Chapter 5

Supporting and communicating the research

> There is no silver bullet solution and the wide range of information on salinity can be confusing for land managers. The development of productive and effective management tools requires ongoing local research and development, coupled with good extension activities. The co-ordination of research would streamline the path from the plot to the paddock and increase the efficiency of delivery.[1]

Supporting the research

5.1 As discussed in Chapter 3, the major NRM programs are directed towards developing a coordinated approach to deliver programs and funding directly to land mangers on the ground. However, behind these programs there must be sound salinity science. The House of Representatives Report discussed in detail the salinity science base (chapter 4). This report does not intend to go over the same ground. In this chapter the Committee identifies a number of key areas where the effectiveness of NRM programs may be hampered by current aspects of salinity science and research. These include:

- the need for research to be conducted and connected across a range of scales;
- the need for national standards and protocols for research and information management;
- the need for more effective coordination and communication of research; and
- the need for more research and data in key areas: salinity risk mapping and profitable salinity management solutions.

Research scale

5.2 There is a wide range of stakeholders with an interest in, and responsibility for, salinity management. These range from individual farmers to larger regional bodies and industry groups. Each group has different requirements for salinity science and information. The Committee heard significant evidence that suggests there is a need for science to be translated across a range of scales. The CSIRO submitted:

> While there is often detailed knowledge of specific research subjects and sites, and knowledge of broad scale processes, there are significant challenges in integrating current knowledge across the range of scales needed to apply it to landscapes, regional and paddock scales. It is not surprising that both practitioners and users of science are having difficulty

1 Pastoralists and Graziers Association, *Submission 4*, p. 2.

> coming to grips with the complexities of managing both natural and developed ecosystems.[2]

5.3 The ANAO audit of *The Administration of the National Action Plan for Salinity and Water Quality* reported challenges in undertaking research at the right scale and in forms that could be readily used by regional communities:

> One of the key challenges noted by many regions was the difficulty in obtaining adequate data and analysis at an appropriate scale on natural resource conditions and trends for the regional planning process. Most data from key research institutions is either at a national scale (such as the NLWRA) or selective in terms of its applicability to particular regions. A submission from a salinity research institution to the ANAO noted particular gaps for NAP regions in the:
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> - knowledge of salt stores and water flows in rural and urban landscapes necessary to provide accurate estimates of the extent, severity and the potential risks of salinisation of land and water resources;
> - economic analysis of salinity mitigation options;
> - mapping of salt hazards at a level suitable for property management purposes;
> - identification of the sources of salinity in catchments; and
> - the impacts of salt on wetlands.[3]

5.4 Mr Andrew Campbell from Land & Water Australia highlighted a gap between large scale research and priorities, and farm or paddock scale action:

> We also need to be reorganising ourselves to be able to meet the needs of catchment bodies and land-holders for natural resource management work and, in particular, to bridge the gap between catchment scale targets and priorities, and farm and paddock scale action. At the end of the day, the action mainly happens on farm, and decisions are made at that scale. There is some very challenging science involved in moving up and down between a decision as to what to plant in a particular paddock or where to put trees and the impact on a river 100 kilometres away.[4]

Funding regional and large-scale research

5.5 While witnesses identified the need for research at local and regional scale, the Committee heard that the current funding arrangements under the NAP are for on-ground works and therefore the program does not have the capacity to fund regional level research. Further, the Hunter-Central Rivers CMA submitted that NHT funding has limited scope for research at a regional level:

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2 CSIRO, *Submission 15*, p. 7.

3 Australian National Audit Office, *The Administration of the National Action Plan for Salinity and Water Quality*, Audit Report No. 17, 2004-2005, p. 56.

4 Mr Andrew Campbell, Land & Water Australia, *Committee Hansard*, 6 September 2005, p. 25.

> NHT investments are currently driven by a formula that is biased towards on-ground actions so under the current federal agreement there is little investment available for research at the catchment level.[5]

5.6 The Committee heard from some CMAs who argued that current funding guidelines under the NAP has lead to gaps in research, which, in turn, make it difficult for CMAs to effectively target on-ground works. For example, the Hawkesbury-Nepean Catchment Management Authority noted that the national groundwater flow system information did not cover all catchments to show local and sub catchment variations in salinity processes. Similarly, data on basic surface and groundwater quality and flow trends were limited in some catchments, yet:

> These types of issues and the need to carry out investigations to fill data gaps are generally not allowed for in guidelines for funding and reporting.[6]

5.7 Similarly, Dr Petrina Quinn from the Central Riverina Landcare Network and Murrumbidgee Landcare Association, noted the need for NAP funding to be made available so that research into the local hydro-geological system could be undertaken:

> The charter of the National Action Plan does not include funding salinity R&D, beyond a limited role for regional level implementation. In the case of salinity and its temporal attributes R & D in particular considering groundwater levels, water quality attributes and geology is essential to understanding the local hydro-geological systems and thus the impact of what we can and are doing. There does appear to be a gap in regional R & D and that deemed of national relevance.[7]

5.8 The Committee heard evidence that the lack of funding for research may limit the regional bodies' capacity to build relationships with researchers. Dr Vervoort from the Centre for Salinity Assessment and Management, University of Sydney, said:

> Several people from the CMAs, from the contacts we have, have pointed out to us that a lot of the funding they are getting is based on on-the-ground works and that it creates very few opportunities to build relationships with research providers because there is no money available for research.[8]

However, the Centre for Salinity Assessment and Management, University of Sydney cautioned that CMA activities need to be linked to the best contemporary national and international research.[9]

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5 Hunter-Central Rivers CMA, *Submission 2*, p. 3.

6 Hawkesbury-Nepean Catchment Management Authority, *Submission 12*, p. 2.

7 Central Riverina Landcare Network and Murrumbidgee Landcare Association, *Submission 48*, p. 3.

8 Dr Rutger Vervoort, McCaughey Senior Lecturer, Hydrology and Catchment Management, Faculty of Agriculture, Food and Natural Resources, University of Sydney, *Committee Hansard*, 14 October 2005, p. 42.

9 Centre for Salinity Assessment and Management, University of Sydney, *Submission 17*, p. 1.

5.9 Dr Ian Prosser from CSIRO argued that while there is a need for regional scale research, regional organisations doing their own research was not a wise use of resources:

> You run the risk … of inventing 57 rail gauges across Australia if they are all doing their own research. They share many common things, particularly with neighbouring regions which may have similar environments, and it would be very inefficient for each one to be doing their own investigations.[10]

5.10 Land & Water Australia made a similar point and argued the need for pooled resources to fund research on common areas of need:

> The need to connect regional groups with national knowledge generation also has lessons for the design of national programs. Clearly it will not be the most effective use of resources for 57 regional groups to develop and implement research programs that duplicate each other. However, under funding arrangements for the NAP all Australian Government funds were committed at the regional level, through state agreements. The difficulty in coordinating funding contributions from each region to support a national research initiative on fundamental problems means such research simply may not be undertaken. The need for some form of national funding pool should be recognised in future program arrangements.[11]

5.11 The CRC for Plant-Based Management of Dryland Salinity similarly argued that there is a need for larger-scale research, which is currently not accommodated in the national programs:

> There needs to be better integration into the program of issues that are better handled at scales larger than the regions (i.e. state or national). The following responses are usually better handled at a larger scale, and research indicates that they are often more cost-effective than the types of responses currently being prioritised by CMAs. They should be funded from core salinity program funds if required, rather than left to chance. This implies that a significant share of program funds should not be directed through CMAs.
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> - Development of improved technologies, such as more profitable (more adoptable) farming practices for salinity management.
> - On-ground works on public lands (e.g. pumping in nature reserves, engineering responses to protect infrastructure and safe disposal).
> - Legal/regulatory approaches (e.g. the need to purchase water rights to plant perennials in water resource catchments, as discussed in the National Water Initiative).

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10 Dr Ian Prosser, Water Resources, Commonwealth Scientific and Industrial Research Organisation, *Committee Hansard*, 6 September 2005, p. 34.

11 Land & Water Australia, *Submission 26*, p. 4.

- Research to provide improved data for subsequent planning, including biophysical and socioeconomic research.[12]

5.12 Both the concerns discussed above – the need for regional level research, and the need for pooled funds to research issues of cross-jurisdictional significance - were captured in the House of Representatives Report. Recommendation 10 proposed that the Australian Government work with the states to:

> identify and remove impediments for catchment management organisations (CMOs) to undertake or commission research, and encourage CMOs to support research activity as part of their investment strategies.[13]

5.13 At the same time, the need for national funding to support research which is of nationwide significance was argued:

> The Committee is concerned that the NAP does not have a charter to fund salinity R&D, at least not beyond that required for regional level implementation. Adequate funding should be available to support on-going salinity R&D, particularly into generic issues that are of nationwide significance or for research that is beyond the scope of individual CMOs.[14]

5.14 The report recommended the establishment of a salinity research and development fund (recommendation 8). In its response to recommendation 8 the Government noted that:

> The state and territories have not supported the establishment of a separate national research and development fund…Considerable Australian Government funding is provided for salinity research outside the NAP… financing salinity research at the national and state-wide level.[15]

5.15 In its response to recommendation 10 of the House of Representatives Report, the Government explained that the principal role of the regional bodies is to 'plan, deliver and represent on on-ground management actions' rather than being 'primary

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12 CRC for Plant-Based Management of Dryland Salinity, *Submission 18*, p. 2.

