Chapter 2

The framework to address salinity

What is salinity?

2.1 Salinity is a critical problem threatening the Australian natural environment and the sustainability of productive agriculture areas.[1] One of Australia's most complex and costly environmental issues, it causes damage to roads, buildings, agricultural production, biodiversity, rivers and water supplies. It is hard to quantify the cost of this damage, but one widely used estimate puts the cost of land and water degradation alone at $3.5 billion per annum in economic terms.[2]

2.2 Salts are naturally present in much of the Australian landscape. Salt stores have accumulated over geological time from cyclic rain, whereby salt has been carried inland from the oceans by wind and deposited by rainfall. Examples of this primary or naturally occurring salinity are the marine plains around the Australian coastline and the salt lakes in central and western Australia. Salts are also released from rocks as a result of weathering.[3]

2.3 Secondary salinity is the salinisation of land and water resources due to land use impact by people.

2.4 Salinity is categorised in a number of different ways, depending on how and where salt is mobilised and what the impacts are:

- **Dryland salinity** is salinity that occurs in non-irrigated areas. It usually occurs where deep-rooted perennial vegetation is replaced by crops and pastures that use less water because they have shallow root systems and shorter growth cycles. This increases leakage to the groundwater system (recharge) which, in some areas, may lead to the mobilisation of salts stored deep in the soil. Saline groundwater may rise to the surface (discharge) in low-lying areas or at the break of slope. Groundwater may also flow underground directly into streams and rivers.

---

1 Department of Agriculture, Fisheries and Forestry and the Department of the Environment and Heritage, *Submission 24*, p.1.

2 Council of Australian Governments, *Our Vital Resources: A National Action Plan for Salinity and Water Quality,* November 2000, p. 1 in ANAO Report ANAO Audit Report No.17 2004-05 *The Administration of the National Action Plan for Salinity and Water Quality*, December 2004, p.13.

3 *Australian Dryland Salinity Assessment 2000*, http://audit.deh.gov.au?ANRA/land/sal)context/AUS.cfm?region_code=Aus& (accessed 4 January 2006).

Dryland salinity may also be caused by the exposure of naturally saline soils such as hypersaline clays. Sodic soils (soils that have a high concentration of sodium ions in comparison to other ions like calcium and magnesium) can also cause salinity. When wet, sodic soils disperse causing the soil aggregates to separate and block the soil pores. On drying, sodic soils are often hard and dense, and form a crust on the soil surface. The poor soil structure reduces water infiltration and there is little or no leaching of salts below the root zone. Sodic subsoils can create a perched watertable causing waterlogging of the root zone.

- **Irrigation salinity** occurs when there is a localised rise in the level of groundwater caused by the application of large volumes of irrigation water. This problem is compounded by the replacement of native vegetation with crops and pastures that use less water. Irrigation salinity is made worse when water used to irrigate is derived from salty rivers or groundwater.
- **Urban salinity** is the result of a combination of dryland and irrigation salinity processes. Clearing of vegetation for urban development and problems like over-watering parks and gardens, leaking pipes, drains and tanks, and blocking or changing natural drainage paths can cause the groundwater to rise. Besides naturally occurring salt, in the urban environment there are many other sources of salt that can contribute to urban salinity including salt contained in effluent, building materials, industrial waste water, fertilisers and chemicals.
- **Industrial salinity** results from industrial processes that concentrate salt in industrial waste water. Effluent from towns, intensive agriculture and industry can contain high levels of salt. Coal-fired power stations use water for cooling, a process in which water is evaporated and salt concentrated. Mining activities undertaken before the development of strict rehabilitation requirements have led to abandoned mines being a source of salt in some sub-catchments.
- **River salinity** is caused by saline discharges from areas affected by dryland, irrigation and urban salinity flowing into creeks and rivers. Over time, as salinity within catchments worsens, the quality of river water declines.[4]

2.5 The NSW Department of Natural Resource Management points out that salinity is invariably linked with (or contributes to) other natural resource problems. In turn, these problems have a range of environmental, social and economic impacts:

> Salinity rarely occurs in isolation from other natural resource problems such as decreasing soil and water quality, erosion and loss of native vegetation. For example, water coming from areas affected by dryland, irrigation or urban salinity flows into creeks and rivers causing salinity

4 These definitions are directly taken from the NSW Department of Natural Resource Management website – formerly DIPNR - http://www.dlwc.nsw.gov.au/salinity/basics/types.htm (accessed 24 October 2005).

levels to rise. This affects the water quality, which in turn affects the health of plants and animals. Low water quality affects farm income but may also impact on town water supply, which can have social and economic impacts for both rural and urban dwellers caused by rising council rates and taxes to cover the costs of desalinating the water supply.[5]

Historical background[6]

2.6 As noted earlier, salts are naturally present in the Australian landscape. Prior to European settlement, native vegetation adapted to Australia's natural conditions. With a high prevalence of perennial vegetation with relatively deep roots, most of the water entering the soil was soaked up. As a result, the leakage of water past the root zone into the deeper soil and groundwater was generally minimised.

Photograph: Salinity-affected land in the Great Southern Region, WA

2.7 However, changes in land use since European settlement significantly changed the hydrology of the Australian landscape. Most notably, large scale clearing of native vegetation was undertaken, which was then replaced with shallow-rooted annual crops and pastures. This activity considerably increased the amount of water entering groundwater systems. In turn, the equilibrium or balance was disturbed. As the input to the groundwater exceeded the output, the water table rose discharging

5 NSW Department of Natural Resource Management website – formerly DIPNR http://www.dlwc.nsw.gov.au/salinity/basics/types.htm (accessed 24 October 2005).

6 Material in this section draws heavily on the report of the House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, May 2004, pp 63-68.

more water to the land surface: 'Whenever this groundwater contains salt or intercepts salt stored in the landscape, salt is mobilised to these seepage faces, and hence to the land's surface, rivers and streams.'[7]

Geographical and temporal separation

2.8 The causes of salinisation and the manifestation of its effects in the landscape may be both spatially and temporally distant from each other.

2.9 Land salinisation occurs when the saline groundwater evaporates, leaving salt deposits. The salt may then be moved by rain into waterways and river systems. Water leaking beyond the root zone can also move laterally through soils and flow directly into rivers and streams. In this way, the original cause of the water entering the watertable may be distant from where the effects of salinity manifests. As explained in the House of Representatives Report, *Science Overcoming Salinity*, 'salinity can occur on-site (farm scale), elsewhere in the catchment or outside the catchment (downstream).'[8]

2.10 Further there may be a considerable time delay between the cause of salinity and its effects. Response times in groundwater levels and time lags between the original cause of salinity and its expression in the landscape may be up to 100 years or more.

