasses. Land holders are also concerned about ensuring the land is tilled inside of a ten year period because if it is left unused it then becomes protected under the Act and may not be cleared. This tillage is simply to maintain an option to turn the land to production should opportunity arise. Greater benefit could be derived through ground water management by maintaining the vegetation until such time as a market is suitable for agricultural production again.

RECOMMENDATION 21: The Committee recommends review of the *Native Vegetation and Conservation Act* to avoid adverse outcomes for the management of salinity.

4.10 NO-TILLAGE FARMING

This is an agricultural management technique that is found to improve water management in soils and contribute to better ground water management. By not ploughing after a harvest, moisture is retained in the soil for the next season. As a result, the organic content of soil is maintained which then facilitates better moisture holding capacity of the surface matter. Ploughing exposes the soil to wind and sun. Leaving stubble in the ground in a no-till situation keeps the moisture in the soil. The remaining organic matter reduces recharge. The moisture retention also enables farmers to weather droughts due to the increased moisture in the soil. In the current drought, several farmers have found, if they had conventionally farmed, they would have no productive crop currently in the ground.

A disadvantage is that disease can build up in the stubble. To avoid this, farmers should utilise crop rotation techniques and treat for weeds. Another advantage some farmers have found is that there is a reduced labour requirement as there is no need to plough. It has also increased the frequency and timeliness of sowing. However, there may be an increased use of herbicides to keep weeds under control but it is cheaper to spray than it is to plough. Some soil types do not lend themselves to no-till techniques. Government may assist in development of this opportunity through investigating suitable conditions, sites and options. Through assisting farming networks and facilitation of information dissemination this technique may become more widely adopted.

4.11 PASTURE CROPPING

While this technique is not strategically a salinity mitigating option the higher utilisation of ground water for increased production is a business opportunity that will likely reduce recharge. Pasture cropping means to establish wheat crops directly into the pasture that is then harvested before it is required for use for grazing. This increases the productivity of the

[98] Daryl Cluff and Colin Seis, Stipa Native Grasses Association, Transcript of Evidence, 27 September 2002

land with very little opportunity cost. This system is not widespread but may be adopted in areas where conditions are favourable and is likely to reduce the rate of recharge. It requires careful management and timing of crop establishment and livestock rotation and is more successful in higher rainfall zones. However, as there is little opportunity cost for some farmers it is a business opportunity that increases revenue for grazing land and potentially increased carrying capacity for grazing. The increased organic content can facilitate the same advantages as no-tillage farming through increased moisture holding capacity of the surface layers of the soil. Further information on this opportunity and education through successful demonstration sites could lead to wider adoption.

The drawbacks are the increased management required, careful grazing of livestock (which may run hand in hand with a rotational grazing regime) and equipment for crop management. Where these factors currently exist, this business opportunity may prove lucrative to land holders in productive cropping zones.

These systems may be assisted by Government through further identification of where these systems will best work. Development of demonstration sites through farmer networks and education may facilitate wider adoption. Promotion through extension services of DLWC and the NSW Agriculture to demonstrate the increased productivity and profitability should avoid the need to subsidise or provide direct funding.[99]

RECOMMENDATION 22: The Committee recommends that future pilot projects to measure environmental services include the use of no-tillage farming and pasture cropping to reduce recharge to groundwater.

4.12 OTHER GRAZING AND CROPPING OPTIONS.

Stirzaker et al. (2000) and others suggest a revolution in land use and farming systems including:

- opportunity cropping (rotations of winter and summer crops that are sensitive to soil water);
- phase farming (alternating phases of crops and lucerne);
- companion farming (over-sowing annual cereals into perennial forages/pastures);
- new agricultural plants;
- perennial pasture;
- high rainfall tree products;
- low rainfall tree products and revegetation with native woodlands and forests; and
- agroforestry.

Some of these options are more beneficial than others in controlling ‘leakage'. Some are available now, while others require additional research needed to determine which tree-crop-pasture mixes can reduce ‘leakage' to acceptable levels and continue to generate

[99] Grant Stuart – Hearing Sep 26th 2002; Colin Seis and Daryl Cluff, Stipa 26 September 2002

attractive farm and community wealth. The appropriate siting of two or more of the above options within a catchment (taking account of soil type and landscape position) may have a beneficial multiplier effect for salinity management. The ability to complement one another increases productivity and reduces risk.

4.13 FORESTRY

Forestry is a key method for reversing dry land salinity and can be used in both recharge and discharge areas. In most instances, it is recognised as mitigating recharge by intercepting water before it reaches ground aquifers. The Committee learned that establishment of trees shares many other benefits beyond amelioration of soil salinity and that these benefits should be included in the valuation of their establishment. However, forest trade is not really among the most attractive of investments. A great deal of the problems contributing to the high initial costs are a result of acquiring land and land management agreements. As a result, the bulk of forestry investment, particularly reforestation in Australia, has been carried by governments. What governments have seen is that forests and forestry are important for rural economies. Australia has a $2 billion a year trade deficit in forest products and yet one of the most tremendous opportunities to grow trees of anywhere in the world.[100]

Conventional plantation technology

It is important to clarify, when using conventional plantation techniques, if the primary objective is to grow the most productive tree crop possible, combat a water and salinity problem, or both. In most instances, the lower rainfall zones are unfavourable to highly productive plantation crops. In several scattered regions of NSW there may well be opportunity for these systems but in most cases strategic agroforestry programs are more likely to suit land holders than forest plantations.

> *Forests fundamental value, in terms of the environmental services, dramatically outweighs their value as a pure source of commodity products like timber. But timber is the only priced commodity and so therefore it becomes impossible for private capital to be applied to addressing enhancement of environmental services. What has happened in the forestry investment model has been that the environmental services or values of forests have been treated as constraints on the timber production function rather than objectives in their own right. As long as these environmental services remain both priceless and unpriced, it is impossible for those who are involved in investment to be able to use their value as part of our investment analysis and decision making.*[101]

Infrastructure

From evidence submitted to the Committee, the development of forest projects is well suited to existing infrastructure. Grant Stuart from the Department of State and Regional Development outlined suitable sites for plantation establishment adjacent to existing timber rail infrastructure and the expansion of existing markets. State Forests material provided to the Committee indicates the current expansion of the plantation resource adjacent to existing structures.

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100 Dr David Brand, Transcript of Evidence, 8 April 2002

101 Ibid.

The opportunity to address salinity with forest projects holds hidden dangers for development of plantation resources. The gradual expansion of infrastructure to access further areas will facilitate plantation development. Grant Stuart and David Brand both indicated the importance of markets for plantation development. The question of establishing plantations before developing infrastructure holds greater risks for the land holder and forest investor. The evidence before the Committee suggests leveraging private funds is less speculative if infrastructure is initially established.

Procurement

Of the greatest cost to large-scale forest projects is the availability of land. To develop a substantial resource base it is crucial to obtain large homogenous portions of land for plantation establishment. The cost of acquiring this land may often be the most prohibitive factor. Outright purchase is a preferred option for a forest grower as it enables complete control of the estate in perpetuity. However, it comes at the greatest cost. Joint venture projects and annuity schemes are also often used to obtain the "forestry right" to a private land holder's property. These incentive schemes, while less expensive, carry their own drawbacks as they introduce complexity to management over the duration of the plantation. They may also set a revenue stream that needs to be maintained for the duration of the plantation that may prove a significant financial drain over the long term. Hidden costs also must be factored in such as ongoing management, fire protection and maintenance. For these reasons large-scale projects need to consider the full costs associated with gaining access to land.[102]

However, the business opportunity that arises from salinity is that it offers an ameliorative effect to potentially degraded sites (especially in the case of discharge). Therefore the land cost is likely to be lower due to poor productivity so the opportunity cost to the land holder is also lower. The challenge will be with farmers on unaffected land in recharge areas as they will require higher incentives than those on damaged land. This may complicate investments where there seems little salinity outcome will be achieved on site or for a long period of time.

RECOMMENDATION 23: The Committee recommends in regard to salinity tree planting proposals, that all costs associated with land procurement by Government agencies be considered including ongoing management, maintenance and fire protection under all types of arrangements.

Managed investment schemes:

In evidence provided to the Committee by David Brand, Hancock Resources stressed the need for Government to develop opportunities for investment schemes to enhance forest projects.

> *Providing they are carefully targeted, investment schemes may prove an effective way to leverage private capital.*[103]

The factors important to encourage managed investment schemes are as follows:

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102 Transcript of Evidence, 27 September 2002

103 Dr David Brand, Director, Hancock Natural Resources Group, Transcript of Evidence, 8 April 2002

1) Liquidity. *If an investor buys a forest they often have the problem that they may be sitting on these assets and trying to sell them for a long period of time. As a result, investors demand higher rates of return from forestry assets than, for example, from equity investments in the stock market. Investors expect 10 per cent to 12 per cent per annum as a return from forestry. Forestry has a lot of difficulty generating that over these very long periods of time.*

2) Risk and the management of risk. *In the forestry sector there is careful management of risk, but there is also a feeling that in the past the forestry investment sector has come up with rosy projections or overstated returns. There is a real need for transparency in regard to the disclosure of risk and returns associated with forestry assets.*

3) Cash flow*. Development of an environmental services market will likely generate cash flow for static forest investments. Investors often do not like to simply sit on asset that is going up in value but prefer to see income being generated. Forestry investments in reforestation currently, do not have any value for any of the environmental services, therefore there is no cash flow. This is a negative factor for institutional investors.*

4) Research. *State Forests and the CSIRO have undertaken trial work to identify species, growth rates, and drought tolerance suitable for production in low rainfall zones. Further work needs to continue for development of alternative markets. There is a role for government to act as a catalyst to try to create new investment structures around forestry. It is possible to undertake large-scale targeted reforestation plantings when government agencies and scientists have clear maps of critical areas requiring revegetation. This land could then be acquired or the conservation rights over that land. Under a conservation easement an investor would hold a carbon, salinity or even biodiversity right over that land. This would then create an investment that would return short-term cash flow, liquidity and an ability to create a reasonable return on equity.*

5) Tax issue. *Commonwealth government has indicated that land holders could donate a conservation easement over their land and then receive a tax write-off for loss in future revenue associated with it. This would be highly attractive to investors who would go in, to the revegetation, put the conservation easement over it and possibly resell land or leave it with the existing landowner, but holding the rights to the environmental services. That again allows the exit and allows the liquidity to occur in a way that will be positive to the investor. This may be an attractive investment framework for institutional investors. The second area is to look at tax and bringing tax benefits to investors who go into these critical areas that have been identified by governments. This may assist creating less risk and more return for the investor.*[104]

The Committee has heard that opportunities for government to tap private funding will need to be carefully managed to derive specific outcomes. While many environmental benefits can cross over one another, the market objectives should be clear and the valuation of environmental services should be tangible.

State Forests

It is often said that trees are the saviour of salinity. That is not quite right, there are certainly other activities. It is basically horses for courses. Some of the recent work by the CSIRO in particular indicates that deep-rooted perennials have a major role to play. The commercial planting of wood plantations will be another major type of activity.[105]

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104 Brand, Transcript of Evidence, 8 April 2002, pg 2

105 Bob Smith Chief Executive of State Forests, Transcript of Evidence Pg 2 8 April 2002, pg2

State Forests has secured Government funding to initiate large-scale projects of plantation establishment around its current markets utilising existing infrastructure. The organisation is leveraging the opportunities for recharge abatement to develop further plantation resource. This is the most efficient method for large-scale reafforestation and can deliver many social and economic benefits to regional NSW.

There is some degree of animosity towards these projects however, by other players in the market. Particularly those in the private forestry sector or proposing other perennial plants in direct competition with trees.

Witnesses believe that State Forests still has a monopoly over plantation establishment in NSW. While its programs are intended to fit with NSW catchment management blueprints, it is felt that there are competitive advantages held by the organisation. Private businesses have been unable to access funding for large-scale projects to get new technologies, techniques and salinity plantings off the ground.

Another issue raised by Saltgrow was the level of private forest establishment.

> *There have been no private plantings of hard wood in New South Wales for the last 15 years.*
>
> *Any plantings in New South Wales have been controlled by State Forests and that is only really on the north coast. There is nothing really happening and what impact is this going to have on regional forestry agreements in the future?*[106]

This issue is of concern to the Committee members who would like to see private forest projects adopted for recharge abatement. The apparent monopoly held by State Forests seems to be a result of the lack of incentives, large-scale restructure of the timber industry and the apparent lack of security. There are opportunities for plantings of hard wood to combine salinity abatement, hard wood timber production and carbon sequestration but intervention to encourage a more favourable environment to private investors is required.

State Forests and the Minister for Forestry have been very successful in advancing the matters for which they are responsible. However, there is a concern that there is not a NSW Government agency with a commercial interest in non-woody perennial plants and that opportunities to address salinity and sequester carbon using these plants may not be pursued as vigorously. Banks and other investors are pursuing opportunities to address salinity and sequester carbon from non-woody perennial plants but the work to underpin a methodology of offsetting greenhouse gas emissions needs to be coordinated by government. The Committee believes that there needs to be appropriate formal representation arrangements with NSW Agriculture and the CRC for Plant Based Management of Dryland Salinity to ensure that the synergies between reducing greenhouse gas and ground water are not lost.

State Forest trial salinity tree plantings - Gunnedah

State Forests has undertaken tree planting trials in Central Western NSW. The objective of the trials is to undertake an operational scale project of planted forest in the Gunnedah area in order to develop new products and environmental services markets for planted forests in priority salinity hazard areas. The areas selected are in critical recharge areas across twelve properties that are used predominantly for pasture and cropping. The project is trialing a selection of hardwood species, establishment techniques and planting densities. It

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106 Robert Prince, Transcript of Evidence, 27 September 2002, pg 5

is intended to develop appropriate and effective land procurement mechanisms/ legal agreements through which land holder participation in broad scale land use change can be achieved. It is also hoped the project will stimulate further land holder interest and commitment to forestry, both as a legitimate and profitable land-use in non-traditional forestry areas and as a viable tool for addressing the problem of dryland salinity. It is intended that the trial plantings will demonstrate an effective way to target State Government funding to achieve a range of environmental objectives while building towards a long term commercially sustainable investment framework.

Four hundred hectares of land has been procured. The site preparation has been completed and 200ha have been planted. Due to the drought the further 200ha has not been planted. The survival rate of the existing plantings has been 95 per cent. The project is due for completion in 2004.[107]

Limitations

In a recent study, *An Assessment of the Potential for Plantation Development in New South Wales,* ABARE and BRS noted that timber of a sufficient commercial quality and quantity could not be derived from non-traditional plantation areas to justify the development of plantations or processing facilities. Thus, the commercial and non-commercial benefits (such as carbon sequestration, salinity mitigation or environmental amenity) of establishing plantations would have to exceed the total development cost to be economically viable. These costs include the opportunity costs of agriculture, as well as the establishment and management costs of the plantation development.

These factors contribute to the necessity to value other environmental benefits that these projects will deliver over the longer term. Policies that run counter to these initiatives should be addressed so they are more strategically effective. Wayne Gummley of the Department of Business Law and Tax, Monash University indicated that many policies currently exist that contribute to problems such as land clearing, unsustainable agricultural practices, and flood irrigation. If these disincentives were valued in an environmental sense they would far outweigh the initiatives to improve the situation. Issues such as concerns held by land holders over the long term stability of policy on private land and their “Rights to manage land and water” have contributed to adverse outcomes. Land use management to suit policies that were intended for another objective moves away from salinity objectives in some cases. By improving these policies this would remove limits on what new programs can achieve.

Secondary markets

Saltgrow, a private forest company involved in saline forestry, and David Brand both raised an important issue for most forest projects, which is a secondary market for investors. Both State and Federal governments are looking for private investment to help address the salinity problem. In evidence to the Committee Robert Prince indicated:

> *If you are going out there and planting trees for salinity abatement, you are there for the long haul as an investor, for 20 years until you get to maturity. If you go out and buy a property as an investment property you can sell that after a few years. One of the big problems and turn-offs to investors is the 20 year investment time frame rather than*

[107] Sue Salvin, State Forests, Submission No. 13

> *saying I have an option out I can sell it to someone else at seven years, I am going to turn the secondary market.*[108]

Options such as these are likely to encourage further investment as the long term commitment of capital will no longer be a barrier as investors can sell earlier. As stated by David Brand:

> *It is fundamental to business to develop investment products that will be attractive to investors in environmental services. The first issue we have to overcome is liquidity. If you go out and buy stock on the market, BHP for example, and pay $11 or $12 or whatever it is trading for today, you can turn around five minutes later and sell it back into the market. That is perfect liquidity. If you buy forests you often have the problem that you may be sitting on those assets and trying to sell them for years.*[109]

Products from wood, other than timber

- **Oil Mallee**

Large-scale revegetation of catchments is needed to significantly reduce salinity. However, there are few plants which can be profitably grown on a large-scale. Oil Mallee is a plant being grown on a large-scale in Western Australia. The natural solvent potential of eucalyptus oil is an attractive business solution because it has a large potential market volume. Additionally, Oil Mallee has the potential to provide large volumes of low cost wood and residues for other products. It is amenable to extensive production systems used currently in agriculture. However, it needs to be close to a processing facility due to the cost of transport. It can be grown in short rotations, has multiple product options, is compatible with present agricultural products and has the advantage of being a native species.

Oil Mallees are established in belts on cleared farmland to achieve high levels of productivity. Growth rates of between 10-20 green tonnes per year are possible in regions with less than 300mm rainfall per year. In addition, there is significant additional growth in the underground stem (lignotuber) and root systems. Oil Mallees can be harvested initially between four to six years of age and then every two to four years depending on species, location, soil type and rainfall.

The planting of Oil Mallees in belts enables mallee crops to be integrated into traditional agricultural practices without detriment. Experienced Mallee growers have been able to configure their plantings so that there is no impact on cropping or grazing operations. Oil Mallees are, in most circumstances, unpalatable to stock and therefore do not require expensive fencing.

The WA Government intends to establish a possible nine integrated mallee processing plants across the wheat belt of WA. It is an estimated investment of $400M in Mallee crops and infrastructure. These processing plants would take 900,000 tonnes of Mallee feedstock that could be produced from approximately 90,000ha. This is 0.6 per cent of the WA wheat belt and quite small in relation to the scale of planting required for recharge control.

These opportunities may also exist for NSW, however, some lessons from the WA experience may be learned first. Currently only one of the nine plants is operating and while farmers have begun establishing plantations, technical difficulties with harvesting machinery

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[108] Robert Prince, Saltgrow, Transcript of Evidence, 27 September 2002, pg 5

[109] David Brand, Transcript of Evidence, 8 April 2002, pg 3

have meant delays in accessing some of the over-mature resource. Once the trees have grown stems of substantial thickness they are no longer appropriate for this market. There is currently little alternative so farmers have stands of trees that they are unable to sell. It is important in this situation that there is a market for the resource before full processing capacity comes on-line. One of the main alternatives is cogeneration and bioenergy.

4.14 BIOENERGY REVEGETATION: LARGE MARKETS FOR WOOD

CSIRO Land and Water, in a report *A Revolution in Land Use*[110] believes that salinity can only be addressed through extensive tree planting to bring leakage of rainwater below the root zone of plants back to levels similar to that of the original native vegetation. Extensive tree planting in low rainfall (400 – 700mm) areas is seen as potentially the most effective way of addressing salinity. The report points to the lack of markets of sufficient size and value for these products as the major obstacle to tree planting. The size of the markets needed are very large as indicated by John Bartle (Western Australia Oil Mallee project), in his presentation to the Committee.

Energy and transport fuels are potential markets large enough to support significant revegetation. However, there would need to be a significant commitment by governments to replace the use of fossil fuels with biomass over a period of time. This would be on a 'nation building' level.

Barney Foran, Manager, CSIRO Resource Futures Group put to the Committee during a seminar on 8 April 2002 that in the next 10 or 15 years Australia will hit the plateau of cheap oil availability.

> *Over the next 10 or 15 years we will start sliding down the other side of the plateau of cheap oil availability. This prediction is based on the key availability of oil.*[111]

As a result opportunities for methanol, ethanol and alternative fuels that may be derived from plantings on recharge areas may become more economical. Production of trees for biomass would also become more commercially viable for farmers. The result would be extracting products with higher value from the wood and having biomass as a secondary income stream.

Benefits of using biomass

The use of biomass for energy and transport fuels has multiple advantages:

- Reducing salinity;
- Energy generated from biomass does not add to greenhouse gas levels;
- If biomass power displaced 1000 megawatts of electricity from coal-fired power stations net carbon dioxide emissions would fall by 7.4m tonnes a year nationally.
- Increasing energy security (ie less reliant on imports)
- Biomass residue contains no sulfur (cause of acid rain);

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110 http://www.clw.csiro.au/publicity/70445.pdf

111 Barney Foran, Transcript of Evidence, 8 April 2002 at p.1

- The ash left is non-toxic and can be used as a soil conditioner;
- One of the lowest cost renewable energy sources;
- Trees planted for energy crops also reduce erosion and increase biodiversity
- Waste wood can also be used in power plants reducing land fill and burning off;
- Regional jobs in construction, production harvesting and transportation of the fuel because growth in electricity demand can be better matched by small biomass plants than a centralised power station. The capital requirements of small plants are less, the need for transmission lines is reduced and so are electricity losses in transmission.
- Valuable co-products such as resins, fertilisers and activated carbon which can improve the economic attractiveness of biomass.[112]

Currently biomass is less energy efficient and more costly than fossil fuels but the USA is working on technological advances, which may make biomass more competitive. Ultimately, as fossil fuel deposits decline and extraction becomes more expensive, biomass will become competitive.

Barriers to the wider scale use of biomass energy are:

- Competition with low cost natural gas;
- The need to develop dedicated energy crops; and
- Concern that lack of energy crop diversity could make soil less fertile.[113]

The main market drivers for biomass. Are these markets subsidised?

Main market drivers have been greenhouse gas reduction, job creation, industry development, energy security and self sufficiency, management of wastes, local environmental outcomes, improvement of animal habitats and biodiversity. Bioenergy, like several other renewable energy sources, is generally more expensive than fossil fuel energy. Market incentives and production subsidies have often been used to initiate the renewables industry overseas. In addition bioenergy receives indirect financial assistance wherever agricultural and/or forestry production is subsidised, as prevails in Europe and the USA. In the UK there has been the NFFO (Non Fossil Fuel Obligation) program which provided subsidised power purchase arrangements. Although this scheme has now been superseded, a number of bioenergy projects are still in the development pipeline. These include a number of projects based on biomass pyrolysis oil.

Green Power schemes, where electricity consumers are invited to pay a premium for renewable energy with prequalified environmental attributes have been developed in several places around the world. A Green Power scheme is now operating in Australia. These schemes are not subsidised, as consumers volunteer to pay a premium for Green Power.[114]

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112 NREL, Biopower Fact Sheets, 2001, Bioenergy Australia, Biomass Energy and Products, June 2000

113 NREL Facts, December 1998

114 Steven Schuck, Bioenergy Australia, Transcript of Evidence, 5 September 2002

NSW government developments to facilitate biomass using forestry or grasses as feedstock.

There is currently poor recognition of the merits of bioenergy in Australia and New South Wales. One of the greatest difficulties being experienced with bioenergy at the present time is the onerous nature of the regulations as they pertain to solid biofuels. Specifically, the Regulations under to the *Renewable Energy (Electricity) Act* (Commonwealth), which implement the Mandatory Renewable Energy Target, effectively preclude the development of dedicated tree energy crops for bioenergy. As the Regulations and their interpretation stand, tree energy crops are covered under plantations, where only wood waste is permitted for generating Renewable Energy Certificates. A higher value product is required, with bioenergy being only a secondary product. As a result dedicated tree energy crops cannot directly obtain Renewable Energy Certificates. Similarly, the Regulations require energy crops to be established primarily for energy, and ignore the multiple benefits of bioenergy, such as possible future salinity credits, eco-credits and the like. It is suggested that the NSW Government play an active part in rectifying this anomalous situation during the Mandatory Renewable Energy Target (MRET) review, set to commence on 18 January 2003.

Where trees or grasses may be grown as a salinity remediation measure, also producing timber and/or biomass for energy, the availability of financial incentives could make a considerable difference to the financial viability of bioenergy projects. However, such a measure may not, of itself, be sufficient to satisfy the above mentioned "higher value" test under the MRET.

It is suggested the NSW Government plays a more active role in bioenergy development through its policies, programs and agencies. It could establish specific bioenergy development positions in its relevant agencies. It is noted that State Forests NSW, SEDA, Delta Electricity, Macquarie Generation, Pacific Power International, Country Energy, Waste Service NSW, Resource NSW have been involved in Bioenergy Australia, a national forum on bioenergy. It is suggested the NSW government take the initiative through its various agencies to set up a large-scale bioenergy demonstration project with stakeholders, in an appropriate area of NSW (Murray Darling Basin), to develop and encourage bioenergy as a salinity mitigation measure.

Government should provide research support for bioenergy for salinity mitigation. This could be administered through the Sustainable Energy Research and Development Fund (MEU) which appears to have ceased active funding in recent years.[115]

RECOMMENDATION 24: The Committee recommends that the NSW Government establish specific bioenergy development positions in relevant NSW Government agencies.

RECOMMENDATION 25: The Committee recommends that the NSW Government work with the Commonwealth Government to review the *Renewable Energy Regulation* to include trees in the definition of renewable energy crops and to amend the high value test on plantations.

[115] Stephen Schuck, Bioenergy Australia. Response to Questions on Notice, 13 September 2002

RECOMMENDATION 26: The Committee recommends that the NSW Government take the initiative to set up a large-scale bioenergy demonstration project with stakeholders, in an appropriate area of NSW, such as Murray Darling Basin, to develop and encourage bioenergy as a salinity mitigation measure.

4.15 ENGINEERING WORKS

Another salinity business opportunity stems from improved recharge management through engineering and drainage systems. The Committee visited several sites demonstrating examples of these opportunities. NSW has not adopted these systems widely but recognises their potential. Engineering methods that intercept surface water through banks or shallow drains can be used for recharge control. Good quality water harvested by pumping or water diversion can be reused elsewhere on a property for irrigation or stock watering.

Engineering options fall into two broad groups: the fairly simple, largely on paddock surface water management measures (e.g. banks, drains) and the more expensive, often larger area measures (e.g. deep drains, sub surface drains, pumps, interception and diversion systems).

Surface water management to control flows for erosion and waterlogging and harvesting water on farms have been common features of many regions and offer opportunities for removing surface water before it can contribute to recharge. These measures along with more innovative opportunities such as raised bed farming in saline sites are a feature of farming systems particularly in Western Australia.

The more classical engineering options using ground water pumps, deep drains and interception and storage/disposal structures have been limited mainly to irrigation areas or areas where water resources are being threatened. The high cost of establishing and operating these technologies means that they are applicable either to protecting high value assets, or where it is necessary and economically viable to extract ground water for industry development. Where ground water is 'fresh', it might be used to support industries such as intensive horticulture; where saline, it might be used as the resource base for new and emerging saline industries.[116]

In general, the application of these engineering options is limited by the permeability of the ground water flow system being pumped or drained, although where high-value assets need protecting, it will usually be technically feasible, although sometimes costly, to implement these options.[117]

4.16 DRAINAGE SYSTEMS

Many engineering systems are geared towards discharge sites. They, as yet, have not been adopted on recharge areas at a more regional scale. On a single land holder's property, such solutions as, better drainage systems may be implemented in recharge areas to ameliorate discharge sites. These are areas where there is clear local cause and effect to groundwater movement that allows more simplistic schemes to work. In regions of

116 PUR$L, Conference, Fremantle, Western Australia, 16 to 20 September 2002

117 http://audit.ea.gov.au

extensive recharge, the use of efficient drainage systems may permit better groundwater movement and avoid excess build up in aquifers some distance from the area of recharge. The challenge is to identify where these systems will yield the greatest benefit and to implement incentives for farmers where the benefit will otherwise only be derived by outside parties.

Improved drainage systems may be as simple as clearing drainage lines of debris to improve flow. Increasing the depth of drainage lines to facilitate ground water interception is a basic technique adopted in Western Australia by many private land holders. However, there is much yet to be understood of whether the benefits do merit the cost of construction. There is debate in Western Australia that drain construction is often put forward as the immediate solution to the salinity problem while there is still much to be understood about the off-site impacts. The greatest problem is the transfer of water to the next site, which then may not have the infrastructure to manage the increased flow.

It is important to establish a complete system for drainage to avoid movement of problems from one site to another. This requires more comprehensive planning and cooperation amongst land holders towards a common goal. Legislative support for development of these systems may assist implementation and provide a regulatory instrument to control development. In WA there have been a number of incidents where land holders, requiring minimal permission to undertake drainage works, have actually increased salinity problems by changing ground water flows for the benefit of their own portion of land. Many of these issues relate to discharge areas but are contributed by recharge movement.

The Committee identified from its study tours that typical recharge engineering works intercept surface flows. One technique used was mounding which diverted flow away from areas where water concentrated. It is often used in conjunction with drain systems and may be effective in local systems. The problems raised by this method is where the diverted flows will concentrate and whether this system will work across the landscape. This may also be a method successfully adopted with careful regulation and strategic planning.[118]

4.17 ENVIRONMENTAL SERVICES SCHEMES [ESS]

At the time of writing, the NSW Government was receiving expressions of interest from landholders for 20 trials under the ESS. The scheme is in its infancy and these trials are intended to provide data on the environmental outcomes of different types of land use change in different landscapes. Reduction in salinity is one environmental outcome being sought.

The environmental outcomes will help the NSW Government put a value on different types of land-use change in different landscapes. The ESS scheme will value environmental services. The NSW Government hopes that there will be buyers of these services. Irrigator groups may, for instance, be willing to pay for services higher in the catchment which improve the quality of water coming into irrigation districts, thereby cutting their costs for salinity control.

Saltgrow stated in evidence that both at State and Federal level, the model for environmental services, currently being trialed, will not show any end result or benefit in the

118 PUR$L Conference, op cit

near future. Robert Prince stated, *it is really a model on how to put the scheme in place for tracking expenditure*.[119]

However, DLWC believe the pilot scheme will put a value on many environmental benefits, public and otherwise, that may be adopted in long term future markets. The NSW ESS will value environmental services by putting an economic measure on environmental gains. It will also put a value on bundled benefits.

> *We are in our infancy with this at the moment. People talk about salinity markets and biodiversity markets. Basically they are at an opportunistic or boutique level at the moment. There are no broad-scale markets available for those products. Carbon is probably the closest.*[120]

Questions such as "Can trees be used to achieve three outcomes (economic, environmental and social) effectively and still make someone a profit?" will be answered by this project. It is based on land use change but may also explore the options of paying farmers to take land out of production**.**

Europe ESS

ESS, referred to in the European Community as agri-environment schemes, have operated in the UK since 1985. The schemes are set to expand as direct production subsidies from the European Union are progressively dismantled and the funds redirected into rural development, including payments to farmers for environmental services.

European ESS policy context

Agri-environment schemes in Europe are a response to agricultural overproduction and environmental degradation related to intensive farming practices. Agricultural overproduction is a consequence of the European Union policy of price subsidies for agricultural products. Food surpluses are causing farm incomes in the UK to fall, even with price subsidies.

To respond to these challenges, the European Union is pursuing a policy of diversification of farm incomes to move away from a dependency on food crops and livestock. The European Union from 1992 onwards has also been supporting sustainable farming and has recognised the need to progressively dismantle payments to farmers based on production levels.

Agri-Environmental Schemes

Agri-environment schemes pay farmers for delivering a public benefit, as distinct from, and a step beyond, 'duty of care' or compliance with minimum environmental requirements. The aid is paid annually and calculated according to the income lost and additional costs of the undertakings, as well as the need to create a financial incentive.

These schemes address environmental problems and provide farmers with a secondary income for providing environmental services.

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119 Prince, op cit, at p.5

120 Bob Smith Director-General DLWC and State Forests, Transcript of Evidence, 8 April 2002, pg 1

The European Union report *Agriculture, Environment, Rural Development, Facts and Figures: A Challenge for Agriculture* (July 1999), states:

> *The general idea underlying these considerations is that farmers should observe a certain basic level of environmental practice as part and parcel of support regimes. But all environmental services beyond this basic level of good agricultural practice and compliance with environmental legislation should be paid for by society through agri-environmental programs.*[121]

UK Environmentally Sensitive Areas and the Countryside Stewardship Scheme

These schemes provide farmers with a payment for environmental services of benefit to the public. The services delivered under these schemes are creation and maintenance of wildlife habitat, protection and restoration of heritage features, maintenance and restoration of attractive landscapes and public access to farmland for recreation.

The schemes are voluntary and competitive. Farmers and non-farming land owners such as local authorities submit an application for a ten year agreement which is given a score.

♦ Issues and Future Directions

These schemes are popular with land holders because they provide a predictable income and a reasonable degree of flexibility through tailored agreements. The Countryside Stewardship Scheme was 100 per cent oversubscribed and even after a significant budget increase in 1999, it was 30 per cent oversubscribed. Early indications are that the pilot schemes being offered by the NSW Government may become oversubscribed.

The Policy Commission on the Future of Food and Farming advocates that agri-environment schemes be significantly expanded but not in their current form. The two problems identified by the Policy Commission with the UK's approach were that:

1. it was administratively costly; and

2. unsuited to addressing broader environmental issues such as water quality.

Their critique is instructive for the NSW Government which appears to be embarking on a model which is also tailored and focuses on high priority areas identified in Catchment Management Blueprints in much the same way that the Countryside Stewardship Scheme focuses on county targets.

1. Administrative costs

The Rural Development Regulation (the European Council issued the Rural Development Regulation which provides financial support for implementation of rural development by the European Agricultural Guidance and Guarantee Fund) grant funding for the UK for 2001/02 was £189.4M. Of this, around 25 per cent was spent on administration. Around a third of the budget of the Countryside Stewardship Scheme was spent on administrative costs.