13 House of Representatives Standing Committee on Science and Innovation, May 2004, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, p. 193.

14 House of Representatives Standing Committee on Science and Innovation, May 2004, *Science Overcoming Salinity: Coordinating and extending the science to address the nation's salinity problem*, p. 188.

15 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, p. 9, www.aph.gov.au/house/committee/scin/salinity/govtresponse/govtresponse.pdf (accessed 31 January 2006).

providers' of research. However, the Government noted that regional bodies contribute to partnerships with research bodies through in-kind assistance.[16]

5.16 The Committee acknowledges that research of national significance is currently undertaken by relevant CRCs and other bodies. It further appreciates that one of the main role of regional bodies is to conduct on-ground works. However, it is clear from evidence received that there are still gaps in research at both a regional and cross- regional level, which do not appear to be able to be addressed under the current funding arrangements.

5.17 The Committee further notes that regional bodies have indicated a need to establish stronger links with industry (discussed in Chapter 4). The Committee believes that regional bodies have a strong role to play as partners in research and development with industry and research bodies. It is important that regional needs are accommodated in salinity research priorities. In order to get the best out of research partnerships and provide input into guiding research priorities, dedicated research funding for regional bodies is required. The Committee further believes that the capacity for regional groups to alter their projects as new research becomes available should be factored into the funding allocated to regional bodies and in their investment strategies.

National protocols for research and information management

5.18 Witnesses from the Centre for Salinity Assessment and Management highlighted the need to develop national standards and protocols for research and information management. Dr Vervoort told the Committee that this was particularly important when public money was being used to support this research:

> The key thing to me is that [information management] has to be built on national standards. When we have publicly funded projects, the data monitoring and research—whether it is NHT monitoring or NAP monitoring of waterways or whatever—should be organised and collected using some national standard or protocol. It has to be some national body that develops that. Right now there are state bodies that collect data, and different states use different protocols. There is no real overlap. There is at least some attempt to do a metadata collection in terms of spatial data. The ASDD is one example of a body that is trying to collect metadata. That still does not give access to the actual data—sometimes it does; sometimes it does not. So there is a question of accessibility and usability. A national

16 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, p. 11, www.aph.gov.au/house/committee/scin/salinity/govtresponse/govtresponse.pdf, (accessed 31 January 2006).

> program should make sure that there is a standard protocol in the collection of research data.[17]

5.19 Dr Vervoort went on to explain that without consistency and coordination of data collection, data can be lost:

> What happens a lot is that a researcher has a program, collects data and writes a paper and the data sits on a floppy, which disintegrates, or is put in report, or whatever else. It is difficult. .. So there is a real issue there. That is why I think there probably should be some attempt at a national level to try to build that together.[18]

5.20 Professor Les Copeland, the Director of the Centre for Salinity Assessment and Management, highlighted the tension which exists between the competitive and collaborative nature of research. The competitive aspects are needed to ensure sound research and science, and collaboration is needed to ensure knowledge sharing and dissemination:

> I think it comes down to finding mechanisms for sharing information in the first instance and then having some sort of strategic outlook that goes across the various sector boundaries; that might be community, that might be different types of programs. It is managing this competitive versus collaborative tension. You need to have a bit of both. You need to have some competitive element to make sure the science and the work is strong and robust. On the other hand, you need to make sure that that does not inhibit collaboration. That is a very fine point. Where that balanced point is is very hard to define.[19]

5.21 The Committee heard that consideration must also be given to how natural resource data is used as it has implications for land valuation and property rights:

> There are also some real issues with natural resource data. That is why I think a national body should get involved in dealing with privacy, land valuation and property rights. They all need to be addressed before we can release natural resource data in public format, particularly when it deals with agricultural enterprises.[20]

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17 Dr Rutger Vervoort, McCaughey Senior Lecturer, Hydrology and Catchment Management, Faculty of Agriculture, Food and Natural Resources, University of Sydney, *Committee Hansard*, 14 October 2005, p. 39.

18 Dr Rutger Vervoort, McCaughey Senior Lecturer, Hydrology and Catchment Management, Faculty of Agriculture, Food and Natural Resources, University of Sydney, *Committee Hansard*, 14 October 2005, p. 39.

19 Professor Les Copeland, Dean of Faculty, Agriculture, Food and Natural Resources, and Director, Centre for Salinity Assessment and Management, University of Sydney, *Committee Hansard*, 14 October 2005, p. 38.