The extent and impact of salinity

2.11 There are varying statistics and views on the extent and impact of salinity in Australia. In this section, the major surveys of the salinity threat are discussed.

National Land and Water Resources Audit 2000

2.12 The most comprehensive attempt to provide an overview of the (dryland) salinity threat across Australia was undertaken as part of the National Land and Water Resources Audit (the Audit) in 2000. Individual salinity assessments were conducted by six states (New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania), which were then collated into one report, the *Australian Dryland Salinity Assessment 2000*.

2.13 In this report, the National Land and Water Resources Audit Advisory Council reported that approximately 5.7 million hectares of Australia's agricultural and pastoral zone are in regions at risk of developing dryland salinity through shallow

---

7 CSIRO, cited in the House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, 2004, p. 65.

8 House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, 2004, p. 66.

watertables. Predictions based on groundwater trends, field surveys and landscape characteristics indicated that unless effective solutions are implemented, the area could increase to 17 million hectares by 2050. Most is agricultural land (more than 11 million hectares):

Table 1. Areas (ha) with a high potential to develop dryland salinity in Australia[9]

State/ Territory*	1998/2000	2050
New South Wales	181 000	1 300 000
Victoria	670 000	3 110 000
Queensland	not assessed	3 100 000
South Australia	390 000	600 000
Western Australia	4 363 000	8 800 000
Tasmania	54 000	90 000
Total	**5 658 000**	**17 000 000**

* The Northern Territory and the Australian Capital Territory were not included as the dryland salinity problem was considered to be very minor.

2.14 The Audit revealed that the largest areas of dryland salinity are in the agricultural zone of south-west Western Australia, where groundwater levels are still rising. Over four million hectares have areas at risk, which could double the existing area affected by salinity by 2050. It was also found that large areas are at risk of dryland salinity in South Australia, Victoria and New South Wales.[10]

2.15 The non-agricultural area of Western Australia and far western New South Wales was considered to have a very low salinity risk and were not included in the assessment. Further, the report noted the finding of an existing salinity hazard assessment for the Northern Territory (Tickell 1994b) that the overall hazard for the Territory was relatively low. As a result, the Audit did not conduct further assessment of the NT.[11]

2.16 It was noted that northern Australia has far less dryland salinity than temperate Australia. However, it was acknowledged that dryland salinity could become a problem for many catchments with high salt stores if water balance changes

9 National Land and Water Resources Audit Advisory Council, *Australian Dryland Salinity Assessment 2000*, 2001, Table 1, p. 3 of 10, http://audit.ea.gov.au/ANRA/land/docs/national/Salinity_AUS.html, (accessed 6 January 2006).

10 National Land and Water Resources Audit Advisory Council, *Australian Dryland Salinity Assessment 2000*, 2001, pp 2-3 of 10, http://audit.ea.gov.au/ANRA/land/docs/national/Salinity_AUS.html, (accessed 6 January 2006).

11 National Land and Water Resources Audit Advisory Council, *Australian Dryland Salinity Assessment 2000*, 2001, p. 3 of 10, http://audit.ea.gov.au/ANRA/land/docs/national/Salinity_AUS.html, (accessed 6 January 2006).

led to groundwater rises. The Audit concluded that the extent of salinity in northern Australia could be minimised by preventive management.[12]

2.17 The report highlighted three factors that increase the impacts of dryland salinity:

- its off-site effects
- its social and economic consequences
- the high level of inputs required to manage salinity and the long timeframes to achieve this[13]

Photograph: salt lakes in the Great Southern Region, WA

Assets at risk of salinity

2.18 Salinity can impact on a broad range of assets including biodiversity, water quality, crops and infrastructure. The Audit report outlined on-farm and broader impacts:

> The main impact of increasing salinity at the farm level is loss of production and income. Other on-farm effects include the decline in capital

12 National Land and Water Resources Audit Advisory Council, *Australian Dryland Salinity Assessment 2000*, 2001, p. 3 of 10, http://audit.ea.gov.au/ANRA/land/docs/national/Salinity_AUS.html, (accessed 6 January 2006).

13 National Land and Water Resources Audit Advisory Council, *Australian Dryland Salinity Assessment 2000*, 2001, p. 4 of 10, http://audit.ea.gov.au/ANRA/land/docs/national/Salinity_AUS.html, (accessed 6 January 2006).

value of land, damage to infrastructure, salinisation of water storage, loss of farm flora and fauna, and loss of shelter and shade. These effects are magnified at the regional level, where they have a substantial impact on public resources such as biodiversity, water supplies and infrastructure.[14]

Table 2. Summary of assets in areas at high risk from shallow watertables or with a high salinity hazard[15]

Asset	2000	2020	2050
Agricultural land (ha) [1]	4 650 000	6 371 000	13 660 000
Remnant and planted perennial vegetation (ha) [2, 5]	631 000	777 000	2 020 000
Length of streams and lake perimeter (km) [2]	11 800	20 000	41 300
Rail (km)[2]	1 600	2 060	5 100
Roads (km)[2]	19 900	26 600	67 400
Towns (number)[3]	68	125	219
Important wetlands (number)[1, 4]	80	81	130

Notes:
[1] Data from all States, Qld only for 2050.
[2] Data from WA, SA, Vic and NSW, Qld only for 2050.
[3] Data from WA, SA, Vic and NSW.
[4] Including Ramsar wetlands.
[5] Much of the remnant and perennial vegetation reported for each State occurs on agricultural lands.

Other major assessments

2.19 In 2002, the Australian Bureau of Statistics (ABS) conducted a Land Management and Salinity Survey[16] collecting information from farmers on the extent of land showing signs of salinity as well as the strategies used by farmers to manage and prevent salinity.

2.20 The results showed a lower level of saline land than other sources. The report suggested that these different results are most likely the consequence of different concepts, assessment methods and coverage used in each study. The ABS survey covered agricultural land as it is defined for ABS agricultural collections. This includes about 60% of Australian land. Information on all salinity, not just dryland salinity as in the other studies, was collected.[17]

---

14 National Land and Water Resources Audit Advisory Council, *Australian Dryland Salinity Assessment 2000*, 2001, p. 5 of 10, http://audit.ea.gov.au/ANRA/land/docs/national/Salinity_AUS.html, (accessed 6 January 2006).