These schemes are costly because they are tailored to individual farms and require extended site visits, intensive free advice and monitoring. These services are delivered by the Rural Development Service from regional offices. The Service negotiates and manages

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121 European Union Report, *Agriculture, Environment, Rural Development, Facts and Figures: A Challenge for Agriculture,* July 1999 at p.1 (europa.eu.int/comm/agriculture/envir/reort/en/intro_en/report.htm)

agreements, deals with compliance issues and processes claims for payment. There is a strong need for audit trails and regional offices must keep records of payments. Dealing with amendments to agreements is particularly time consuming. The Rural Development Service also provides technical advice to agreement holders and runs a demonstration farm program. This constant source of advice by familiar staff is popular with farmers. The Policy Commission on the Future of Food and Farming said:

> *Schemes like the existing stewardship programmes are probably the best way to target specific, tailored prescriptions at particular areas of value. But because of the invariably high overheads they would be a very expensive way of handling a bigger throughput of spend.*
>
> *… we believe the case is strong for a more broadly based approach which, as it rolls out, will get much larger numbers of land managers involved and will encourage good environmental practice across a much wider area than those habitats and designated parts of the countryside that current schemes embrace. There are pressing environmental problems in the countryside, and some of them – poor water quality, general loss or degradation of landscape features and archaeological sites, loss of species like the brown hare in western England, the skylark everywhere and the cornflower almost to the point of extinction – will not be solved by protecting isolated islands of countryside.*[122]

2. UK reform of ESS's to address broader environmental issues

The Policy Commission has recommended what is being referred to as a 'broad and shallow' scheme that a new proposal would bring together environmental management systems for all farms in Britain with agri-environment schemes. The aim of the model is to ensure that all farmers across Britain meet minimum levels of natural resource protection and conservation required by existing and forthcoming legislation as a foundation which can be built upon. There are three broad levels under this proposal.

Level One: Minimum Compliance

This would involve whole farm environmental plans and an audit. The audit would cover natural resource protection issues and conservation issues. It would examine the farm against existing and forthcoming environmental legislation on resource protection. It would provide farmers with information about their environmental obligations and would signpost farmers not in agri-environment schemes to participate to their advantage. Farmers would be given a one-off payment for the whole farm plan and audit.

The audits would build up a picture of the environmental assets and compliance gaps across the country as a whole. By identifying gaps in compliance the model could reduce the amount of regulation. The Environment Agency, as regulator, would be able to take a risk assessment approach, working with farmers whose audit showed they were likely to have difficulty complying with environmental legislation and leaving the rest to self-regulate. Self-regulation would be backed by a system of random audits to a proportion of farms with heavy penalties for those who fail to meet the requirements.

Level Two: Basic Stewardship

Farmers who pass the audit will be eligible for a new basic tier of stewardship.

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[122] Policy Commission on the Future of Food & Farming, *Farming and Food: A Sustainable Future*, January 2002 at p.79

The Policy Commission advocated that the new entry level tier would:

- be whole farm based;
- be simpler and less expensive to operate;
- have lower payment rates;
- have simple targets which can be monitored without a bureaucracy;
- measure compliance, wherever possible, remotely such as through satellite technology;
- not be a competitive process as this is inappropriate for mass take-up, costly to farmers applying and requires considerable administration.

Currently, under UK ESS schemes, farmers are paid different rates of management costs for different management options on different landscape types. The Policy Commission recommends that a flat rate per hectare be paid. Although different rates could apply to different regions and farming sectors to bring a measure of targeting and recognising varying levels of cost.

In return for payment, farmers would have to engage for at least five years "*in a menu of simple but effective environmental management practices across the farm".*[123]

Details of the farmer's chosen options would be marked up by the farmer on the map prepared as part of the audit. The decisions on how to implement the options on the ground would be left for the farmer to decide in consultation with environment agencies. High quality advice would be available to farmers to assist them. Farmers who had already implemented the requirements of the basic stewardship level would be eligible for payment. The Policy Commission says:

> *Such a scheme would reward existing good management, responding to farmers' complaints that the current stewardship schemes are biased against existing good performers by paying only for the creation or recreation of new features.*[124]

Level Three: Advanced Stewardship

The existing agri-environment schemes, which focus on special environments, would form the upper tiers of the new single stewardship scheme. The Policy Commission recommends that the current funding levels of the schemes are maintained for the upper level tiers.

Lessons for NSW

The lessons from the UK are timely for the NSW Government which is currently piloting it's ESS. The Policy Commission's recommendations to use whole farm plans and audits as the foundation for environmental services payments is well worth noting. The Policy Commission has found that highly tailored schemes are not suited to addressing broad environmental problems like water quality. Salinity is a broad environmental problem. The complexity of management, administration and bureaucracy required to implement such tailored schemes reduces their capacity to deliver.

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123 Policy Commission on the Future of Food & Farming, op. cit, at p.83

124 Policy Commission on the Future of Food & Farming, op. cit, at p.84

The Commonwealth and State Governments are currently identifying what the role for government should be in facilitating environment management systems. The Environmental Management Systems Working Group released a discussion paper, *Towards a National Framework for the Development of Environmental Management Systems in Agriculture* in November 2001.

Australia does not have the burden of high levels of agricultural production subsidies like the European Community. However, the dismantling of the production subsidies provides the European Community with a source of funding for agri-environment schemes. Australian governments would have to find a new source of funding if they wanted to establish a "broad and shallow scheme" like that proposed for the UK.

RECOMMENDATION 27: The Committee recommends that the NSW Government take account of comments by the Policy Commission on the Future of Food and Farming about environmental services schemes in the UK and avoids the use of highly tailored schemes which have high administrative costs.

4.18 ENVIRONMENTAL MANAGEMENT SYSTEMS [EMS]

Establishing EMS on farms to progressively improve the environment can be a business opportunity for farmers through obtaining higher prices for accredited produce and through better market access.

Australian State and Commonwealth governments are examining EMS as a possible approach to addressing environmental problems at farm level. These solutions are agronomic, however farmers are unable to afford all costs associated with land use change. Essentially, the price of food in supermarkets does not incorporate the cost of the environmental goods used to produce the food. Commonwealth and State governments are currently considering what role government should play in facilitating EMS in Australia. The NSW Government's Liverpool Plains Pilot Project is looking at linking EMS with market based incentives in order to bring about landuse change.

This Pilot Project is:

- developing and evaluating cost sharing mechanisms; and
- undertaking market research to assess the effectiveness of linking EMS and the implementation of specific landscape based management options to incentives provided by the market.

Di Bently, of the Liverpool Plains Pilot Project stated:

> *In quantifying the actions of the projects we have tried to look at the difference between the current and the planned conditions. What is the gap between those two? Where does the broader community benefit as opposed to the benefits that stay on the farm for the farmer undertaking the works? We are attempting to value and put a price on those things, and one of the mechanisms we use in the Liverpool Plains is natural resource auctions.*[125]

[125] Bently, Liverpool Plans Management Committee, Transcript of Evidence, 8 April 2002, pg2

EMS is much further developed in Europe, where major supermarket chains have come together to require that fresh food suppliers which want to trade with them implement EMS. Europe provides a case study of market based approaches to EMS.

The Natural Resource Management Standing Committee Discussion Paper*, Towards a National Framework for the Development of Environmental Management Systems in Agriculture* provides the following definition:

> *Environmental management system (EMS) is a generic term used to describe any systematic approach used by an enterprise or organisation to manage its impacts on the environment. The system identifies environmental impacts and legal responsibilities, then implements and reviews changes and improvements in a structured way. An EMS provides a management framework that achieves continuous improvement through a 'plan, do, check, act' cycle …. within which best management practices can be integrated, and codes of practice upheld. An EMS can be externally audited and may be certified to international, ISO 14001 standard. An EMS may also be readily integrated with other existing activities such as quality assurance.*[126]

Economic benefits of EMS

EMS can be a business opportunity through:

- Market access;
- Product differentiation; and
- Premium prices

EMS can also be a requirement of entry into schemes where the government pays farmers to deliver environmental services.

Product Differentiation

Implementation of EMS by producers, allows supermarkets to advertise their products and their image as environmentally sound and safe for consumers. In Europe the focus is on products which are free from pesticides and genetically modified plants. Products may also be differentiated on the basis of 'clean, green' home brands or 'clean, green' regional products. However, opportunities exist for salinity in the same way.

Banrock Station Wines from South Australia advertise that a percentage of their sales are spent on restoring the environment around their vineyards. The property with its restored wetlands is also an eco-tourism destination.

Product differentiation is assisted by the use of eco-labels such as logos which consumers can identify. The Natural Resource Management Standing Committee Discussion Paper says that an eco-label is:

> *… designed to enable products to be differentiated as more environmentally friendly than other similar products. If such an eco-label is to maintain market credibility, it needs*

126 November 2001, at p.6

a process that validates the claims made – a certified and audited EMS could provide that assurance.[127]

Premium Prices

In theory it is possible to obtain premium prices for goods which carry an 'eco-label'. However, in the UK farmers are not receiving higher prices from supermarkets for implementing an EMS. This means that they are having to absorb the costs of implementing EMS on their properties. Sainsbury's supermarket acknowledges that compliance is costly. Membership of the Assured Produce Scheme alone is £250 for farmers in the UK and £1,000 for farmers overseas. Membership is required for an audit. Compliance may also involve costs such as building new pesticide stores.

The lack of premium prices and absorption of costs is a contentious matter. There has been some concern by farmers, environmentalists and others that supermarkets are using their market position unfairly.

The Green Party in its response to government consultation on farming says:

> *The agricultural sector is unique in that it has tens of thousands (billions worldwide) of small producers of raw resources, but extremely concentrated ownership of seed merchants, traders, processors and retailers. Only a very small slice of the value of the finished product ends up in the farmer's hands. … Four British supermarket giants share between them some 70 to 80% of the market in many products. The democratic and legal frameworks to regulate these giants in a globalised economy do at present not exist. (Green Farming in a Green Land.*[128]

The Policy Commission on the Future of Food and Farming commissioned by the UK Government says:

> *Over 95% of people do their main shopping at a supermarket, and there are no signs that this is going to change in the near future. The trend to consolidation gives supermarkets, food service chains and major processors significant influence both over consumers and farmers. They will use this power to require higher, more consistent standards from producers- at lower prices.*[129]

The delegation was informed by Committee staff at the House of Commons that British supermarkets had recently been investigated by the Competition Commission regarding their pricing policies and their reluctance to enter into long term contracts with growers. This means that growers may have to plough in a field of vegetables because an order has been cancelled.

Sainsbury's supermarket confirmed that they do not pay farmers premium prices for complying with EMS. Sainsbury's, however, argues that they are expecting no more than a good grower should do and that the implementation of their protocols is a due diligence exercise.

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127 Environmental Management Systems Working Group, *Towards a national framework for the development of Environmental Management Systems in Agriculture*, November 2001at p.31

128 www.greenparty.org.uk/reports/2001/agriculture/greenfarm/htm, accessed 29 May 2002

129 Policy Commission on the Future of Food & Farming, op cit, at p.16

Sainsbury's prefers to buy British and argues that by doing so it is already paying premium prices. Since British farmers cannot compete with the cheaper prices offered by developing countries turning to intensive agriculture, British farmers must compete on quality and environmental critieria if they expect Sainsbury's to continue to source products from them.

The experience in the UK suggests that there can be difficulties if EMS is left entirely to the market because of the strong market position of supermarkets relative to farmers. Some degree of government intervention in an umpire role may be necessary to ensure that if supermarkets receive premium prices some of the benefits do flow back to farmers. The government may also need to ensure that farmers are not expected to absorb costs beyond those consistent with a basic environmental duty of care. An alternative approach may be for farmers to form growers groups to negotiate with supermarkets.

It is less likely that an environmental problem like salinity could be addressed through consumer driven approaches to EMS. Governments may need to play a larger role. It may be possible to link EMS to market based incentives.

4.19 MARKET MECHANISMS

There is a lot of development yet to occur to increase the market structures that may leverage private capital for salinity abatement opportunities. The NSW Government established a Salinity Experts Group to specifically look into this issue. For market mechanisms to work there is a need to:

- Provide incentives for producers and consumers to take account of the implications of their actions on the environment;
- Allow freedom to choose the best way of contributing towards the achievement of better natural resource management outcomes given their individual circumstances;
- Enable least cost solutions to be applied; and
- Encourage the search for and application of better and cheaper means of maintaining and improving environmental quality.[130]

Barriers to Market Mechanisms

The complexity of market development is a major barrier to wide-scale business opportunities. It is unlikely that investors will risk investing capital in market mechanisms until some the current uncertainties are addressed. Currently some major barriers to tapping these financial resources are:

- Lack of infrastructure;
- Transport and freight costs;
- Markets and processing facilities; and
- Federal legislative framework which limits growth and market development.

130 Salinity Experts Group: Report on Market-Based Instruments, September 2000

All of these barriers are under consideration to develop salinity mitigation business opportunities. The removal of these barriers is where government can play a major role through development of industries with supporting infrastructure that may become a market opportunity for land holders in the region. Legislative backing to support new structures will also reinforce these opportunities for wide-scale adoption.

Conditions necessary for Market Based Instruments and Investment Vehicles to Work

The Committee was informed that there are a number of conditions which need to be satisfied in order for an effective market in salinity trading to develop. In designing market instruments for salinity it is important to adopt a pragmatic approach that addresses issues at a regional level and does not rely on overly sophisticated and costly trading, monitoring and financial frameworks.

1. Clear goals and targets with appropriate Legislative backing

Salinity goals and targets will be an integral part of designing and establishing trading schemes within agreed boundaries. The NSW Government's Salinity Strategy will provide the basis for determining specific salinity targets for defined regions in terms of: salinity concentration (expressed in Electrical Conductivity EC units); salt loads (expressed as tonnes per year) and area affected by salt. Such targets will form the basis for establishing credits and offsets that will underpin trading schemes. In cases where the current salinity levels are above the desired targets, a set of targets declining over time needs to be established. To ensure the validity of credits, emissions or resource use targets will need to be underpinned by appropriate regulation.

2. Accurate and sufficient data

Accurate and sufficient physical and financial data are needed in order to assess whether trading will achieve desired reductions in salinity.

Relevant physical data will include:

- Salinity measurements (in terms of concentration, loads and areas affected);
- Salinity reduction targets on a location specific basis;
- The relative impact/effectiveness of different remediation options (different agricultural practices, different species of plantations, salt interception schemes etc) on a location specific basis; and
- Mapping of groundwater flow systems (local, intermediate and regional) to assist in the determination of market boundaries.

Relevant financial data will include:

- Cost of remediation measures; and
- Financial viability of potential market participants;

It will make sense to develop pilot trading schemes in those areas where the most accurate and comprehensive physical and financial data is available. Identification of such areas may be facilitated by work being done under the auspices of the Australian Land and Water

Resources Audit who in partnership with the States are developing a strategic framework for dryland salinity management.

3. Determination of appropriate boundaries

An identifiable catchment or sub-catchment is required so that boundaries to trading areas can be defined and outcomes measured within these areas.

Factors that need to be taken into account in determining boundaries include:

- The physical characteristics of groundwater recharge and salt mobilisation.
- The need for the market to be of sufficient size to facilitate trading opportunities.

4. Variable remediation costs

If the costs of meeting salinity targets do not vary materially between potential market participants then there will be limited incentive to trade credits. Identification and attribution of amelioration costs will therefore be an important scoping task prior to the establishment of any trading schemes.

5. Effective compliance and enforcement mechanisms

As with any regulatory system, there must be appropriate monitoring and enforcement in cases of non-compliance to maintain the integrity of a trading scheme. Inadequate enforcement could undermine the ability to achieve targets whether through a trading scheme or direct regulation. A strong regulatory regime has been identified as a key contributor to the success of environmental trading programs in the United States.

6. Adequate institutional structures

Trading schemes require appropriate institutional structures to administer and monitor trades. The level of involvement required by the institution in specific negotiations will depend on several factors (such as the number and competitiveness of the sources) and on transaction costs. The institutional arrangements chosen should be designed to facilitate credit price discovery and limit the possibility of anti-competitive behaviour.[131]

Market Mechanisms changing the focus of agricultural subsidies and "leveraging private capital"

The development of market mechanisms is aimed at incentives for land use change. It is the creation of market structures to encourage private investment and initiatives to address environmental problems. Due to the complexity of the landscape and the scope of problems there is a need for a wide range of diverse market structures. This will develop unique opportunities that address environmental problems such as salinity at different levels and avoid policies that favour one environmental outcome to the detriment of others.

Leveraging private capital is the goal of these market structures as it taps financial wealth across the community. Governments provide seed funds and develop market structures while private investors participate in trading. This is a step away from direct subsidies to cover the marginal utility of a land use change. The development of markets also

[131] Experts Group Background Paper No. 2 - http://www.treasury.nsw.gov.au/salinity/bgpaper2.htm

strengthens the valuation of other aspects of the environment and begins to place economic value on environmental resources.[132] The challenge for government will be developing the regulatory environment that investors see as an opportunity rather than stifling business.

Increased land management complexity due to environmental market mechanisms may also lead to perverse outcomes that will require careful monitoring to maintain integrity. The development of market structures will need to be monitored to ensure private capital is yielding environmental outcomes.

As the establishment of markets by government intervention involves the expenditure of taxpayers money to private individuals or groups, there needs to be a strong justification. Firstly, it needs be demonstrated that the market cannot work effectively without intervention and secondly the net public benefit must exceed the costs.[133]

4.20 ENVIRONMENTAL CREDITS TRADING

Another future business opportunity is salinity credits trading. It is not yet clear whether it would be possible to develop a model that involved landholders. Currently, the only salinity credits schemes operate between States in the Murray Darling Basin and between participating industries under the Hunter River Salinity Trading Scheme. The latter regulates discharge of saline water into the Hunter River by mines and power stations.

A variety of different types of trading schemes have evolved since the United States first started experimenting with rights based policies for industrial emissions in the 1970's. The best known scheme is the "cap and trade" system, where by an aggregate emission target is set for an industry and individual firms are allocated tradeable permits that entitle each firm to emit a specified share of the cap.

Another type of trading system is "baseline credit", where by a baseline level of environmental performance is established for individual firms and improvements beyond this baseline generate credits for the firm. Often existing regulations dictate the baseline. A firm with a surplus of credits can either sell the credits to other firms who wish to exceed their baseline, or the firm can retain the credits for later use should it drop below its baseline in future periods.

Offset schemes were formulated to ensure that new facilities or industries do not increase the total level of gas emissions in a specified geographic region. When a new facility is to be set up in an area that is subject to a cap on total emissions, the firm must obtain credits from existing sources in a proportion determined by the offset rate applying to the particular area.

Salinity, in a market sense is an externality, therefore it may not be necessary to impose an enforceable cap to stimulate market demand. This is because, in the case of private externalities, the removal of the externality produces an off-site benefit to "downstream" firms. Under these circumstances it may be sufficient to define property rights in the form of environmental credits, then leave the rest to the market. If benefits are truly off-site, then "downstream" firms may form a cooperative and purchase credits from "upstream" firms. An example of this form of trade is the Memorandum of Understanding that was signed in 1999 by NSW State Forests and Macquarie River Food and Fibre (a farmer cooperative

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132 Bob Smith, DLWC, State Forests, Seminar: Investing in Solutions to Salinity, 8 April 2002

133 Wayne Gummley, Lecturer, Monash University, Transcript of Evidence, 26 September 2002

comprising over 600 irrigation farmers). Under this arrangement, the cooperative has agreed to purchase salinity control credits generated by new forests planted in the salt prone Macquarie River catchment. The credits are defined in terms of the quality of water transpired from 100ha hectares of newly planted forest.

Credit systems - Carbon model

The development of salinity credits may be based on the same model as the carbon trading market.

To date the most notable international trading model lies under the Kyoto Protocol. Under Article 3.3 of the Protocol a planted forest which is established after 1 January 1990 on previously cleared land will count as a carbon sink. The carbon dioxide sequestered in such a forest can be used to create carbon credits.

Emissions trading will allow countries and individual companies to buy and sell carbon credits created by activities that reduce the level of greenhouse gas emissions.

The creation of carbon credits using sinks will only ever form a small proportion of the activities that will need to be implemented to achieve emission reduction targets. This is because the total area that can be planted as carbon sinks is limited and the cost in establishing such forests is significant.[134]

It should also be noted that under the Kyoto Protocol, the only carbon credits that can be traded to meet emission reduction requirements are those credits arising from carbon sequestration between 2008 and 2012 (the first commitment period under the Kyoto Protocol), plus any subsequent agreed commitment periods. This means that carbon sequestered up to 2008 is not available for sale as carbon credits to meet Kyoto emission reduction targets. However, opportunities may exist to sell these pre-2008 carbon sequestration benefits to achieve compliance under the NSW greenhouse benchmarks.[135]

Australia is a long way from establishing a comprehensive salinity credits scheme. However, forests and other perennial plants used to sequester carbon could also be sited to reduce recharge to groundwater, producing multiple environmental benefits. The opportunity for salinity mitigation lies in the potential monetary value of carbon sequestered by vegetation, which may tip the scales on marginal investments to profitable solutions.

Australia's reluctance to ratify the agreement places NSW at a disadvantage in a trading sense as it will make international investment in carbon offsets for Australia difficult.[136]

RECOMMENDATION 28: The Committee recommends that the NSW Government continue to encourage the Commonwealth Government to meet Kyoto Protocol objectives, particularly trading in carbon credits, as this provides a market driver for the establishment of forests (under article 3.3) and other perennial plants (under article 3.4) which can also be used to reduce salinity.

TEPCO forestry investment for environmental service - carbon

134 State Forests, Submission op cit

135 Ministry of Energy and Utilities, Sequestration Workbook. (http://www.doe.nsw.gov.au)

136 Robert Vincin – Emission Traders International, personal comment, 2002

One of the only carbon trading examples in NSW that demonstrates the potential opportunity for salinity mitigation is an agreement signed between State Forests and TEPCO on 14 February 2000 to plant between 1,000 and 4,000ha per year of forest plantations for the next 10 years (age classes). Planting commenced at much the same time.

Under the agreement, State Forests provides all plantation establishment and management services in return for an annual management fee (calculated on a per hectare basis). As a result, TEPCO owns the timber and carbon rights to the plantations for the duration of the rotation until final harvest (approximately 30 years).

Three annual programs have been completed by State Forests thus far, each of 1,000ha and each approximately a 50:50 split between North coast eucalypt hardwoods and South West slopes radiata pine. The annual program for the forthcoming year is also forecast to be 1,000ha.

The total value of the project over the full 30 year rotation length of all 10 age classes ranges from approx $97M (assuming all ten age classes are 1,000 ha) to $270M (assuming the first four age classes are 1000ha each and the subsequent six age classes are 4000ha each). (These values are all in year 2000 A$).

Land for planting is leased to TEPCO under 35-year annuity agreements which is a combination of State Forest owned land and privately owned land. The silvicultural management of the plantations is directed at the production of high quality sawlogs and veneer logs as the primary products as all plantings are intended for harvest. The timber value of the plantations underpins the investment entirely, so that the project has a positive internal rate of return across the full rotation, on the basis of timber revenues alone. This is how many forest projects with a carbon sequestering goal can hedge the investment should the carbon market fail to establish.

Carbon sequestration is forecast to be approximately 600 tonnes per hectare over the full rotation (average 20 tonnes CO2e per hectare per year). Therefore, total project sequestration will be between 6M tCO2e (assuming 10,000 hectares planted, the minimum) and 16.8M tCO2e (assuming 28,000ha planted, the maximum now possible). Under the Kyoto accounting rules all sequestered carbon will be re-emitted after final harvest, but that will be 30 years hence, so it will have served its purpose as a "flexibility mechanism". By then, TEPCO will have had time to make structural adjustments to its business so that equivalent or greater permanent emissions reductions will be in place.

This project has not been established with any salinity benefit as an objective, yet it illustrates the infrastructure and potential market value for similar projects. State Forests anticipates more projects should the Kyoto Protocol be ratified and hopes to expand business opportunities into marginal regions that will benefit salinity and be lucrative because of the carbon sequestration value.

NSW off-sets for electricity retailers – new mandatory targets

The NSW Government has introduced legislation to improve the State's greenhouse gas emissions. The same type of regulation may be possible for salinity outcomes in the longer term. This also represents a business opportunity for salinity as electricity suppliers seek ways to meet targets through bioenergy or carbon sequestration. This could turn a marginal salinity investment to profitable.

Electricity supply accounts for one third of NSW greenhouse gas emissions with the majority of greenhouse gas being generated from the combustion of coal. The NSW government has undertaken a number of initiatives to improve energy efficiency and reduce greenhouse gas emissions. The NSW government requires electricity suppliers to measure the emissions arising from the production of the electricity they supply, and to develop strategies for reducing those emissions. Retailers can reduce emissions by increasing their use of sustainable energy technologies, and by helping customers use electricity more efficiently.

On 8 May 2002, the Premier and the Minister for Energy announced that the NSW Government will be implementing an enforceable greenhouse benchmarks scheme for electricity retailers.

The targets

- The benchmark has been set as a five per cent reduction in per capita greenhouse gas emissions from 1989/90 levels by 2007. This equates to a benchmark of 7.27 tonnes per capita in 2007.

- The scheme will commence on 1 January 2003, with 2003 being the first year of compulsory compliance. The benchmark for 2003 has been set at 8.65 tonnes CO 2 -e per capita. Annual targets will follow a linear path to achieve the benchmark of 7.27 CO 2 -e per capita in 2007. The target will be maintained at that level until 2012 or until reviewed.

The penalties

- A penalty (expressed in $/tonne of carbon dioxide equivalent) will be imposed on retailers and other liable parties (market customers) to the extent of the excess of their greenhouse gas emissions (as measured by a methodology approved by the Minister for Energy) above their greenhouse gas emissions benchmark for each year from 1 January 2003.

- The penalty will be set at least as high as the marginal cost of abatement to encourage compliance, but not above $15 per tonne.[137]

4.21 OTHER SALINITY INIITATIVES IN RECHARGE ZONES – CENTRAL WEST LOCAL GOVERNMENT SALINITY ACTION ALLIANCE

There may be business opportunities for local councils in delivering actions under catchment management blueprints, if they can obtain NAP funding. The Central West Local Government Salinity Action Alliance is a cooperative strategy to ameliorate salinity in the Central West. This brings together councils, land care groups, DLWC, NSW Agriculture and land holders to adopt regional approaches to salinity. The councils have structured the alliance on catchment boundaries in the upper Macquarie catchment. This was the only example the Committee is aware of where councils have structured themselves specifically to carry out actions under catchment management blueprints and seek NAP funding.

This alliance is separate to the NSW CMBs funded by the NAP for Salinity and Water Quality. However their objectives will coincide with catchment management blueprints set up by the CMBs. The Alliance was established to form closer links between local

137 Ministry of Energy and Utilities, Sequestration Workbook. (http://www.doe.nsw.gov.au)

governments and catchment management boards. The Alliance is more specific in the targeting of local areas and development of networks at the local government level. Swapping ideas to deal with urban salinity develops a more uniform approach through the alliance members to these problems. Projects relate to education of the rural community and depend on community networks and groups for implementation such as Greencorp. These initiatives will be encouraged by Conservation Grazing officers located with councils or State agencies.

This local government initiative is one of many new networks and forums that has sprung up in the wake of the salinity problem. The development of awareness and the momentum of the problem have increased pressure for action at all levels. These forums are typically established to address problems caused by discharge of saline water. Thereby they may struggle with development of initiatives on recharge sites outside their area of jurisdiction and may be reluctant to spend funds outside their constituency. The landscape approach may often clash with the political climate and man-made boundaries. The need for broad strategies to coordinate towards a common goal is crucial to a long-term approach that addresses the problem.

PART E

BUSINESS OPPORTUNITIES FOR DISCHARGE SITES

5 PRODUCTIVE USES OF SALINISED LAND

5.1 THE BENEFITS OF LIVING WITH SALT

One of the key messages to emerge in this inquiry (discussed in chapter 3) is that in many areas it will not be technically feasible or economically viable to reduce salinisation. Recent scientific evidence demonstrates that many areas will not be responsive to change. Economic analyses have also shown that preventing recharge to groundwater in many areas is beyond the capacity of governments to pay and certainly beyond the budget of the NAP. This means that governments will be forced to select some high priority areas where the value of the assets at risk, including environmental assets, are high, the landscape is responsive to change and the costs of recharge options are reasonable.

In other areas the community will need to live with salt. This does not mean writing off these areas. There are a number of uses of salt affected land and water which are potentially profitable. Some of these uses also rehabilitate the land and remove salts from the hydrological system. For instance, salt tolerant plants will make use of the abundant water close to the surface causing the groundwater table to drop. Due to this constant source of water, salt tolerant plants can be grazed in summer providing farmers with a more flexible use of their land. Salt harvesting and chemical extraction removes salts from water and can provide a source of fresh water. This part of the report will examine a range of potentially profitable uses of salt affected land and water.

In many areas it will be more cost-effective to rehabilitate saline land and water than revegetating large areas of land with perennial plants to reduce salinity. There are two reasons for this. Firstly, land in recharge areas is expensive because it is not affected by salinity. Currently most options for revegetation cannot compete economically with traditional farming. There is, therefore, a high 'opportunity cost'. in revegetating the land with perennial plants. However, traditional crops or pasture plants will not grow, or will perform poorly, on saline land, so alternative options such as salt tolerant plants may give farmers some economic return where previously there was little to none.

Secondly, rehabilitating saline land and water means targeting only the affected area whereas reducing recharge usually requires extensive revegetation of the catchment with perennial plants. Stephanie Bolt, in her report for the National Dryland Salinity Program on the Options for the Productive Uses of Salinity [OPUS Report, November 2001] says:

> *It may be less costly in some catchments for governments to support activities in the discharge areas than to subsidise very broad scale land use change in recharge areas.*[138]

David Panell, Associate Professor of Agricultural and Resource Economics at the University of Western Australia provides two examples where rehabilitation is cheaper than prevention. The costs of desalination have been falling for the last 20 years as technology has improved. David Pannell believes that within the next ten to 20 years it will be cheaper to desalinate water than put in place extensive programs of revegetation throughout catchments to meet salinity targets at Morgan in South Australia.

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138 OPUS Report at p.221

His other example is that the cost of repairing salt damage to buildings in some areas is much cheaper than putting in place revegetation programs across the catchment to reduce the water table beneath the buildings. He says:

> *In some situations it is far more efficient and effective to allow the salinity to occur and then repair the damage. That sounds pretty unattractive but the numbers show that the difference in outcomes and the cost of outcomes is quite dramatic in some situations. Not always. I am painting examples here, I am not drawing generalisations. The bottom line says that the cost of repair to salinity in the Merredin town site in the wheat belt of Western Australia over the next 60 years has a net present value of about .4 of $1 million. The cost of preventing that damage is between five and ten times that much.*[139]

Salinised land and water is gradually being viewed as a resource rather than a waste product. The organisation Productive Uses and Rehabilitation of Saline Land [PUR$L] has held eight national conferences since 1993. The Conferences present the latest research and field demonstrations of the productive uses of salinity. The second round of the National Dryland Salinity Program, which provides high level research, recognised salinised resources as one of four priority areas. The Cooperative Research Centre [CRC] for Plant Based Management of Dryland Salinity is devoting around 30 per cent of its resources to saltland issues.

David Pannell said that in Western Australia and parts of South Australia lying outside of the Murray Darling Basin the importance of options for living with salinity is well accepted whereas in Eastern Australia it is still viewed as an irrelevant or unacceptable option, including in policy spheres.[140]

The *NSW Salinity Strategy* does address options for living with salt but the focus on this area is minimal compared with the focus on reducing recharge. This is partly because there are fewer discharge areas in NSW than Western Australia. Western Australia has 80 per cent Australia's salinity affected land. Western farmers have had first hand experience of the failure of many small to medium scale options to reduce recharge so living with salinity is therefore a pressing need for them. Policy in Western Australia recognises productive uses of salt affected land as a key focus. In contrast, there is a heavy focus in the Murray Darling Basin States on protecting water resources. Whilst this should remain a key focus, there is a need to develop a more coherent policy approach to salinised land in private ownership and assistance to country towns. Currently, off-setting the costs of salt interception schemes on the Murray Darling river system is the main driver of options for the productive uses of salinity in the Murray Darling Basin. Whilst this is clearly useful, it will not necessarily produce options which can be applied at farm scale.

5.2 OVERVIEW OF PRODUCTIVE USES OF SALINITY

Stephanie Bolt, in the OPUS Report, examined the commercial viability of a large range of options for productive use of salinised land and water. She notes that many landholders faced with salinised land have been experimenting with productive uses of that land and there are some success stories. The Committee on its study tours of regional Australia was impressed with the efforts by landholders to make use of salinised land and water resources. The Committee also took evidence from many entrepreneurs with products and

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139 Transcript of evidence, 8 April 2002, at p.5

140 National Economic and Policy Issues in the Productive Use of Salinised Resources, PUR$L Conference, September 2002

services to address salinised land and water. However, none of these options have been widely adopted by landholders and other groups because there are a considerable number of barriers. Stephanie Bolt says:

> *Some of these industries are still in a preliminary research phase (eg algal production); some might be considered as ' boutique' rather than mainstream in terms of production potential (eg date palms); some could be deemed to involve significant infrastructure inputs or changes to the farm enterprise base (eg saline aquaculture), while some might be more compatible with extant farm enterprise mixes (eg saltland pastures).*[141]

In addition to these general barriers, there are also location-specific factors which farmers would have to consider before changing their enterprises to saline industries. These include climate, soil characteristics, the extent to which the farm is affected by salinity, farm size, farm viability and current farm enterprises. Stephanie Bolt says that the efficacy of the saline industries for reclaiming land and reducing salinity outbreaks is also highly significant to farmers, as are their personal motives for considering adoption.