20 Dr Rutger Vervoort, McCaughey Senior Lecturer, Hydrology and Catchment Management, Faculty of Agriculture, Food and Natural Resources, University of Sydney, *Committee Hansard*, 14 October 2005, p. 39.

5.22 The House of Representatives Report (chapter 7) emphasised the importance of sound data collection, management and retrieval processes. While the report acknowledged there was a range of federal and state government initiatives to encourage and facilitate sound data management, the need for improvement in this area was noted. Recommendation 13 proposed that the relevant Australian and state government agencies 'accelerate' development of standardised, integrated and accessible data management systems.[21] Recommendation 14 proposed that ANZLIC (spatial information council) and the National Land and Water Resources Audit be resourced to support sound data management practices at a regional level.[22]

5.23 In response to the recommendations, the Australian Government noted its support of sound data collection and management systems and explained that, in conjunction with the states, they are addressing recommendation 13 through their support of the National Land and Water Resources Audit (NLWRA). It was further reported that a new body had recently been established under the Natural Resource Management Ministerial Council. The Executive Steering Committee on Australian Salinity Information will be responsible for coordinating salinity information and will work closely with the NLWRA.[23]

5.24 In response to recommendation 14, the Australian Government reported that a Natural Resources Information Management Toolkit is available online. The toolkit provides resources to facilitate good data/information management and sharing practices at a regional and local level. The toolkit was developed by the NLWRA and ANZLIC.[24]

5.25 The Committee appreciates the importance of consistent and robust data/information management and encourages ongoing action by the Australian and state/territory governments in this area. The Committee notes that there needs to be a process for ensuring that national protocols are agreed to. This will require the Australian Government to enter into an agreement with research providers and

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21 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. 216.

22 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. 217.

23 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, p. 15, www.aph.gov.au/house/committee/scin/salinity/govtresponse/govtresponse.pdf, (accessed 31 January 2006).

24 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, p. 14, www.aph.gov.au/house/committee/scin/salinity/govtresponse/govtresponse.pdf, (accessed 31 January 2006).

partners and ensure mechanisms are in place to monitor compliance with these protocols.

Communicating the research

5.26 In the previous section the Committee discussed the need for salinity science to be produced at a variety of scales, and for regional bodies to be supported in research partnerships to ensure research priorities take account of regional need. The section also raised the issue of standardised research protocols and information management to ensure that research is produced and maintained in a consistent format to enable use by the range of salinity management stakeholders.

5.27 This following section examines how, once produced, salinity research can best be communicated. It identifies the need to:

- better link research providers to users;
- communicate salinity science to a range of stakeholders; and
- develop a knowledge brokering system to meet these objectives.

Linking research providers to users

5.28 The House of Representatives Report found that a wealth of salinity research had been undertaken by a range of Australian Government funded agencies and programs and that from this, an array of research products and management tools had been developed.[25] However, during this inquiry the Committee heard that the use of this material was not as widely used as could be. Land & Water Australia posed the question:

> While high quality knowledge products such as these exist, they may not be being used to the extent possible by regional groups. Key considerations for the Committee might be 'to what extent are they actively used by planners and land managers?' and 'what can be done to improve the use of this knowledge?'[26]

5.29 As discussed at length in the House of Representatives Report (chapters 5 and 8), the management and dissemination of the salinity science base and research to regional bodies and land managers is a key challenge. Dr Bruce Munday told the Committee:

> One of the barriers, which I am sure you would be aware of, is not that people are short of information but that they are short of effective ways of providing that information. Most of us are deluged with information. The challenge for us is to understand what the researchers are doing, interpret

25 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, Chapter 4.

26 Land & Water Australia, *Submission 26*, p. 3.

> that and put it into a language and form which is suitable and useful for the end users, who may be local government, farmers, farm advisers, government agencies and so forth.[27]

5.30 The ANAO audit report of the NAP identified an urgent need to better link research providers and their products with regional groups, land managers and others undertaking on-ground works. In particular, it was argued that it was crucially important to the evolution of the NAP regional delivery model that the regions have access to the practical lessons being learned and the emerging science, economic analysis or better practice examples from other NAP regions and other relevant programs such as the NLP and the NHT.