15 National Land and Water Resources Audit Advisory Council, *Australian Dryland Salinity Assessment 2000*, Table 2, p. 5 of 10, http://audit.ea.gov.au/ANRA/land/docs/national/Salinity_AUS.html, (accessed 6 January 2006).

16 Australian Bureau of Statistics, *Salinity on Australian Farms,* 4615.0, 2002.

17 Australian Bureau of Statistics, *Salinity on Australian Farms,* 4615.0, 2002, p. 3.

2.21 The survey confirmed that Western Australia is the state most affected by salinity and that the Northern Territory, Australian Capital Territory and Tasmania are the least affected.[18]

2.22 A comparison of the ABS figures with the figures from two previous studies, the 1999 report of the Prime Minister's Science Engineering and Innovation Council and the National Land and Water Resources Audit, is shown in the table below:

Table 3. Area affected by salinity, comparison of survey results with other estimates[19]

State	PMSEIC 1999	NLWRA 2001	ABS 2002
	Area of salinity affected land (a)	Area at risk of salinity (b)	Area showing signs of salinity (c)
	'000 ha	'000 ha	'000 ha
NSW/ACT	120	181	124
Vic.	120	670	138
Qld	10	n.a.	106
SA	402	390	350
WA	1802	4363	1241
Tas.	20	54	6
NT	0	0	2
Total Australia	**2476**	**5658**	**1969**

(a) As determined by experts.
(b) As estimated from water table heights.
(c) As reported by farmers.

2.23 Such variations in estimates of areas considered to be at risk as a result of the use of different testing methods were noted by Professor Copeland, Director of the Centre for Salinity Assessment and Management, University of Sydney. In response to Committee questioning on the current extent of salinity, he commented:

> I think there are different ways of measuring salinity and salinity threat. Each has its strengths and limitations, and calibration between the different methods is also not the easiest thing to do, so to base a conclusion on one type of measurement is perhaps a little bit open to question. I think the temporal aspect is also really critical. Taking a snapshot of a particular time does not really give you much information. You need to measure it over a period to see what the trend is, to establish if it is increasing or decreasing. I think that will tell you what is really happening. But I repeat that each of the techniques that is used to measure has its strengths and weaknesses, and we have got to recognise that.[20]

2.24 A recent paper by the Australian Farm Institute examined the methodologies underpinning the figures in the 2000 Audit report. It notes that the risk assessments conducted across the states were based on a range of factors and that the data available

18 Australian Bureau of Statistics, *Salinity on Australian Farms,* 4615.0, 2002, p. 3.

19 Australian Bureau of Statistics, *Salinity on Australian Farms,* 4615.0, 2002, Table 5.1, p. 5.

20 Professor Les Copeland, *Committee Hansard,* Sydney, 14 October 2005, pp 35-36.

on each of these factors was highly variable. The paper concludes that the 2000 Audit figures were considerably overestimated.[21]

2.25 However, as Mr Aldred from the Department of Agriculture, Fisheries and Forestry explained, the Audit assessment was 'based on the best available science and information at the time'. He went on to say that 'the science that underpins those sorts of assessments has continued to be worked on' and, in light of this, information and figures are in the process of being updated.[22]

2.26 Mr Peter Baker, Bureau of Rural Sciences, told the Committee that recent work indicates the salinity risk in eastern Australia is more localised than earlier predicted:

> it has become quite clear from work done over the last five years, largely financed through the National Action Plan for Salinity and Water Quality, that the concept of salt being everywhere and prevalent is not accurate. It is actually confined to some specific parts of the landscape.[23]

2.27 He went on to clarify that even if the salt is there, the risk of it actually being mobilised has been shown to be less through more detailed mapping of the landscape.[24]

2.28 In response to questions concerning the current and likely future environmental and economic impacts of salinity, Mr Lee, Natural Resource Management Team, Department of Agriculture, Fisheries and Forestry (DAFF), said:

> …I think it is fair to say that, with increasing knowledge, it seems the picture may be a little more optimistic than we thought from the first review of salinity risk provided by the National Land and Water Resources Audit. For instance, I believe that, while the aggregate figures in the projections for salinisation in the wheat belt of Western Australia are still remarkably high, they have come down somewhat from the projections that were published in 1999 or 2000 from that work. With better understanding, we are also seeing the mechanisms of salinity and understanding them better. … we are seeing that the hazard in eastern Australia is more specific and perhaps more manageable, so the picture is more optimistic than we thought.[25]

---

21 M. Keogh, 'The national Dryland Salinity Audit 5 Years on: Is the 17 Million Hectare Estimate Still Valid or Useful?', *Farm Policy Journal*, Vol. 2, No. 4, November Quarter 2005.

22 Mr Tom Aldred, Executive Manager, Natural Resource Management, *Committee Hansard*, 28 February 2006, p. 37.

23 Mr Peter Baker, *Committee Hansard*, 6 September 2005, p. 3.

24 Mr Peter Baker, *Committee Hansard*, 6 September 2005, p. 4.

25 Mr Mike Lee, General Manager, Australian Government Natural Resource Management Team, Natural Resource Management Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 6 September 2005, p. 7.

2.29 Mr Lee went on to explain that advances in knowledge and emerging tools enable more precise mapping and, in turn, the opportunity for more targeted interventions.[26]

2.30 Mr Lee suggested that in the light of this emerging information, revision of the previous hazard maps is required.[27] However, he did caution that while the salinity picture looks more optimistic, several years of drought has provided temporary respite. He also noted that salinity still presents a major environmental and economic challenge:

> …there is a counter-risk that the drought has essentially masked the appearance of the salinity problem over the last several years. Ground water levels have been depleted by drought, and you can see that there is a large seasonal and interseasonal component, no doubt, in ground water levels and the salinity that has been expressed. The impacts of salinity have been disguised somewhat by drought over the period. … So what is actually happening in an underlying way is probably more severe than what we are observing. But I think by any calculation we are still faced with a major threat to our biodiversity, our agriculture and our civic infrastructure across the country.[28]