Government support is necessary to further develop saline industries and to encourage farmers and other investors to adopt them. Without assistance the risks for investors may be too high to be acceptable. The justification for expenditure of public funding must be public benefit. This can be determined by the extent to which salinity is reduced and the commercial viability for farmers and other groups. Stephanie Bolt has classified the policy potential of various saline industries according to:

- efficacy for reducing salinity;
- current commercial potential;
- level of activity (ie whether there is a large established market for the product (mainstream) or only a niche market (boutique) and whether the option can be applied broadly across the landscape or is limited to particular locations);
- switching quotient (ie whether it would involve a large and costly change from traditional farming); and
- knowledge status (ie whether the industry is still in the research phase or whether there is a large body of information on production and markets)

Saline industries are classified accordingly in the following table.

141 OPUS Report, op cit, at p.221

5.3 INDICATORS FOR POLICY POTENTIAL OF OPUS INDUSTRIES[142]

INDUSTRY	Potential Efficacy for reducing salinity impact	Current Commercial Potential	Level of Activity	Switching Quotient	Knowledge Status	Policy Potential Ranking
Saline Aquaculture	Low	Medium	Mainstream	High	Medium-High	Poor
Date Palms	Low	Low	Boutique	Medium	Medium	Very Poor
Saline Forestry	High	Medium	Mainstream	Low-Medium	Medium-High	Very Good
Saltbush	Medium-High	Medium	Mainstream	Low	Medium-High	Very Good
Salt Tolerant Pastures	Medium-High	Medium	Mainstream	Low	Medium-High	Very Good
Algae Production	Low	Low	Boutique	Medium-High	Low	Very Poor
Brine Shrimp Production	Low	Low	Boutique	Medium-High	Low	Poor
Desalination	Medium	Low	Location-Specific	Medium	Medium-High	Moderate
Energy Generation	Medium	Low	Location-Specific	High	Medium-High	Moderate
Salt Harvesting	Medium	Medium	Boutique	Medium-High	Low-Medium	Moderate

While none of these options currently has high commercial value because they require further development and support, the table shows that saline forestry, Saltbush and salt tolerant pastures have the greatest national potential because:

- they can reduce the impact of salinity over a large area;
- have the best commercial potential;
- are mainstream activities which means that there are large and well known markets (ie for meat, wool and wood);
- the infrastructure already exists (eg abattoirs for slaughter, refrigerated transport, wool production facilities, sawmills);

142 OPUS Report, at p.223

- the cost for farmers of changing to these enterprises is relatively low; and
- there is already a reasonable amount of information on how they are grown and managed.

In contrast, while aquaculture, algae and brine shrimp production could make commercial use of salty water, they do not remove salt from the water and therefore offer fewer public benefits. Of these options, aquaculture has currently has the greatest commercial potential because there is a large established market for fish (it is a mainstream activity).

Desalination and energy production have potential but at the current stage of development lack commercial viability and are expensive to establish. They are also limited to certain areas where there is a sufficient supply of saline water to sustain production.

Salt harvesting removes salts from the hydrological system and has reasonable commercial potential. Currently, however, there is only a niche market for various salts, information about production and markets is still being developed and the cost of establishing facilities is high.

It should be noted, however, that there may be situations in which a particular option is well suited. Some of these options also have greater potential when they are combined. For instance, desalination produces brine which can be used in aquaculture, salt harvesting and energy production. Since desalination requires an energy source, energy produced from brine in solar ponds could off-set the costs of electricity from the grid.

The remainder of this chapter looks in more detail at these options, where on the landscape they work, the economic opportunities they offer, the rationale for government investment, the barriers to their adoption, and what type of support governments could provide to overcome these barriers.

5.4 OPTIONS FOR SALINISED LAND

Livestock grazing on salt tolerant pastures

♦ **Salt Tolerant Pasture Plants**

A wide variety of species are moderately salt tolerant including perennial grasses, clovers and medics. Those that have been commercialised and are therefore commonly used in Australian agriculture are:

♦ **Grasses**

- puccinellia (Puccinellia Cilata);
- tall wheat grass (Thinopyrum ponticum);
- tall fescue (Festuca arundinacea);
- phalaris (Phalaris aquatica)

The perennial grasses listed above are all exotics. A greater range of plants is needed to suit different landscapes and environmental stresses such as acid soils and waterlogging in winter. Native grasses are thought to have potential for some difficult environmental situations. However, funding for research on native salt tolerant grasses has been sadly lacking. A small research program by DLWC (Cole, Semple and Koen) in 1996 identified

the five following promising grasses which could be further developed but funding has now ceased:

- Sporobolus virginicus;
- Sporobolus mitchellii;
- Cynodon dactylon;
- Paspalum vaginatum; and
- Distichlis distichopylla.[143]

♦ **Legumes**

- balansa clover© (Trifolium michelianum);
- strawberry clover.

Legumes which have been trialed but not commercially marketed include:

- persian clover (Trifolium resupinatum);
- hourglass clover;
- melilotus (Melilotus alba)
- lucerne

Of the legumes which are not commercially marketed, only lucerne is commonly used.

♦ **Halophytes (Salt loving plants)**

Some discharge sites in NSW require plants which are productive at high levels of salinity. There are fewer highly salt tolerant plants which have been developed as forage plants.

♦ **Saltbush**

Saltbush (Atriplex spp) and blue bush/cotton bush (Marieana spp), native chenopod shrubs, are salt loving plants (halophytes). Saltbush grows in a range of salinity levels from moderate to severe. The plants are drought, disease and vermin tolerant. Each plant has an 80-100 year lifespan. It has roots 3-4 metres deep which can intercept groundwater before it reaches the surface. Andrew Sippel of Grazing Management Systems which run a Saltbush nursery reported that one hectare of Saltbush can take up to 10 megalitres of water out of the soil per year.[144]

♦ **Distichlis**

There has been less research into, and use of, other highly salt tolerant plants in Australia. Distichlis (NyPa Forage™) is a plant native to inter-tidal areas of the USA, Canada,

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143 Information provided by Bill Semple

144 Transcript of Evidence, 26 September 20, at p.14

Argentina and Sudan. United States species have been bred by NyPa International to make them more productive.

The plant fits a very important niche because it thrives on salinity levels close to seawater and in waterlogged conditions, including winter waterlogging. It is productive in hot temperatures and thrives in the middle of summer when other pasture plants will not grow. It excretes salt so it has a low salt content.

5.5 WHERE ON THE LANDSCAPE WILL THIS OPTION WORK?

Mildly salt tolerant pastures

These plants are best suited to areas with lower salinity groundwaters and higher rainfall, including the Great Dividing Range and foothills in Victoria, NSW and Queensland. Salt tolerant pastures will survive in other areas but are more difficult to establish and manage.[145]

The majority of farm land in NSW is already under non-saline pasture. In NSW, 80M hectares (or 80 per cent of NSW's landmass) is under farming operations and of this, 50M hectares is covered in pastures.[146]

Importantly, the main area of NSW that is both the source of salt and is affected by salinity is currently under non-saline pastures. This is the 550-750mm rainfall zone on the Western slopes of the Divide and the nearby cropping belt. The north of the area projected to be affected by salinity by 2050 has high densities of cattle production, most of the affected area has very high densities of sheep and the affected area also takes in the Eastern part of the cropping zone. On the slopes West of the Dividing Range wheat is rotated with sheep production.[147]

The use of salt tolerant pasture plants is, therefore, likely to be one of the most attractive options to farmers in these areas because it requires the least change and capital outlay.

- **Saltbush**

Saltbush is suitable for the 250 – 600mm rainfall zone. The main salinity risk areas within this rainfall zone is the area containing Coolamon, Junee, Holbrook and Wagga Wagga and the irrigation areas of NSW.[148]

- **Distichlis**

Distichlis (NyPa Forage™) is suitable for highly saline waterlogged areas in regions that experience cold wet winters and hot dry summers. The Western-most saline groundwater

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145 OPUS report, op cit, at p.51

146 Dr Archer, Transcript of Evidence, 4 September 2002

147 Dr Archer, Transcript of Evidence, 4 September 2002

148 ALRTIG low rainfall climate zone, www.ffp.csiro.au/alrtig/the_low_rainfall_zone.htm, 18 October 2002; DLWC map series NVWR-6, Edition 1, June 1998

systems of the Riverine Plains of NSW and the foothills of the Great Dividing Range are examples of such areas.[149]

5.6 WHAT ARE THE ECONOMIC BENEFITS OF SALT TOLERANT PASTURES?

Salt tolerant pasture species can be grown for livestock production. The investment needed should be reasonable as most discharge areas in NSW are typically small (less than 10 hectares).

Mildly Saline Sites

Mildly saline land has the potential to be very productive because the soil has higher levels of moisture than adjacent areas of non-saline land. Whole farm productivity can be improved by using pastures that are at their most productive in summer when other parts of the farm are too dry for pasture production to be maintained. Salt tolerant pastures have the potential to extend stock holding capacity, improve lamb finishing performance and reduce the need to buy or produce supplementary fodder. Producers could gain higher prices by selling lamb out of season and through improved wool quality.[150]

NSW Agriculture informed the Committee that preliminary animal production data from pastures on saline lands indicate that acceptable levels of livestock performance can be obtained. Dr Archer said:

> *In NSW, preliminary studies on mildly saline affected land near Yass indicate that sheep will grow about 60-70g/head/day over an extended period.*[151]

Stephanie Bolt, in the OPUS Report lists the following potential benefits of salt tolerant pastures:

- Salt tolerant pastures are free of grass seeds, which can increase general wool yield and quality (and gross margin) or enable an enterprise to run fine-wool merinos.
- Reduced dust from pasture renovation also increases wool quality.
- Reduced necessity for hand feeding livestock.
- Use of salt tolerant pastures can support spring-lambing, leading to more flexible grazing management and improved profits.
- Conjunctive use of salt-tolerant pastures may enable a landholder to delay early grazing on conventional pastures, thus increasing the biomass yield of the latter, and enabling a higher overall stocking rate.
- Cost of establishment comparable with or cheaper than other pastures, but increases the carrying capacity of degraded land.
- Can support seed production or hay-making enterprises from otherwise degraded land.

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149 OPUS report, op cit, at p.73

150 NSW Agriculture/DLWC submission for funding for Sustainable Grazing on Saline Land

151 Transcript of Evidence, 4 September 2002, at p.6

- High palatability and persistence.
- Reduces summer evaporation rates and therefore less salt rises to the upper soil layers.

> *Ancilliary 'products' of salt tolerant pasture establishment includes benefits such as saline land reclamation, erosion control, dewatering, flood mitigation, aesthetic improvement and off-season grazing.*[152]

A significant minority of farmers are already trialing this option themselves, particularly in South and Western Australia where a larger area of the landscape has discharge sites. *Salt* magazine, produced by the National Dryland Salinity Program, is replete with stories on farmers who have successfully treated salinity outbreaks on their properties with a mixture of trees and pasture plants.

The Langley family of Greenthorpe NSW discussed the success of their approach with *Salt* magazine:

> *There is a small area on the property that used to be waterlogged….We decided to manage the area by using the water as it came out of the ground. The area was fenced off, planted with around 600 eucalypt trees and put into pasture using a mix of tall wheat grass and phalaris. The rising ground water acted like an underground irrigation system, and allowed us to use the area productively all year round.*[153]

Mr and Mrs Dumaresq of Kyeamba Valley, east of Wagga Wagga have also successfully treated discharge sites on their property with a mix of trees and pasture plants:

> *Although only a small area of land was affected, we were concerned because we could see that the scalds were getting worse…..To manage the problem we tried tree planting and pasture improvement. I guess we have planted 40,000 trees in the last 12 years…..Originally, we planted the least productive land but soon began planting along the fence lines and at the break of slope, making sure we were targeting the areas directly above the salt scalds. The scalds were planted to tall wheat grass and instead of undertaking earthworks, we fenced off and revegetated any wash-out areas.*
>
> *All pastures are sowed using direct drill methods. We avoid grazing in the first year and use a low stocking rate in the second year. That way we get a good strike rate and are able to manage more stock per hectare later on. It also means we can maintain sufficient leaf area to keep the root system active.*
>
> *We use a mix of deep-rooted pasture species including lucerne, phalaris and cocksfoot. Our pasture is productive and has both summer and winter active species to ensure maximum water use at all times. …The areas that were affected by salinity have virtually disappeared. We have a greater number of birds on the property…..and better protection for our stock. The farm looks much better and will probably have a better resale value.*[154]

Andrew Southwell in a paper for the PUR$L Conference, *Turning Salt of the Earth into Wool for the World,* says that his saline paddocks over five years have been more productive than his non-saline paddocks. His saline paddocks have a carrying capacity of 11.73 dse/ha/yr compared to 9.39 for non-saline paddocks.

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152 OPUS report, op cit, at p.51

153 Issue no 6 at pp.12-13

154 Issue no 6, at pp.16-17

Stephanie Bolt provides the following summary of the profitablity of saltland pastures. This does not include an assessment of any environmental benefits:

> *Under the assumptions set in this analysis, salt tolerant pasture species appear to be an excellent investment, provided that only a relatively small contribution to fixed costs [fuel, labour utility services] is required. If a full pro-rata contribution of the salt tolerant pasture to farm fixed costs is required, then the enterprise is unprofitable over time.*
>
> *…*
>
> *According to Morris (2000), landholders in the Upper South East of South Australia are calculating gross margins of around $15-21 per dse. Landholders reported increased production by 3-5 dse/ha. For one particular enterprise, a gross margin of $117/ha has been achieved over 3 consecutive years, virtually recouping the capital cost of pasture establishment (renovation) within the first year of grazing. These figures suggest much higher profitability than our spreadsheet analysis, which is based on assumptions indicating an annual gross margin of around $30/ha (or $7/dse) with minimal required contribution to farm fixed costs.*[155]

Highly Saline Sites

Salt tolerant pastures are more difficult to establish and manage on highly saline sites.

♦ Saltbush

As with salt tolerant pasture plants, Saltbush can provide farmers with greater flexibility in the use of their land. In NSW discharge areas are typically less than ten hectares, if planted with Saltbush they can provide a seasonal supplement and allow pastures on other areas of the farm to recover. Ed Amery from 'Long View' at Narrandera in a testimonial presented by Grazing Management Systems said:

> *We planted our first blocks on salt scald 5 years ago and today you can hardly see any signs of salting. The way our other pasture country is responding to the extra rest we can* [sic] *while the animals are on the salbush is encouraging. Our autumn feed gap is no longer a problem as the omsb [Old Man Saltbush] is used for this. Less money and time is spent on supplementary feeding. Have not greatly increased our stock numbers but are doing it much easier….it is valuable production, from the land that was fast becoming unproductive from the salt encroachment. I keep good paddock records and it is now the Saltbush paddocks that give us the best grazing performance on a yearly basis.*

Saltbush can also be planted with other perennials and annuals. Balansa© and persian clovers have been found to grow well in Saltbush based pasture systems. The Saltbush will lower the watertable while the clovers would be the main source of fodder. Michael Lloyd, Chair of the Saltland Pastures Association, has planted 500 hectares of his West Australian property to Saltbush. There is too much saline land (40 per cent of the property) to just use Saltbush as a seasonal supplement. Mr Lloyd uses annual clovers and grasses as companion plants in his Saltbush pastures. Stephanie Bolt, in the OPUS Report, , states:

> *Mr Lloyd says that he is running three times the number of sheep per hectare on the saline land than on the areas in his property sown to annual pastures (Lloyd, pers comm., 2000). On a 30 hectare paddock, sown to Saltbush in 1991, a stocking rate of 5.2 dse/ha was achieved in the 1993/94 summer. This compares with a rate of 3.0*

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155 OPUS report, op cit, at pp.64-65

> *dse/ha in a better adjacent paddock with annual pastures (Lloyd 1998). In addition, wool cuts per head for the ewes have been consistently higher than the average for the district, which is approximately 6.0kg/hd (Lloyd, pers. comm, 1998).*
>
> *Another result of the shift from annual pastures to perennial saltland grazing systems has been that watertables beneath the property have been lowered 60-70cm (over 40%). There has also been less wind and water erosion, less waterlogging and increased numbers of native fauna in the revegetated areas.*[156]

Andrew Sippel of Grazing Management Systems which produces and establishes Saltbush says:

> *As a fodder crop for sheep, Saltbush can increase stocking rates four to fivefold, while producing a finer fleece and a leaner more succulent and tender meat, ideally suited for the domestic and export markets. Importantly, Saltbush can grow in saline soils and over time will help restore land threatened by salt. (submission)*

Saltbush also acts as a carbon sink, sequestering or storing carbon taken from the atmosphere to the soil. Saltbush may therefore have potential for reducing greenhouse gas emissions. Mr Sippel informed the Committee that Japanese coal brokers were interested in investing in Saltbush for carbon credits.

Grazing Management Systems are seeking funding to establish a marketing alliance with a number of sheep producers in the Central West of NSW for producing, processing and marketing 'Drover's Choice' to the domestic retail and restaurant markets. Funding has been received from the Orana Regional Development Board but further funding will be required.

Saltbush can be difficult to establish from seed. Currently Saltbush seed is expensive ($30-$70 kg) and the quality is highly variable. Using nursery raised plants is more reliable but can be prohibitively expensive.[157]

Saltbush is not salt tolerant at establishment and salt must be leached from the soil and the plants established on mounds.

As Saltbush grown on saline sites takes up a lot of salt, livestock must have sufficient alternative feed. They must also have three times as much water a day compared with non-halophyte pastures. Saltbush can be planted on moderately saline sites to intercept and transpire large quantities of water. This can improve adjacent severely degraded land. As groundwater tables drop non-salt tolerant plants will emerge.

Stephanie Bolt in the OPUS report, concludes that Saltbush pastures on their own are unlikely to be profitable but a system that includes a mix of pasture species has good potential. However, Bolt is examining a Saltbush grazing enterprise while what is more appropriate for NSW is the use of Saltbush pasture as a relatively small part of the farming system. Part of the reason for the marginal profitability of Saltbush is the commodity price of lamb and wool. Another reason is the high establishment costs of Saltbush.

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156 OPUS report, op cit, at p.47

157 OPUS Report at p.34

♦ Distichlis

Distichlis (NyPa Forage™) has potential to rehabilitate salt scalds and provide some productivity from the land. The plant grows 2 metres in six months on salt scalds. It also reduces the watertable to the benefit of up-slope crops while improving the soil structure, drainage and organic matter.

It can be grown as a companion crop to annual cereals in moist flats where it drains the root zone of saline water in summer and autumn leaving the cereal to grow in winter and spring.

There have been small scale trials of NyPa Forage™ in Australia since 1995. It is currently being trialed in Victoria, South Australia and Western Australia by Elders Ltd, NyPa International and the International Institute of Development. The Wool Program under the National Dryland Salinity Program and the Western Australian Government are going to provide some financial support for research on livestock production on NyPa Forage™.

Raymond Matthews is a farmer involved in trialling NyPa Forage™ on his property in the South West of Western Australia. A third of the property has been lost to salinity. Some paddocks are now bare salt scalds. A single NyPa Forage™ plant has yielded 12 hectares of pasture on his property. He told *The Australian*:

> *It's bloody exciting…now we can potentially achieve production on our worst country and turn our worst liabilities into an asset.*[158]

John Leake informed the Committee that on one site in Western Australia stocking rates of sheep went from nil to six dse as a result of using the plant.[159]

NyPa Forage™ requires careful grazing management and application of fertilizer (nitrogen and potassium) to achieve protein levels of 17 per cent. John Leake, Managing Director of NyPa Australia provided the following data.

NyPa Forage Analysis from Wickepin (WA)[160]

SAMPLE	PROTEIN %	ASH %	NEUTRAL DETERGENT FIBRE %	DIGESTIBILITY
Nitrogen applied	9.56	6.51	75.04	55.46
No nitrogen applied	11.06	7.86	76.14	56.79
Potassium applied	12.48	8.23	75.38	56.29
No potassium applied	12.94	11.66	71.18	59.24
Long nitrogen applied	16.17	6.39	73.73	59.24
Nitrogen and potassium applied	17.33	8.33	71.13	60.04

Notes: Long nitrogen applied represents a sample of forage taken from a sward of forage that was approximately 30cm in height. All other samples taken were 10-15 cm in height. There was no dead material in any of the samples.

158 The Australian Newspaper, 31 July 2002

159 Transcript of evidence, 5 September, at p.15

160 Source: Correspondence from John Leake, NyPa International, dated 30 September 2002

NyPa Forage™ could also be irrigated with water from salt interception schemes to reduce the volume of water that has to be pumped to disposal basins. It could also be irrigated with waste water from aquaculture reducing the amount of saline water to be disposed of.

NyPa Forage™has other environmental benefits. Its rhizomaceous roots improve drainage and organic matter in the soil. Although it grows best in light soils it will grow in very hard cracking clays.

John Leake informed the Committee that NyPa Forage™ is not invasive because it does not grow well away from salt water. As it spreads to non-salty areas it is outcompeted by non-salt tolerant plants. The plants are all males so they do not produce seed. They spread only through the roots.

Stephanie Bolt in the OPUS Report, states:

> *For broad usage, a new crop species or cultivar must be salt tolerant, sufficiently productive, culturally acceptable in all parts of the world, adaptable to a wide range of salt, soil and climactic condtions and meet the economic needs of different peoples. A new plant that shows the greatest amount of promise in meeting these requirements is distichlis, a halophytic grass that has been bred into a variety of patented cultivars, most notably WildWheat grain, a cereal, and NyPa Forage, a pasture.*[161]

However, further research and development is needed to overcome barriers to the adoption of distichlis. This is discussed below.

5.7 WHAT IS THE RATIONALE FOR GOVERNMENT INVESTMENT?

Discharge areas in NSW are often located close to streams and waterways so the use of salt tolerant pasture plants may have public benefits in reducing off-site impacts of water movement from saline lands.

Salinity is one of a number of environmental problems caused by poorly managed pastures and by no means the most economically costly problem for farmers. Other environmental problems are soil acidity, soil erosion and weeds. Salinity, soil acidity and erosion are all linked as they are all associated with loss of water from the landscape through deep-drainage or run-off. Salt tolerant pasture plants will provide permanent groundcover which can assist in preventing soil containing salts and nutrients entering waterways.

Vigorously growing perennial pastures will suppress weed seedlings from establishing and spreading. Groundcover will also improve biodiversity.

5.8 ARE THERE BARRIERS TO THE USE OF SALINE PASTURE PLANTS?

Research and Development

Stephanie Bolt, in the OPUS Report, summarises the research needs for mildly salt tolerant pasture plants as follows:

- *Establishment and management techniques for optimal productivity;*

[161] OPUS Report, op cit, at p.77

- *suitability of species for differing biophysical settings and tolerance to multiple stresses;*

- *genetic improvement. The heritability of the most essential properties (eg digestibility, palatability, persistence) is only partly understood, particularly for grasses, and there is the potential for selection of species properties using modern biotechnology.*

- *Animal health and performance on mixed pastures.*[162]

Dr Archer, Program Manager of Pastures and Rangelands at NSW Agriculture, informed the Committee that while some farmers are sowing perennial grasses such as tall wheatgrass and puccinellia on sites affected by salinity with good results, the benefits of this system have not been measured and the principles of managing them such as fertiliser, liming and grazing regime are poorly understood. Similarly, there is little research on the effects of well managed saltland pastures on water movement, salt export to waterways, animal production, biodiversity and pasture productivity.

Mr Wolford Parsons, a South Australian farmer, supports the need for research. He told *Focus on Salt,* the newsletter of the National Dryland Salinity Program:

> *We have reclaimed about 120 ha of salinised land that previously had no productive value at all….But it has cost a lot of time and money, involved educated guess work, and has been difficult to persuade the banks that this is a good investment. What we badly need is well-founded research that shows us the most reliable, economic and sustainable way forward for our conditions.*[163]

These issues are being addressed by an important new national research project, *Sustainable Grazing on Saline Land.* The national project involves a consortium of funding bodies: Australian Wool Innovations Pty Ltd; Meat and Livestock Australia; Land and Water Australia, the CRC on Plant-based Solutions for Dryland Agriculture and representative agencies including universities, CSIRO and State agencies in Western Australia, South Australia, Victoria and NSW (NSW Agriculture and the DLWC). A sum of $9M over five years commencing in 2001 has been set aside for this project.

The three objectives of the national project are:

- More profitable grazing and sustainable grazing systems for use on saline land;

- A reduction in the negative impacts from salinised land; and

- Pride for participating producers in their property, production system and product.

Under the national project farmers with salinised land will be sharing their knowledge and gaining new knowledge through networks built on existing groups.

NSW will receive $1M for a state-based project. The project will:

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162 OPUS Report at p.66

163 Focus on Salt, Issue 22, March 2002, at p.3

- compare the quality and quantity of a tall wheatgrass pasture under a series of treatments, including fertilizer and grazing management, with an untreated wheatgrass pasture.
- monitor animal liveweight gain and wool production;
- measure the on-site environmental impacts; and
- measure off-site environmental impacts.

This will fill many of the information gaps that have been a barrier to broader adoption of the existing range of salt tolerant pastures. However, the current range of available salt tolerant pasture plants is far too limited. The variability of salt affected landscapes must be recognised. There is a need for a broader range of plants to suit different landscapes and which tolerate various combinations of environmental stressors.

The CRC for Plant Based Management of Dryland Salinity has developed a comprehensive program to select new salt tolerant herbaecous plants under Program 3 *new and better varieties of woody and herbaceous perennials* for which it is seeking funding.

The CRC for Plant Based Management of Dryland Salinity is a national research program which aims to provide new plant-based management systems that lessen the economic and social impacts of dryland salinity and will help to sustain rural communities. New plant-based systems will be based on a thorough understanding of the way natural and agricultural ecosystems work. The participants in the CRC are:

- Charles Sturt University;
- CSIRO;
- Department of Agriculture Western Australia;
- Department of Conservation and Land Management, Western Australia;
- Department of Natural Resources and Environment, Victoria;
- New South Wales Agriculture;
- Primary Industries and Resources, South Australia;
- University of Adelaide;
- University of Western Australia.

The Committee believes that the NSW Government's contribution to the CRC is an excellent investment. The development of plants for recharge and discharge area that have economic benefits will make it possible to plant large areas of land and in turn this will reduce the impacts of salinity.

Funding has been received from the Grains Research and Development Corporation for stage one of the research under Program 3, Project 5, to conduct field evaluations of existing germplasm. However, no funding has been forthcoming for stage two which involves breeding new salt tolerant pasture plants. A sum of $700,000 – $800,000 is being sought for this project. The CRC has applied unsuccessfully under the NSW Salinity Strategy and National Action Plan. The Committee understands that the application to the

NSW Government was unsuccessful because NSW is prioritising more demonstration projects and on-ground trials. Dr Brian Dear, Principal Research Scientist, NSW Agriculture, told the Committee:

> *There are some barriers to this program and to the adoption of those plants. The current emphasis seems to be demonstrations of existing technology. The plants that I have mentioned have limitations. The emphasis by governments is to see the effects on the ground quickly but these do not develop new ideas or expand the range of possible tools. While they are important to bring awareness to farmers of what can be done, we need to put more funding into the start of the program and generate more tools, more diversity of species. Otherwise we will quickly run out of options.*
>
> *There is a role for existing plants but unless we get new ones for the environment in which they are not suited we will not be able to make the progress that we want. Currently the private sector does not fund these species. Most funding comes from rural industry boards, such as the Grain Research and Development Corporation , or by government departments. Obviously, there is a need for bodies to redirect some funding towards developing new options if we are to make any progress.*[164]

Funding of research into new salt tolerant pasture plants should be a high priority. It is complementary to the research under the Sustainable Grazing of Saline Land which looks at how existing plants can be effectively used. The range of existing plants is limited to certain landscapes and many of the existing plants will not tolerate multiple environmental stresses.

RECOMMENDATION 29: The Committee recommends that the NSW Government provides funding to the CRC for Plant Based Management of Dryland Salinity to develop new salt tolerant pasture plants suitable for the diverse landscapes of NSW.

- **Saltbush**

Stephanie Bolt provides the following summary of the research gaps for Saltbush:

> *To address knowledge gaps, research is needed in the following areas:*
>
> - *Genetic improvement. The heritability of the most essential properties (eg survival, palatability, persistence) is yet to be determined and there is the potential for selection of specific properties using modern biotechnology;*
> - *seed quality, harvesting, handling and storage;*
> - *suitability of species for differing biophysical settings and tolerance to multiple stresses (eg waterlogging);*
> - *establishment and management techniques for optimal production;*
> - *requirements for successful Saltbush pastures mixed with clovers and grasses;*
> - *animal health and performance on Saltbush and mixed pastures.*[165]

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164 transcript of evidence, 8 April 2002, at p.55

165 OPUS Report, op cit, at p.44

Given that Saltbush is drought and salinity tolerant and sequesters carbon, a higher priority should be given to addressing current gaps in knowledge that limit its adoption in grazing management systems. Research should have the long term aim of developing more cost effective Saltbush pasture systems.

RECOMMENDATION 30: The Committee recommends that NSW Agriculture advocates that the CRC on Plant Based Management of Dryland Salinity undertakes research on sheep production from Saltbush pastures aimed at filling current gaps in knowledge which are limiting its adoption by land holders. The Committee recommends that funding is provided from the salinity budget for this purpose.

- **Distichlis**

Stephanie Bolt in the OPUS Report concludes:

In Australia, a handful of field trials have been conducted with NyPa Forage over several years with mixed results. Knowledge and understanding of NyPa Forage- agronomic characteristics, productivity, animal performance and biophysical limitations are at this stage grossly lacking. Significant support for research and development must be sought to generate more rigourous field trials and experimentation. Nontheless, the encouraging results from field trial site in Western Australia, backed by information from overseas, *presents an overall optimisitc picture of a perennial, salt loving pasture that is productive, digestible to livestock, low in salt content, improves soil condition and lowers saline watertables.*[166]

NyPa Australia have had support from the Rural Industries Research and Development Corporation and the Departments of Agriculture in Western Australia, South Australia and Victoria and from the private sector. NyPa Australia would welcome support from the NSW Government.

Recommendation 31: The Committee recommends that NSW Agriculture advocates that the CRC on Plant Based Management of Dryland Salinity undertakes research on Distichlis aimed at addressing gaps in knowledge which are limiting its adoption. The Committee recommends that funding is provided from the salinity budget for this purpose.

Training

There are two elements to successfully managing saltland pastures that become abundantly clear on reading case studies written by farmers who have eliminated saline discharge on their properties. Firstly, in every case the farmers stress the need for whole farm planning. Environmental problems and production systems are seen as a whole and a suite of solutions are used which are integrated. Saline land is viewed as a resource which can be used in combination with other areas of the farm to maximise production.

Secondly, the success or failure of saltland pasture relies to a large extent on using the correct grazing management systems. Training farmers to manage saltland pasture is critical to its success. Rotational grazing is essential to prevent the plants being overgrazed. Also some grasses need to be grazed hard at particular times of the year to keep the grass

166 OPUS Report, op cit, at p.77

succulent. Mr Sippel of Grazing Management Systems which provides Saltbush to farmers explained the importance of rotational grazing to the Committee:

> *Rotational grazing is critical. Set stocking, that is leaving animals on the one paddock all year, is largely the single most reason why Saltbush was destroyed- it was overgrazed. To manage Saltbush and also to manage native grasses, rotational grazing is the only way to do it. The only thing really that is needed is a mindshift in the thinking of landholders, and this is why education is so critical. It has got to go hand in hand with it. As far as capital for fencing and water, there are so many easy ways to use portable fencing and portable water troughs and things like that…..It is more of an attitudinal change that has to happen first. That is why holisitic management thinking and educating landholders in the form of those principles is just so critical. Saltbush and holistic management of Saltbush and rotational grazing all go hand in hand.*[167]

Mr Stuart, former Salinity Business Facilitator with the Department of State and Regional Development also explained how different rotational grazing is from set stocking:

> *Rotational grazing means that you are bringing animals onto the land at a heavy stocking rate for a short period of time and they are chewing the grass down to a certain level- they normally talk about it in terms of kilograms per hectare of grass that is left- and then you get them off and you take them to the next paddock and the you have a rest period on that grazed area to allow it to build up...*
>
> *with rotational grazing they graze with really high densities for short periods of time. We are not just talking about four or five animals per hectare, but you are literally putting very, very high numbers, you are putting several hundred animals in a few hectares, and you might only be working on 3-4 hectare blocks at a time, not 10-20 hectare paddocks.*[168]

Stephanie Bolt also emphasises that lack of familiarity with managing Saltbush is a factor limiting its adoption:

> *Saltbush grazing enterprises appear promising from the point of view of market opportunities and marketing infrastructure. Landholders would be supplying traditional commodities such as wool and meat into large, well-established markets with developed marketing infrastructure. Nonetheless, the skills and techniques required for successful Saltbush pasture management differ from those used in conventional farming. Growing halophyte forages means learning about and investing in new plants and new management systems on degraded soils that involve greater risk than non saline soils- an important social factor detracting from the adoption of this technology.*[169]

Rotational grazing requires changes to the size of paddocks. Andrew Southwell provided a paper for the 2002 PUR$L Conference, *Turning Salt of the Earth into Wool for the World.* He says that his non-saline paddocks average 16 hectares whilst his saline pastures average 6.4 hectares. This involves higher costs for fencing and in the case of Saltbush a larger number of watering points. If the areas on which the Saltbush paddock is located is saline, fresh water must be brought in for the livestock.

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167 Transcript of Evidence, 26 September 2002, at p.15

168 Transcript of Evidence, 26 September, 2002, at pp.33-34

169 OPUS Report, op cit, at p.44

There are no simple formulas for timing grazing on saltland pasture. Education is a vital element in encouraging the wider adoption of saltland pastures. Grazing Management Systems have a proposal with the Commonwealth Government to establish a mobile education program to provide information to landholders through Catchment Management Boards about growing Saltbush.

The Department of State and Regional Development also intends to fund a group of farmers in conjunction with the University of Sydney to run seminars on pasture cropping and rotational grazing. The Department sees this as a way of getting results in reducing salinity quickly with a minimal capital outlay.