5.31 Further, it was argued that investment will be wasted if interventions are poorly targeted or not based on sound science or economics. The report noted that Australian Government agencies (with their national focus, the NRM website, the employment of facilitators in all regions and the annual NRM forum) were well placed to provide these services and guidance to the regions in conjunction with state agencies. The report recommended that:

> The Departments of Agriculture, Fisheries and Forestry and Environment and Heritage in consultation with other service providers (including State and Territory agencies and national level research providers) develop measures to strengthen the access by NAP regional bodies to lessons learned and better practice NRM relevant to salinity and water quality in the NAP priority regions. These measures may include mechanisms to better link research providers to users and facilitate research at the appropriate scale and in forms that can be better utilised by regional bodies.[28]

5.32 The need to better link research providers to users to ensure that research is appropriate and targeted was acknowledged by the NRMMC Regional Implementation Working Group:

> The generation of good information is not sufficient on its own; it must be relevant, useful and made available to those who need it. Partnerships need to be formed between community and regional groups and research bodies to generate information relevant to the needs of the area.[29]

5.33 The focus on partnerships suggests that the communication between researchers and research-users must be a two-way process. The Committee believes that unless this mutual exchange occurs, there is a very real risk that the research undertaken will not be relevant to the needs of research users.

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27 Dr Bruce Munday, *Committee Hansard*, 16 November 2005, p. 55.

28 Australian National Audit Office, *The Administration of the National Action Plan for Salinity and Water Quality*, Audit Report No. 17, 2004-2005, p. 61.

29 Department of Agriculture, Fisheries and Forestry and the Department of the Environment and Heritage, *Submission 24*, Attachment I, p. 13.

5.34 CSIRO also argued the need to develop sufficient linkages or mechanisms to channel new science research and information to regional bodies:

> In our view, it is less certain whether the NAP/NHT have established sufficient mechanisms to efficiently transfer new scientific information and understanding from research and development agencies such as CSIRO and the CRCs to catchment management authorities.[30]

5.35 The CSIRO suggested this communication could be achieved through a coordinating body:

> The flow of quality scientific and technical information, albeit greatly enhanced by NAP/NHT, still needs to be considerably improved, potentially through a focused body comprised of key scientists and major stakeholders that interfaces closely with Catchment Management Authorities, State Agencies and the Commonwealth.[31]

5.36 Similarly, Professor Les Copeland, the Director of the Centre for Salinity Assessment and Management, argued the need for improved communication channels. In particular, he highlighted the need for information in a relevant and accessible format:

> I think there has to be a promoting of discussion forums, a sharing of access to information systems, a developing of information systems to the point where they are not just accessible to people with a high level of technical knowledge. There are ways of capturing that data that is scientifically and technically adequate, but translating that into a form that can be used by people in the local communities is something that probably needs to be developed. There is probably a need for some capacity building and a need to provide more transfer of how to use that information to the people who are actually the practitioners. It is the technology transfer issue that applies much more widely.[32]

5.37 The NRMMC Regional Implementation Working Group discussed 'learning circles' as a method to bring together a range of stakeholders to better deliver technical advice:

> 'Learning circles' created through the formation of technical advisory groups across several regions to focus on catchment-wide priorities (eg. salt, biodiversity and river restoration) would help bring together researchers/technical personnel with relevant regional and community personnel to review how each is managing the issue. [33]

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30 CSIRO, *Submission 15*, p. 5.

31 CSIRO, *Submission 15*, p. 5.

32 Professor Les Copeland, Dean of Faculty, Agriculture, Food and Natural Resources, and Director, Centre for Salinity Assessment and Management, University of Sydney, *Committee Hansard*, 14 October 2005, p. 38.

33 Department of Agriculture, Fisheries and Forestry and the Department of the Environment and Heritage, *Submission 24*, Attachment I, p. 13.

Communicating to a range of stakeholders

5.38 A number of submitters felt that their information needs were not being adequately met. ALGA highlighted that local governments needed information in a form which is user friendly:

> Local governments need access to the latest science in a user-friendly format. Information is required to both assist councils with their decision making and for councils to educate their community.[34]

5.39 Mrs Sharon Fingland from the Western Sydney Regional Organisation of Councils highlighted the fundamental difference between the objectives of salinity science and research and those of local government in delivering services.

> We stressed the fact that science is problem orientated, yet government is service orientated—and there was a bit of an issue there.[35]

5.40 The Committee also heard that regional bodies themselves were not necessarily very good at sharing information. As discussed in Chapter 4, the range of resources available to regional bodies varies significantly across the country, as does the level of capacity. The Hunter-Central Rivers Catchment Management Authority raised its concerns that there was limited sharing of information on salinity between regional bodies, and that there was not a single database or an awareness of sources of information available to local land managers and users.[36]

5.41 The need to develop networks along which salinity science can be transferred was raised as critical. Mr Simon Veitch from the Landcare and Invasive Species Natural Resource Management Division within the Department of Agriculture, Fisheries and Forestry also highlighted the fact that research can no longer be about a single issue and that management must be whole-of-catchment. Consequently, the science must be communicated to a wide range of stakeholders and land managers:

> It is true that a strong collegiate group dealing with salinity science has been built up over the last decade. In more recent years it has directed its energy towards translating the research and development, and the understanding of salinity, for people on the ground… There is still a question concerning how research and development reaches the hands of people who directly manage the land. I think increasingly the question is now being translated more into one of whole-of-catchment type of management—that it is not just a single issue and that the issue of land uses needs to be considered and the impact that they have on water management. That will of course impact on salinity. There are other considerations. A single-issue approach to natural resource management will only take you so far, and we have seen some of the limitations of that. Now the focus is more

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34 Australian Local Government Association, *Submission 13*, p. 5.