2.31 This view was reiterated by Dr Bruce Munday who told the Committee that:

> I do believe there is a grave risk that we are thinking that salinity is all over because we have had a series of dry years, particularly on the east, but not only there. One of the things that we know from the National Dryland Salinity Program is that some of these ground water systems are very sluggish. They respond very slowly. Some of them, the local ones, respond quite quickly but the regional intermediate ones take a long time to respond. So if we go into a wet period, and none of us can predict whether we will or not, particularly if it is dominated by episodic events—floods—we may well find that it all comes back to bite us again. We will just repeat it all and people will trawl out statements that people made 10 years ago and say, 'Why didn't we listen?' We are having a bit of a honeymoon or spell from dryland salinity at the moment. I would have to be honest and say that is a gut feeling, but one based on having read a lot of stuff.[29]

2.32 The National Land and Water Resources Audit 2000 salinity assessment provided a broad brush picture of the salinity threat in Australia. Evidence suggests this has been instrumental in focusing greater attention on the salinity problem. The Committee was encouraged to hear that recent knowledge and more sophisticated mapping offer an outlook that is not quite as bleak as previously thought. However,

---

26 Mr Mike Lee, *Committee Hansard*, 6 September 2005, p. 7.

27 Mr Mike Lee, *Committee Hansard*, 6 September 2005, p. 8.

28 Mr Mike Lee, *Committee Hansard*, 6 September 2005, p. 8.

29 Dr Bruce Munday, *Committee Hansard*, 16 November 2005, p. 58.

the Committee appreciates that salinity still presents a significant environmental and economic challenge.

Salinity management in Australia

2.33 The range of measures the Australian Government is applying to the salinity problem includes research and development, making direct on-ground interventions, and developing timely information on salinity and building capacity.[30] In collaboration with the states and territories, the Australian Government is dealing with salinity through a wide range of initiatives and research and development bodies. The major programs and initiatives are discussed below.

2.34 The three main programs administered at the Commonwealth level to tackle salinity and other national resource management issues are the National Action Plan for Salinity and Water Quality (NAP), the Natural Heritage Trust (NHT) and the National Landcare Program (NLP). The NAP is directed at improving salinity and water quality conditions in the Australian environment whilst the NHT is focused on the protection and sustainable use of Australia's land, water and marine resources. The NLP focus is on ensuring sustainable agriculture practices and providing support to landholders at the local level.[31] The Natural Resource Management Ministerial Council (NRMMC) oversees the development and implementation of these national natural resource management programs.

The Natural Resource Management Ministerial Council

2.35 The Natural Resource Management Ministerial Council (NRMMC) consists of the Australian, state/territory and New Zealand government ministers responsible for primary industries, natural resources, environment and water policy. The Council is the peak government forum for consultation, coordination and, where appropriate, integration of action by governments on natural resource management issues. Its objective is: 'to promote the conservation and sustainable use of Australia's natural resources'.[32]

The NRMMC seeks to:

- develop policies and strategies for national approaches to the conservation, sustainable use and management of Australia's land, water, vegetation and biological resources;

---

30 Department of Agriculture Fisheries and Forestry and Department of Environment and Heritage, *Submission 24*, p. 2.

31 Department of Agriculture Fisheries and Forestry and Department of Environment and Heritage, *Submission 24*, pp 2-3.

32 Natural Resource Management Ministerial Council, http://www.mincos.gov.au/about_nrmmc.htm, (accessed 22 August 2005).

- oversee the development and implementation of national natural resource management programs including the National Action Plan for Salinity and Water Quality (NAP), the Natural Heritage Trust (NHT) and other agreed programs;
- monitor and evaluate outcomes of these policies, strategies and programs and the health of the nation's natural resources;
- promote community understanding of and engagement with the key challenges associated with the sustainable use and management of Australia's land and water, vegetation and biological resources; and
- liaise with other Ministerial Councils and other bodies on matters relevant to the activities of the Council.[33]

Natural Resource Management Standing Committee

2.36 The Standing Committee supports the Council in meeting its objectives. Membership is comprised of all departmental heads/CEOs of the Australian, state/territory and New Zealand government agencies responsible for natural resource policy.

2.37 Expert advisory committees have been established to provide advice to the Standing Committee and the Council. In turn, a range of working groups and ad hoc task forces support the work of the advisory committees.[34]

The National Action Plan for Salinity and Water Quality[35]

2.38 In November 2000, at the Council of Australian Governments' meeting, Premiers and Chief Ministers supported the Prime Minister's proposal for the National Action Plan for Salinity and Water Quality (NAP). The goal of the NAP is to motivate and enable regional communities to:

- prevent, stabilise and reverse trends in salinity, particularly dryland salinity affecting the sustainability of production, the conservation of biological diversity and the viability of our infrastructure; and
- improve water quality and secure reliable allocations for human uses, industry and the environment.

---

33 Natural Resource Management Ministerial Council, Terms of Reference, http://www.mincos.gov.au/about_nrmmc.htm, (accessed 22 August 2005).

34 Natural Resource Management Standing Committee, http://www.mincos.gov.au/about_nrm_sc.htm (accessed 22 August 2005).

35 Information in this section is from the Department of Agriculture Fisheries and Forestry and Department of the Environment and Heritage, Submission 24, Attachment B and the National Action Plan website, http://www.napswq.gov.au/, (accessed 20 January 2006).

2.39 Through the NAP the Australian and state/territory governments are investing a total of $1.4 billion over the period to 2007-08. These funds support the actions of communities and land managers in selected priority regions across Australia to manage salinity and improve water quality in their region.

2.40 The NAP operates in 21 priority regions across Australia and is complemented by region-based planning and action through the extension of the NHT.

2.41 Support is provided in three main ways:

- Foundation funding is provided by the National Action Plan to help make sure all priority regions have accredited regional catchment strategies to support future investment. Foundation funding allows the development of targets to measure landscape changes, and enables community participation and support plan development. Activities in a foundation program can include: development of an investment plan and a communication plan, facilitated risk and R&D needs analysis, and preparing a strategy for monitoring and evaluation. The foundation program can be used to fill information gaps and to provide natural resource data and information required for ongoing salinity planning and monitoring.
- Priority actions are proposals agreed between the Australian Government, state/territory governments and regional bodies prior to accreditation of the regional catchment strategy. The proposals recognise that, in some areas, significant planning efforts have already been made in consultation with the community. The actions proposed are expected to be consistent with priorities identified under existing plans and activities.
- Capacity building is a high priority and all investments are directed to providing information, tools or skills to support the outcomes of the National Action Plan. There is an emphasis on building the capacity of communities and landholders to assist them to develop and implement an accredited regional catchment strategy.