Another example of a grazing education program for farmers is the Prograze Program run by NSW Agriculture. It does not focus on saltland pastures. Prograze aims to bring about grazing systems which are more profitable and more sustainable. Information provided by NSW Agriculture states that:

Having completed Prograze participants indicate they are confident to more effectively :

- *target pastures to suit livestock requirements;*
- *meet livestock production and market targets;*
- *utilise their pastures more efficiently ;*
- *use supplementary feeding to meet livestock targets;*
- *achieve productive, stable pastures;*
- *use pastures to address sustainability issues; and*
- *develop grazing plans for the entire farm.*[170]

Prograze training involves local groups which are more likely to have in common pasture types, enterprise types and grazing management issues.

NSW Agriculture states that the course is regularly modified based on new research and feedback from participants, deliverers and grazing management specialists.

RECOMMENDATION 32: The Committee recommends that NSW Agriculture reviews the contents of the Prograze Program to incorporate information on managing saltland pastures from the results of the Sustainable Grazing of Saline Lands Program and other research into saltland pastures.

RECOMMENDATION 33: The Committee also recommends that education programs for farmers form part of any incentives offered by the NSW Government in future for establishment of saltland pasture systems.

[170] NSW Agriculture, Brochure (Alan Bell)

5.9 ASSISTANCE WITH CAPITAL ESTABLISHMENT COSTS

Another key barrier to widespread adoption of salt tolerant pastures is the costs of capital establishment and the opportunity cost of not being able to graze the land for up to two years. The costs of establishing Saltbush pastures involve the least capital outlay of any saline industries, however, banks are not familiar with these plants and are currently unlikely to approve loans for this purpose.

Stephanie Bolt provides some indicative costings based on annual per hectare costs reported by landholders from the Upper South East of South Australia. It should be noted that establishment costs will vary according to location, site conditions, rainfall and species selection.The establishment cost reported by landholders varies from $35 - $145/ha. Stephanie Bolt reports that a typical establishment cost for a mixed salt tolerant pasture is $138/ha. This sum can be reduced by collecting seed on farm and modifying fertiliser application.

Michael O'Connell in a paper for the 2002 PUR$L Conference *The Role of Saltland Pastures in the Farming System-A Whole Farm Bio-Economic Analysis,* states that the cost of establishing Saltbush in two medium rainfall districts of Western Australia were: $225 per hectare for high productivity saline soil; $200 per hectare for moderate productivity saline soil and $175 per hectare for low productivity saline soils. The assumptions used in the costings are as follows:

> *…..we assumed a contract charge of approximately $170/ha to establish Saltbush. A further $55/ha was included to allow for establishment of an improved legume base pasture, bringing the total cost of establishment to $225/ha……An adjustment was made for risk of establishment failure and the cost was amortised over 5 years at a real interest rate of 5%. The cost per year was calculated by adding the cost of an annual application of fertiliser. The costs of establishment and the annual fertiliser on the moderate and low productivity saline soil were scale back to reflect a decreased input level.*[171]

NyPa Forage™ propagates by vegetative means (not by seed). There is currently no broadacre agricultural equipment to plant it. It has been planted with a broccoli planter at the rate of 1-2 hectares per day. As the labour requirement is high, the plant is expensive to establish. It currently costs about $1,000 per hectare to establish. It is possible to reduce costs by planting further apart and waiting for the plant to fill in. Establishment costs and lack of familiarity of the plant are currently major barriers to its adoption. John Leake, Managing Director of NyPa Australia said:

> *The major barrier to us is cost of establishment. I think that many farmers- as I said with that farm there- he cannot imagine how he can convince his bank manager that these plants will save his farm because the bank manager has never heard of them. It is not an established industry. It will cost money to establish.*[172]

The plant cannot be grazed until it strikes root which is an opportunity cost. However, land suitable for NyPa Forage™ is unlikely to producing anything else.

Stephanie Bolt states:

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171 Conference Proceedings, at p.225

172 Transcript of Evidence, 5 September 2002, at p.18

> *…..the cost of pasture establishment must be around $100/ha or less if the enterprise is to remain profitable, unless the system is highly productive and generating a net return of $30/ha or more.*[173]

In spite of positive reports by farmers with saltland pastures, establishment costs are a key barrier to widespread adoption of this approach to reducing salinity. Support for salt tolerant pastures by governments should be a high priority because it is a relatively low cost approach to addressing salinity affected sites over a large area of land. As it is marginally profitable government funds can be leveraged over a large area compared to other activities which are loss-making.

Grant Stuart, former Salinity Business Facilitator with the Department of State and Regional Development told the Committee that the biggest gross change in reducing salinity would come from making rotational grazing with perennial plants profitable and successful.[174]

The cost -benefit analyses provided above do not include environmental values. There may be significant on-site and off-site benefits of using salt tolerant pastures. Off-site benefits from salt tolerant pastures are particularly likely where discharge areas are close to waterways. The Sustainable Grazing of Saline Land Program is currently measuring these environmental benefits with some salt tolerant pasture plants.

RECOMMENDATION 34: The Committee recommends that if the Sustainable Grazing of Saline Land Program finds that there are public benefits from growing saltland pastures, that landholders be eligible for the Environmental Services Scheme to assist with the capital establishment costs of saltland pastures.

5.10 CROPPING ON SALINE LAND

The only option the Committee is aware of for producing crops on saline land is WildWheat™ grain, a distichlis cultivar. Wildwheat™ grain is a perennial plant which thrives in highly saline areas. As with NyPa Forage™ discussed above, the plant excretes salt so has a low salt content. It grows in summer and tolerates waterlogging in winter. In overseas trials the grain yield has been two tonne.

Overseas field trials have found WildWheat™ to have similar properties and nutritional characteristics to wheat. Bread baked with Wildwheat™grain tastes similar to whole wheat bread and is gluten free, making it a useful alternative for people with wheat allergies. The bread is sold to local gourmet outlets in the USA. The grain is also suitable for pasta making.

Elders has provided some modest funding and Ausindustry has provided a grant to to improve the grain. John Leake believes that Wildwheat™ grain will be in commercial production within three years.

The Committee has recommended that NSW Agriculture supports further research into Distichlis.

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173 OPUS report, op cit, at p.40

174 Transcript of Evidence, 26 September 2002, at p.34

5.11 SALINE FORESTRY

Saltgrow is part of a privately funded research and development syndicate established in 1996 which has developed a salt tolerant Eucalypt hybrid. The syndicate comprises:

- Centre for Tree Technology (Victoria);
- State Forests (NSW);
- Murdoch University (WA);
- University of Melbourne Forestry Department;
- University of Western Sydney;
- University of Queensland; and
- Saltgrow (a subsidiary of Arthur Yates and Company).

$7.5M was invested into the project. The syndicate partners licensed technology from several organisations working on salt tolerance on trees. These parties receive royalty payments on the commercialisation of the technology. Saltgrow has been doing the project management and commercialisation of the technology.[175]

The hybrid combines the salt tolerance of Eucalyptus Camaldulensis (River Red Gum) with the form and fast growth of Eucalyptus Grandis (Flooded Gum) and Eucalyptus Globulus (Blue Gum). The hybrid is also tolerant to sodic soils and waterlogging.[176]

Saltgrow has over one hundred field trials of the trees in Australia. There are trials in every State, except the Northern Territory to test for performance across a range of climactic, soil and geographic conditions. There are trials on recharge, discharge, saline, non-saline, sodic, acid sulphate and low rainfall areas.

The original trial site at Mt Scobie in Victoria has a shallow saline watertable, half a metre from the surface, with salinity levels up to 8.5 dS/m or 8500 EC. At these salinity levels the area was no longer productive. The soil is also sodic and has a heavy clay texture. The area has an annual average rainfall of 465mm. The hybrids were first planted in 1998. In the first year the trees were watered with fresh water and thereafter were watered with waste water at 10dS/m. In 2002, the trees are 10 – 11 metres tall with a diameter of four to five inches. Saltgrow informed the Committee that the trees are out-performing normal native trees on non-saline land in the same area.[177]

A subsequent trial commenced in 1999 at Deniliquin, irrigating the trees with saline water, is showing similar results.

Hybrids grown under low rainfall (<550mm) dryland conditions have grown three metres in nine months.

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175 Submission, 27 February 2001

176 Submission 27 February 2001

177 Submissions: 17 October 2000; 27 February 2001; and 25 March 2002

Where on the landscape does it work?

The hybrid has been developed for lower rainfall areas down to 400mm, including on saline land. The 400mm – 700mm rainfall zone encompasses most of the salinity hazard areas on the 1998 DLWC hazard map.

What are the economic benefits

In their submission, Saltgrow explained that Australia is not self sufficient in timber. Australia's trade deficit in forest products is $2 billion per year. *The Plantations for Australia 2020 Vision* of the National Forests Policy aims to triple the area of Australia's plantations to three million hectares. With normal trees there is usually only an economic return in higher rainfall areas (over 800mm). However, land in these areas is expensive and also becoming scarce with companies forced to pay increasingly high rental, lease or purchase fees. The benefit of salt tolerant trees is that they will grow productively in lower rainfall areas on saline land where the opportunity cost of land is much lower. Robert Prince of Saltgrow states:

> *Afforestation of saline areas offers a potential new land resource, and opportunity to contribute to the NFP for timber production, with parallel realisation of the environmental benefits of forest plantations.*[178]

Until the first Eucalypt hybrids mature it is not possible to tell what quality the timber will be. As discussed earlier, the hybrids are a cross between River Red Gum, Flooded Gum and Blue Gum. High quality timber grown in long rotations of up to fifty years for River Red Wood and 40 years for Flooded Gum can produce face veneer quality wood. Flooded Gum in long rotation of up to 40 years can produce saw logs. However, fast growing trees like Blue Gum do not usually produce high quality wood. Fast growing trees in short rotation of up to fifteen years are grown for pulp for paper and fibreboard.[179]

The product dictates the type of processing facilities needed and also what the economical distance from market is. Sawlogs have a higher value and can be grown further from the market than pulp wood.

There are products other than timber that can be produced from low rainfall Eucalypts, these include:

- *eucalyptus oil for the pharmaceutical, cosmetic and industrial solvent industries;*
- *electricity from biomass resources;*
- *ethanol from biomass resources;*
- *charcoal and activated carbon;*
- *essential oils; and*
- *use as fodder for grazing stock.*[180]

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178 Submission, 27 February 2001, at p.1

179 OPUS Report, op cit., at p.87

180 OPUS Report, op cit, at p.83

Stephanie Bolt in the OPUS Report, , states that multiple products are the key to commercial success in agroforestry and that potential waste utilisation industries such as electricity generation, transport fuel production, activated carbon or firewood supply and important to increase profitability. With the exception of firewood, processing facilities for these products do not currently exist in most rural areas and would need to be developed. The decentralised establishment of new value added industries which attracted new private investment into rural regions could provide a boost for regional economies.

There would also be opportunities for education and training in the forest and natural resource management sectors.

Plantation forestry is not a particularly attractive option for landholders to enter into by themselves due to the high establishment costs and uncertainty of potential earnings. Higher quality timbers require careful silvicultural management. Also in many lower rainfall areas processing facilities for the timber do not exist. The production of wood for pulp would therefore only be an option for landholders within one hundred kilometres of existing processing facilities.[181]

A more attractive option for landholders is to lease their land to a private forestry company. Investment in forestry may be attractive to patient capital such as superannuation funds because schemes which mature after many years have lower capital gains tax implications. Forestry investments are usually a collaboration between investment organisations, companies that manage the forest and landholders. The land is leased from landholders. The benefit to landholders is the receipt of a long-term stable revenue with minimal or no management overheads. Landholders may also be entitled to a proportion of revenue from the plantation, depending on the particular arrangement.

What are the environmental benefits

A number of environmental benefits may result from planting trees on saline sites, these include:

- reducing the ground water table;
- reducing erosion;
- increasing biodiversity;
- sequestration of carbon;
- replacement of degraded landscapes with productive forests;
- use of milling residues for bio-energy to reduce greenhouse emissions;
- buffering and protection of engangered wetlands, riverine forests and remnant vegetation; and
- provision of wildlife habitat and corridors.

[181] OPUS Report, op cit, at p.92

These environmental benefits would be an additional benefit to commercially viable saline forestry projects. However, these environmental benefits from saline forestry have not yet been quantified.

According to Stephanie Bolt in the OPUS Report, , there are few discharge sites that can be reversed by the use of trees. She says:

> *There are very few hydrogeological circumstances in Australia where dryland salinity effected by groundwater discharge can be ameliorated by the planting of trees on saline lands. Most saline areas represent groundwater discharge from the down-basin end of the groundwater flow system, and whilst trees might remove water in the short term they generally do so at the expense of increasing salt concentration in the longer term There are also hydrological limits to the extent to which trees can lower watertables.*[182]

In other words, saline forestry may provide a productive use of saline land with secondary environmental benefits but it is probably not suitable primarily as an environmental tool for reclaiming large areas of land.

Saline forestry may, however, provide measurable environmental benefits in irrigation areas or with drainage schemes for reducing the quantity of saline water that has to be discharged. Robert Prince from Saltgrow says:

> *Afforestation of saline discharge areas is expected to provide a sink for discharge waters which would otherwise find their way into drainage systems, with consequent impacts on downstream habitats and ecosystems. Also as productive utilisation of saline discharge sites will be economically preferable to alternative options which may involve a net cost, afforestation of such sites with salt tolerant hybrids may allow private investment funds to be raised to establish plantations on saline discharge sites, thereby releasing limited public funds to address other environmental issues which require options involving a net cost.*[183]

A delegation of this Committee inspected Red Rock Ranch near Fresno in California, where the owner practises on-site detention of drainage water. He re-uses his drainage water several times on plants of increasing salt tolerance. The brine is then evaporated to produce salt. None of the irrigation water he uses is discharged into the environment. Salt tolerant trees may be a useful part of a system like this. A measurable reduction of saline water off-site may have public benefits that warrant financial support from governments.

Saltgrow hybrids could be used by landholders for environmental purposes on a farm-scale. Robert Prince says:

> *Many saline, heavy clay and waterlogged sites occur along drainage lines in narrow bands through the landscape.*[184]

Intercepting saline discharge sites may improve the productivity of adjacent areas of land. Robert Prince says that afforestation of drainage lines may also provide a wildlife corridor:

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182 OPUS Report, op cit, at p.89

183 Submission, 27 February 2001, at p.2

184 Submission, 27 February 2001

Afforestation of sites along drainage lines will re-establish riverine forests where none currently exist, providing artificial wildlife corridors potentially linking isolated reserves or refuges.[185]

Saltgrow informed the Committee that the threat to native forests from escapes of hybrids are assessed as low because hybrids do not survive well without specific silivicultural practices to allow them to quickly access groundwater.

What are the barriers?

One of the key barriers to saline forestry as proposed by Saltgrow Pty Ltd is that it is being sold as both an environmental tool worthy of subsidy and as a commercial forestry option. However, the effects of plantations on addressing saline discharge have not been adequately researched. The use of trees on a large-scale can reduce water flows to rivers and cause an increase in salinity in the system.

As the proposal is packaged as an environmental tool, it is difficult to ascertain whether trees grown in saline areas would be commercially viable without environmental subsidies. Saltgrow anticipates that the wood will be of sawlog quality. However, until the trees reach maturity one cannot be certain whether the timber will be suitable for higher value products.

In many low-rainfall areas the infrastructure for processing hardwood does not currently exist and would need to be developed. Saltgrow states that a timber resource of 20,000 hectares is a critical threshold to establish an integrated timber processing facility. This could be achieved by one hundred landowners planting 8 hectares/year.[186] This would involve getting a large number of landowners within a given area to agree to lease their land.

If the product from the plantations is intended to be high value hardwood, government support is likely to be necessary to improve the viability of the Australian hardwood industry. Stephane Bolt says that in spite of declining availability of hardwood due to protection of native forests, the market for higher value hardwood sawlogs and timber veneer are also declining and products such as posts rely on developed local niche markets.[187]

The domestic and overseas market growth potential for high value hardwood requires further research. Eucalypts are mainly grown in Australia for the woodchip market. Eucalyptus is not well known as a high value hardwood overseas as Australian marketing of this product has been limited. Australian technology for processing hardwood is outdated. The processing of softwood in Australia is highly mechanised and provides standard measurements such as tensile strength so that the suitability of the wood for construction is graded. However, the processing of hardwood is not highly mechanised and grading of the wood is subjective.

As well as upgrading processing facilities, new value-added products would probably have to be developed for the market as the demand for traditional hardwood products is declining.[188]

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185 Submission, 27 February 2001

186 Submission, 27 February 2001

187 OPUS Report, op cit,

188 OPUS report, op cit, at p.101

RECOMMENDATION 35: The Committee recommends that future pilot projects to measure environmental services provided by changed land uses, includes the use of salt tolerant trees to reduce the volume of saline agricultural drainage water.

Until some of the salt tolerant hybrids have reached maturity, it is not possible to know what the eventual rate of growth or quality of the wood will be. These factors determine how viable saline forestry is, what the product is and the nature of the business plan that would need to be developed.

6 OPTIONS FOR THE PRODUCTIVE USE OF SALINE WATER

6.1 SALINE AQUACULTURE

Aquaculture

In many countries around the world, including Australia, the number of fish are declining. For this reason, fish farming has emerged as a major industry. Marine fish are usually farmed in coastal areas in cages. However, in some countries fish are being farmed in saline groundwater.

However, since 1997 there has been a growing interest in using saline groundwater in discharge areas for fish farming.

Stewart Fielder, Scientific Officer with NSW Fisheries informed the Committee that in 1997 the Australian Centre for International Aquaculture Research hosted a workshop which brought together scientists from all round Australia to identify a direction for research. This led to a Fisheries Research and Development Corporation funding a research and development plan and resource inventory which identified aquaculture in the evaporation ponds of salt interception schemes as having the most commercial potential for aquaculture development.[189]

A range of fin fish are being considered for farming in inland saline aquaculture. Those which appear to be suitable for a range of saline areas across Australia are:

- Murray cod
- black bream
- rainbow trout
- snapper; and
- mulloway.[190]

NSW Fisheries is currently trialing the production of silver perch and black tiger prawns for suitability.

There are well established markets for fish and global demand has been steadily increasing. There is currently an undersupply of fish in Australia and the potential exists to replace imports through Australian aquaculture.

Other possible products are brine shrimp, crustaceans, algae and seaweed. Brine shrimp can be produced as fish food for aquariums and the aquaculture industry. Crustaceans such as crabs and lobsters can be sold to the domestic and restaurant markets. A wide variety of products can be derived from algae including:

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189 Transcript of evidence, 5 September 2002 at p.8

190 OPUS Report, op cit, at p.126

- beta-carotene a food supplement and natural colourant used in food and cosmetics manufacture;
- vitamins and minerals;
- aquaculture feed; and
- fuel oil, particularly biodiesel.

A variety of products can be derived from seaweeds including:

- dried seaweeds such as nori used in Japanese cooking;
- phycocolloids which are used in food manufacturing and industrial applications (setting and thickening agents)
- fertiliser used in agriculture and horticulture;
- polysaccharides for use in pharmaceuticals;
- seaweed extracts used in beauty treatments.[191]

A niche market exists for products harvested from microalgae which are already farmed commercially using seawater in Australia. The brine shrimp and seaweed industries are still at a very early stage of development. The OPUS report states that they are potentially high value products but there is currently a lack of data to support commercial scale development. One of the barriers to these industries is competing seawater facilities. However, these industries have the capacity to generate income from waste salt water from drainage and groundwater interception schemes which may lower the costs of production.[192]

Where on the landscape will it work?

Small-scale marine aquaculture could be practiced in farm dams in areas where there is highly saline water.

Large-scale marine aquaculture requires a constant, high volume source of highly saline water. There are many such areas in NSW where aquaculture would be possible.

Foremost amongst these areas are the drainage schemes in irrigation areas and salt interception schemes in the Murray Darling Basin. There are currently 11 salt interception schemes which have over 6,000 hectares of surface area of ponds. Another eight schemes are under construction or planned for construction. This surface area provides opportunities for the development of a large aquaculture industry. As Stewart Fielder, Scientific Officer with NSW Fisheries explained to the Committee, the entire Australian aquaculture industry would currently cover an area of approximately two hundred hectares.[193]

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191 OPUS Report, op cit, at pp151, 158 – 159,164 – 165

192 OPUS Report, op cit, at p.xiii

193 Transcript of Evidence, 5 September 2002, at p.9

Stewart Fielder also informed the Committee that there are 74 Australian metropolitan and rural towns affected by rising groundwater. Country towns such as Wagga Wagga and Dubbo are currently examining proposals to pump ground water from beneath the town. There are a number of possible productive uses of the water which would off-set some of the costs of pumping. Aquaculture is one possible use.

The chemical composition of saline water in southern Australia is similar to seawater and therefore can sustain some types of marine fish with minimal changes to the chemical composition of the water.[194]

What are the economic benefits of inland saline aquaculture?

Globally fish stocks are declining due to overfishing and the demand for fish is steadily increasing. There is an under-supply of Australian fish. NSW imports about 1200 tonnes of snapper each year from New Zealand and Western Australia.[195] .

In order to meet the growing global demand many countries have established fish farming (aquacutlure) industries. Australia has a national plan to expand its aquaculture industry. It is predicted that in 20 years time aquaculture in Australia will be worth $2.5 billion. However, the expansion of the Australian aquaculture industry is currently limited by a lack of suitable sites in coastal areas. Australia lacks deep, protected bays close to infrastructure and as most of the population lives close to the coast there are lots of competing interests for waterways. There is also a perception that sea cage aquaculture has negative environmental impacts on the ocean. There are therefore lots of barriers to coastal aquaculture.

In this context, there has been a growing interest in the use of saline groundwater in inland areas. The drainage schemes in irrigation areas and the salt interception schemes in the Murray Darling Basin offer vast areas of salt water where there are few other competitors for the resource.

There are currently 11 potentially suitable salt interception schemes in the Murray Darling Basin. They cost $3M a year to run. As discussed above, another eight are under construction which will cost $2M to operate. The Murray Darling Basin Commission is interested in off-setting the running costs of these schemes by making productive use of the saline water.

Organisations managing salinity affected areas such as Murray Irrigation Limited and the Murray Darling Basin Commission could sell options to aquaculture farmers in their existing ponds. Cages could be placed in the ponds in which fish are grown. Another option would be to sell saline ground water to adjacent aquaculture farms. The farmers could use the water and then dispose of it back into the interception basin.

Stewart Fielder of NSW Fisheries explained that there are opportunities for the new salt interception schemes to have purpose built aquaculture ponds:

> *If we can work up the technology and determine that we can grow the animals economically, the best way to do it may be to allocate perhaps 20 percent of the total surface area to evaporation ponds, the high saline end of the system, build a supply*

194 OPUS report, op cit, at p.127

195 Stewart Fielder, Transcript of Evidence, 5 September, at p.7

network from all the bores which supply all the low salinity ground water and then build purpose built parallel aquaculture ponds around the system. You could develop an aquaculture technology for private investors and the opportunity is there.

Advantages to water managers would be that the interception schemes would cost a fraction of what they do now to build and manage. The advantages to aquaculturalists are two fundamental things. They have a water supply and potentially a free or very cheap disposal system. Disposing of water from any aquacultural system is a major problem. Here we have a one way street. All of the effluent is captured and does not go into the surrounding waterways.

The land is also likely to be quite cheap and available, give the environment in which it is potentially going to be constructed, and the advantage to the community is that we could afford to build a lot more schemes potentially and obviously there would be more productive farming land surrounding these systems.[196]

Since 1997, NSW Fisheries has had a project with Murray Irrigation Limited at the Wakool evaporation ponds to examine the feasibility of inland saline aquaculture. Murray Irrigation Limited built a small experimental pond within the evaporation pond. Funding support was also received from the Department of State and Regional Development and the Murray Land and Water Management Plan (for the irrigation area).

NSW Fisheries found that temperate marine finfish can be grown in inland environments. Saline groundwater is deficient in potassium but this can be rectified cheaply by adding potash to the water. Snapper were grown successfully over an annual cycle. NSW Fisheries found that fish grown at Wakool grew more slowly during winter but much faster during summer, than fish grown in sea cages at Botany.

NSW Fisheries also found that the salt interception ponds need lining because there is a build up of organic matter in the ponds over time which releases toxins, if disturbed. This was rectified by using plastic liners.

NSW Fisheries and its partner organisations have arrived at the stage where they know that it is possible to grow fin fish inland in saline groundwater but they do not yet know whether it is economically viable.

In order to develop and validate the technology they established the Inland Salinity Aquaculture Research Centre in May 2002. Murray Irrigation Limited provided the capital to build the facility and funding has also been provided by NSW Fisheries, the Department of State and Regional Development and Wakool Shire Council to operate the facility. None of the funding provided so far has come from the salinity budget. The funding to operate the facility finishes in September 2003.[197]

The planned experiments at the facility include:

- optimum densities and management techniques for growing snapper;
- evaluating the suitability of saline groundwater and developing the technology to grow an annual crop of black tiger prawns;

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196 Transcript of Evidence, 5 September 2002 at p.11

197 Fielder, Transcript of Evidence, 5 September 2002 at pp.10-11

- evaluating the suitability of saline groundwater and developing the technology to grow mulloway which has a high market profile and grows quickly; and

- evaluating the potential of silver perch which is a fresh water species that tolerates a high level of salinity.

NSW Fisheries reported that many farmers from areas surrounding the research facility are interested in going into inland saline aquaculture and that they have been careful not to encourage them at this stage when so little is known about the commercial viability of the industry.[198]

In Western Australia, since 1997, landholders have been participating in farm scale trials producing trout in existing saltwater ponds and dams on their properties. The project, known as 'Outback Oceans', is the initiative of Fisheries WA and Agriculture WA. In 2000, more than 200 landholders were trialing small numbers of fish. The trout farming is not highly technological and is intended to supplement farm incomes whilst requiring minimal inputs. The aim of the project is to address key industry development questions whilst involving minimum risk for landholders. An important feature of the trial is that producers have been working together to develop a supply chain.[199] Producers are leasing processing facilities and employing fish filleters.[200]

What is the rationale for government investment?

Aquaculture does not rehabilitate saline environments. In fact, aquaculture would add nutrients and chemicals to the saline water. The advantage of aquaculture in evaporation ponds is that the effluent from aquaculture can more easily be prevented from entering waterways than in coastal aquaculture. Evaporation basins provide a disposal system for the water. The main benefit of aquaculture is to make productive use of saline water and to off-set the costs of engineering schemes used to pump and store groundwater. The commercial viability of inland saline aquaculture is not yet known, however the potential exists for governments to save money which would release funds for other environmental purposes.

An environmental benefit, not related to salinity, is the sustainable production of fish without wild harvest.

What are the barriers to the use of inland saline aquaculture?

It is important to understand that the concept of inland saline aquaculture has only emerged in recent years and is still in the research stage. Its commercial viability is not yet known. Stewart Fielder, of NSW Fisheries said:

> *We can grow fish in small numbers and over an annual cycle, but we do not know whether we can do it economically. We have not demonstrated the commercial viability of it. It would be imprudent for us to go out and say we need stakeholders to get involved*

198 Transcript of Evidence, 5 September 2002 at p.8

199 OPUS Report, op cit, at pp.147-148

200 Jasper Trendall, pers comm, 2001

in this now because we do not have the real information to be confident that it is going to be viable.[201]

NSW Fisheries believes it will take five to ten years to develop an inland saline aquaculture industry.

A major barrier to progress with the research is that the funding to operate the Inland Saline Aquaculture Research Centre finishes in September 2003. NSW Fisheries has applied unsuccessfully to the Murray Darling Basin Commission and has not been able to find an avenue to apply for funding under the salinity budget. NSW Fisheries is currently hoping to be involved in a bilateral project with India through which it would gain funds that could be invested in inland saline aquaculture.[202]

Another barrier is that the six ponds at the Inland Saline Aquaculture Research Centre are too small to be a commercial demonstration site. NSW Fisheries needs to double the size to demonstrate inland saline aquaculture on a commercial scale and to develop technology which can be translocated to industry.[203]

Coorong Council received further funding from the Natural Heritage Trust in 2001 to expand its aquaculture research facility at the Bedford Groundwater Interception site in South Australia to a pilot commercial scale system.[204]

As the governments of the Murray Darling Basin states invest significant amounts of funding in salt interception schemes, it may be in their interest to invest in research to examine the economic potential of aquaculture, in particular the extent to which it could off-set the cost of these engineering schemes.

RECOMMENDATION 36: The Committee recommends that the NSW Government advocates that the Murray Darling Basin Commission provides a funding contribution towards the expansion of the Inland Saline Aquaculture Research Centre in NSW into a commercial scale demonstration site with a view to developing integrated salt interception schemes and inland saline aquaculture technology parks.

Issues which must be dealt with in future are the development of a supply chain particularly specialised refrigerated transport for live fish and access to licensed packing sheds. The costs of transport may be a significant challenge as the enterprises would be located far apart. However, as Stephanie Bolt points out the need for an ocean fishing fleet did not impede the development of catching fish from the wild. Another issue is the need for a quality assurance system for the fish for food safety.

Stephanie Bolt, in the OPUS Report, says that inland saline aquaculture is currently a fragmented industry driven by researchers and small investors. In order to progress there needs to be a partnership between all the sectors of industry needed to establish a supply chain and quality assurance system. Stephanie Bolt says:

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201 Transcript of Evidence, 5 September 2002 at p.8

202 Fielder, Transcript of Evidence, 5 September 2002 at p.11

203 Ibid.

204 Tim Flowers and Wayne Hutchinson, Bedford Groundwater Interception Scheme, Proceedings PUR$L Conference 16 – 20 September 2002 at pp.201-207

> *The nature of the industry network makes it almost impossible for a single sector (eg producers) to drive industry growth. According to Trendall (2000), growth of an aquaculture industry requires a partner-like relationship between all of the businesses involved and a whole of industry approach. At issue is whether the industry can develop on a decentralised basis, or whether a more integrated approach may be more efficient.*[205]

As recommended earlier in this report, if the Natural Resource Management Ministerial Council established a body to allocate funding for research and commercialisation it could play a key role in establishing partnerships between the sectors of industry which would need to be involved in the inland saline aquaculture supply chain.

6.2 DESALINATION

Desalination technologies are used to provide clean water for domestic and industrial consumption around the world, particularly in arid countries with limited supplies of potable water. In the Middle East and North Africa seawater is desalted to provide municipal water supplies.

The United States has 16 per cent of the world's desalination capacity. This is set to increase particularly in California where sources of drinking water are drying-up and the population is rapidly increasing.

Desalination consumes large amounts of energy and produces brine which is costly to dispose of. However, the rising cost of water and falling costs of desalination technology are making desalination economically feasible in the United States. Although desalination is still four times more expensive than groundwater, several metropolitan water districts are currently considering proposals to build seawater desalination plants. In November 2002, voters in California will be considering Proposition 50 , a $3.4 billion water quality bond measure which would provide hundreds of millions of dollars for desalination projects.[206] This is to secure water supplies and also because the scarcity of water will push the price up to the extent where in the future desalination is economically viable. California is already using more water from the Colorado River than its entitlement and will be required to cut-back.

Considering that many parts of Australia are arid, the use of desalination is limited. Some remote areas of Australia have small desalination units, particularly in remote mine sites and base camps.The largest desalination unit in Australia is at the Bayswater Power Station in the Hunter Valley in NSW where discharge water from the power station is cleaned and recycled.

With increasing salinity problems, Australia has large supplies of brackish water which could be desalinated. The costs of desalination depend on many location specific factors. However, in general, desalination of brackish water is three to five times cheaper than desalinating sea water.[207]

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205 OPUS Report at p.138

206 LA Times ,19 August 2002

207 OPUS Report, op cit, at p.204

Where on the landscape will it work?

The suitability of desalination as an option is location specific. A reliable source of saline groundwater and electricity would need to be present in the proximity of a town, industrial plant, irrigation area or other end-use of the clean water.

The costs of producing clean water through desalination at that site would need to be cheaper than current alternatives. This would depend on a number of factors including: the level of salinity in the intake water, the type of technology used, the scale of the operation and the desired quality of water produced.

What are the economic benefits of desalination?

The Commonwealth Department of Agriculture, Fisheries and Forestry has recently released *Economic and Technical Assessment of Desalination Technologies in Australia: With Particular Reference to National Action Plan Priority Regions (September, 2002)*. The report is intended to help communities determine whether desalination is a viable option for their circumstances and which of the technologies is most appropriate. The report concludes that currently desalination would probably only be economical in some remote rural areas. However, water prices are currently subsidised, if governments bring in regulatory, market and policy changes to charge consumers the real costs of water supply, this would make desalination more economical. Geoprocessors Pty Ltd, a company which licenses its desalination technology believes that water prices will increase and make desalination more economical. Dr Arakel, Director , said:

> *…water pricing and other issues will be the drivers of the business. Water pricing is already impacting Western Australia and to some degree South Australia. They produce water in Perth-this is insane-they produce water in Perth at the price of $7.40……Country towns 300 kilometres away and they charge the community $2.40. Because of political and other reasons, they cannot go higher, and there is a $3 to $4 difference. Somebody has to pay for that. So they have started increasing the water price, and because the water price is going up, now they are looking at what they call production rights, where you have a desalination plant at that locality, at that town, to produce local water at their own cost, at their own service, and that is the concept we are promoting, urban salinity, in New South Wales too, and I think it needs to be taken more seriously in terms of how you can justify subsidising water at the cost to the environment and the next generation.*[208]

Likewise, if more stringent regulations are applied to the release of saline agricultural drainage water, this would also make desalination more economical for irrigation schemes. As discussed above, Bayswater Power Station has the largest desalination unit in Australia, The introduction of this measure is partly due to restrictions on discharge of saline water into the Hunter River under the Hunter River Salinity Trading Scheme.

If groundwater is pumped from beneath agricultural land it can be returned to productive use and hence increase in value. Desalination would provide a source of clean water for high value agricultural crops and if productive uses could be found for the brine such a project may be economically viable.