35 Mrs Sharon Fingland, Western Sydney Regional Organisation of Councils, *Committee Hansard*, 14 October 2005, p. 16.

36 Hunter-Central Rivers Catchment Management Authority, *Submission 2*, p. 3.

> on how we bring those things together and put useful information and useful tools in the hands of the people who directly manage land.[37]

Knowledge brokering

5.42 CSIRO suggested the need for an information brokering service to assist with information sharing and to ensure that information is provided in a distilled and user-friendly format:

> There is a need for an information brokering structure accessible by NRM planners that provides up-to-date information and assistance. Such a structure should also provide a forum for planners, decision makers and scientists to exchange ideas to identify research gaps and signpost new research avenues.[38]

5.43 Similarly, Mr Andrew Campbell from Land & Water Australia told the Committee:

> …we are going to need highly skilled intermediaries between the science and the practice if we are going to inform good decision making at those different scales—farm, catchment and region.[39]

5.44 Land & Water Australia submitted that they had recognised the critical need for effective brokering to facilitate uptake of knowledge, and had established 'Knowledge for Adoption' as one of its three core strategies within its new five-year Strategic Plan:

> Under this strategy we are developing a broad suite of methods to manage for adoption, from direct engagement or collaborative research through to tailored communication products and finally to indirect information provision. An important new initiative that goes directly to the heart of the issues is the "Knowledge Brokering for Regional NRM" project, funded through the Natural Heritage Trust and managed by Land & Water Australia.[40]

5.45 The National Knowledge Brokering for Regional NRM project aims to build stronger links between national research and information providers and the regions. The project's scoping report identified five key areas of concern for regional bodies in relation to knowledge exchange:

- Fragmentation – the information base is highly fragmented
- Volume – the sheer volume of information is daunting

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37 Mr Simon Veitch, Manager, Landcare and Invasive Species, Natural Resource Management Division, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 6 September 2005, p. 12.

38 CSIRO, *Submission 15*, p. 7.

39 Mr Andrew Campbell, Land & Water Australia, *Committee Hansard*, 6 September 2005, p. 25.

40 Land & Water Australia, *Submission 26,* p. 5.

- Relevance – much of the information seems of dubious relevance
- Two-way-flow between regions and national organisations
- Information sharing – within and across regions[41]

5.46 Land & Water Australia submitted that the project is working with regions to investigate and test ways to overcome these areas of concern and to improve knowledge connections. Some of the mechanisms that will be used include:

- A feasibility study into a 'first-stop knowledge shop' that would assist regions to find the most appropriate source of information for specific needs
- Improving the use of existing tools and the development of tool kits
- Synthesis documents, case studies and best practice manuals
- Workshops, regional roadshows and national forums
- Region-to-region mentoring and information exchange [42]

5.47 The Committee is encouraged that communicating salinity science and research continues to be a major focus for government agencies involved in supporting NRM and supports the views of Land & Water Australia who argued:

> Through better information support, regions will be able to undertake more informed NRM planning, decision making, implementation and evaluation activities. Access to good scientific information and knowledge is paramount to the success of NRM; as is responsiveness by relevant research organisations to regional needs.[43]

5.48 However, the Northern Agricultural Catchments Council pointed out that access to information is only half of the picture. The other half of the picture involves ensuring that land managers' practices reflect this science:

> [G]ood and up-to-date science is not the main factor in improved natural resource management (NRM). Many of the components to improved NRM are already well-known but not undertaken by land managers.[44]

5.49 The Committee notes that land use change is difficult to achieved unless land managers are well supported via extension services and are provided with viable alternative practices.

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41 Land & Water Australia, *Submission 26*, p. 5.