2.42 The NAP incorporates six key elements:

- setting of targets and standards for natural resource management;
- investment based on integrated regional natural resource management plans;
- capacity building for communities;
- improved governance frameworks;
- clear roles for all levels of government and communities; and
- public communication programs.

2.43 In December 2004 the Australian National Audit Office (ANAO) tabled its audit report on the administration of the National Action Plan for Salinity and Water

Quality.[36] The objective of the audit was to examine and report on the planning and corporate governance for the new regional delivery model of the NAP program.

2.44 A more detailed discussion of this report is dealt with in Chapter 3.

The National Heritage Trust[37]

2.45 The NHT was set up in 1997 to assist in the restoration and conservation of Australia's environment and natural resources. The NHT provides funding for environmental activities at a national, state, regional and community level. Its goal is to stimulate activities in the national interest to achieve the conservation, sustainable use and repair of Australia's natural environment.

The Natural Heritage Ministerial Board

2.46 The Natural Heritage Minsiterial Board was established under the *Natural Heritage Trust of Australia Act 1997*. It is comprised of the Minister for the Environment and the Minister for Agriculture, Fisheries and Forestry.

2.47 The Board is a formal mechanism through which the two portfolios liaise and collaborate on matters relating to the Trust package. The two Ministers are requried to consult with each other on all decisions relating to the expenditure of Trust funds. All decisions must accord with the principles of ecologically sustainable development.[38]

Natural Heritage Trust extension

2.48 In the 2001 Federal Budget, an additional $1 billion was allocated to the NHT, extending the funding for a further five years. It was specified that at least $350 million of this additional funding was to be spent on measures to improve Australia's water quality. A further $300 million was announced in the 2004 Federal Budget, extending the funding to 2007-2008. This made the total investment in the NHT $3 billion.

2.49 Under the NHT extension (NHT2) there was a fundamental shift towards a more targeted approach to environmental and natural resource management in Australia. These included improved water quality, less erosion, improved estuarine health, improved vegetation management and improved soil condition. State and territory governments match the Australian Government's investment in delivering the NHT at a regional level, with funding going to activities based on regional plans.

---

36 Australian National Audit Office, *The Administration of the National Action Plan for Salinity and Water Quality*, Audit Report No. 17 2004-2005.

37 Information in this section is from the Department of Agriculture Fisheries and Forestry and Department of the Environment and Heritage, Submission 24, Attachment B and the Natural Heritage Trust website, http://www.nht.gov.au/about-nht.html, (accessed 20 January 2006).

38 Natural Heritage Trust website, http://www.nht.gov.au/orgcom/nhmb.html (accessed 20 March 2006).

National Landcare Program[39]

2.50 The National Landcare Program (NLP) supports the landcare movement and the sustainable use and management of natural resources. The NLP consists of two sub-programs - Community Support and the National Component.

2.51 NLP Community Support provides support for community landcare groups and resource-based industries with the purpose of ensuring effective links with regional NRM plans and investment strategies of NAP and NHT. The role of landcare is to facilitate links between regional plans and farmers through their common need for information about effective natural resource management practices, including those to manage salinity.

2.52 The NLP National Component supports activities of a national or overarching nature. This has included grants for groups or individuals to test innovations that contribute to improved natural resource management. The National Component also supports partnership projects with industry groups and includes development and implementation of industry strategies to manage the causes and effects of salinity.

2.53 Since the 1993-94 financial year, the Australian Government has allocated $830 million to the NLP. In the 2004-05 budget the Australian Government appropriated a further $110 million to this program over the three financial years 2005-06 to 2007-08.

The Regional Model

2.54 A regional model underpins the delivery of the NAP and the NHT. A total of 56 NRM regions have been established across Australia with a corresponding regional body. Each region develops a regional plan, which is accredited in accordance with agreed national standards. These plans form the basis for investment of NAP and NHT funds.[40]

2.55 The regional bodies are responsible for: regional planning and investment; engaging community involvement in the planning process; and reporting against targets at the regional scale.[41]

---

39 Information in this section is from the Department of Agriculture Fisheries and Forestry and Department of the Environment and Heritage, Submission 24, Attachment B, and the National Landcare Program, http://www.daff.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A04273, (accessed 20 January 2006).

40 Department of Agriculture, Fisheries and Forestry and Department of Environment and Heritage, *Submission 24*, Attachment I, p. 33.

41 Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, p. 4.

2.56 Environments differ across Australia shaped by specific local conditions. The capacity to understand and respond to these varying conditions is viewed as a critical component of the regional delivery model.

2.57 Dr Prosser from the CSIRO told the Committee that:

> the management of salinity depends on the precise local conditions and the trade-off decisions with other regional goals that have to be made within each region on its own. So this requires that the general principles are interpreted through a deep knowledge of the local conditions in each region. This is the real crux of the challenge of salinity management.[42]

2.58 The regional delivery model is discussed in greater detail in Chapter 4.

Other major program and initiatives

2.59 Along with the three major programs discussed above, the Australian Government invests in a range of research and development initiatives that address salinity management. This includes projects undertaken by: rural industry research and development corporations (RDCs); Cooperative Research Centres (CRCs);[43] science organisations such as the CSIRO; and the joint state initiative, the Murray-Darling Basin Initiative. A brief summary of some of these initiatives is provided below.

The Murray-Darling Basin Initiative – Basin Salinity Management Strategy

2.60 The Basin Salinity Management Strategy (BSMS) sits under the Murray-Darling Basin Initiative, which gives effect to the 1992 Murray-Darling Basin Agreement. The Agreement is 'to promote and coordinate effective planning and management for the equitable, efficient and sustainable use of the water, land and other environmental resources of the Murray-Darling Basin'.[44] The Agreement was signed by the Australian, NSW, Victoria, South Australian, Queensland and ACT governments.

2.61 The BSMS is a 15-year strategy, which guides communities and governments in managing salinity in the Murray-Darling Basin. The strategy sets targets for the river salinity of the Murray-Darling system and each major tributary valley.[45]

2.62 The objectives of the strategy are:

---

42 Dr Ian Prosser, *Committee Hansard*, 6 September 2005, p. 29.

43 The CRC Program is administered by the Department of Education, Science and Training. The program links researchers with industry encouraging a practical and commercial focus in R&D endeavours.

44 Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, Attachment A, p. 1.

45 Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, Attachment A, p. 1.