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208 Transcript of evidence, 4 September 2002 at p.7

Many Australian towns are affected by rising water tables which are damaging houses, parks, roads, pipes, sewerage systems and underground cables at great expense to ratepayers. Some councils are finding it cheaper to pump groundwater from beneath the towns than to keep paying for the maintenance bills for the damage. Wagga Wagga is one such town. The problem Wagga Wagga faces now is how to dispose of the saline water without causing further environmental problems. Currently, Wagga Wagga is discharging the saline water into waterways but this arrangement cannot continue indefinitely. Wagga Wagga City Council and Dubbo City Council are currently exploring a proposal by GeoProcessors Pty Ltd to desalinate the water and off-set some of the costs through harvesting the salts in the water. This is following a successful trial that was supported by the Department of State and Regional Development in NSW and the Federal Government's Regional Solutions Program. What is unique about the proposal is that it combines the production of clean water with safe disposal of the brine.

Merredin is a regional town in Western Australia which is trialing a desalination plant to desalt water pumped from beneath the town to protect it. The 12 month project is an initiative of Agriculture WA, the Water Corporation and Merredin Shire. It is funded by the State Salinity Council's Community Support Scheme. The desalination plant will produce clean water to supplement the town water supply which is supplied from Mundaring Weir via the Kalgoorlie pipeline. Two hectares of evaporation ponds will be located outside of the town with an adjacent desalination plant and reservoir.

The desalination plant will reduce the town's dependence on piped water and cut down the size of the evaporation basin required to dispose of the groundwater.[209]

The two highest costs of operating desalination plants are electricity and disposal of the brine. Desalination is more economical if integrated with productive uses for the brine. Possible uses are aquaculture, salt harvesting and solar ponds (energy).

Desalination plants are often set-up to produce both clean water and electricity. Both distillation and reverse osmosis plants have been connected to energy recovery devices. The brine produced by the plants could also be used to generate electricity from solar ponds. Another option is for the plant to be co-located with an another alternative power source, such as solar power or wind generation, this would cut down the costs of electricity. Currently, however, alternative power is more expensive to generate than standard electricity generation. However, this too is location specific and in remote areas standard power generation would not be economical.

What is the rationale for government investment?

Desalination is not directly environmentally rehabilitative. Whilst it removes salts from water, the process also produces large quantities of brine (20 – 70 per cent of the volume of input water) which must be safely disposed of.

The rationale for local government investment in desalination is that it is one productive use of saline groundwater pumped from beneath towns or other high value assets to lower the ground water table. If the saline water beneath the town is coming from areas beyond the shire or council boundaries there is an argument for subsidy by State and/or Federal governments. Also if the desalination of the water results in lower salt loads in rivers, there is an argument that councils should be paid for the environmental service to the broader community.

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209 AFFA, Introduction to Desalination Technologies in Australia, September 2002, at p.4

The Commonwealth and NSW Governments currently contribute towards the costs of Land and Water Management Plans to progressively implement more environmentally sustainable irrigation systems. Desalination and other productive uses of saline agricultural drainage water would result in less saline water being discharged into waterways from irrigation areas with significant environmental benefits. There is an argument for cost sharing in the development of such technologies for use in irrigation areas.

What are the barriers to the use of desalination?

The main barrier to desalination is that currently in most areas it is more expensive than existing sources of clean water. Stephanie Bolt in the OPUS Report concludes that further economic assessment on a case by case basis is required to identify areas where desalination may already be economically viable for domestic or industrial purposes. She says:

> *A significant difference in cost of water will continue to exist between desalinated water and conventional water supplies, particularly for many rural centres or industries for which the cost of desalinated water may indeed be comparable. Further economic analysis is required to determine the situations and locations where desalinated water can indeed be produced for comparable, if not reasonable, cost to the consumer.*[210]

Geoprocessors Pty Ltd is encountering a number of barriers to the desalination of water pumped from beneath country towns. One of the barriers is the complexity of dealing with many different NSW Government departments with different interests and regulations over the use of water. A related issue is who owns the saline groundwater, and if treated, who owns the freshwater. If councils and other organisations are to enter into a partnership to desalinate water through leasing technology from Geoprocessors they need to 'own' the water. Geoprocessors described these problems to the Committee:

> *They* [Tamworth City Council] *extract water out of the Peel River, treat it, send it to their customers, the customers use it and send it back and they have to treat it. They have normally discharged it to the river. The EPA say you cannot discharge it to the river, you have got to discharge it to the land. So the council had to buy 3,000 hectares, I think they said, of land so they can irrigate. The Department of Land and Water Conservation say to them, "You cannot put it to the land. We want it to the river for water flow. " We have come to them and said, "If you have got to put it to the land, you are going to raise the water table.*
>
> *To solve the problem, they have got to pump the water from the land. If they pump the water from the land, that affects their cap, but they cannot pump the water from the land because the department says, "We have got to take it off your allocation of water". When they take it out of the water and we produce minerals, because it is a straight production thing, we are into the madness of mineral rights and mineral licences and we have got another Government department to deal with, or they have* [the council]*, not us.*[211]

Geoprocessors Pty Ltd advocates that the Government resolves the problem of the ownership of the groundwater and streamlines approval processes.

> *The issue of who owns the saline groundwater… At present councils say, okay, we own it, we are prepared to make it good by using SALPROC™ or other technologies, but*

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210 OPUS Report, op cit, at p.204

211 Transcript of evidence, 4 September 2002, at p.6

> *there are three claimants over there: EPA, Land and Water, Mines Department. They all make claims over the water produced, but they do not want to look at the big picture, and I think that is why we need to see that the Government takes a more active role in addressing these issues. They can easily be addressed to the benefit of the environment and community.*[212]

The Department of State and Regional Development is also involved as it has been supporting investigations into the feasibility of desalinating groundwater through its Salinity Business Facilitation Program. The Committee believes that the desalination of groundwater in country towns and productive uses of the brine should be facilitated by the NSW Government to lower the saline groundwater tables beneath these towns and to reduce the discharge of saline water into the environment.

RECOMMENDATION 37: The Committee recommends that the EPA, DLWC, Department of Mineral Resources and Department of State and Regional Development work together to streamline the process of approving desalination of groundwater in country towns and the productive uses of brine.

Another issue raised by Geoprocessors Pty Ltd is that there have been few assessments of the costs of controlling or remediating salinity in country towns. The costs of a 'do nothing' scenario are essential as a baseline against which to measure the benefits of any proposals brought by the private sector to remediate salinity. It has only been possible for Geoprocessors Pty Ltd and the Department of State and Regional Development to work with Wagga Wagga City Council because such data is available for Wagga Wagga. The cost of salinity damage if nothing is done in Wagga Wagga has been estimated to be $95M over 15 years. Geoprocessors Pty Ltd estimates that the net cost of the SALPROC™ treatment plant and operating costs, after the sale of water and salts, is $5.59M over fifteen years. Sinclair Knight Merz has been commissioned to undertake an independent analysis of the costs of the proposal and options for funding it. Geoprocessors Pty Ltd states:

> *A meaningful and useful salinity risk analysis should employ elements of local and regional landscape and hydrological features but be based on factual valuation of public and private assets, as well as the cultural and heritage related values, and the costs of maintenance and upgrade of current salinity control measures. It is **only** such integrated salinity risk analyses that will enable the investors to make a value judgement and make a significant contribution to the huge and ever increasing cost of the salinity reparation tasks.*[213]

Geoprocessors Pty Ltd recommends:

> *That the State Government as a matter of priority commissions an independent study involving risk and valuation analysis of urban salinity, followed by similar studies for other 'hot spots' where the assets of high monetary, community and ecological value are threatened.*[214]

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212 Transcript of Evidence, 4 September 2002, at p.7

213 GeoProcessors Pty Ltd, Submission, 28 March 2002

214 GeoProcessors Pty Ltd, Submission, 28 March 2002

RECOMMENDATION 38: The Committee recommends that the NSW Government supports local councils to undertake an assessment of the costs of controlling or remediating salinity in country towns as a baseline against which to measure the benefits of any proposals brought by the private sector to remediate salinity.

At the time of writing, options for paying for the scheme are being considered by Sinclair Knight Merz on behalf of the councils. The Committee has not seen the proposal. However, in theory, the options for payment are ratepayers who will benefit from preventing damage to the town which would incur higher rates; purchasers of salts and clean water and the Commonwealth and State governments for any public environmental benefits such as lower salt loads in rivers. Under the current proposal the Councils intend to use the clean water to save on water costs. However, an alternative canvassed by the local Member of Parliament, Mr Maguire, in discussion with Geoprocessors Pty Ltd, is that the clean water could be sold to microirrigators for high value agricultural crops. This would necessitate additional infrastructure and the cost benefits of this would need to be examined.

RECOMMENDATION 39: The Committee recommends that the NSW Government works with local councils to identify how schemes which safely dispose of saline groundwater should be paid for, and to establish tendering processes as a point of entry for private entrepreneurs who can contribute to the management of salinity in council areas.

6.3 SALT HARVESTING AND MINERAL EXTRACTION

Salt harvesting and mineral sands mining

The composition of saline groundwater in many areas of Australia is similar to seawater. Seawater and saline groundwater can contain high concentrations of mineral salts which are commercially harvested. This includes:

- sodium salts, including eating salt (halite),
- magnesium salts,
- calcium salts,
- potassium salts
- other salts (borates, iodine, bromine, boron)

Eating salt (halite) can be harvested from saline groundwater by pumping it into a series of ponds where sunlight and wind cause the water to evaporate, leaving a bed of pure salt.

Eating salt is used in the food industry in bread and pastry making, vegetable processing and canning, cheese manufacturing, fish and meat curing and general home cooking. However, there are many other uses of eating salt. The chemical sector accounts for 55 per cent of world salt consumption. It is used to produce caustic soda, soda ash and chlorine which are used in many other products particularly, pulp and paper, organic and inorganic chemicals, glass, petroleum, plastics and textiles.

Other uses of eating salt (halite) are:

- hide curing;

- swimming pool chlorination;
- water softening;
- animal feed supplementation and
- road de-icing (in the northern hemisphere).[215]

In 1999, 209 tonnes of eating salt were produced globally. Australia is the sixth largest producer, supplying around five per cent. Western Australia produces salt from seawater for export to Asia, Africa and the Middle East. Japan is the largest importer of salt and sources this mostly from Australia and Mexico.[216]

Magnesium and potassium rich waters (known as bitterns) are left behind after eating salt has been extracted from saline water. Magnesium can be used in the production of metals and alloys, animal feed, fertilisers, soil conditioners, building materials (eg Sorel cement), colour stains, water treatment agents, dust suppressants and other chemical reagents.[217]

Where on the landscape will it work?

Salt harvesting and mineral extraction from saline groundwater requires a constant, large volume of water with salinity levels close to seawater (preferably not less than 30,000 mg/L). Groundwater with a lower concentration of salts will take much longer to precipitate and therefore be less economic. To maximise evaporation, salt harvesting works best in semi-arid regions with higher solar radiation and low rainfall. A large, low cost, land area is required for evaporation ponds. Mineral extraction does not require high evaporative conditions.

The OPUS Report states that suitable areas are restricted to the western Murray Darling Basin (Mallee lands of Victoria and South Australia) and eastern wheatbelt of Western Australia. However, salt harvesting is taking place across the border from Northern Victoria in NSW in the salt interception schemes of the Wakool Irrigation District and the Mourquong Basin near Wentworth.

The Murray Darling Basin has large mineral sands deposits. The mineral sands resulted from an inland sea which extended from Adelaide to Cobram and Horsham and nearly to Broken Hill. There are fourteen prospect sites in this area, of which seven are in NSW. These can be mined to extract minerals. If the companies involved decide to progress to further processing of the minerals and decide to process them in the Murray Darling Basin, there is an opportunity to make use of saline water from drainage and salt interception schemes. Processing of industrial minerals requires chemicals which can be made from salt.

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215 OPUS Report, op cit, at p.173

216 OPUS Report, op cit, at p.178

217 OPUS Report, op cit, at p.183

What are the economic benefits of salt harvesting and mineral sands mining?

♦ Salt Harvesting

Currently, the commercial viability of salt harvesting from saline groundwater is limited because most of the salts produced have a low value and the costs of transportation would eliminate any profit. Furthermore, there are large well established Australian companies already supplying the chemical industry. Salt export businesses in Western Australia are located close to shipping and to the Asian market.

The potential for salt harvesting from saline groundwater is through the development of high-grade or value-added products.

Pyramid Salt is a small business in Northern Victoria producing salt from groundwater. It has found a niche market producing high grade gourmet flake salt. It produces 2,000 tonnes of stock feed grade salt at $160/tonne and 1-2 tonnes of high grade gourmet food salt at $1500 – 1600/tonne. Important factors in Pyramid Salt's success are the production of high grade salt and proximity to food processing plants in the Shepparton Basin.

The OPUS Report states that salt harvesting is not a viable option for single operators or landholder enterprises because of the high costs of establishing and running a salt harvesting business. This includes high labour costs as salt harvesting requires substantial expertise and is labour intensive. Pyramid Salt, for example, employs several staff including managers and chemists.[218] Other costs include, transport, electricity and pumping.

Stephanie Bolt in the OPUS Report concludes:

> *The value of salt is highly dependent on the grade and end use of the salt produced. Based on the experience of Pyramid Salt, small scale production appears to offer marginal returns on investment, and it is perceived that above a certain size, new entrants to the market would not likely survive the high degree of competition from the major Australian companies*[219]

SunSalt is a company which has been harvesting salt from saline groundwater for up to 20 years. They are involved in a long-term project with the CSIRO to produce value-added chemicals from salts.

The company is developing the Mourquong Basin and Wakool sites in NSW and the Hattah site in Victoria into large salt producing facilities. DLWC informed the Committee that SunSalt will have the potential to harvest up to 80,000 tonnes per annum. CSIRO is working with Sunsalt on a project which will initially involve extracting magnesium rich materials from the saline water. SunSalt, in collaboration with CSIRO, has developed a mobile extraction plant for magnesium sulphate and can move the plant to sites where the brine is located. Duncan Thompson of Sunsalt is currently commssioning the mobile processing plant on his site at Hattah. The mobile plant will then be taken to Mourquong and Wakool to start recovering the magnesium salts there.

The next phase in the project between Sunsalt and CSIRO would be to achieve a purer grade of magnesium sulphate which meets the market specifications for fertiliser additive.

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218 OPUS Report, op cit, at p.176

219 OPUS Report, op cit, at p.181

If the production of value added minerals and light metals from mineral sands proceeds in the Murray Darling Basin, the project with Sunsalt could involve further processing the salt into chlorine, caustic soda and hydrochloric acid for use in the process. (This is discussed in more detail later in this section.) Processing salt into value-added products is likely to make the industry more economically viable.

DLWC has been providing technical advice to the company and advised the Committee that there is potential for SunSalt to develop other sites with short lead times.[220]

- **Mineral Extraction**

As discussed above, salt harvesting becomes more economically viable when the salts are processed into value-added products.

The mineral sands deposits in the Murray Darling Basin can be mined to extract minerals. This process does not require salts. However, these minerals can be further processed into a range of other products.

This further processing uses chemicals which can be derived from saline groundwater. There is an opportunity to link the use of saline water from drainage and salt interception schemes with the processing of minerals into valuable products such as light metals. This would depend on whether the companies involved choose to process the products within the Murray Darling Basin. These industries are potentially highly valuable but their establishment would involve significant government support, particularly in the establishment of supporting infrastructure such as road, rail, water and electricity.

The value of the coarse grain deposits is valued at $13 billion and the value of the finer grain deposits is valued at $40 billion. If processed into titanium the resource may be worth close to $300 billion. The major commercial minerals recovered from mineral sands are zircon, rutile and ilmenite. The CSIRO provided the following data on the prices for minerals which can be extracted from mineral sands.

Mineral	**Global Production – (tonnes per year)**	**Price (Australian dollars per tonne)**
Zircon	1, 000,000	$700
Rutile	400,000	$950
Ilmenite	4, 800,000	$130 - 140

Salts from saline water can be used to process these to produce the following range of products. The processing of mineral sands to titania pigment is an established process in other parts of Australia. However, the processing of the pigment into titanium metal would be a novel industry in Australia. Titania pigment and metal are particularly valuable.

[220] Correspondence, dated 20 September 2002

Upgraded Product	Global Demand (tonnes per year)	Price (Australian dollars per tonne)
Zircon fluor	0.5 million	$910
Synthetic rutile	0.92 million	$575
Titanium slag	1.14 million	$750
Titania pigment	4.15 million	$2,950
Titanium metal sponge	50,000	$18,000

Source: response to questions on notice, 26 September 2002 / TZMI Mineral Sands Report

Currently, titanium metal is expensive and used mainly in the aerospace industry. The current process used to produce it results in a very pure but very expensive metal to meet aerospace testing and safety standards.[221]

CSIRO aims to develop a new process to cut the costs of titanium production by half which would make its use in cars, buildings, chemical and desalination plants and ships economically viable. The automotive industry is a potential market as light metals such as magnesium are gradually replacing more parts in cars to reduce the weight of vehicles in order to reduce the fuel consumption.

The new process would replace the current multi-stage process with a single step from ilmenite to titanium.[222] Titanium is 43 per cent lighter than steel, tougher and more flexible than steel and far more corrosion resistant. If the cost of titanium production was halved it would be competitive with steel. CSIRO informed the Committee that:

> *A new supply really requires a new demand and that is what we are factoring into some of the work that we are doing.*[223]

CSIRO is currently evaluating four new processes for making titanium metal. It has made a submission, along with other partners such as the University of New South Wales, for funding from one of the Cooperative Research Centres.

CSIRO's titanium metal initiative will also be one of its flagship projects, which are projects which CSIRO foresees as having national benefits in the medium to long-term. The initiative is part of the Federal Government's Light Metals Action Agenda.[224]

In order to be used in mineral processing, salts from the saline waters would have to be produced at commercially competitive prices. Approximate prices for some salts that may be produced are as follows.

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221 Media Release, Ref 2001/219, 2 October 2001

222 Ibid

223 Transcript of evidence, 5 September 2002, at p.1

224 Transcript of evidence, 5 September 2002, at p.5

Salts	Price per tonne (Australian dollars)
Sodium Chloride	Bulk salt has a price of $30 – 40. Specialty salt would be produced at a much higher price.
Magnesium Sulphate Magnesium Chloride	Can be recovered from the bitterns left after harvesting sodium chloride. Price depends upon the grade but is around $500.
Chlorine Sodium Hydroxide	$260 $450

Source: response to questions on notice, 26 September 2002, p2)

Current Status and Timeline for Development

CSIRO Minerals has been working with mineral sands companies since the 1970's. In the last two or three years it has worked with almost all of the new explorers and producers in the Murray Basin to bring their material on-line.

The projects in the Murray Darling Basin are being developed by Iluka Resources Limited (the second largest mineral sands producer in the world) or by several junior mining companies such as Southern Titanium and BeMax Resources. Iluka Resources has several deposits in the Murray Basin that it is evaluating. It is proposing to bring one into production in the next 1-2 years. Sons of Gwalia has also increased its interests in two companies in the Murray Basin . The other companies that have developments are small exploration companies. A current trend is for larger companies to take over smaller ones.

At the same time, CSIRO Minerals is negotiating a contract with the Murray Darling Basin Commission which manages the salt interception schemes on the River Murray to research the economic viability of recovering mineral salts from the saline water. This proposal involves: CSIRO Minerals, CSIRO Land and Water, exploration and mining interests in Sydney and the South Australian Government. CSIRO anticipates that the contract agreement will be in place in mid 2003.

The project will involve:

- sampling water from the interception schemes all along the River Murray;
- examining the mineral composition of the water,
- using chemical models to predict what salts will precipitate from those waters,
- obtaining information on the market price for those salts;
- obtaining information on the markets for the products from those salts; and
- an economic assessment of the viability of the business, if prices were obtained in a certain range or if the market was increased.[225]

[225] Transcript of evidence, 5 September 2002, at p.4

If the production of salts from the salt interception scheme proves to be viable, the mineral sands mining industry would be a major outlet for some of the salts.

The Murray Darling Basin Commission plans to seal the lakes in the salt interception scheme so the water stays on site and evaporates into salts. CSIRO aims to control the way the salts are precipitated and to do something with them.

The plans for mineral sand mining in the Murray Basin will proceed in two stages. Graham Sparrow, Research Scientist with CSIRO Minerals said:

> *The development of the mineral sands deposits can be considered to take place in two stages.*
>
> *The first will involve the companies defining the extent and composition of their deposits followed by commissioning of a separation plant to produce individual mineral concentrates of zircon, rutile and ilmenite by gravity and electrostatic separation techniques. These concentrates will be exported and sold into the world markets.*
>
> *The second stage will involve further processing of the minerals to value added products. It is possible that this processing will take place in the Murray Basin. It is at this second stage of the development of the mineral sands deposits that there is the potential to use salts recovered from saline waters. The salts could be converted to chemicals required to upgrade the mineral sands.*[226]

The implementation of the full scheme is expected to take ten years. It is proposed that:

Between 2002 – 2006 mineral sands operations will start producing and selling rutile, zircon and ilmenite, sorel cement, magnesia and spinel based refractories.

At the same time, a brine and bittern chemical based industry could be established selling the salts extracted from saline water at salt interception schemes.

The first salt that precipitates is calcium sulphate (gypsum). Of particular interest, is the magnesium rich liquid left after producing sodium chloride (eating salt).

CSIRO is working with a company to market magnesium products as dust suppressant and fertilizer. CSIRO is also looking at whether it can make magnesium based cements (Sorel cements) and SiroSpinel commercially and meet market specifications. In the future, CSIRO is interested in producing magnesium metal from the salts.

When the companies involved in mineral extraction have made an income from these processes they will be in a position to proceed to upgrading the mineral sands to high value products.

Between 2007 – 2011 further processing of ilmenite to titania pigment and zircon to zirconia is expected to commence using chemicals from saline water in the process.

This would involve processing sodium chloride into chlorine (used to produce titania pigment); caustic soda (used to process zircon); and hydrochloric acid (used to up-grade the mineral sands).

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226 Sparrow – response to questions on notice, 26 September 2002

It is likely that the industries producing these chemicals would sit side by side and the product would be taken from one company to the next for the subsequent processing.

CSIRO's integrated proposal for the use of saline water in processing industrial minerals also involves the use of the saline water from the salt interception scheme to produce fresh water and energy. This water would be desalted in desalination plants located across the Basin. The plants would supply the fresh water needed for the final stage of ore treatment and the effluent would be used to recover the industrial minerals. These plants will also use saline water for solar ponds to supply heat and electricity.

What is the rationale for government investment?

The rationale for government investment is that salt harvesting and the use of saline water in mineral processing removes salts from the hydrological system. If water is pumped from the groundwater table it will lower the groundwater table for a considerable distance, allowing the land to return to productive use. Pyramid Salt in Victoria extracts 200 Megalitres of saline groundwater a year. This has dropped the groundwater level to two metres for two to three kilometres to the north of the site.

As discussed in the chapter on desalination, Geoprocessors Pty Ltd is working on a proposal with country towns affected by salinity to desalinate water pumped from beneath the towns to protect them from salinity damage. Geoprocessors Pty Ltd has developed the SALPROC™ process which progressively extracts all of the salts in the ground water leaving no residue. The water produced is cleaner than that currently used for domestic purposes in the towns. The use of this process may reduce salt loads into adjacent waterways. However, these environmental benefits have not yet been measured.

If salts are harvested from salt interception and drainage schemes this will reduce the salt load in waterways as well as off-setting the costs of such schemes.

The areas where SunSalt is operating are drainage and salt interception schemes with large quantities of saline water which must be disposed of. Currently, the water is stored in evaporation ponds. The concentration of salts in the water eventually prevents further evaporation shortening the life of the evaporation basin. It is in the interests of organisations which manage drainage and salt interception schemes to find productive use for the saline water. In the past two years, Sunsalt has received funding from the NSW Department of State and Regional Development and Commonwealth and Victorian Governments.

As discussed above, several mineral sands mining companies are working with the CSIRO to develop mineral deposits in the Murray Darling Basin. In future, these minerals may be further processed using saline ground water. However, at this stage it is not clear how much salt this would remove from the hydrological system. Graham Sparrow, Research Scientist, with CSIRO Minerals said:

> *If the mineral sands companies choose to use salts from saline water then some salt will be removed from the hydrological system. The amount will depend on the extent to which upgrading of mineral sands takes place in the Murray Basin and the actual processes that are applied. There are a number of scenarios that could be considered to obtain an indication of how much salt may be utilisied . These scenarios have not been evaluated at present.*

It is expected that salts will be used also in other applications besides upgrading mineral sands and so further increase the amount of salt taken out of the ground waters.[227]

There are also some environmental hazards from salt harvesting and mineral extraction which would need to be carefully managed. CSIRO informed the Committee that waste from salt production is expected to be simple to handle. The excess liquours can be returned to the pond areas. The production of magnesium salts is likely to produce more sodium chloride (eating salt) than can be used. This may require some means of disposing of the salt.

The production of mineral sands produces sand and clay slurry. This would be placed back into the mined out areas, covered with the overburden removed before mining and the area revegetated using well established methods developed by mining companies. Water will be recovered from the slurry for use in the plant.

The up-grading of mineral sands into value added products creates different effluent streams depending on the particular process used. These would need to be treated with chemicals before they could be safely disposed of.

What are the barriers to salt harvesting and mineral sands mining?

Stephanie Bolt, in the OPUS Report and Graham Sparrow, Research Scientist with CSIRO Minerals highlighted a number of barriers to salt harvesting and mineral extraction.

♦ Economic Feasibility

According to Stephanie Bolt in the OPUS Report further research is needed to determine the commercial viability of mineral extraction from saline groundwater and supply chain feasibility. She says that there are highly competitive export markets for minerals.[228]

There are also highly competitive export markets for the chemicals produced from salts. The European Commission in 1997 produced a report, *An Economic and Environmental Analysis of the Chlor-Alkali Production Process.* It concludes that although demand for chlorine and caustic soda is growing, this demand will be met by increased production in Asia and the gulf states of the USA. Exports from the European Union are declining as it is unable to compete on price with the gulf states of the USA. A significant factor is that electricity is 35 per cent cheaper in the gulf states than in the European Union.[229]

Inland Australian manufacturers of chemicals from salts may not be able to compete on the world market. An economic assessment for Australian applications is important. The development of mineral sands processing in the Murray Darling Basin as a major purchaser of chemicals produced from salts may be crucial to its economic feasibility.

♦ Infrastructure

The establishment of a mineral sands mining industry in the Murray Darling Basin in NSW will require significant support from the NSW Government to provide the necessary infrastructure of road, rail, water and electricity.

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227 Response to questions on notice, 26 September 2002

228 OPUS Report at p.187

229 European Commission, *An Economic and Environmental Analysis of the Chlor-Alkali Process*, 1997 at pp.i-ii

Graham Sparrow, Research Scientist, CSIRO Minerals said:

> *The plant near Mildura is a large pilot plant, if you like. When they develop the deposits in New South Wales they might elect to put the processing plants somewhere more central to them, or up at Broken Hill somewhere, depending on what the infrastructure is. There is no doubt that there will have to be extra infrastructure to shift the mineral once they start.*
>
> *The first deposit of mineral sands to be mined is in Wemen in Victoria. The site is expected to produce 20,000 to 30,000 tonnes of minerals a year. The Victorian Government has recently completed an infrastructure survey of the area and is considering increasing the rail facility from Mildura directly to Portland or Geelong to transport the material. The material will be up-graded in Hamilton and exported out of Portland.* [230]

There is no rail line close to the deposits in NSW and the deposits in NSW are much larger than those at Wemen.

Graham Sparrow informed the Committee that the decision by mineral sands companies on where to have the minerals processed will be an economic one and this will depend on where the necessary infrastructure for processing is. He said that if the companies decide to process close to the deposits, Broken Hill would be an option as it has the infrastructure to do this sort of processing.[231] . This could provide a boost to the economy of Broken Hill which has experienced a decline in income from mining as deposits are worked out.

- **Streamlining Approval Processes for Demonstration and Commercial Mineral Extraction and Salt Harvesting Plants**

The Committee was contacted during its inquiry by SunSalt which had concerns about the length of time and complexity of the approval process for salt harvesting. In 2001, when it contacted the Committee, Sunsalt had been trying to establish their business on crown land at Mourquong for four years and had not yet received all the necessary approvals. The process involves:

- Confirmation that native title has been extinguished on the land where the evaporation works will be constructed and consultations with the Aboriginal community under Subdivision H of the *Native Title (NSW) Act 1994* for two areas of land where native title has not been extinguished;
- Environmental Impact Statement (EIS)
- Landholder Consent
- Development Application and EIS lodged with Wentworth Shire Council; and
- A mining lease;

In NSW (but not in Victoria) salt is deemed to be a mineral under the *Mining Act 1992*. This means that a mining lease is required. This is anomalous as salt is produced rather than mined. However, an exemption from the requirement to obtain a mining licence can create

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230 Graham Sparrow, transcript of evidence, 5 September 2002

231 Transcript of evidence, 5 September 2002, at p.2

its own problems as it can greatly complicate meeting the requirements of the *Native Title (NSW) Act 1994.*

The application for a mining lease provides a process to acquire a title to Crown Land under the *Native Title (NSW) Act 1994*. The process involved has some legal certainty. If the requirement to obtain a mining lease for salt harvesting were to be removed from the *Mining Act 1992*, rights to use the land for salt harvesting would have to proceed by compulsory acquisition or Indigenous Land Use Agreement, which are legally untested and unclear.

Graham Sparrow of CSIRO Minerals believes there is a role for government in streamlining the approval process for salt harvesting and mineral extraction. There would be public benefit in supporting a process which has beneficial environmental outcomes in removing salt from the hydrological system and prolonging the life-span of evaporation basins.

- **Research**

Stephanie Bolt in the OPUS Report states that mineral extraction based on saline groundwater is in its infancy. There is a role for government in supporting further research into: the nature of the salts in the groundwater; processes to produce salts that meet market specifications and to demonstrate the application of salts to mineral sands mining.

Stephanie Bolt says that the application of mineral extraction using saline groundwater is limited to small scale pilot plants and the process needs to be scaled up. She says:

> *From the information available, it would appear that the next step in the development of the industry is generating support for the scaling up of production processes to capitalise on known market opportunities.*[232]

- **Financial Support for Salt Harvesting Industries**

Graham Sparrow of CSIRO Minerals emphasises that governments may need to financially support the development of the salt harvesting industries to produce industrial minerals and chemicals. These businesses are small compared to the mineral sands mining companies which are potentially a key purchaser of their products. In order for saline groundwater from salt interception schemes to be used in processing minerals, these salts and chemicals would need to be produced at commercially competitive prices.

- **Role for Government**

Graham Sparrow, Research Scientist, with CSIRO Minerals provided the following suggestions for a role for governments in supporting the development of a commercial salt industry in the Murray Darling Basin:

> *I suggest there are several possible ways that the NSW and Federal governments could help in the development of a commercial salt industry in the Murray Basin and the development of mineral sands deposits.*
>
> *Support is required for fundamental research to determine the nature of the salts that may be recovered from the saline waters and to develop processes to purify the salts recovered so they can meet grade specifications for the appropriate markets. Initially some support may be required to demonstrate the application of these salts to the*

232 OPUS Report, op cit, at p.187

upgrading of mineral sands before the mineral sands industry may consider their use in the further processing of the mineral sands products in the Murray Basin.

Governments can also assist all these operations by facilitating approval processes to establish the demonstration and full scale processing operations. Also financial support (loans or grants) is likely to be required for the salt producers who can be expected to be smaller operations with limited finances compared with the mineral sands companies. It may be in support of the companies trying to establish an industrial salt industry that the NSW Government could become a partner in operations in the Murray Basin.

In all the new developments in the Murray Basin a significant improvement in infrastructure (eg road, rail, water, power) for the operations will be required. This will offer the opportunity to upgrade facilities to the cities and towns in the area as a whole, not just to the particular operations.[233]

Currently the NSW Government is not a partner in any of the mineral sands operations in the Murray Basin. However, the Department of State and Regional Development has provided some funding to support salt harvesting by SunSalt. The Department of State and Regional Development advised the Committee that the details of its arrangements with businesses are commercial-in-confidence. Typically, however, the sums provided by the Department to facilitate salinity businesses are small.

There are public benefits in the removal of salt from the hydrological system. CSIRO informed the Committee that currently, however, there are no estimates of the quantity of saline groundwater that would be removed through the production of chemicals for use in mineral processing. Graham Sparrow of CSIRO Minerals stated that there are a number of scenarios that could be considered to obtain an indication of how much salt may be utilised but these scenarios have not been evaluated at present.

RECOMMENDATION 40: The Committee recommends that the NSW Government supports an evaluation of the quantity of salts that would be removed from the hydrological system through the production of chemicals to supply the mineral industry and other markets. If significant public benefits are likely to accrue through the reduction of salt loads in rivers and prolonging the life span of evaporation basins, then the NSW Government should become a partner in the operations in the Murray Basin. This should occur through supporting companies establishing a salt industry to supply chemicals for processing minerals. Support is required to assist companies to meet market specifications at commercially competitive prices.

6.4 ELECTRICITY GENERATION

A solar pond is a body of shallow saline water several metres deep that collects and stores heat from the sun. The pond is set up so there is increasing salinity with depth. Solar radiation entering the pond is stored as heat in the lower layer. The salinity gradient of the water prevents hot water rising and dissipating. The heat (up to 80ºC in summer) is trapped in the lower level of the pond where it is available on a 24-hour basis.

Stephanie Bolt in the OPUS Report states that solar ponds have been recognised for decades as a renewable energy technology. The technology is proven with at least 60

233 Answers to questions on notice, dated 26 September 2002

(mainly experimental) systems having been constructed around the world, mostly to provide process heat to industry.

Israel has led the world in the field of solar pond technology having invested $US20M between 1975 and 1985 alone.