42 Land & Water Australia, *Submission 26*, p. 6.

43 Land & Water Australia, *Submission 26*, p. 6.

44 Northern Agricultural Catchment Council, *Submission 6a*, p. 2.

Extension services

5.50 In their submission to the House of Representatives Standing Committee on Agriculture, Fisheries and Forestry, *Inquiry into Rural Skills, Training and Research*, Land & Water Australia submitted:

> Land & Water Australia remains of the view that the job of achieving landscape-scale adoption of more sustainable land management practices requires highly skilled intermediaries between science and practice. Research funding bodies, like Land & Water Australia, can no longer assume that the outputs of its research investments will be picked up by a well-structured, well-organised, well-trained and resourced rural extension system.[45]

5.51 In regional New South Wales, the Committee heard of the important and valued role played by natural resource facilitators and extension officers. Mr James Phillips, who was employed by the Soil Conservation Services of New South Wales from 1950, told the Committee:

> The council natural resource facilitators are at the forefront of organising and also at the forefront of dealing with the media. I feel that to maintain councils and people like that is most important.[46]

5.52 Sister Carmel Wallis, also a Wagga Wagga resident, endorsed this position:

> We would never have been able to do what we have done without the help of the council and their natural resource facilitators. I sometimes do not think that the elected council members have an understanding of the important role they play right across the community. It is very important. Even their networking and their sense of the overall issues is excellent. We are very grateful to them.[47]

5.53 The importance of extension services was a major theme of the House of Representatives Report (see chapter 8). Despite a number of recommendations made on the need to provide adequate support for extension services to ensure continuity of local capacity, this inquiry has found that a number of concerns still remain. The Pastoralists and Graziers Association of Western Australia noted the continuing decline in government provided extension services:

> The issue of declining extension activities needs to be addressed. The State Agriculture Department has made a clear move away from the provision of extension in general and there is no commercial market for these services in the salinity area. The Landcare program may be able to fill this gap in some

45 Land & Water Australia, *Submission 26b*, p. 12.

46 Mr James Phillips, *Committee Hansard*, 10 February 2006, p. 16.

47 Sister Carmel Wallis, *Committee Hansard*, 10 February 2006, p. 16.

> way but would need a significant increase in capacity, funding and support.[48]

5.54 Mr Tom Aldred from the Department of Agriculture, Fisheries and Forestry commented on the decline in state and territory extension services and argued that, to a certain extent, the 'burden' has shifted to the Australian Government:

> I think it is quite reasonable to say that there has been a decline in traditional extension services by state and territory governments, which, as you pointed out, have prime responsibility for those. At the same time, I believe an increasing share of the burden, if you like, has been shouldered by the Australian government through programs such as the National Heritage Trust, the National Action Plan for Salinity and Water Quality and the National Landcare Program and so on. A very significant number of natural resource management coordinators or facilitators are funded either directly through those programs or are picked up as part of projects funded under the regional planning arrangements.[49]

5.55 Land & Water Australia highlighted the diminishing investment by the states on extension and the critical importance of NAP, NHT and Landcare in developing community involvement. However, they also argued that there has been a disinvestment in the extension profession:

> There has been a marked shift in expenditure on extension (broadly defined) from the States to the Commonwealth over the last fifteen years. Commonwealth funding of facilitators and coordinators through Landcare, the Natural Heritage Trust and the National Action Plan has been critical in facilitating community involvement and on-ground activities funded through these large national programs. However, there has been a gradual disinvestment in the underlying extension profession, and the infrastructure that supports it.[50]

5.56 Mr Geoff Fishburn, from the NSW Department of Natural Resources, raised the significance of NHT funding to support natural resource officers. Mr Fishburn also told the Committee that in NSW it is anticipated that the number of officers on the ground will rise in the future:

> With regard to the establishment of catchment management authorities just from our organisation alone, we automatically shifted across 93 natural resource officers in terms of their NHT funded positions. I guess we could call them Landcare based in certain areas. It is probably best to call them natural resource officers. I just want to differentiate between those particular staff that we moved across and the 262 staff that we moved across from the recurrently funded section of the organisation. With regard

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48 Pastoralists and Graziers Association, *Submission 4*, p. 2.

49 Mr Tom Aldred, Department of Agriculture, Fisheries and Forestry, *Committee Hansard*, 28 February 2006, p. 47.

50 Land & Water Australia, *Submission 26*, p. 6.

> to those 93, with the $436 million allocation over four years, my view is that, across the state in the 13 CMAs, that number will grow rather than reduce in terms of the on-ground projects the CMAs will effect across all the natural resource areas in that four-year period. So I am not expecting that we will see a diminution in expertise or numbers on the ground; I think we will see a rise in numbers on the ground.[51]

5.57 However, the Committee heard a significant amount of evidence on the decline of extension services. A major concern was that due to diminishing funding, the retention of experienced extension staff was difficult. In turn, this brings the credibility of extension services into question. The Western Australian Farmers Federation submitted:

> The current level of extension services available to provide information/advice/assistance on control measures to suit individual circumstances is inadequate and requires further consideration. There is also a perception amongst some landowners that those involved in co-ordination and extension services lack credibility due to a lack of experience and insufficient time spent in the field.[52]

5.58 These issues were canvassed at length by Land & Water Australia in their submission to the House of Representatives inquiry into rural skills training and research:

> The remaining advisors and the new facilitators are often relatively young and even if well qualified in the sciences, they lack significant experience… The predominance of short-term contract work, high levels of staff turnover and loss of good people from the sector results in institutional amnesia and lack of support for people in the field. It also means that it is not easy to find out what is being done/has been done elsewhere, and what lessons have been learned. Regional NRM staff feel as if wheels are being reinvented all over Australia.[53]

5.59 The Committee heard that most extension officers are on short term tenure, do not receive adequate professional department/agency support, have poor training opportunities and consequently, limited career paths.