- maintaining the water quality of the shared water resources of the Murray and Darling Rivers;
- controlling the rise in salt loads in all tributary rivers of the Murray-Darling Basin;
- controlling land degradation and protecting important terrestrial ecosystems, productive farm land, cultural heritage and built infrastructure; and
- maximising net benefits from salinity control across the Basin.[46]

Land & Water Australia

2.63 Land & Water Australia is a statutory research and development corporation in the Australian Government Agriculture, Fisheries and Forestry portfolio. It is responsible for 'research and development (R&D) aimed at the productive and sustainable management of the land, water and vegetation resources underpinning Australia's primary industries and regional communities'.[47]

2.64 Land & Water Australia's principal contribution to salinity management was its involvement in the National Dryland Salinity Program (discussed below). However, it continues to contribute to salinity management through:

- hosting the National Land and Water Resources Audit, which invests in data collection of salinity and other NRM trends
- Managing the National Knowledge Brokering for Regional NRM Project (discussed in Chapter 5)[48]

National Dryland Salinity Program

2.65 The National Dryland Salinity Program (NDSP) ran between 1993 and 2004. The program was managed by Land & Water Australia in partnership with Australian and state government agencies, CSIRO, the Murray-Darling Basin Commission and industry research and development corporations.

2.66 The NDSP provided a national forum for awareness raising, and knowledge generation and exchange, bringing together many of Australia's leading hydrogeologists, soil scientists, agronomists, economists, social scientists and policy advisers.[49]

---

46 Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, Attachment A, p. 2.

47 Land & Water Australia, *Submission 26,* p. 1.

48 Land & Water Australia, *Submission 26*.

49 Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, Attachment A, p. 4.

2.67 The NDSP ran over two five-year phases. During this time approximately 50 research projects were commissioned, coordinated and managed, with an investment value of almost $25 million. In the final year of the NDSP (2003-04) the findings of these projects were pulled together to create the *Managing Dryland Salinity in Australia Resource Kit*. [50]

2.68 The NDSP and the NDSP products are considered in more detail in Chapter 5.

Cooperative Research Centre (CRC) for Plant-based Management of Dryland Salinity

2.69 The CRC for Plant-Based Management of Dryland Salinity is a national organisation linking over 300 researchers and 11 industry partners across four states (WA, SA, Victoria and NSW).[51] The CRC works with the CRC for Australian Weed Management, CRC for Landscape Environments and Mineral Exploration, Land & Water Australia, CRC for Catchment Hydrology, Meat and Livestock Australia, Australian Wool Innovation, the Grains Research and Development Corporation and federal, state and territory agencies.

2.70 The CRC focuses on the interaction between the natural and agricultural ecosystems with the aim of providing new plant-based land use systems that reduce the economic, environmental and social impacts of dryland salinity.[52]

2.71 Some examples of research programs underway include:

- Sustainable Grazing from Saline Lands – researching, refining and demonstrating the scope for profitable livestock enterprises on salt affected land;
- Perennial Pasture for High Rainfall Zones – developing, testing and demonstrating new plant-based systems that are profitable and reduce off-site impacts, especially recharge to groundwater;
- Ecosystems Function in Recharge Zones – increasing understanding of water management in natural ecosystems to create the scientific fundamentals for developing plant-based solutions to dryland salinity; and
- FloraSearch – builds on the WA Search project investigating new products and industries from Australian native woody perennial plants to improve

50 Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, Attachment A, p. 4.

51 CRC for Plant-Based Management of Dryland Salinity Website, www.crcsalinity.com/aboutus/index (accessed 2 March 2006).

52 Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, Attachment A, p. 4.

sustainability of farming practices in the more challenging low rainfall zones where salinity is a more intractable problem.[53]

'Science Overcoming Salinity': House of Representatives Report[54]

2.72 On 18 August 2003, the Minister for Science, the Hon. Peter McGauran MP, referred to the House of Representatives Standing Committee on Science and Innovation an inquiry into the 'Commonwealth's role in managing and coordinating the application of the best science in relation to Australia's salinity programs'.[55] The Committee was asked to give particular consideration to the:

a) use of the salinity science base and research data (including the development of new scientific, technical and engineering knowledge) in the management, coordination and implementation of salinity programs;

b) linkages between those conducting research and those implementing salinity solutions, including the coordination and dissemination of research and data across jurisdictions and agencies, and to all relevant decision makers (including catchment management bodies and land holders); and

c) adequacy of technical and scientific support in applying salinity management options.[56]

2.73 The inquiry did not focus on the causes of salinity, but rather sought to determine whether the best and most up-to-date science was being applied to individual problems, and whether effective coordination was in place so that the science made it 'down to the ground'. The Committee reported its findings in May 2004 and made twenty-four recommendations.

2.74 This section provides a summary of the House of Representatives' *Science Overcoming Salinity* Report. The recommendations from the House of Representatives Report are contained in Appendix 4 of this report.

2.75 In Chapter 2, the report examined the major national programs aimed at addressing salinity: the National Action Plan for Salinity and Water Quality (NAP);

---

53 Taken directly from the Department of Agriculture, Fisheries and Forestry and Department of the Environment and Heritage, *Submission 24*, Attachment A, pp 4-5.

54 House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, Canberra, May 2004.

55 House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, Canberra, May 2004, p. xii.

56 House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, Canberra, May 2004, p. xii.

the Natural Heritage Trust (NHT); and the National Landcare Program (NLP). Also examined were strategies to address salinity in the Murray-Darling Basin and a number of state and local government initiatives. In examining these programs four key issues of concern were identified.

2.76 First, it was found that the architecture of the NAP:

- Inhibited national research coordination;
- did not have a charter to fund salinity research;
- had geographic gaps by focussing on only 21 regions;
- excluded industry participation and marginalised state agency involvement;
- rendered achievement of targets under the Murray-Darling Basin Salinity Management Strategy vulnerable; and
- lacked a rigorous scientific basis for the allocation of funds to regions.

2.77 Second, the report highlighted a failure to incorporate key research findings into salinity programs and the mistaken presumption that economically viable solutions were available for widespread adoption.

2.78 Third, it was found that the Australian Government's science investments neglected research into new salinity management methods and technologies. This was evident in both inadequate support for R&D into new salinity management methods and technologies and poor coordination between NAP-related research agencies and state and regional activities.

2.79 Fourth, there was concern that region-based planning and delivery of NRM programs would introduce additional complexity and fragmentation into the salinity research effort and that this may be exacerbated by limitations in the capacity of some regional bodies.