- In Beit Ha'Arava, Dead Sea, 2.5 hectares of solar ponds generate five Megawatts of electricity.

- In El Paso, Texas, the University of Texas has constructed a 3350 metre square pond that has been used to produce 330 kilowatts process heat for a food canning operation, 70 kilowatts of electricity for industrial consumption and 16,000 litres a day of fresh water.

- In Kutch, Bhuj, India a 6000 metre square pond was constructed in 1990 to supply hot water to a dairy operation.[234]

In Australia, RMIT University, Geo-Eng Australia Pty Ltd and Pyramid Salt Pty Ltd were awarded a $550,000 grant under Round 2 of the Australian Greenhouse Office's Renewable Energy Commercialisation Program. The project is to demonstrate and commercialise a system using a solar pond to generate heat for a range of industrial purposes. The hot brine from solar ponds is passed through a heat exchanger. A heat exchanger can produce hot air or hot water.

The Committee inspected the solar pond at Pyramid Hill in Northern Victoria which is being used to supply heat to dry air used in the salt production process. This substitutes for heat previously supplied by electric heating elements, reducing the company's electricity consumption.

The second stage of the project by RMIT and its partners is to generate electricity using the heat stored in the solar pond.

Where on the landscape will it work?

Like salt harvesting, solar ponds require a constant, large volume of water with salinity levels close to seawater.

They are also suited to arid regions with higher solar radiation and low rainfall. As the efficiency of solar ponds in converting solar radiation into heat and electricity is low, a large, low cost, land area is required for solar ponds.[235]

The OPUS Report states that suitable areas are restricted to the Western Murray Darling Basin (Mallee lands of Victoria and South Australia) and Eastern wheatbelt of Western Australia. However, CSIRO has a long-term integrated proposal to establish solar ponds throughout the Murray Darling Basin in conjunction with mineral sands mining operations.

What are the economic benefits of electricity generation?

RMIT states that solar ponds have strong market prospects to provide process heat from sunlight to other rural industries in salt affected areas such as:

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234 OPUS Report, op cit, at p.188

235 OPUS report, op cit, at p.192

- dairy industry, for example, to preheat feed water to boilers;
- aquaculture to grow fish or brine shrimp;
- fruit and grain drying;
- water supply for desalination; and
- factory and office space and water heating at suitable rural sites.

The electricity produced by solar ponds is, equivalent to, or cheaper in remote areas than diesel generated power, LPG or photovoltaic technology. Stephanie Bolt in the OPUS report examines data on the comparative costs of alternative energy supply sources in South Australia, provided by Primary Industries and Resources, South Australia. She says:

> *Based on these cost estimates, the cost of energy derived from solar ponds is several times higher than the cost of power supplied through the electricity grid. Conversely, in remote areas, the energy costs from solar ponds is equivalent to, if not cheaper than, diesel generated power or photovoltaic technology.*[236]

Later in her review she also says:

> *In Australia, solar ponds can produce process heat (60 – 80 celsius) at an average cost of about AUS$10/GJ (gigajoule) compared with over AUS$20/GJ (at 43c/litre) from liquefied petroleum gas (LPG) or fuel oil in rural areas (RMIT, 2000). Direct heating from electricity costs over AUS$45/GJ at peak rate, and AUS$9/GJ off peak. Therefore, heat from solar ponds is expected to be competitive with the use of LPG and electricity in rural areas, with the exception of those areas where natural gas is available (RMIT 2000).*[237]

The cost of conventional energy is rising and the cost of constructing solar ponds is decreasing which will improve the competitiveness of solar pond technology in the future.

Cliff Hignett, a contributor to the Saltlist internet forum claims that:

> *A solar pond of 1 ha … can produce $55,000 worth of electricity a year.*[238]

The upper layers of solar ponds need to be topped up with fresh water and salt has to be added periodically to the lower layer. There are, therefore, economies in co-locating desalination plants, solar ponds and salt harvesting enterprises.

At Pyramid Salt Pty Ltd in Victoria the solar pond is co-located with the salt harvesting business. The Committee inspected the 3,000 square metre pond.

The temperature at the bottom of the pond in winter is 35°C and 30 kilowatts of electricity is being extracted from the heat. The cost of producing the electricity is half way between that of retail and wholesale power costs. In summer the temperature in the pond is 80°C and produces 100 kilowatts of electricity on a continuous basis.

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236 OPUS Report, op cit., at p.194

237 OPUS Report, op cit, at p195

238 E-mail to Saltlist subscribers, 4 November 2002

The pond cost $200,000 to establish. Mr Privett, a business partner and industrial chemist, explained that solar ponds *"are not rocket science"* – the process of technological development involves experimenting to iron out practical problems. The project aims to make ponds that are cheap to construct and have low maintenance costs.

In other parts of the world, such as the USA, there are solar ponds but these use chemicals to keep the water clean. The pond at Pyramid Hill uses brine shrimp. A new strain of brine shrimp has been developed which survives well in the solar pond.

Mr Privett informed the Committee that solar ponds have great commercial potential. He believes that within a few years the commercialisation of the ponds will be at a level where a five hectare solar pond could provide electricity for a town of 200-300 people. He believes that by 2008 solar ponds will be a $60M per annum industry for Australia.

Stephanie Bolt in the OPUS report, says that the operation of solar ponds is not suited to landholder enterprises as it requires substantial human resources. She says that a 25 hectare pond or larger requires a full time operator. In addition solar ponds require periodic maintenance by contractors. The skills and knowledge of how to construct and operate a solar pond are currently limited to a few experts.

As solar ponds store heat energy for days they can be used as a back-up energy supply for other forms of power.

Enviromission is a public company that has an $800M project to establish solar thermal energy generation as a commercial alternative in the Australian energy market. It is establishing a facility in the Buronga district in NSW which will produce 200 megawatts of electricity. The facility will be 7 kilometres wide and have a solar tower 1,000 metres tall and produce enough electricity to power 200,000 homes. Enviromission anticipates that construction will begin on the site in January 2003.[239]

Enviromission has engineers examining the use of a solar pond to provide a source of energy during the night when sunlight is unavailable. Enviromission hoped to sign an agreement in September 2002 with DLWC for a six week study of the possibility of using saline groundwater from a salinity mitigation scheme. [240]

What is the rationale for government investment?

The rationale for government investment is that solar ponds support the pumping of saline groundwater to reduce groundwater tables. There is a large amount of evaporation from solar ponds which means that they would be a constant, high-volume user of saline water. There are at least four groups of stakeholders who could benefit from this:

- landholders benefit from the remediation of their land;
- residents and local government benefit from the lowering of water tables to protect towns and other valuable infrastructure;
- irrigation areas and districts would benefit from the productive use of saline drainage water; and

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239 www.environmission.com.au, accessed 13 August 2002. Pers comm, Richard Parker, 2002

240 pers comm, Richard Parker, 2002

- governments could benefit from the productive use of saline water from salt interception schemes.

The substitution of conventional electricity from that produced from solar ponds also reduces greenhouse gas emissions.

Solar ponds do not remove salts from the hydrological system as they produce waste brine which needs to be disposed of. This can be managed by co-locating solar ponds with salt harvesting facilities. Some of this salt can be fed back into the solar pond operation.

Solar ponds can pose an environmental threat if they leak.

What are the barriers to the use of saline water for electricity generation?

Stephanie Bolt in the OPUS report highlights a number of barriers to the use of solar ponds. Foremost amongst these are the need to commercialise solar pond technology and expand the pool of expertise in Australia. Funding from the Federal Government's Renewable Energy Commercialisation Program has made the two year commercial trial at Pyramid Hill possible. Further Federal Government funding and support is vital for the commercialisation of the technology.

Research is also needed to identify appropriate sites where a solar pond would be technically feasible and there would be both environmental and economic benefits.

6.5 SALT INTERCEPTION SCHEMES

This chapter has mentioned a number of potential salinity businesses such as aquaculture and salt harvesting which can be used to off-set the costs of salt interception schemes.

Salt interception schemes are large-scale groundwater pumping and drainage projects that intercept saline water flows in the rivers of the Murray Darling Basin and dispose of them usually by evaporation in large ponds. These engineering works are paid for jointly by the Commonwealth and States Governments under the Murray Darling Basin Ministerial Council arrangements discussed below. Joint works were undertaken from 1988 under the *Salinity and Drainage Strategy*. This has been superseded by the *Basin Salinity Management Strategy* of 2001. Under the latter, a new joint program of salt interception schemes totalling $60M capital works over seven years has been agreed by the Commonwealth and Basin States. These works make early gains against salinity while land management changes are progressively implemented that will reduce salinity in the longer term.[241]

The Murray Darling Basin Ministerial Council

The Murray Darling Basin Ministerial Council was established in 1985 comprising Ministers from the governments of NSW, Victoria, South Australia, Queensland and the Commonwealth holding land water and environment portfolios. An ACT Minister is a non-voting member.

241 www.mdbc.gov.au/naturalresourcesplanning/planning/salinity/factsheets/fsal003_101.html – 25 November 2002.

The Council determines major policy issues of common interest to the contracting Governments and authorises measures for the equitable, efficient and sustainable use of such water, land and other environmental resources in the Murray Darling Basin.

The Council has the power to make decisions for the Basin as a whole. Resolutions of the Council require a unanimous vote. Decisions taken by the Council represent a consensus of governmental opinion and policy across the Basin.

Murray Darling Basin Commission (MDBC)

The Commission is the executive arm of the Murray-Darling Basin Ministerial Council. The Commission is an autonomous organisation equally responsible to the Governments represented on the Council as well as to the Council itself. It is not a government department or a statutory body of any individual government.

Community Advisory Committee

This was established in 1985. The Community Advisory Committee reports directly to the Ministerial Council. Currently, the Committee comprises an independent Chairman and 26 members representing catchments/regions as well as representatives of the National Farmers Federation, the Australian Conservation Foundation, the Australian Local Government Organisation, the Australian Landcare Council, and the Indigenous Land Corporation.

Management of salinity

- **Water accounting and 'the cap'**

The most important achievements of the MDBC are keeping an account of the water used by the States and gaining the agreement of all states in the Basin, except Queensland, to a limit on diversions of water from the Basin's rivers at 1993/94 levels of development ('the cap').

The cap keeps a balance between water consumption and in-stream uses.

- **The Salinity and Drainage Strategy, 1988**

The Salinity and Drainage Strategy operated from January 1988 to 2001. It established a framework for NSW, Victoria, South Australia and the Commonwealth to manage salinity in the rivers of the Murray Darling Basin. The Strategy aims to ensure that salinity levels at Morgan in South Australia, at the monitoring station, is less than 800 EC, 95 per cent of the time. This ensures the river does not exceed the World Health Organisation standard for the quantity of salts that can safely be in drinking water.

NSW, Victoria and the Commonwealth jointly funded salt interception and drainage diversion schemes to reduce salinity at Morgan by 80 EC. Of this, 50 EC were deemed to be necessary to off-set the degradation in the river during the historical development of irrigation.

30 EC were deemed to be salinity credits or "salt disposal entitlements". The Strategy established a system of salinity credits and debits to manage the state accountabilities. A state receives a salinity credit for any works or planning measures that reduce average salinity at Morgan by more than 0.1 EC, and a debit for any measures that increase the average salinity at Morgan by more than 0.1EC. Each state must remain in credit and ensure that there is not an overall increase in salinity in the shared rivers due to land and

water management plans in irrigation areas, activities affecting point sources and specific works implemented since January 1988.

With these credits, NSW and Victoria can undertake developments which increase salinity by 15 EC each.

- **Salinity Audit of the Murray Darling Basin, 1999**

The Murray Darling Basin Ministerial Council released the *Salinity Audit* of the Murray Darling Basin in 1999. The results show that the effects of dryland salinity is more severe than had been realised and that unless government and community efforts are increased the target of 800 EC 95 per cent of the time would not be maintained. There would also be enormous damage to the natural environment, productive rural enterprises and buildings and infrastructure.

- **Basin Salinity Management Strategy 2001 – 2015**

The Basin Salinity Management Strategy covers the period 2001 – 2015. It recognises that to maintain the salinity target at Morgan in South Australia to 2015 a further reduction of 100 EC will have to be found by new engineering works. A new joint program of salt interception schemes costing an estimated $60M commenced in 2001. Ten schemes are being considered, of these, two are in New South Wales. These are the Sunraysia Regional SIS Optimisation and Integration and the Billabong Creek SIS.[242]

The MDBC estimated that the NSW interim end-of-valley targets will not be sufficient to protect the Morgan target from the impacts of increasing dryland salinity. NSW will have to introduce further measures to make up a shortfall of 5.3 EC.

The Committee believes that salt interception schemes are an essential part of addressing salinity which allows the community to buy time whilst longer term land management changes are made. In some cases, it may be more cost-effective to establish salt interception schemes than introduce major land-use changes, particularly where the groundwater system is not responsive as discussed in chapter 3.

This chapter has discussed a number of possible commercial uses of saline water from salt interception schemes which could be used to off-set some of the costs. The Committee believes that the NSW Government should support the development of these commercial opportunities. The Committee also believes that the NSW Government should continue to support construction of new salt interception schemes.

RECOMMENDATION 41: The Committee recommends that the NSW Government continues to support the development of salt interception schemes.

242 www.mdbc.gov.au/naturalresourcesplanning/planning/salinity/factsheets/fsal003_101.html – accessed 25 November 2002.

Appendices

Acronyms

ABARE	Australian Bureau of Agriculture and Resource Economics
ACF	Australian Conservation Foundation
AEM	Airborne Electro Magnetic
BRS	
CMB	Catchment Management Board
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DLWC	Department of Land and Water Conservation
EC	electro-conductivity
EMS	Environmental Management Systems
ERIC	Environmental Research and Information Consortium
ESS	Environmental Service Schemes
MDBC	Murray Darling Basin Commission
MEU	Ministry of Energy and Utilities
MRET	Mandatory Renewable Energy Target
NAP	National Action Plan
NCC	Nature Conservation Council
NFFO	non fossil fuel obligation
NHT	Natural Heritage Trust
PUR$L	Productive Uses and Rehabilitation of Saline Land
RFPs	requests for proposals
SIS	Salt Interception Scheme
SME	small to medium enterprise

List of Witnesses Appearing Before the Committee

WITNESS	ORGANISATION	POSITION	DATE APPEARED
ANGEL, Jeff	Total Environment Centre	Director	29 March 2001
ARAKEL, Aro	GeoProcessors Pty Ltd	Director	4 September 2002
ARCHER, Ken	NSW Agriculture	Program Manager, pastures and Rangelands	4 September 2002
BEACROFT, Warrick	Department of Information Technology and Management	Division Manager, Information Sourcing	28 May 2001
BLACKMORE, Don	Murray Darling Basin Commission	Chief Executive	11 April 2001
BOLT, Stephanie	PPK E & I Ltd	Environmental Consultant	4 September 2002
BROSTER, Leon	Murray Darling Association	General Manager	18 July 2001
BROWN, Amanda	Blacktown City Council	Environmental Health Officer	28 May 2001
BUDGE, Trevor	Research Planning and Design Group	Director	21 September 2001
BUTLER, Craig	Penrith City Council	Manager, Building Approvals & Environment Protection	28 May 2001
BUTTERWORTH, Perce	Department of State and Regional Development	Executive Director of Policy and Resources	26 March 2001
CARSON, Simon	NSW Farmers Association	Assistant Director, Conservation and Resource Management	29 March 2001
CLIFTON, Craig	Sinclair Knight Merz	Senior Scientist	18 July 2001
CLUFF, Daryl	Stipa Native Grasses Association	Coordinator	27 September 2002
CONNOLLY, Phil	NSW Treasury	Principal Adviser, Natural Resources Branch	29 March 2001

WITNESS	ORGANISATION	POSITION	DATE APPEARED
CREELMAN, Robert	Centre for Industrial and Process Mineralology University of Western Sydney	Adjunct Associate Professor	26 September 2002
CULLEN, Michael	Department of State & Regional Development	Executive Director, Regional Development Division	26 September 2002
CURLL, Mike	NSW Agriculture	General Manager, Strategic Review	9 March 2001 26 March 2001
DAVIS, John	Live Earth Resource Management Pty Ltd	Director	6 September 2001
DAWSON, Gill	Holroyd City Council	Manager, Strategic Planning	28 May 2001
DEWAR, Liz	New South Wales Treasury	Acting Executive Director, Resource Allocation	29 March 2001
ELYARD, David	Department of State and Regional Development	Senior Manager, Strategic Projects	26 March 2001
FARRIER, David	University of Wollongong	Professor, Centre for Natural Resource Law and Policy	21 September 2001
FIELDER, Stewart	NSW Fisheries	Scientific Officer, Marine Fish Breeding	5 September 2002
FISHER, Tim	Australian Conservation Foundation	Coordinator, Land and Water Ecosystems	21 September 2001
GEERING, Don	Department of Urban Affairs and Planning	Director, Natural Resources Planning	11 April 2001 28 November 2001
GOURLAY, Rob	Environmental Research & Information Consortium	Managing Director, Environmental Scientist	11 April 2001
GUMLEY, Wayne	Department of Business Law & Tax, Monash University	University Lecturer	26 September 2002
HALE, David	Local Government and Shires Association	Senior Policy Officer, Water	28 May 2001 29 November 2001
HUNTER, Bob		Private Citizen	5 September 2002
IRVINE, Rob	Department of Local Government	Senior Policy Adviser, Policy and Research Branch	28 November 2001

WITNESS	ORGANISATION	POSITION	DATE APPEARED
IZMUR, Gul	The Cabinet Office	Assistant Director	9 March 2001 26 March 2001
JAMES, Glennys	Blacktown City Council	Director, Environmental and Planning Services	28 May 2001
JOHNSON, Clive	Lachlan Catchment Management Board	Chairman	29 November 2001
KEOGH, Mick	NSW Farmers Association	Policy Director, Conservation and Resource Management	29 March 2001
KNOWLES, Jacqueline	NSW Farmers Association	Research Assistant, Conservation and Resource Management	29 March 2001
LAUTREC, Danielle	Cabinet Office	Principal Policy Officer, Salinity Action Unit	27 September 2002
LEAKE, John	NyPa Australia	Managing Director	5 September 2002
LEUTTON, Ralph	Cotton Australia	Program Manager, Policy and Legislation	18 July 2001
MCALOON, Jane	The Cabinet Office	Assistant Director-General	29 November 2001
MANWARRING, Jim	Department of State and Regional Development	Manager, Regional Programs (Salinity)	26 September 2002
MONTGOMERY, Mike	Shires Association	President	29 November 2001
MOONEY, Des	Department of Information Technology and Management	General Manager, Land and Property Information NSW	28 May 2001
MULLETTE, Keith	GeoProcessors Pty Ltd	Senior Consultant	4 September 2002
MULLIGAN, Mark	Country Energy	Group Manager, Corporate Business Development	4 September 2002
NEWLIN-HARDY, Lindsay	State Land Council	Consultant	29 March 2001
NICHOLSON, Rebecca	Western Sydney Regional Organisation of Councils	Salinity Project Officer	28 May 2001

WITNESS	ORGANISATION	POSITION	DATE APPEARED
O'HARA, Tony	State Forests	General Manager, Investment Services Division	26 March 2001
OWENS, Derek	Care Free Water Conditioners	Sales Manager	6 September 2001
PAVAN, Neville	Department of Land and Water Conservation	Senior Natural Resource Officer	28 May 2001 28 November 2001
PRINCE, Robert	Saltgrow Ltd	General Manager	27 September 2002
RIDGE, Kathy	Nature Conservation Council	Executive Officer	29 March 2001
ROGAN, Ian	Central West Catchment Management Board	Chairman	29 November 2001
RYAN, Julia	Western Sydney Regional Organisation of Councils	Senior Project Officer, Environment	28 May 2001
RYAN, Margaret	Department of Information Technology and Management	Executive Director, Office of Western Sydney	28 May 2001
SALVIN, Sue	State Forests	Manager, Environmental Services	26 March 2001
SCHUCK, Stephen	Bioenergy Australia	Director	5 September 2002
SEIS, colin	Stipa Native Grasses Association	Chairman	27 September 2002
SHARP, Brian	Murray Darling Association	President	18 July 2001
SIPPEL, Andrew	Managing Director	Grazing Management Systems	26 September 2002
SMITH, Peter	Blacktown City Council	Manager, Building and Environmental Services	28 May 2001
SMITH, Tommy	NSW Aboriginal Land Council	Manager, Land Rights Unit	29 March 2001
SPARROW, Graham	CSIRO	Program Manager, Industrial Minerals	5 September 2002
STUART, Grant		Consultant, Salinity Business Development Officer	26 September 2002

WITNESS	ORGANISATION	POSITION	DATE APPEARED
UDEN, Robert	Care Free Water Conditioners	Proprietor	6 September 2001
VERHOEVEN, John	Department of Land and Water Conservation	Acting Director, Landscape Management	9 March 2001 26 March 2001 28 November 2001 27 September 2002
WILLIAMS, Brad	Irrigators Council	Executive Director	29 March 2001
WOODS, Peter	Local Government and Shires Association of NSW	President, Local Government Association of NSW	28 May 2001
YOUNG, Mike	CSIRO, Land and Water	Director, Policy and Economic Research Unit	21 September 2001

List of Submissions

No.	Name	Organisation / Department
1.	Mr Lionel Henderson, Manager	Yates Botanicals
2.	Mr John Bradd	*Private Citizen*
3.	Mr Alan Stewart, General Manager	Tallaganda Shire Council
4.	Mr David Philpott, General Manager	Boorowa Shire Council
5.	Mr Warren Lee Hill	Private Citizen
6.	Mr Bryan Short, Design Services Manager Mr Graeme Faulkner, General Manager	Wagga Wagga City Council
7.	Mr Glenn Evans, Chief Executive Officer	Hunter Catchment Management Trust
8.	Mr Robert Prince, General Manager	Saltgrow Pty Ltd
9.	Mr Robert Gourlay, Managing Director	Environmental Research & Information Consortium Pty Ltd (ERIC)
10.	Mr Robert Uden, Director,	Care-Free Water Conditioners Australia
11.	Mr Paul Anderson, Environment & Planning Services	Tamworth City Council
12.	Ms Kate Lorimer-Ward, Executive Support	Lachlan Catchment Management Board
13.	Ms Sue Salvin, Manager, Environmental Services	State Forests of NSW
14.	Mr Denis Porter, Executive Director	NSW Minerals Council
15.	Mr Chris Champion, Chief Executive Officer	Institute of Public Works Engineering Australia Limited
16.	Hon Harry Woods MP	*Minister for Local Government*
17.	Hon Mr Michael Egan, MP	Minister for State Development, NSW
18.	Mr Len Reade	Private Citizen
19.	Hon. Kim Maxwell MP	*Minister for Information Technology, Energy, Forestry and Western Sydney*
20.	Cr Leo Kelly, Vice President	Local Government and Shires Association of NSW
21.	Mr Rod Towney, Chairperson	NSW Aboriginal Land Council
22.	Mr Marc Allas, Solicitor	Environmental Defender's Office (NSW)
23.	Mr Squires, VET Schools Consultant	Department of Education and Training, Bathurst

No.	Name	Organisation / Department
24.	Ms Kathy Ridge, Coordinator Corey Watts, Coordinator	Nature Conservation Council of New South Wales Salinity & Sustainable Agriculture Program Australian Conservation Foundation
25.	Ms Julia Ryan, Senior Project Officer	Western Sydney Regional Organisation of Councils Ltd
26.	Mr Gary Mitchell, Executive Officer	Water Directorate
27.		Blacktown City Council
28.	Ms Sylvia Nuttgens	Blacktown and District Environment Group
29.	Mr Shane Godbee, General Manager	Cootamundra Shire Council
30.	Mr Dennis Trezise, General Manager	Holroyd City Council
31.	Mr Sid Clarke	Landowner
32.	Mr Paul McCardell, Director	Fodder King Ltd
33.	Mr Noel H Wilson, Inventor	Migmaplas
34.	Mr Ninian Struthers	Private Citizen
35.	Mr Devon Roberts	Private Citizen
36.	Mr Neville Elphinston, Marketing Coordinator	Grazing Management Systems Pty Ltd
37.	Mr Stuart Carter, President	Scone-Parkville Environment Watch
38.	Mr Robert Prince, General Manager	Saltgrow Pty Ltd
39.	Mr George Nixon, Director	Saltbush Grazing Pty Ltd
40.	Mr Tony Hyles,	Gwydir Valley Turf Trees & Erosion Control
41.	Mr Bill Henty	W J Henty & Co
42.	Dr Aro Arakel, Director	Geo-Processors Pty Ltd
43.		GecOz, Geospatial & Environmental Consultants
44.	Mr Brian Hearne, Managing Director	Simple Grow Fertilizers & Hydroponics
45.	Mr Aron Gingis, Managing Director	Australian Management Consolidated Pty Ltd
46.	Mr Bob Hunter	Agricultural & Commercial Project Adviser
47.	Mr Barry Dunn, Chairman of Directors	Water for Australia
48.	Dr Robert Creelman, Adjunct Associate Professor	College of Science & Technology, Uni of Western Sydney

Minutes of Proceedings of the Select Committee on Salinity

Minutes of Proceedings of the Select Committee on Salinity
Wednesday 30 August 2000, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr Hickey**	**Mr McGrane**
Mr Anderson	**Mr Maguire**	**Mr D L Page**
Mr Black	**Mr Martin**	**Mr Windsor**

In the absence of the Clerk of the Legislative Assembly, the Clerk-Assistant (Committees) opened the meeting and read entry 14 from the Votes and Proceedings No. 55, dated 17 August 2000.

"Mr Amery moved, by leave, That:

1. A select committee be appointed to inquire and report with the following terms of reference:

To examine:

(a) Business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas.

(b) The options for salinity management that are available to local councils, including but not limited to, planning instruments, building codes, urban water management plans, differential rating, development of local council expertise and resource-sharing between councils.

(c) Any barriers to adoption of salinity management strategies by local councils and means to overcome the barriers.

(d) The adequacy of the Commonwealth's response and contribution to addressing salinity.

2. That such committee consist of Ms Allan, Mr Martin, Mr Black, Mr Hickey, Mr Anderson, Mr Windsor, Mr McGrane, Mr Maguire and Mr D.L. Page.

3. That the committee have power to make visits of inspection within the State of New South Wales and other States and Territories of Australia.

Question put and passed".

Election of Chairman

Resolved, on the motion of Mr Black, seconded by Mr Hickey:

"That Ms Allan be elected Chairman of the Committee".

Ms Allan made her acknowledgment to Committee Members.

Procedural Motions

Resolved, on motion (in globo) of Mr Anderson, seconded by Mr Hickey:

That arrangements for the calling of witnesses and visits of inspection be left in the hands of the Chairman and the Committee Manager to the Committee.

That, unless otherwise ordered, parties appearing before the Committee shall not be represented by any member of the legal profession.

That, unless otherwise ordered, when the Committee is examining witnesses, the press and public (including witnesses after examination) be admitted to the sitting of the Committee.

That persons having special knowledge of the matters under consideration by the Committee may be invited to assist the Committee.

That press statements on behalf of the Committee be made only by the Chairman after approval in principle by the Committee or after consultation with Committee members.

That, unless otherwise ordered, access to transcripts of evidence taken by the Committee be determined by the Chairman and not otherwise made available to any person, body or organisation: provided that witnesses previously examined shall be given a copy of their evidence; and that any evidence taken in camera or treated as confidential shall be checked by the witness in the presence of the Committee Manager to the Committee or an officer of that Committee.

That the Chairman and the Committee Manager to the Committee be empowered to negotiate with the Presiding Officers through the Clerk of the Legislative Assembly for the provision of funds to meet expenses in connection with advertising, operating and approved incidental expenses of the Committee.

That the Chairman be empowered to advertise and/or write to interested parties requesting written submissions.

That upon the calling of a division or quorum in the House during a meeting of the Committee, the proceedings of the Committee shall be suspended until the Committee again has a quorum.

That the Chairman and the Committee Manager make arrangements for visits of inspection by the committee as a whole and that individual members wishing to depart from these arrangements be required to make their own arrangements.

That pursuant to Standing Order 338, evidence, submissions or other documents presented to the committee which have not been reported to the House not be disclosed or published by any Member of the Committee or by any other person.

Staffing

The Clerk-Assistant (Committees) informed the committee on proposed staffing arrangements.

Briefing on Salinity

Mr R.P Smith, Director General of the Department of Land and Water Conservation, and Ms Mary Darwell, Principal Policy Officer – Salinity Action Unit of the Cabinet Office, were admitted and briefed the committee on various aspects of the salinity issue and on the Government salinity strategy.

General Business

The Committee deliberated on matters for inclusion in a committee workplan. The committee also agreed on a regular meeting time for 1.00pm on sitting week Thursdays.

The committee adjourned at 2.11pm until 1.00pm Thursday 12 October 2000.

Chairman Clerk-Assistant (Committees)

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 11 October 2000, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr Hickey**	**Mr McGrane**
Mr Anderson	**Mr Maguire**	**Mr D L Page**
Mr Black	**Mr Martin**	**Mr Windsor**

The committee met on a date amended by notice from the previous meeting.

Minutes

Resolved, on the motion of Mr Hickey, seconded by Mr Anderson:

That the minutes of the meeting of 30 August 2000, as circulated, be confirmed.

Resourcing

The Clerk-Assistant (Committees) updated the committee on arrangements for the resourcing of the committee.

Visit by South Australian Committee

The Chairman informed the committee of arrangements made for the visit by the Select Committee on the Murray River of the South Australian House of Assembly on Tuesday 31 October 2000.

Briefing on Urban Salinity

Ms Suzanne Hayward, of the Department of Land and Water – Penrith, and Mr Eddie Harris and Ms Ros Chivers, of the Strategy and Policy Unit, Department of Land and Water – Head Office were admitted and briefed the committee on various aspects of urban salinity.

General Business

The Committee deliberated on the possible visits of inspection to Wagga Wagga, Griffith and the Murray River valley.

Mr Maguire forwarded general correspondence.

The committee adjourned at 1.50pm until 12.30pm Tuesday 31 October 2000.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Tuesday 31 October 2000, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr McGrane**	**Mr Anderson**
Mr Maguire	**Mr D L Page**	**Mr Black**
Mr Martin		

Apologies

Apologies were received from Mr Hickey and Mr Windsor

Discussions

The Committee held joint discussions on matters of mutual interest with the visiting South Australian House of Assembly Select Committee on the River Murray.

The committee adjourned at 2.05pm until 1.00pm Thursday 2 November 2000.

Chairman Clerk to the Committee

No. 4

Minutes of Proceedings of the Select Committee on Salinity

Thursday 2 November 2000, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr McGrane**	**Mr Anderson**
Mr Maguire	**Mr D L Page**	**Mr Black**
Mr Martin		

Apologies

Apologies were received from Mr Hickey and Mr Windsor

Minutes

Resolved, on the motion of Mr Black, seconded by Mr Maguire:

That the minutes of the meetings of 11 and 31 October 2000, as circulated, be confirmed.

Visit of Inspection

The Clerk-Assistant (Committees) distributed the finalised itinerary and the final arrangements for the visit of inspection to Deniliquin and Wagga Wagga on 6 and 7 November 2000.

Administrative Matters

The Clerk-Assistant (Committees) updated the committee on administrative matters as a consequence of the approval of funding for the committee.

General Business

The Committee deliberated on the possible future activities.

The committee adjourned at 1.30pm until 9.30am Monday 6 November 2000.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Monday 6 November 2000, at 9.45am
Deniliquin Airport

Members Present

Ms Allan	**Mr Hickey**	**Mr McGrane**
Mr Anderson	**Mr Maguire**	**Mr D L Page**
Mr Black	**Mr Windsor**	

Apology

An apology was received from Mr Martin.

Briefings on Wetland Salinity

The committee was met at Deniliquin Airport by officers of the Department of Land and Water Conservation and proceeded to the Murray Region Office in Edward Street, Deniliquin.

The committee was given a brief over view of the Murray Region by the following officers of the Department of Land and Water Conservation: Kaye Dalton; Saji Joseph; and, Nimal Kulatunga, as well as Bill Currans, of the Murray Catchment Management Board.

The committee was given an outline of the Murray Irrigation districts by and Carl Mathers of Murray Irrigation Limited.

The committee was briefed on Murray Land and Water Management Plan strategies addressing salinity by Geoff McLeod, the Environmental Manger of Murray Irrigation Limited.

Inspections

The committee, accompanied by Saji Joseph, Bill Currans, Nimal Kulatunga, Carl Mathers and Martin Driver, proceeded on the following inspections and held discussions with:

Martin Driver of Greening Australia at Oddy's Drain (15 kilometres north of Deniliquin) regarding a surface drainage scheme;

Daniel Liphuyzen, farmer, at "Lochinvar" in the Denimein Irrigation District;

David Shannon, Mayor of Wakool, and Bill Hetherington of Murray Irrigation Limited, and Carl Mathers, Manager of the Wakool Tullakool Sub Surface Drainage Scheme, at the Wakool Tullakool Sub Surface Drainage Scheme;

Robert Mears, farmer, at "Bultara", Green Gully;

Ian and Jan Ferguson, farmers, at "Womboo", Green Gully; and,

Scott Holschier, farmer, at "Paringa Vale", Green Gully.

Inspections concluded, the committee returned to Deniliquin Airport to proceed to Wagga Wagga and adjourned at 5.30 pm, until 9.00 am Tuesday 7 November 2000.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Tuesday 7 November 2000, at 9.00am
Wagga Wagga

Members Present

Ms Allan	**Mr Hickey**	**Mr McGrane**
Mr Anderson	**Mr Maguire**	**Mr D L Page**
Mr Black	**Mr Windsor**	

Apology

An apology was received from Mr Martin.