2.80 The report noted considerable variation across regional bodies in the uptake of science. The Committee recommended that regional planning, investment strategies and on-ground works be informed by the best available science and that regional bodies and land managers be adequately supported to use and incorporate science into their planning and investment activities (See Appendix 4, recommendation 1).

2.81 Chapter 3 of the report provides an overview of the nature of the salinity problem and examines alternative scientific perspectives on the sources of salt, salinity processes, the extent of the salinity problem and the veracity of some public sector research and audits.

2.82 The report noted that while the precise extent of salinisation is unclear, 5.7 million hectares of agricultural and pastoral land were estimated to have a high potential for developing salinity and that two million hectares of agricultural land were currently showing signs of salinity. The effect of salinity in urban areas was also canvassed.

2.83 The costs imposed on landholders, governments and residents of rural towns as a result of salinity on infrastructure, water quality, productive land, bio-diversity, remnant vegetation and conservation reserves was identified as significant. The following estimated figures were reported:

- the loss in profits for the agricultural sector in Western Australia - estimated at between $80 and $260 million per year
- the cost of dryland salinity in eight tributary valleys of the Murray-Darling Basin - approximately $247 million per year
- the cost of salinity to consumptive users of River Murray water - totals $47 million per year
- in Wagga Wagga, the damage to infrastructure in the town would amount to $180 million over 30 years, with some residents already spending up to $20 000 to repair their homes.

2.84 Chapter 4 reviews the agencies and programs whose research efforts constitute the 'science base and research data' to address salinity at the national level. The chapter identifies that a wealth of salinity research has been undertaken by a range of Australian Government funded agencies and programs, including: national science agencies, Cooperative Research Centres, Research and Development Corporations (RDCs), the National Dryland Salinity Program (NDSP), the National Land and Water Resources Audit, and universities. Further, it identifies an array of research products and management tools that have been developed.

2.85 However, the Committee found a lack of coordination and consolidation of these research products and management tools. It identified the need for a comprehensive audit of the Australian Government investment in salinity research to: map the salinity science base and management tools currently available; identify critical research gaps; and assist in bringing greater coherence to the range of science investments for salinity and, potentially, improve their effectiveness (see Appendix 4, recommendation 2).

2.86 Chapter 5 describes the coordination of salinity research at national and state levels, the challenges for research coordination in the new NRM environment and institutional proposals for improved coordination. Evidence reviewed in this chapter suggests that there are benefits for salinity R&D to be nationally coordinated. The reasons for this were outlined as follows:

- the structural changes ushered in with the NAP, notably the devolution of NRM responsibilities to regions and the fragmentation of efforts at the national level;
- the perhaps unavoidable complexity of salinity research efforts across a large number of agencies and programs, which need to be effectively coordinated—now more than ever;
- to link research providers and their products with CMOs, land managers and others undertaking on-ground works;

- to identify the R&D issues of national significance, ensure they are adequately addressed and avoid duplication;
- to maintain the momentum developed through the NDSP in R&D and extension; and
- to better coordinate research programs with state and territory salinity strategies, so as to avoid overlap between governments at different levels.[57]

2.87 The report highlighted the then imminent closure of the National Dryland Salinity Program (NDSP) and noted that the NDSP served a unique function, which would be missed if discontinued. Consequently, the Committee argued that the role of the NDSP be continued and its functions expanded to address other relevant matters, including irrigation and urban salinity (see Appendix 4, recommendation 3).

2.88 Chapter 6 canvasses the adequacy of the science base, research needs and funding. The chapter reinforces findings in earlier chapters that, given the volume of salinity research that has been undertaken to date, the necessity for significant additional research was not an issue. However, the need to fund on-ground works and address barriers to the adoption of existing research was identified as an immediate priority.

2.89 The report outlined several salinity research needs as follows:

- additional basic research, including into the sources of salt and salinisation processes;
- improvements in groundwater mapping and monitoring methods that can be used and responded to by land managers and CMOs;
- improvements in modelling techniques to provide more useful guidance on targeted responses, rather than widespread landscape change responses;
- better understanding of the effectiveness of different engineering solutions for treating rising groundwater levels, and improving design of future engineering options (for example, to deal with saline effluent from groundwater pumping);
- better understanding of the impact of salinity on freshwater environments, biodiversity and the relationship between landscape and waterscape processes;
- intensification of urban salinity research, particularly pertaining to assessment and risk evaluation, options for treatment and management and development of appropriate building codes;
- intensification of research into vegetative solutions, including perennial plant-based systems for recharge and discharge systems;

57 Taken directly from the House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, Canberra, May 2004, p. xxxvi.

- development of technologies for making productive use of salinised land and water resources, with specific emphasis on generating marketable products and industries;
- combined systems research into multiple benefits from perennial vegetation, in particular biodiversity, carbon sequestration and aquatic systems;
- socio-economic analysis to improve resource allocation and better understand constraints to the widespread adoption of technologies;
- developing innovative policy instruments to deal with the diversity of management regimes required to address salinity; and
- encouraging the emergence of new industries and environmental management system frameworks for existing industries that will increase the adoption of salinity management technologies as they develop.[58]

From this analysis several recommendations were made.

2.90 The Committee noted that the arrest of salinity requires substantial land use change, which will only be achieved through the development of commercial crops and new industries. The Australian Government's calls to encourage commercially-driven tree production systems, including the development of environmental markets, and to ensure that regional bodies introduce industry development planning into their NRM planning and R&D funding prioritisation processes was reiterated and a recommendation made to this effect (see Appendix 4, recommendation 5).

2.91 Chapter 6 also discussed the effects of urban salinity and recommended the need for the development of technologies to address urban salinity, including salinity assessment and risk evolution methods and options for treatment and management (see Appendix 4, recommendation 6).

2.92 The need for multidisciplinary and interdisciplinary research in order to address the silo and specialisation approaches to both research and resource management was recommended (see Appendix 4, recommendation 7). The report noted that this specialisation clashes with the needs of landholders, who must manage a multitude of themes simultaneously and integrate knowledge across a range of disciplines. It was acknowledged that landholders require knowledge and tools that enable them to address the interplay between resource degradation issues.

2.93 Funding for nationally coordinated salinity research was highlighted. The Committee recommended that the Australian and state governments make provision within the National Action Plan for Salinity and Water Quality for the establishment of a salinity research and development fund, to finance research that is of national or state-wide significance, beyond the scope of individual regional bodies. Further, it was

58 Taken directly from the House of Representatives Standing Committee on Science and Innovation, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, Canberra, May 2004, pp 168-170.

advised that the allocation of the pooled research funds have regard for the research needs of regional bodies and the research priorities identified in the report (see Appendix 4, recommendation 8).