Inspection of Dryland Salinity

The committee, accompanied by Greg Bugden, Advisory Services Manager, Geoff Fishburn, Warwick Ford of the Department of Land and Water Conservation, Wagga Wagga, Kevin Wales, Mayor of Wagga Wagga, and Rob Kuiper, of Murray-Riverina Farm Forestry, proceeded on the following inspections in the Kyeamba Valley and held discussions with:

Rick and Pam Martin, farmers, at "Burnbank", Corienbob, together a briefing by Rob Kuiper on reclamation work and native tree planting on the property;

Sid Clarke, farmer, at "Simarra"; and,

Peter Cregan, farmer, at "Teneriffe".

Inspections concluded, the committee returned to Wagga Wagga.

Briefing on Urban Salinity

The committee was briefed at the Civic Centre on urban salinity problems by Mayor Kevin Wales, Deputy Mayor Lindsay Vidler, Gary Wells, Manager of Engineering Services, Bryan Short, Manager Design Services and Elizabeth Madden, Urban Salinity Facilitator, of Wagga Wagga City Council.

Briefing concluded.

Inspection of Urban Salinity

The committee, accompanied by Greg Bugden, Kevin Wales, Lindsay Vidler, Gary Wells and Bryan Short, proceeded on an inspection of urban salinity sites in Wagga Wagga.
Inspection concluded, the committee proceeded to the Department of Land and Water Conservation Centre for Natural Resources, Wagga Wagga.

Briefing on Salinity Programs

The committee was briefed on salinity prediction and investigation programs and the work of the Murrumbidgee Catchment Management Board by Geoff Beale, Research Scientist, and Peter Barker of the Riverina Field Studies Centre.

Briefing concluded, the committee adjourned at 4.55 pm until 1.00 pm Thursday 23 November 2000.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Thursday 23 November 2000, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr Hickey**	**Mr McGrane**
Mr Maguire	**Mr D L Page**	**Mr Black**
Mr Martin	**Mr Windsor**	

Also in attendance: Ms Christina Thomas, Project Officer.

Apology

An apology was received from Mr Anderson.

Minutes

Resolved, on the motion of Mr Hickey, seconded by Mr Martin:

That the minutes of the meeting of 2 November 2000, as circulated, be confirmed.

Briefing on National Action Plan

Mr Chris Guest, Assistant Director General of The Cabinet Office briefed the committee on the detail of Commonwealth Government's National Action Plan for Salinity and the proposed detail of its implementation and administration.

The committee noted correspondence to the Clerk to the Committee from the Natural resource Management Business unit of the Commonwealth department of Agriculture Fisheries and Forestry.

Administrative Matters

The Clerk-Assistant (Committees) introduced Ms Christina Thomas, the appointed Project Officer to the committee and advised that recruitment for the position of Research Officer was well advanced.

Planning for 2001

The committee deliberated on a possible program of inquiries, visits and activities to undertake in 2001 for the Chairman to consider.
General Business

The committee reviewed the visit of inspection to Deniliquin, Wakool, Green Gully, Wagga Wagga and Kyeamba Valley and endorsed the sending of thank you letters to the various Departmental and Local Government Officers and landholders the briefings, discussions and inspections.

2. The committee noted correspondence from Arthur Yates and Co forwarded by Mr D L Page.

3. The committee discussed the desire to have a further meeting next for discussions with the Minister for Land and Water Conservation.

The committee adjourned at 1.45 pm until 1.00 pm Thursday 30 November 2000.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 21 February 2001, at 12.20pm
Bengalla Mine, Muswellbrook

Members Present

Ms Allan	**Mr Anderson**	**Mr Hickey**
Mr Maguire	**Mr Martin**	**Mr Windsor**

Also in attendance: Ms Christina Thomas, Project Officer; and Ms Susan Want, Research Officer.

Apologies

Apologies were received from Mr Black, Mr McGrane and Mr D L Page.

Welcome

The committee was welcomed to Bengalla Mine by James Bailey, Environmental Manager of Bengalla Mine, and Harold Sternbeck, Chairman of the Hunter River Catchment Management Trust.

Briefings on Hunter River Salinity Trading Scheme

The committee was briefed on salinity in the Hunter Region and the Hunter River Salinity Trading Scheme by: Cathy Cole, Regional Director, of the Department of Land and Water Conservation; Jill Pattison, Director Regulatory Innovation, Environment Protection Authority (Hunter); and, James Bailey, Environmental Manager of Bengalla Mine.

Briefings concluded.

Discussions

The committee held round table discussions with: James Bailey, Environmental Manager of Bengalla Mine; Dean Chapman, Catchment Manager (Water), Hunter River Catchment Management Trust; Cathy Cole, Regional Director, of the Department of Land and Water Conservation; Jill Pattison, Director Regulatory Innovation, Environment Protection Authority (Hunter); Amanda Payton, Environmental Officer, Muswellbrook City Council; and Harold Sternbeck, Chairman of the Hunter River Catchment Management Trust.

Discussions concluded.

Inspections

The committee, accompanied by James Bailey, Dean Chapman, Cathy Cole and Jill Pattison, proceeded on an inspection of computer monitoring of environmental conditions and a tour of Bengalla Mine to inspect environmental protection measures and in particular mine discharge operations related to the Hunter River Salinity Trading Scheme.

The committee then proceeded to Blackjack Mountain with Cathy Cole to inspect dry land salinity and was joined by Tony Voller, Department of Land and Water Conservation, Muswellbrook Office, who briefed the committee on rehabilitation work being undertaken by the local Landcare group.

The committee then proceeded to Bayswater Power Station (Macquarie Generation) and was briefed by John Neely, Manager - Bayswater Power Station, and Peter Sewell, Production Manager.

Briefing concluded the committee, accompanied by John Neely and Peter Sewell, inspected Bayswater Power Station for environmental protection measures as participants in the Hunter River Salinity Trading Scheme.

Inspections concluded, the committee adjourned at 6.00 pm, until 9.00 am Thursday 22 February 2001.

Chairman Project Officer

Minutes of Proceedings of the Select Committee on Salinity

Thursday 22 February 2001, at 9.00am
Evelyn Wilkinson Vineyard, Pokolbin

Members Present

Ms Allan	**Mr Anderson**	**Mr Hickey**
Mr Maguire	**Mr Martin**	**Mr Windsor**

Also in attendance: Ms Christina Thomas, Project Officer; and Ms Susan Want, Research Officer.

Apologies

Apologies were received from Mr Black, Mr McGrane and Mr D L Page.

Inspections and Briefings

The committee was briefed by Chris Cameron, Managing Director and Vineyard Manager, Peppertrees, and inspected the Evelyn Wilkinson Vineyard desalination plant.

Briefing concluded the committee proceeded to Aberdare East.

The committee was welcomed by Phil Warren, General Manager – Hunter Plant Operator Training School and was briefed Greg Summerhayes, Principal Environment Officer of the Department of Mineral Resources, on rehabilitation of the derelict mine.

Briefing concluded, the committee accompanied by Greg Summerhayes and Michael Alexander, Environmental Planning Officer of Cessnock City Council, inspected the Aberdare East derelict mine to look at works to control saline and acid leachate from the old mine workings.

Inspections concluded, the committee adjourned at 12.30 pm, until 12.30 pm Thursday 1 March 2001.

Chairman Project Officer

Minutes of Proceedings of the Select Committee on Salinity

Thursday 1 March 2001, at 12.30pm
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Also in attendance: Ms Christina Thomas, Project Officer.

Minutes

Resolved, on the motion of Mr Anderson, seconded by Mr Hickey:

That the minutes of the meetings of 6, 7 and 23 November 2000, as circulated, be confirmed.

Correspondence

The committee noted various correspondence received and sent.

Hunter Region Visit of Inspection

Resolved, on the motion of Mr Maguire, seconded by Mr Martin:

That the committee endorses the arrangements made for the visit of inspection to the Hunter Region made on 21 and 22 February 2001.

Work Program

The committee discussed a work program to timetable the reporting on the terms of reference, including hearing dates and possible visits of inspection.

Resolved, on the motion of Mr Anderson, seconded by Mr McGrane:

That Messrs Hickey, Maguire and Windsor be the committee delegates to the 7th National Productive Use and Rehabilitation of Saline Land Conference, to be held in Launceston 20 –23 March 2001.

Resolved, on the motion of Mr Black, seconded by Mr Anderson:

That the committee undertake a visit of inspection to the Lower Murray and Upper South East Regions of South Australia, from 30 April to 4 May 2001.

Administrative Matters

1. The committee expressed a preference for executive summarises of submissions to be circulated to members.

2. The Clerk-Assistant (Committees) advised the committee that the Research Officer had resigned and that action had been taken to recruit a replacement.

General Business

The Chairman reminded members of the launch of the local government salinity initiative memorandum of understanding between the Department of Land and Water Conservation and the Local Government and Shires Associations in the Jubilee Room at 9.00 am Friday 2 March 2001.

Briefing

Mr Stephen Hunter, Deputy Secretary of Environment Australia and Mr Ian Thompson, Executive Manager – Natural Resource Management Business Unit, Department of Agriculture, Fisheries and Forestry, were admitted and briefed the committee on the Commonwealth position on salinity management and the range of programmes administered by the Commonwealth addressing salinity.

Briefing concluded and Messrs Hunter and Thompson withdrew.

Resolved, on motion of Mr Hickey, seconded by Mr Martin:

That the committee write to the Commonwealth seeking reasons why the Hunter Region was excluded from the National Salinity programme with a view to seeking priority funding for the Hunter Region.

The committee adjourned at 2.10 pm until 12.00 noon Monday 26 March 2001.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Monday 26 March 2001, at 12.00 noon
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Hickey**
Mr Maguire	**Mr Martin**	**Mr McGrane**
Mr D L Page		

Also in attendance: Ms Christina Thomas, Project Officer; Mr Chris Papadopoulos, Research Officer; and, Ms Cassandra Adams, Assistant Committee Officer.

Apologies

Apologies were received from Mr Black and Mr Windsor.

Hearings

The press and public were admitted.

By direction of the Chairman, the Clerk read the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses.

Mr John Verhoeven, Acting Executive Director, Landscape Management, Department of Land and Water Conservation, sworn and examined.

Evidence concluded the witness withdrew.

Dr Gηl Izmir, Assistant Director-General, The Cabinet Office, affirmed and examined.

Evidence concluded the witness withdrew.

Dr Michael Curll, General Manager, Strategic Review, New South Wales Agriculture, sworn and examined.

Evidence concluded the witness withdrew.

Mr Anthony O'Hara, General Manager, Investment Services, sworn and Ms Susan Salvin, Manager, Environmental Services, affirmed, both of State Forests examined.

Evidence concluded the witnesses withdrew.

Mr Perce Butterworth, Executive Director of Policy and Resources, sworn and Mr David Ellyard, Senior Manager, Strategic Projects, affirmed, both of Department of State and Regional Development examined.

Evidence concluded the witnesses withdrew.

The committee adjourned at 4.34 pm until 10.30 am Thursday 29 March 2001.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Thursday 29 March 2001, at 10.30am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Also in attendance: Ms Christina Thomas, Project Officer; Mr Chris Papadopoulos, Research Officer; and, Ms Cassandra Adams, Assistant Committee Officer.

Hearings

The press and public were admitted.

By direction of the Chairman, the Clerk read the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses.

Mr Michael Keogh, Policy Director, Mr Simon Carson, Assistant Director, and Ms Jacqueline Knowles, Research Assistant, of the New South Wales Farmers Association, sworn and examined.

Evidence concluded the witnesses withdrew.

Mr Brad Williams, Executive Director, New South Wales Irrigators Council, sworn and examined.

Evidence concluded the witness withdrew.

Mr Thomas Smith, Acting Manager, Aboriginal Land Rights Unit, New South Wales Aboriginal Land Rights Unit, and Mr Lindsay Newlin-Hardy, Secretary, Western Metropolitan Region Land Council, sworn and examined.

Evidence concluded the witnesses withdrew.

Ms Catherine Ridge, Executive Officer, Nation Conservation Council, and Mr Jeffery Angel, Director, Total Environmental Centre, affirmed and examined.

Evidence concluded the witnesses withdrew.
Ms Elizabeth Dewar, Acting Executive Director, Resource Allocation Directorate, and Mr Phil Connolly, Principal Adviser, Natural Resources Branch, both of New South Wales Treasury, sworn and examined.

Evidence concluded the witnesses withdrew.

The committee adjourned at 2.07 pm until 10.15 am Friday 6 April 2001.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 11 April2001, at 9.45am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr Windsor**	

Also in attendance: Ms Christina Thomas, Project Officer; and, Mr Chris Papadopoulos, Research Officer.

Apology

An apology was received from Mr D L Page.

Minutes

Resolved, on the motion of Mr McGrane, seconded by Mr Hickey:

That the minutes of the meetings of 21 and 22 February and 1, 26 and 29 March 2001, as circulated, be confirmed.

Terms of Reference

The Committee discussed the scope of the terms of reference with particular reference to the examination of "business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas".

Resolved, on the motion of Mr Martin, seconded by Mr Maguire:

That the definition of 'business opportunities' includes business opportunities arising from market-based solutions and strategic investment, such as the initiatives referred to in the NSW Salinity Strategy.

Interim Report

The Committee discussed the desirability of producing an interim report on what has been seen and to account for what the Committee has done and to foreshadow the future directions of the Committee wants to go.

Hearings

The press and public were admitted.

By direction of the Chairman, the Clerk read the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses.

Mr Donald Blackmore, Chief Executive, Murray-Darling Basin Commission, sworn and examined.

Evidence concluded the witness withdrew.

Mr Donald Geering, Environmental Scientist, Director of Natural Resources Planning, Department of Urban Affairs and Planning, sworn and examined.

Evidence concluded the witness withdrew.

Mr Robert Gourlay, Environment Scientist and Managing Director, Environmental Research and Information Consortium Pty Limited, affirmed and examined.

Evidence concluded the witnesses withdrew.

The committee adjourned at 1.20 pm until Tuesday 1 May 2001.

Chairman Clerk to the Committee

Minutes of Proceedings of the Select Committee on Salinity

Tuesday 1 May 2001, at 11.15am
Renmark Airport

Members Present

Ms Allan	**Mr Anderson**	**Mr Hickey**
Mr Maguire	**Mr Martin**	**Mr McGrane**
Mr D L Page	**Mr Windsor**	

Apology

An apology was received from Mr Black whose flight was delayed and would join committee members in Berri.

Inspections

The committee was met at Renmark Airport by Jack Seekamp, Horticultural Management and Drainage Consultant and Honorary Research Assistant, Flinders University, Stephanie Weinert, Office Manager, River Murray Catchment Water Management Board, and Ross Stockdale, Senior Technical Officer, Murray-Darling Division, Department of Water Resources (S.A.).

The committee, accompanied by Jack Seekamp and Ross Stockdale, was briefed on the Noora Drainage Disposal Scheme and the Chowilla Wetlands whilst conducting inspections of:

- Disher's Creek Basin;
- Chowilla Wetlands; and
- Noora Drainage Basin.

Inspections concluded, the committee proceeded to Berri and suspended proceedings at 4.30 pm until 6.30 pm.

Briefings

The committee, joined by Mr Black, resumed proceedings at 6.30 pm at Hamley House, Berri under the auspices of the River Murray Catchment Water Management Board [RMCWMB].

The committee met with and was formally and informally briefed by the following persons:

Jeff Parish, Presiding Member of the RMCWMB and CEO of Central Irrigation Trust and Graham Broughton, General Manger of the RMCWMB;

Margaret Evans, Mayor, and Michael Hurley, Chief Executive Officer of Berri Barmera Council;

Jan Cass, Mayor, and Trevor Burgemeister, Chief Executive Officer of Loxton Wakerie Council;

Rod Thomas, Mayor, and Bob Waples, Chief Executive Officer of Renmark Paringa Council;

Bruce Tonkin, Chairman, and Julie Sippo, Project Officer of Loxton to Bookpurnong Local Action Planning;

Theresa ter Bogt, Chairman, and Todd Goodman, Project Officer of Renmark to Border Local Action Planning;

John Gorman, Chairman, and Peter Waanders, Project Officer of Riverland West Local Action Planning;

Daryl Wuttke, Chairman, and Michelle Campbell, Project Officer of Berri Barmera Local Action Planning;

Keith Payne, Chairman of Murray-Mallee Local Action Planning;

Ross Forster, Regional Manager – Riverland, and Peter Forward, Manager – Salinity Control of SA Water Corporation;

Tony Meissner, Regional Manager of EPA Murraylands;

Neville Wurst, Chairperson, Murray Mallee Soil Conservation Board;

John Peterson, Chairperson of Central Irrigation Trust;

John Craker, Chairperson of Renmark Irrigation Trust;

Barry Harden, Chairperson of Golden Heights Irrigation Trust;

Tony Rae, Chairperson of Sunlands Irrigation Trust;

Leon Broster, General Manager, and Les Hill, Chairman – Region 5 of the Murray Darling Association; and

John Berger of the Mallee Water Resources Committee.

Briefings concluded, the committee adjourned at 10.00 pm, until 8.30 am Wednesday 2 May 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 1 March 2001, at 12.30pm
Berri

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Inspections

The committee proceeded on the following inspections and held discussions with:

Jeff Parish, Presiding Member of the RMCWMB at Lock 4 on the Murray River;

Jeff Parish, Reg Bristow, Operations Manager of Central Irrigation Trust, Peter and Jackie Schultz at the Schultz property, Loxton;

Jeff Parish, Reg Bristow, and Peter Kernich at the Kernich property, Loxton;

Wayne Piltz, Board Walk Supervisor of Banrock Station, at Kingston on Murray;

Peter Forward, Manager – Salinity Control of SA Water Corporation, on the Woolpunda Reach Salt Interception Scheme, at Banrock Station;

Allan Buckley, Vice President of Mallee Sustainable Farming Project, Ian Kroehm, member of the RMCWMB, and Chris McDonough, Rural Solutions – Department of Primary of Primary Industries and Resources at the Buckley property, near Waikerie;

Peter Forward, Manager – Salinity Control of SA Water Corporation, on the Waikerie Salt Interception Scheme, at Ramco Lagoon.

Inspections concluded, the committee proceeded to Adelaide and suspended proceedings at 3.30 pm until 6.45 pm.

Discussions

The committee resumed proceedings at 6.45 pm at Parliament House, Adelaide and held joint discussions with the South Australian House of Assembly Select Committee on the River Murray.

Discussions concluded, the committee adjourned at 8.45 pm, until 9.30 am Thursday 3 May 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 3 May 2001, at 9.30am
Murray Bridge

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Briefing

The committee was met at the office of the Lower Murray Irrigators Advisory Board at Murray Bridge by Wayne Thorley, Chairman, Terry Lee, General Manager, and Hans van Dyk, Financial Manager of the Lower Murray Irrigators Advisory Board.

The committee was briefed on irrigation and farming issues in the Lower Murray.

Inspections

The committee proceeded on the following inspections and held discussions with:

Darren Garret, Process Controller, of United Utilties operators of the water supply off-take and filtration plant at Tailem Bend;

Bill Patterson, CEO, and Clarry Fisher, Manager Environmental Services, of Coorong District Council at the Coorong District Council Fish Farm Project, Cookes Plain;

Bill Patterson, CEO of Coorong District Council, Graham Gates, Project Officer of Coorong Local Action Plan, Julian Desmazures, Presiding Member, and Evan Pettingill, Executive Officer, of the South Eastern Water Conservation and Drainage Board [SEWCDB], on the Coorong Local Action Plan at Meningie;

Roger Strother and Ken Strother of Strother Fish Pty Ltd on fish farm operations at Meningie West;

Evan Pettingill, Executive Officer of SEWCDB, on the Upper South East Dryland Salinity and Flood Management Plan at Morella Basin, Salt Creek and groundwater discharge channels in southern areas.

Inspections concluded, the committee adjourned at 4.45 pm, until 10 am Friday 4 May 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Friday 4 May 2001, at 10.00am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Briefings

The committee was met by, and briefed on matters, as follows:

Leon Broster, General Manager of the Murray Darling Association on the Murray Darling Association and its current work concerning the issue of salinity; and

Paul Harvey, Manager – Murray Darling Policies and Judy Goode, Senior Policy Adviser, Salinity Management, Murray Darling Division of the Department of Water Resources, on the development of South Australia's Murray River Salinity Strategy and Dryland Salinity Strategy.

Briefings concluded, the committee adjourned at 11.45 am, until 9.30 am Monday 28 May 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Monday 28 May 2001, at 9.35am
Blacktown City Council Chambers

Members Present

Mr Anderson	**Mr Hickey**	**Mr McGrane**
Mr D L Page		

Also in attendance: Ms Christina Thomas, Project Officer; Mr Chris Papadopoulos, Research Officer; Ms Cassandra Adams, Assistant Committee Officer

Apologies

Apologies were received from Ms Allan, Mr Black, Mr Maguire, Mr Martin and Mr Windsor.

Acting Chairman

Resolved, on the motion of Mr Hickey, seconded by Mr McGrane:

That Mr Anderson be appointed Acting Chairman for the purpose of the hearing.

Hearings

The press and public were admitted.

By direction of the Acting Chairman, the Clerk read the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses.

Ms Glennys James, Director, Environmental Planning Services, Ms Amanda Brown, Mr Peter Smith, Blacktown City Council; Mr Craig Butler, Manager, Building Approvals and Environment Protection, Penrith City Council; and, Ms Gil Dawson, Manager, Strategic Planning, Holroyd City Council, sworn and examined.

Evidence concluded the witnesses withdrew.

Ms Julia Ryan, Senior Project Officer, Environment and Ms Rebecca Nicolson, Salinity Project Officer, Western Sydney Regional Organisation of Councils, affirmed and examined.

Evidence concluded the witnesses withdrew.

Ms Margaret Ryan, Executive Director, Office of Western Sydney, Mr Des Mooney, General Manager, Land and Property Information NSW, Mr Warrick Beacroft, Division Manager, Information Sourcing, Department of Information, Technology and Management, affirmed and examined.

Evidence concluded the witnesses withdrew.

Mr Neville Pavan, Senior Natural Resource Officer, Department of Land and Water Conservation, sworn and examined.

Evidence concluded the witness withdrew.

The committee adjourned at 2.33 pm until 1pm Thursday 31 May 2001.

Acting Chairman Project Officer

Minutes of Proceedings of the Select Committee on Salinity

Thursday 31 May 2001, at 1.00pm
Parliament House

Members Present

Mr Anderson	**Mr Black**	**Mr Hickey**
Mr Maguire	**Mr Martin**	**Mr McGrane**
Mr D L Page	**Mr Windsor**	

Also in attendance: Ms Christina Thomas, Project Officer; and, Mr Chris Papadopoulos, Research Officer.

Apology

An apology was received from Ms Allan.

Election of Acting Chairman

Resolved, on the motion of Mr Hickey, seconded by Mr Black:

That Mr Anderson be Acting Chairman during the absence of the Chairman at this meeting and any subsequent meetings during June 2001.

Minutes

Resolved, on the motion of Mr Hickey, seconded by Mr Windsor:

That the minutes of the meeting of 11 April 2001, as circulated, be confirmed.

Correspondence

The Committee agreed to write to the Department of Land and Water Conservation to seek information on the allocation of the salinity budget by sub-programs and sub-actions.

The Committee agreed to write to the Premier to seek his support for the inclusion of the Hunter and Western Sydney regions in the list of priority regions under the Commonwealth Government's National Action Plan for Salinity and Water Quality.

Consideration of Travel Report and Feedback on skeleton Interim Report

Resolved, on the motion of Mr Maguire, seconded by Mr Martin:

That consideration of the travel report and feedback on the skeleton Interim Report be deferred until the next meeting.

Overseas Study Tour

Resolved, on the motion of Mr McGrane, seconded by Mr Martin:

That the Chairman, Mr Page and the Committee Manager undertake an overseas study tour to India, Copenhagen, the Netherlands and Brussels as per the submission to the Speaker.

Attendance at the National Government Summit on Salinity and inspection of businesses addressing salinity

Resolved, on the motion of Mr Black, seconded by Mr Hickey:

That the Committee and appropriate staff travel to attend the National Local Government Summit on Salinity at Moama and inspect businesses addressing salinity in Kyabram and Kerang (Victoria) from 16 – 20 July 2001.

It was agreed that the Secretariat would report back to the next meeting on the feasibility of taking evidence in Moama.

Staff Report of meetings in Canberra and Wagga

Copies of the report of meetings in Canberra nad Wagga Wagga held by secretariat staff during February 2001 were distributed to Members for reference. It was agreed that the report would not be tabled in Parliament but that a copy would be provided to the Clerk of the Legislative Assembly for information.

Submissions

Summaries of submissions 14-25 were distributed to Members for information.

Documents for Members

Members indicated that emailing and posting material to their electorate offices were the preferred mode of disseminating information to them.

Date for next hearings

The Committee agreed that its next public hearing would be held on 29 June 2001.

Proposed date for next deliberative meeting

The Committee agreed that its next deliberative meetings would be held on 7 June and 21 June 2001.

The committee adjourned at 1.55pm until 1pm Thursday 7 June 2001.

Acting Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 7 June 2001, at 1.00pm
Parliament House

Members Present

Mr Anderson Mr Black Mr Hickey
Mr Maguire Mr McGrane

Also in attendance: Ms Christina Thomas, Project Officer; and, Ms Cassandra Adams, Assistant Committee Officer.

Apologies

Apologies received from Ms Allan, Mr Martin, Mr D L Page and Mr Windsor.

Minutes

Resolved, on the motion of Mr Maguire, seconded by Mr Black:

That the minutes of the meetings of 28 May 2001 and 31 May 2001, as circulated, be confirmed.

Correspondence

Correspondence from Australian Senate Environment, Communications, Information Technology and the Arts References Committee regarding an inquiry into Australia's urban water management was circulated.

Resolved, on the motion of Mr Black, seconded Mr Maguire:

That the committee would consider making a submission at a later date.

Submission from Blacktown and District Environment Group was circulated.

Resolved, on the motion of Mr Maguire, seconded Mr Black:

That the committee accept the submission.

Travel Report

The report on visits of inspection undertaken by the committee having been previously circulated was considered.

Resolved, on the motion of Mr Hickey, seconded by Mr Maguire:

That the draft report on visits of inspection be adopted with amendment; and

That the draft report on visits of inspection be the Report of the Committee and that it be signed by the Acting Chairman and tabled; and

That the Acting Chairman and Committee Manager/Project Officer be permitted to correct stylistic, typographical and grammatical errors.

Interim Report

The Project Officer briefed the committee on the outline of the draft Interim Report which had been previously circulated.

National Local Government Summit on Salinity

The committee discussed arrangements for attendance at the National Local Government Summit on Salinity.

The committee adjourned at 1.55pm until 1.00pm Thursday 28 June 2001

Acting Chairman Project Officer

Minutes of Proceedings of the Select Committee on Salinity

Thursday 28 June 2001, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Also in attendance: Ms Christina Thomas, Project Officer; and, Mr Chris Papadopoulos, Research Officer.

Minutes

Resolved, on the motion of Mr Black, seconded by Mr McGrane:

That the minutes of the meeting of 7 June 2001, as circulated, be confirmed.

Correspondence

The committee noted out going correspondence.

Interim Report

The draft Interim Report, having been previously circulated and discussed at the previous meeting, was considered.

Resolved, on the motion of Mr Black, seconded by Mr Anderson:

That the draft Interim Report be adopted;

That the draft Interim Report of the Committee be the Interim Report of the Committee and that it be signed by the Chairman and tabled; and

That the Chairman and Committee Manager/Project Officer be permitted to correct stylistic, typographical and grammatical errors.

National Local Government Summit on Salinity

The committee discussed the finalised arrangements for attendance at the National Local Government Summit on Salinity.

The committee adjourned at 1.35pm until Wednesday 18 July 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 18 July 2001, at 5.15pm
Moama Bowling Club, Moama

Members Present

Mr Anderson Mr Black Mr Maguire
Mr McGrane Mr D L Page

Also in attendance: Ms Christina Thomas, Project Officer; and, Mr Chris Papadopoulos, Research Officer.

Apologies

Apologies were received from Ms Allan, Mr Hickey, Mr Martin and Mr Windsor.

Election of Acting Chairman

Resolved, on the motion of Mr Page, seconded by Mr McGrane:

That Mr Anderson be appointed Acting Chairman for the purpose of the hearing.

Public hearing

The public was admitted at 5:25 pm.

Mr Ralph Leutton, Program Manager, Policy and Legislation, Cotton Australia Ltd, affirmed and examined.

Mr John Clements, Adviser to Policy and Legislation, Cotton Australia Ltd, affirmed and examined.

Evidence concluded, the witnesses withdrew.

Mr Brian Sharp, National President, Murray Darling Association, affirmed and examined.

Mr Leon Broster, General Manager, Murray Darling Association, affirmed and examined.

Mr Craig Clifton, Senior Scientist, Land and Catchment Management, Sinclair Knight Merz, sworn and examined.

Evidence concluded, the witnesses withdrew.

The committee adjourned at 6:43 pm until Thursday 19 July 2001.

Chairman Project Officer

Minutes of Proceedings of the Select Committee on Salinity

Thursday 19 July 2001, at 1.00pm
Moama

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Mr Anderson	Mr Maguire
Mr Black	Mr D L Page
Mr McGrane	

Also in attendance: Ms Christina Thomas, Project Officer; and, Mr Chris Papadopoulos, Research Officer.

Apologies

Apologies were received from Ms Allan, Mr Hickey, Mr Martin and Mr Windsor.

Site inspections: Pyramid Salt and salinity affected sites

The Committee inspected Pyramid Salt, and met with Mr Gavin Privett, Operations Manager and founding director.

The Committee then inspected salinity-affected sites en route to Moama, including Barr Creek, Cohuna and Kerang.

Inspections concluded, the committee adjourned at 6.00 pm, until a date to be determined.

Chairman Project Officer

Minutes of Proceedings of the Select Committee on Salinity

Thursday 6 September 2001, at 9.00am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	**Mr Windsor**

Also in attendance: Ms Christina Thomas, Project Officer; and, Mr Chris Papadopoulos, Research Officer.

Public hearing

The press and public were admitted.

Mr Derek Owens, Sales Manager, Carefree Water Conditioners Australia, sworn and examined.

Mr Robert Uden, Proprietor, Carefree Water Conditioners Australia, sworn and examined.

Evidence concluded, the witnesses withdrew.

Mr John Davis, Project Manager, Sydney Metropolitan - Dubbo Regional Organic Resource Management Project, sworn and examined.

Evidence concluded, the witness and public withdrew.

Minutes

Resolved, on the motion of Mr Hickey, seconded by Mr Martin:

That the minutes of the meeting of 1, 2, 3, and 4 May 2001 and 28 June 2001, as circulated, be confirmed.

Report on the National Local Government Summit on Salinity, 17 – 19 July 2001 and Inspection of Pyramid Salt Pty Ltd

The draft Report of the Summit, having been previously circulated, was considered.

Resolved, on the motion of Mr Anderson, seconded by Mr D L Page:

That the draft Report on the Summit be adopted;

That the draft Report on the Summit be the Report of the Committee and that it be signed by the Chairman and tabled; and

That the Chairman and Committee Manager/Project Officer be permitted to correct stylistic, typographical and grammatical errors.

Correspondence

The committee noted incoming and out going correspondence.

Resolved, on the motion of Mr Anderson, seconded by Mr Hickey that:

That letters be prepared to the Federal Minister for the Environment and Heritage and the Minister for Agriculture, Fisheries and Forestry recommending the inclusion of the Hunter and Hawkesbury-Nepean Catchments in the list of priority catchments under the National Action Plan for Salinity and Water Quality.

Resolved, on the motion of Mr Anderson, seconded by Mr D L Page that:

That Mr Gourlay of the Environmental Research Information Consortium be provided with a copy of the letter from the Director-General of the Department of Land and Water Conservation addressing the points raised in Mr Gourlay's submission.

Visit of Inspection to Western Australia

The Committee discussed possible dates for a visit of inspection to Western Australia.

The committee adjourned at 10:30am until 21 September 2001.

Chairman Project Officer

Minutes of Proceedings of the Select Committee on Salinity

Friday 21 September 2001, at 9.00am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	

Also in attendance: Ms Christina Thomas, Project Officer; and, Mr Chris Papadopoulos, Research Officer.

Apology

An apology was received from Mr Windsor.

Roundtable Discussion

The press and public were admitted.

Discussions were held with the following key policy experts: Mr Trevor Budge, Research Planning and Design Group; Professor David Farrier, Centre for Natural Resource Law and Policy, University of Wollongong; Mr Tim Fisher, Coordinator, Land and Water Ecosystems, Australian Conservation Foundation; and Mr Mike Young, Director, Policy and Economic Research Unit, Land and Water, CSIRO.

Discussions concluded, the participants and public withdrew.

Disclosure of Submissions

Resolved, on the motion of Mr Maguire, seconded by Mr McGrane:

That the Committee authorises the disclosure of all the submissions received by the Committee, except that of Mr Len Reade.

Visit of Inspection to Western Australia

Resolved, on the motion of Mr Maguire, seconded by Mr McGrane:

That the Committee and Research Officer undertake a visit of inspection to Western Australia from 28 October to 2 November 2001.

Australian Association of Natural Resource Management Conference

Resolved, on the motion of Mr Black, seconded by Mr McGrane:

That a delegation of the Committee and appropriate staff travel to attend the Australian Association of Natural Resource Management (NSW) Conference in Dubbo on 23 and 24 November 2001.

The committee adjourned at 11:20am until 18 October 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 18 October 2001, at 1.00pm
Parliament House

Members Present

Mr Anderson Mr Hickey Mr Martin
Mr McGrane Mr D L Page

Also in attendance: Mr Leslie Gönye, Committee Manager; Mr Chris Papadopoulos, Research Officer; and Ms Cassandra Adams, Assistant Committee Officer.

Apologies

Apologies were received from Ms Allan, Mr Black and Mr Maguire.

Resignation of Member

The Committee Manager informed the Committee that Mr Windsor had resigned as a member of the Legislative Assembly on Tuesday 16 October 2001.