2.94 The Committee recommended that the Australian Government encourage Research and Development Corporations to invest more substantially in research for sustainable land use systems and in the development of new salinity technologies (see Appendix 4, recommendation 9).

2.95 In order to facilitate greater regional body involvement in research at the regional level, the Committee recommended that, in cooperation with the states, the Australian Government: identify and remove impediments for regional bodies to undertake or commission research, and encourage regional bodies to support research activity as part of their investment strategies; provide incentives for greater collaboration between regional bodies to support research of cross-catchment benefit; and provide an appropriate degree of support to evaluate tenders and contracts let at the regional level (see Appendix 4, recommendation 10).

2.96 Chapter 6 also outlines the need for private sector investment in salinity research (see Appendix 4, recommendation 11) and the need for governments to encourage the development of industry capacity in salinity research and development through the open tendering of public research funds (see Appendix 4, recommendation 12).

2.97 Chapter 7 reviews the Australian Government's data collection, management and retrieval arrangements and outlines a number of concerns with regard to the collection and management of salinity data. Several issues were highlighted including:

- the difficulties associated with accessing data held by individual researchers, research organisations and government agencies;
- the need for nationally consistent data measurement and collection standards across regions, states and other jurisdictions;
- the need to ensure data is maintained appropriately;
- the lack of data upon which to make informed decisions; and
- the lack of certainty over the long-term funding for the collection of salinity data.

2.98 The chapter canvasses options for improving coordination and retrieval of data and describes the Australian Government's initiatives aimed at reducing the problems associated with data management. In particular the National Land and Water Resource Audit is reviewed, as is a range of initiatives at the state and territory level. While the Committee found that the Australian Government played a vital role in the management of NRM data, problems persist. As a result, it was recommended that governments expedite the development of data management systems that are standardised, integrated and accessible (see Appendix 4, recommendation 13).

2.99 Further, the Committee recommended that with the increased involvement of regional bodies in data collection, the Australian Government increase efforts to equip managers of regional projects with the requisite skills for data management (see Appendix 4, recommendation 14).

2.100 Chapter 7 also discussed mapping technologies, with the Committee noting that mapping technologies may perform an important role in salinity management.

2.101 The final chapter of the report – Chapter 8 - reviews the adequacy of the technical and scientific support for land managers who implement salinity management options. In particular the chapter is concerned with extension services and the effectiveness of current arrangements for the transfer of information.

2.102 As in previous chapters, the Committee found that there was a need to consolidate information to build a national database of interpretative material, scientific research and data relating to salinity and its management (see Appendix 4, recommendation 15).

2.103 The Committee found that the success of salinity management depends on the commitment and actions of individuals and community groups, in particular regional bodies. Good face-to-face extension with experienced and trusted extension staff was found to lead to a more rapid and widespread adoption of new technologies and management options. Therefore, the Committee recommended that government agencies and industry groups enhance their support for face-to-face extension services (see Appendix 4, recommendation 16). Further, it was recommended that relevant state government agencies compile and publish a state-by-state manual of viable salinity management options, to assist extension staff and land managers (see Appendix 4, recommendation 17).

2.104 The Committee noted that state and territory governments were withdrawing from the provision of extension services in their traditional form and urged a review of this issue, with particular regard to: the employment conditions of extension officers; their potential career pathways; and the adequacy of the training provided for officers to ensure their knowledge of technical, scientific and policy issues, relating to NRM and in particular salinity, is current and comprehensive (see Appendix 4, recommendation 18).

2.105 The lack of comprehensive data on the Australian Government's role in the provision of salinity extension programs was raised as an issue. Consequently, the Committee recommended that governments undertake an audit of the national, state and regional extension services available for salinity management, and natural resource management more generally (see Appendix 4, recommendation 19).

2.106 Chapter 8 also examined the National Landcare Program and found that Landcare activities are vital to the transfer of information on salinity and its management. While acknowledging reservations about Landcare’s ability to facilitate sufficient land use change in its current form, the Committee suggested that this does not detract from Landcare’s role in the communication and dissemination of

information about salinity. Further, it simply highlights the need for better management options to be developed by researchers, and the strengthening of the mechanism by which information is transferred from researchers to extension providers.

2.107 The Committee recommended that the effectiveness of NLP facilitators in the design and implementation of regional plans be assessed in order to clearly delineate their role and avoid duplication with other extension services (see Appendix 4, recommendation 20).

2.108 In examining investments under the National Action Plan and the Natural Heritage Trust, the Committee reported that a number of facilitators had been employed at national/state and regional/local levels. However, the Committee recommended a need to enhance the capacity of extension staff through suitable employment conditions, career pathways and adequate training (see Appendix 4, recommendation 21).

2.109 At a regional level, the Committee reviewed the role and ability of regional bodies to provide extension services. While many regional bodies were well positioned to provide these services, the Committee found serious concerns about the capacity of many others to adequately extend salinity research and other relevant NRM information. The Committee therefore recommended that additional support be provided to regional bodies (see Appendix 4, recommendation 22).

2.110 The Committee proposed involving scientists in the direct extension of their research findings as this has the dual function of ensuring (a) findings are correctly interpreted; and (b) the priorities of land managers are relayed back to researchers. The Committee recommended that the Australian Government support the establishment of a national annual forum on salinity policy, research and management under the umbrella of the NAP for a wider range of interested participants (see Appendix 4, recommendation 23).

2.111 Finally the Committee also saw a role for the private sector in the provision of extension services and recommended that impediments be removed to facilitate this (see Appendix 4, recommendation 24).

Action taken against report recommendations

2.112 The Government response to the House of Representatives Report was published in December 2005.[59] The response and evidence received on action taken against the recommendations of the House of Representatives Report are discussed

59 The Australian Government, *Response to the House of Representatives Standing Committee on Science and Innovation May 2004 Report – Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, December 2005, www.aph.gov.au/house/committee/scin/salinity/govtresponse/govtresponse.pdf, (accessed 31 January 2006).

within the context of each of the following chapters. A brief summary is then outlined in the concluding chapter of this report.

2.113 Throughout the remainder of this report, the House of Representatives Standing Committee on Science and Innovation's report, *Science Overcoming Salinity*, will be referred to as the House of Representatives Report.