Election of Acting Chairman

Resolved, on the motion of Mr McGrane, seconded by Mr D L Page:

That Mr Anderson be appointed Acting Chairman for the purpose of this deliberative meeting.

Confirmation of Minutes

Resolved, on the motion of Mr D L Page, seconded by Mr McGrane:

That the minutes of the meetings of 18 and 19 July and 6 and 21 September 2001, as circulated, be confirmed.

Proposed hearing and meeting dates

Resolved, on the motion of Mr McGrane, seconded by Mr Hickey:

That the Committee hold a deliberative meeting on 16 November, and a public hearing on 28 November, with 29 November 2001 as reserved date.

Draft findings — proposed arrangements

Resolved, on the motion of Mr Martin, seconded by Mr Hickey:

That the Committee agree to the proposed timetable for the circulation of the draft findings and recommendations of the report on the role of councils, and to give feedback to the Project Officer.

Correspondence

Resolved on the motion of Mr Hickey, seconded by Mr Martin:

That the copies of correspondence circulated to the Committee be adopted as a record of the Committee's recent correspondence with agencies.

Visit of Inspection to Western Australia

Resolved, on the motion of Mr McGrane, seconded by Mr Martin:

That the Committee agree to the proposed itinerary for the visit of inspection to Western Australia.

Members wishing to add any item to the itinerary to contact the Secretariat.

Mr McGrane to follow up his suggestion for an inspection of a state-of-the art abattoir in Albany, subject to time.

Australian Association of National Resource Management Conference, Dubbo 23-24 November

Members wishing to attend the Australian Association of National Resource Management Conference to be held in Dubbo, on 23 & 24 November 2001, were invited to put in an expression of interest as soon as possible.

General Business

1. The Committee decided to wait until its deliberative meeting on 16 November 2001 for the release of the Murray Darling Association's CD-rom on the proceedings of the National Local Government Salinity Summit, Moama, July 2001, before the tabling of the report on the Summit.

Should the CD-rom still not be available on that date, the Committee will proceed to table the report, and include appropriate disclaimers.

2. Resolved, on motion of Mr D L Page, seconded by Mr Martin:

That the Committee write to the Commonwealth and the NSW Governments:

(a) seeking an update on the progress of bilateral agreements
(b) urging acceleration in the negotiations; and
(c) putting the Committee's strong view that Western Sydney and the Hunter Region designated priority catchments under the National Action Plan on Salinity and Water Quality.

The committee adjourned at 1.40 pm until Monday 29 October 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Monday 29 October 2001, at 7.30am
Western Australia

Members Present

Ms Allan	**Mr Anderson**	**Mr Hickey**
Mr McGrane	**Mr D L Page**	

Briefing: Hon. Kim Chance MLC, Minister for Agriculture

The committee met in Perth with the Hon. Kim Chance, MLC, Minister for Agriculture, Mr Mark Pridham, Manager, Rural Towns Program, WA Department of Agriculture, and Mr Rex Edmonson, Chairman of the Rural Towns Program, for a briefing on salinity in Western Australia.

Briefing and site inspection: Rural Towns Program, Corrigin

The committee, accompanied by Mr Pridham and Mr Edmonson, proceeded to Corrigin and met with members and staff of Corrigin Shire Council for briefings on the Shire's approach to dealing with salinity in cooperation with the Department of Agriculture's Rural Towns Program. The Shire was represented by Mr Harry Gayfer (Pesident), Mr Brian Parsons, Mr Peter Doyle, Mr Bruce Mead and Mr David Abe.

The committee then inspected Corrigin with particular emphasis on the damage done by salinity and the measures in place to deal with the problem in and around the town..

Briefing and site inspection: Oil Mallee, Narrogin

The committee, accompanied by Mr Pridham and Mr Edmonson, proceeded to Narrogin and met with Mr Ken Wallace, Regional Manager, Department of Conservation and Land Management (CALM) and Mr David McFall, Regional Manager, Oil Mallee Project, for a briefing on the oil mallee project.

The committee then inspected an oil mallee plantation in Narrogin.

Inspections concluded, the committee adjourned at 5:30pm until Tuesday 30 October 2001.

Chairman Research Officer

Minutes of Proceedings of the Select Committee on Salinity

Tuesday 30 October 2001, at 8.45am
Western Australia

Members Present

Ms Allan	**Mr Anderson**	**Mr Hickey**
Mr McGrane	**Mr D L Page**	

Briefing and site inspections: Rural Towns Program, Wagin

The committee, accompanied by Mr Mark Pridham, Manager, Rural Towns Program, Agriculture WA, and Mr Edmonson, chairman, proceeded to Wagin and met with members and staff of Wagin Shire Council for briefings on the Shire's approach to dealing with salinity in cooperation with the Rural Towns Program. The Shire was represented by Peter Piesse (President), Ian Bartlett and Michael Parker.

The committee then proceeded to Wagin for inspection of salinity impacts and efforts to control it in and around the town.

Briefing and site inspections: Rural Towns Program, Katanning

The committee, accompanied by Mr Pridham and Mr Edmonson, proceeded to Katanning and met with members and staff of Katanning Shire Council for briefings on the Shire's approach to dealing with salinity in cooperation with the Rural Towns Program. The Shire was represented by Mr Doug Cherry (Deputy President), Mr Clinton Strugnell and Mr Norm Reed. The committee was also briefed by Ms Louise Hopegood, hydrologist, Agriculture WA.

The committee then inspected Wagin with particular emphasis on the damage done by salinity and the measures in place to deal with the problem in and around the town.

Briefing and site inspection: Goundrey Winery, Mt Barker

The committee met with Cate Finlay, viticulturist, Goundrey Wines, for a briefing on and inspection of the various measures the company has taken to conserve water and minimise the impact of salinity on the property.
Inspections concluded, the committee adjourned at 4:30pm until Wednesday 31 October 2001.

Chairman Research Officer

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 31 October 2001, at 9.30am
Albany, Western Australia

Members Present

Ms Allan **Mr Anderson** **Mr Hickey**
Mr McGrane **Mr D L Page**

Briefings: Agriculture WA, Albany

The committee met with and was formally briefed by the following persons:

Giles West, Manager, SRD, Agriculture WA
Ruhi Ferdowsian, Hydrologist, Agriculture WA
Naomi Arrowsmith , Waters & Rivers Commission
Paula Deegan, SCRIPT
Bill Porter
David Pannell, Associate Professor and Principal Research Fellow, Agricultural and Resources Economics, University of Western Australia
Michael Power
Geoff Woodall
Tim Overheu
Allan Seymour.

Issues raised included:

Salinity impacts on agriculture and rural towns
High water use farming systems
Alternative perennial farming systens
The community perspective
New developments in hydrology.

Briefings and inspection concluded, the committee adjourned at 3:30pm until Thursday 1 November 2001.

Chairman Research Officer

Minutes of Proceedings of the Select Committee on Salinity

Thursday 1 November 2001, at 9.30am
Parliament House, Perth

Members Present

Ms Allan **Mr Anderson** **Mr Hickey**
Mr McGrane **Mr D L Page**

Briefings

The committee met with and was formally briefed by the following persons:

Don Crawford, Executive Officer, State Salinity Council
Alex Campbell, Chairman, State Salinity Council

Rex Edmonson, Chairman, Rural Towns Program
Garry English, State Salinity Council
Barbara Morrell, Regional Group representative
Neil Young
Michael Lloyd
John Bartle, Department of Conservation and Land Management (CALM)
Robert Lambeck
Ken Pech, Local Government representative
Fiannoula Forest, Chair, Salinity Taskforce

Issues raised included:

Salinity in WA compared to Murray-Darling Basin
State Salinity Council
Treatment options and delivery systems
Commercial farm forestry
Water resource management
Whole of landscape planning
WA Salinity Taskforce
Social impacts of salinity.

Meeting with the Hon. Dr Judy Edwards, MLA, Minister for Environment and Heritage

The committee met with the Hon. Dr Judy Edwards MLA, Minister for Environment and Heritage with special responsibility for salinity, for an exchange of information and ideas about the salinity problem in WA and NSW.

Briefings concluded, the committee adjourned at 5:00pm until a date to be determined.

Chairman Research Officer

Minutes of Proceedings of the Select Committee on Salinity

Friday 16 October 2001, at 10.00am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Hickey**
Mr Maguire	**Mr Martin**	**Mr McGrane**
Mr D L Page		

Also in attendance: Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apology

An apology was received from Mr Black.

Confirmation of Minutes

Resolved, on the motion of Mr McGrane, seconded by Mr D L Page:

That the minutes of the meeting of 18 October 2001, as circulated, be confirmed.

Draft Report: findings and recommendations

Having previously been circulated, the Committee discussed the draft findings and recommendations of the report on the role of councils and general feedback to the Project Officer.

Kyoto Protocol

Having previously been circulated, the Committee discussed the briefing note summarising concerns raised by Deutsche Bank at a meeting with the secretariat on 25 October 2001 regarding proposed carbon credits through land use changes other then forestry, which may also address salinity, under article 3.4 of the Kyoto Protocol.

Resolved on the motion of Mr Anderson, seconded by Mr D L Page:

That the Committee write to the Minister for Energy and Utilities seeking the consideration of article 3.4 of the Kyoto Protocol within the Minister's forthcoming discussion paper on methodologies for allowable carbon credits towards greenhouse gas reductions.

Correspondence

The Committee noted and discussed incoming correspondence from: WSROC concerning the Western Salinity Management Project; the Minister for Environment concerning the disposal of saline water from swimming pools; and the Department of Urban Affairs and Planning concerning aspects of regional planning to address salinity problems.

General Business

The Committee discussed the desirability of conducting, in the first quarter of 2002, a seminar at Parliament House hosting people with interesting messages regarding innovative approaches to salinity.

The committee adjourned at 1.45 pm until 10.00 am Wednesday 28 November 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 28 November 2001, at 10.00am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane		

Also in attendance: Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apology

An apology was received from Mr D L Page.

Hearings

The press and public were admitted.

By direction of the Chairman, the Clerk read the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses.

Mr Donald Geering, Environmental Scientist, Director of Natural Resources Planning, Department of Urban Affairs and Planning, previously sworn, examined.

Evidence concluded the witness withdrew.

Mr John Verhoeven, Group General Manager, Landscape Investment, and Mr Neville Pavan, Senior Natural Resource Officer, both of the Department of Land and Water Conservation and previously sworn, examined.

Evidence concluded the witnesses withdrew.

Mr Robert Irvine, Senior Policy Adviser, Policy and Research Branch, Department of Local Government, affirmed and examined.

Evidence concluded the witness withdrew.

The committee adjourned at 12.30 pm until 10.00 am Thursday 29 November 2001.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 29 November 2001, at 10.00am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	

Also in attendance: Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Hearings

The press and public were admitted.

By direction of the Chairman, the Clerk read the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses.

Mr Clive Johnson, Farmer and Grazier, Chair of Lachlan Catchment Management Board, sworn and examined.

Evidence concluded the witness withdrew.

Mr Ian Rogan, Consultant, Chair of Central West Catchment Management Board, sworn and examined.

Evidence concluded the witnesses withdrew.

Ms Jane McAloon, Assistant Director General of The Cabinet Office, affirmed and examined.

Evidence concluded the witness withdrew.

Mr Michael Montgomery, President of the Shires Association, sworn, and Mr David Hale, Senior Policy Officer of the Local Government and Shires Associations, previously sworn, both examined.

Evidence concluded the witnesses, press and public withdrew for the Committee to deliberate.

Report on Overseas Study Tour

Resolved, on motion of Mr D L Page, seconded by Mr McGrane:

That the draft Report on the overseas study tour be adopted as the Report of the Committee upon the consent of the Chairman and Mr D L Page; and

That the Report be then signed by the Chairman and tabled.

Correspondence

The Committee noted the following correspondence:

The outgoing letter to the Acting Director-General of the Ministry of Energy and Utilities and reply concerning the discussion paper on the methodology for calculating eleigible carbon sequestration for electricity retailers; and
Comments on the Interim Report from Environment Australia and the Department of Agriculture, Fisheries and Forestry-Australia.

General Business

The Chairman gave her felicitations and thanked all Committee Members and the secretariat for their support during 2001.

The committee adjourned at 12.25 pm until a date to be determined.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 14 March 2002, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	

Also in attendance: Mr Chris Papadopoulos, Research Officer; and, Ms Cassandra Adams, Assistant Committee Officer.

In the absence of the Clerk of the Legislative Assembly, the Clerk-Assistant (Committees) opened the meeting and read the following extracts from the Votes and Proceedings of the legislative Assembly-

Entry 22, Votes and Proceedings No. 1, dated 26 February 2002:

"Mr Whelan moved, by leave, That:

1. A select committee be re-appointed to inquire and report with the following terms of reference:

To examine:

Business opportunities created by salinity that contribute to the improved management of groundwater recharge and discharge areas.

The options for salinity management that are available to local councils, including but not limited to, planning instruments, building codes, urban water management plans, differential rating, development of local council expertise and resource-sharing between councils.

Any barriers to adoption of salinity management strategies by local councils and means to overcome the barriers.

The adequacy of the Commonwealth's response and contribution to addressing salinity.

That such committee consist of Ms Allan, Mr Martin, Mr Black, Mr Hickey, Mr Anderson, Mr McGrane, Mr Maguire and Mr D.L. Page.

That the committee have power to make visits of inspection within the State of New South Wales and other States and Territories of Australia.

Question put and passed".

Entry 14, Votes and Proceedings No. 3, dated 28 February 2002:

"Mr Whelan moved, by leave, That this House refer to the Select Committee on Salinity all minutes and transcripts of proceedings and other documents of the Select Committee on Salinity appointed during the third session of the of the Fifty-second Parliament.

Question put and passed."

Election of Chairman

Resolved, on the motion of Mr Anderson, seconded by Mr D L Page:

"That Ms Allan be elected Chairman of the Committee".

Ms Allan made her acknowledgments to Committee Members.

Procedural Motions

Resolved, on motion (in globo) of Mr D L Page, seconded by Mr Hickey:

That arrangements for the calling of witnesses and visits of inspection be left in the hands of the Chairman and the Committee Manager to the Committee.

That, unless otherwise ordered, parties appearing before the Committee shall not be represented by any member of the legal profession.

That, unless otherwise ordered, when the Committee is examining witnesses, the press and public (including witnesses after examination) be admitted to the sitting of the Committee.

That persons having special knowledge of the matters under consideration by the Committee may be invited to assist the Committee.

That press statements on behalf of the Committee be made only by the Chairman after approval in principle by the Committee or after consultation with Committee members.

That, unless otherwise ordered, access to transcripts of evidence taken by the Committee be determined by the Chairman and not otherwise made available to any person, body or organisation: provided that witnesses previously examined shall be given a copy of their evidence; and that any evidence taken in camera or treated as confidential shall be checked by the witness in the presence of the Committee Manager to the Committee or an officer of that Committee.

That the Chairman and the Committee Manager to the Committee be empowered to negotiate with the Presiding Officers through the Clerk of the Legislative Assembly for the provision of funds to meet expenses in connection with advertising, operating and approved incidental expenses of the Committee.

That the Chairman be empowered to advertise and/or write to interested parties requesting written submissions.

That upon the calling of a division or quorum in the House during a meeting of the Committee, the proceedings of the Committee shall be suspended until the Committee again has a quorum.

That the Chairman and the Committee Manager make arrangements for visits of inspection by the committee as a whole and that individual members wishing to depart from these arrangements be required to make their own arrangements.

That pursuant to Standing Order 338, evidence, submissions or other documents presented to the committee which have not been reported to the House not be disclosed or published by any Member of the Committee or by any other person.

Minutes

Resolved, on the motion of Mr Anderson, seconded by Mr D L Page:

That the minutes of the meetings of 29, 30 and 31 October and 1, 16, 28 and 29 November 2001, as circulated, be confirmed.

Business Opportunities - Seminar

The Chairman reported that the next inquiry of the Committee would address the “business opportunities” term of reference. The seminar to be hosted by the Committee “Investing in Solutions to Salinity” on 8 April 2002 would be the platform for the inquiry.

The secretariat reported on arrangements for the seminar.

Draft Report on Council Management of Salinity

The Committee agreed that preliminary consideration of the draft report on Council Management of Salinity be by way of the Project Officer discussing the draft report with individual Members.

General Business

The Committee Manager reported on arrangements for recruitment action for a second Project Officer to assist with the inquiry and report on the Commonwealth’s response” term of reference.

The committee adjourned at 1.20 pm until 1.00 pm Thursday 21 March 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 21 March 2002, at 1.00pm
Parliament House

Members Present

Ms Allan Mr Anderson Mr Black
Mr Maguire Mr McGrane

Also in attendance: Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apologies

Apologies were received from Mr Hickey, Mr Martin and Mr D L Page.

Confirmation of Minutes

Resolved, on the motion of Mr Maguire, seconded by Mr Black:

That the minutes of the meeting of 14 March 2002, as circulated, be confirmed.

Business Opportunities - Seminar

The secretariat updated the Committee on arrangements for the seminar.

Draft Report on Council Management of Salinity

The Project Officer reported on discussions with individual members concerning the draft report. These would be summarised and circulated to the Committee prior to the next meeting.

The Committee discussed the intention to adopt the draft report at the meeting on 11 April 2002 and to hold a joint press conference with representatives of the Local Government and Shires Associations.

General Business

- The Project Officer was to pursue the Energy Review issue with interested members;
- The most important correspondence was to be highlighted and circulated to the Committee at the meeting scheduled for 11 April 2002;
- Members were notified that the papers from the "Getting it Right" natural resource management conference were available;
- The Committee discussed a possible trip to the North West of Western Australia in August 2002;
- Expressions of interest were called for attendance at the NCC seminar "Futurescape – Exploring the Interaction between the Environment, economics and Society" to be held in Sydney, on 29 and 30 April 2002; and
- The Committee discussed the desirability of meeting with the new Minister for Land and Water Conservation.

Minister for Land and Water Conservation

Resolved, on the motion of Mr Anderson, seconded by Mr Black:

- That the Minister for Land and Water Conservation, the Hon. John Aquilina, be invited to attend a meeting of the Committee; and
- That the Committee secretariat meet with and brief the Minister's staff on the work of the Committee.

The Committee adjourned at 1.40 pm until 9.00 am Monday 8 April 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Monday 8 April 2002, at 9.00am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	

Also in attendance: Ms Christina Thomas, Project Officer; Mr Chris Papadopoulos, Research Officer, and Ms Cassandra Adams, Assistant Committee Officer.

Seminar: Investing in Solutions to Salinity

The public were admitted to the Committee-sponsored seminar, "Investing in Solutions to Salinity", which opened at 9.00 am.

The following persons presented papers at the seminar:

Mr David Pannell, Faculty of Agriculture, University of Western Australia
Dr Stephen Beare, Agricultural and Resource Economics, ABARE
Dr Bob Smith, Director-General, Department of Land and Water Conservation
Dr David Brand, Hancock Natural Resources Group, Australia
Ms Di Bentley, Convenor, Liverpool Plains Land Management Committee
Mr Ian McColl, landowner
Mr John Baryle, Department of Conservation and Land Management, WA
Mr Barney Foran, CSIRO Resource Futures
Dr Brian Dear, NSW Agriculture [and CRC on the Plant Based Management of Salinity]

The seminar concluded seminar and the Committee adjourned at 3.50 pm until 11.30am Thursday 11 April 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 11 April 2002, at 11.30am
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Maguire	**Mr McGrane**	**Mr D L Page**

Also in attendance: Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apologies

Apologies were received from Mr Hickey and Mr Martin.

Confirmation of Minutes

Resolved, on the motion of Mr Black, seconded by Mr Anderson:

That the minutes of the meeting of 21 March 2002, as circulated, be confirmed.

Consideration of Draft Report

The Committee began consideration of the draft report. Members discussed the recommendations and agreed to certain changes.

The Committee requested that the secretariat provide Members with maps and other documents indicating:

Catchment Management Boundaries overlaid with Local Government Area Boundaries

A list of the Regional Organisation of Councils in NSW, including their constituent councils

Visit of inspection to USA and UK

Resolved, on the motion of Mr D.L. Page, seconded by Mr Black:

"That Mr Jim Anderson, Mr Daryl Maguire and an accompanying officer undertake a study tour to the USA and UK."

The Committee adjourned at 1pm until 3.30pm later this day on Thursday 11 April 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 11 April 2002, at 3.45pm
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr McGrane**

Also in attendance: Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apologies

Apologies were received from Mr Martin and Mr D.L. Page.

Confirmation of Minutes

Resolved, on the motion of Mr Black, seconded by Mr Anderson:

That the minutes of the meeting of 21 March 2002, as circulated, be confirmed.

Consideration of Draft Report

The Committee began consideration of the draft report. Members discussed the recommendations and agreed to certain changes. The secretariat was instructed to effect those changes and present a revised draft to the Committee for the next meeting.

The Committee requested that the secretariat provide Members with maps and other documents indicating:

Catchment Management Boundaries overlaid with Local Government Area Boundaries

A list of the Regional Organisation of Councils in NSW, including their constituent councils

The Committee adjourned at 4.05pm until after the conclusion of Question Time on Tuesday 7 May 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 7 May 2002, at 3.30pm
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr McGrane**
Mr D L Page		

Also in attendance: Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apology

An apology was received from Mr Martin.

Confirmation of Minutes

Resolved, on the motion of Mr McGrane, seconded by Mr Anderson:

That the minutes of the meetings of 8 April and 11 April 2002, as circulated, be confirmed.

Consideration of the Revised Draft Report

The revised draft report having been previously circulated, the Chairman declared her interest in ERM, a company referred to in the revised draft report in relation to the case study of the Boral site in the Holroyd Local Government area.

The committee considered the revised draft report.

Resolved, on the motion of Mr Anderson, seconded by Mr McGrane:

"That the revised draft Report be adopted."

Resolved, on the motion of Mr Anderson, seconded by Mr McGrane:

"That the revised draft Report of the Committee be the Report of the Committee and that it be signed by the Chairman and tabled."

Resolved, on the motion of Mr Anderson, seconded by Mr McGrane:

"That the Chairman and Committee Manager/Project Officer be permitted to correct stylistic, typographical and grammatical errors."

Visit of inspection to USA and UK

Resolved, on the motion of Mr Anderson, seconded by Ms Allan:

"That Mr McGrane replace Mr Maguire on the overseas study tour to the USA and UK."

The Committee adjourned at 3.50pm until a date to be determined.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 27 June 2002, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Hickey	**Mr Maguire**	**Mr Martin**
Mr McGrane	**Mr D L Page**	

Also in attendance: Ms Christina Thomas, Project Officer; Mr Roland Simpson, Project Officer (Specialist); and Mr Chris Papadopoulos, Research Officer.

Confirmation of Minutes

Resolved, on the motion of Mr Black, seconded by Mr Maguire:

That the minutes of the meeting of 7 May 2002, as circulated, be confirmed.

Introduction of Additional Temporary Staff

Mr Roland Simpson was introduced, as the Project Officer (Specialist) to the committee, on secondment from State Forests.

Report on Local Council Management of Salinity

The Project Officer reported on reaction to the report on Local Council Management of Salinity.

The Committee deliberated and agreed to the follow up action of sending a copy of the report to individual members of the executive of the Local Government and Shires Associations and letters to the relevant Ministers seeking their response to the report within three months.

Calendar/Workplan

A proposed workplan and calendar for the remainder of the year having been previously circulated was deliberated upon and agreed to.

Business Opportunities

A proposed outline for the business opportunities inquiry having been previously circulated was deliberated upon and agreed to.

The Committee adjourned at 1.40pm until a date to be determined.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 4 September 2002, at 10.00am
Parliament House

Members Present

Mr Anderson Mr Hickey Mr Maguire
Mr McGrane Mr D L Page

Also in attendance: Mr Jim Jefferis, Committee Manager to Select Committees; Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apologies

Apologies were received from Ms Allan, Mr Black and Mr Martin.

Acting Chairman

Resolved, on motion of Maguire, seconded by Mr McGrane:

That Mr Anderson be appointed Acting Chairman for the purpose of the hearing.

Hearings

The press and public were admitted.

By direction of the Acting Chairman, the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses were read.

Dr Aro Arakel, Managing Director, and Dr Keith Mullette, Senior Consultant, both of GeoProcessors, sworn and examined.

Evidence concluded the witnesses withdrew.

Mr Barry Dunn, Chairman of Directors, and Mr Laurence Hogan, Designer and Developer, both of Water for Australia Pty Ltd, sworn and examined.

Evidence concluded the witnesses withdrew.

Dr Kenneth Archer, Program Manager, Pastures and Rangelands Program, New South Wales Agriculture, sworn and examined.

Evidence concluded the witness withdrew.

Ms Stephanie Bolt, Environmental Consultant, PPK Environment and Infrastructure, affirmed and examined.

Evidence concluded the witness withdrew.

Mr Mark Mulligan, Group Manager, Corporate Business Development, Country Energy, sworn and examined.

Evidence concluded the witness withdrew.

The committee adjourned at 2.10 pm until 10.00 am Thursday 5 September 2002.

Acting Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 5 September 2002, at 11.00am
Parliament House

Members Present

Ms Allan **Mr Anderson** **Mr Maguire**
Mr McGrane **Mr D L Page**

Also in attendance: Mr Jim Jefferis, Committee Manager to Select Committees; Ms Christina Thomas, Project Officer; and Mr Chris Papadopoulos, Research Officer.

Apologies

Apologies were received from Mr Black, Mr Hickey and Mr Martin.

Hearings

The press and public were admitted.

By direction of the Chairman, the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses were read.

Mr Graham Sparrow, Research Scientist, CSIRO Minerals, sworn and examined.

Evidence concluded the witness withdrew.

Mr Donald Fielder, Scientific Officer, New South Wales Fisheries, sworn and examined.

Evidence concluded the witness withdrew.

Mr John Leake, Manager Director, NyPa Australia Pty Limited, sworn and examined.

Evidence concluded the witness withdrew.

Dr Stephen Schuck, Professional Engineer and Manager, Bioenergy Australia, affirmed and examined.

Evidence concluded the witness withdrew.

Mr Robert Bruce, Retired Farmer and Grazier, sworn and examined.

Evidence concluded the witness withdrew.

The committee adjourned at 1.50 pm until 10.00 am Thursday 26 September 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 26 September 2002, at 10.00am
Parliament House

Members Present

Ms Allan Mr Anderson Mr Hickey
Mr McGrane

Also in attendance: Mr Jim Jefferis, Committee Manager to Select Committees; Ms Christina Thomas and Mr Roland Simpson, Project Officers.

Apologies

Apologies were received from Mr Black, Mr Maguire, Mr Martin and Mr D.L. Page.

Hearings

The press and public were admitted.

By direction of the Chairman, the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses were read.

Mr Wayne Gumley, University Lecturer, Department of Business Law and Tax, Monash University, sworn and examined.

Evidence concluded the witness withdrew.

Mr Andrew Sippel, Managing Director, Grazing Management Systems, sworn and examined.

Evidence concluded the witness withdrew.

Dr Robert Creelman, Consultant Geoscientist and Adjunct Associate Professor, University of Western Sydney, Materials and Minerals Group, sworn and examined.

Evidence concluded the witness withdrew.

Mr Grant Stuart, Agriculture Consultant, Mr Michael Cullen, Executive Director, Department of State and Regional Development, and Mr James Manwaring, Manager – Regional Programs (Salinity), Department of State and Regional Development, sworn and examined.
Evidence concluded the witnesses withdrew.

The committee adjourned at 1.50 pm until 10.30 am Friday 27 September 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Friday 27 September 2002, at 10.30am
Parliament House

Members Present

Ms Allan Mr Anderson Mr McGrane

Also in attendance: Mr Jim Jefferis, Committee Manager to Select Committees; Ms Christina Thomas and Mr Roland Simpson, Project Officers.

Apologies

Apologies were received from Mr Black, Mr Hickey, Mr Maguire, Mr Martin and Mr D.L. Page.

Hearings

The press and public were admitted.

By direction of the Chairman, the committee terms of reference and Legislative Assembly Standing Order No.'s 332, 333 and 334 relating to the examination of witnesses were read.

Mr Robert Prince, General Manager, Technical and Business Development, Arthur Yates and Company, sworn and examined.

Evidence concluded the witness withdrew.

Mr Darryl Cluff, Native Grasses Management and Development Officer, Stipa Native Grasses Association, and Mr Colin Sies, Chairman, Stipa Native Grasses Association, sworn and examined.

Evidence concluded the witnesses withdrew.

Mr John Verhoeven, Department of Land and Water Conservation, and Ms Shayleen Thompson, Manager, Natural Resources Branch, The Cabinet Officer, both sworn, and Ms Danielle Lautrac, Principal Policy Officer, Salinity Action Unit, The Cabinet Office, affirmed, and all examined.

Evidence concluded the witnesses withdrew.

The committee adjourned at 1.15 pm until a date to be determined.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 14 November 2002, at 1.00pm
Parliament House

Members Present

Ms Allan	**Mr Anderson**	**Mr Black**
Mr Maguire	**Mr Martin**	**Mr McGrane**
Mr D L Page		

Also in attendance: Ms Christina Thomas, Project Officer and Mr Roland Simpson, Project Officer (Specialist).

Apology

An apology was received from Mr Hickey.

Confirmation of Minutes

Resolved, on the motion of Mr McGrane, seconded by Mr Martin:

"That the minutes of the meetings of 27 June 2002 and 4, 5, 26 and 27 September 2002, as circulated, be confirmed".

Travel Report on the Visit of Inspection to Western Australia (November 2001)

The draft travel report on the visit of inspection to Western Australia during November 2001 having been previously circulated.

The committee considered the draft report.

Resolved, on the motion of Mr D.L. Page, seconded by Mr McGrane:

1. That the draft report be adopted;

2. *That the draft report be the report of the Committee and it be signed by the Chairman and tabled; and*

3. *That the Chairman and Committee Manager/Project Officers be permitted to correct stylistic, typographical and grammatical errors.*

Travel Report on the Overseas Study Tour to the USA and the UK (May 2002)

The draft travel report on the overseas study tour to the USA and the UK during May 2002 having been previously circulated.

The committee considered the draft report.

Resolved, on the motion of Mr Anderson, seconded by Mr McGrane:

1. *That the draft report be adopted;*

2. *That the draft report be the report of the Committee and it be signed by Mr Anderson and Mr Grane and tabled; and*

3. *That the Chairman and Committee Manager/Project Officers be permitted to correct stylistic, typographical and grammatical errors.*

Final Report

The draft final report of the committee having been previously circulated.

The Project Officers briefed the Committee in relation to the key issues and proposed recommendations of the report.

The Committee discussed the shape and thrust of draft final report.

The Committee adjourned at 2.05pm until 11.00 am Thursday 21 November 2002.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Thursday 21 November 2002, at 11.00am
Parliament House

Members Present

Mr Anderson	**Mr Black**	**Mr Hickey**
Mr Maguire	**Mr Martin**	**Mr McGrane**
Mr D L Page		

Also in attendance: Mr Jim Jefferis, Committee Manager to Select Committees; Ms Christina Thomas, Project Officer and Mr Roland Simpson, Project Officer (Specialist).

Apology

An apology was received from Ms Allan.

Acting Chairman

Resolved, on the motion of Mr D.L. Page, seconded by Mr McGrane:

"That Mr Anderson be appointed Acting Chairman for the meeting".

Confirmation of Minutes

Resolved, on the motion of Mr McGrane, seconded by Mr Maguire:

"That the minutes of the meeting of 14 November 2002, as circulated, be confirmed".

Final Report

The draft final report of the committee having been previously circulated.

The committee considered the draft report.

Recommendation 1, put and agreed to.
Recommendation 2, amended, put and agreed to.
Recommendations 3 and 4, put and agreed to.
Recommendation 5, amended, put and agreed to.
Recommendations 6 to 18, put and agreed to.
Recommendation 19, amended, put and agreed to.
Recommendations 20 to 26, put and agreed to.
Recommendation 27, amended, put and agreed to.
Recommendations 28 to 38, put and agreed to.
Recommendation 39, amended, put and agreed to.
New recommendation 40, put and agreed to.
Chapters 1 to 6.2, put and agreed to.
Chapter 6.3, amended, put and agreed to.
Chapter 6.4, put and agreed to.
New chapter 6.5 proposed.

Consideration of the draft report concluded, the Committee deliberated.

Resolved, on the motion of Mr Black, seconded by Mr D.L.Page:

"That Chairman write to the Premier with suggested terms of reference for an ongoing Parliamentary committee to monitor salinity and business, environmental and related regional issues as they impact on salinity".

The Committee adjourned at 1.10pm until a date to be determined.

Chairman Committee Manager

Minutes of Proceedings of the Select Committee on Salinity

Wednesday 11 December 2002, at 12.00noon
Parliament House

Members Present

Ms Allan Mr Anderson Mr Hickey
Mr D L Page

Also in attendance: Ms Christina Thomas, Project Officer and Mr Roland Simpson, Project Officer (Specialist).

Apologies

Apologies were received from Mr Black, Mr Maguire, Mr Martin and Mr McGrane.

Confirmation of Minutes

Resolved, on the motion of Mr Hickey, seconded by Mr D L Page:

"That the minutes of the meeting of 21 November 2002, as circulated, be confirmed".

Final Report

The revised draft final report having been previously circulated.

The committee considered the revised draft report.

Resolved, on the motion of Mr Anderson, seconded by Mr D L Page:

"1. That the revised draft report be adopted;

2. That the draft report be the report of the Committee and it be signed by the Chairman and tabled; and

3. That the Chairman and Committee Manager/Project Officers be permitted to correct stylistic, typographical and grammatical errors."

Parliamentary Committee

The Committee deliberated on the Chairman's draft letter to the Premier concerning the proposed ongoing Parliamentary Committee.

Resolved, on the motion of Mr D L Page, seconded Mr Hickey:

"That the terms of reference also include water management issues."

General Business

The Chairman, on behalf of Committee members, thanked the secretariat for their service to the Committee.

The Committee deliberated and adjourned at 12.20 pm until a date to be determined.

Chairman Committee Manager