5.60 The Central Riverina Landcare Network and the Murrumbidgee Landcare Association submitted that:

> Much intellectual property has been lost from our communities because of lack of tenure or even contracts beyond a 12 month duration and

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51 Mr Geoff Fishburn, NSW Department of Natural Resources, *Committee Hansard*, 14 October 2005, p. 9.

52 The Western Australian Farmers Federation, *Submission 41*, p. 2.

53 Land & Water Australia, *Submission 26b*, p. 2.

> unsatisfactory remuneration for those designated as extension and related agency staff.[54]

5.61 Mr George Truman, a salinity officer in the Namoi CMA, argued that due to disinvestment in extension officer positions, an increasing and unsustainable work-load is falling on fewer individuals:

> I am the salinity officer; there is only one of me. I am only funded for two years. I am funded under NHT. This is this issue with continuity and having those people on the ground. Because of that lack of people in the other agencies to provide that technical input and getting the investigations, a lot of my time is spent trying to do the investigations or trying to find out what information is coming out of some of the research, getting it into a form that we can deal with and then extending it. It puts a lot of pressure onto the one person but also, in terms of trying to get the most up to date across such a large catchment, it is very limited in terms of getting a really good, broad on-ground works happening because of the limitations of that.[55]

5.62 The Committee was told that only one extension officer is employed by NSW to co-ordinate salinity action along the coast.[56] The limited number of extension officers means that it is often difficult for these individuals to be over all the technical information that is available and to ensure that this information filters down to land managers.[57] Additionally, the complexity of the information needs of land managers contributes to the strain placed upon existing extension service arrangements.

5.63 The House of Representatives Report recommended that:

> the relevant Australian Government agencies in consultation with state and territory governments review the issue of diminishing state extension services, with a particular focus on:
>
> (a) the employment conditions of extension staff;
>
> (b) the potential career pathways of extension staff; and
>
> (c) the adequacy of the training provided for extension staff to ensure their knowledge of technical, scientific and policy issues, relating to natural resource management and in particular salinity, is both current and comprehensive.[58]

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54 Central Riverina Landcare Network and Murrumbidgee Landcare Association, *Submission 48*, p. 3.

55 Mr George Truman, Catchment Officer, Projects (Salinity), Namoi Catchment Management Authority, *Committee Hansard*, 14 October 2005, p. 25.

56 Hunter-Central Rivers Catchment Management Authority, *Submission 2*, p. 3.

57 Mr George Truman, Catchment Officer, Projects (Salinity), Namoi Catchment Management Authority, *Committee Hansard,* 14 October 2005, p. 29.

58 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. 249.

5.64 In response, the Australian Government argued that extension services are primarily the responsibility of the states and territories, as are the employment conditions, career pathways and training of staff. Further, the role of regional bodies in identifying their extension needs was noted:

> Regional catchment management organisations are expected to identify their specific requirements for natural resource management extension services within their regional plans and investment strategies and to determine the service delivery methods most appropriate to their circumstances. This could include direct employment of staff with specific extension skills or acquisition of these services from an outside public or private service provider. Many states have moved to a demand driven model where the services delivered are tailored to the specific needs of the end user.[59]

5.65 The Committee heard that the decline in extension services in production agriculture was being addressed, to a large extent, by private advisory services. However, this solution had not, as yet, burgeoned in the natural resource management sector:

> Like other R&D funders and providers in Australia, LWA can no longer assume that the outputs of its research investments will be picked up by a well-structured, well-organised, well-trained and resourced rural extension system. In production agriculture, the decline in state-funded extension services has largely been offset by private advisory services through consultants and agribusiness firms. However in natural resource management, public funding remains dominant and there has not been a similar emergence of private service providers. It should be noted however that as the regional model matures, it may well foster private sector provision of services to regional organisations on public benefit NRM matters.[60]

5.66 However, the Government response to the House of Representatives Report noted the increasing move by private enterprise to undertake a greater role in coordination and facilitation of NRM issues. To date 680 agricultural advisers across NSW, Victoria, South Australia, Queensland and Western Australia have taken part in the nationally accredited salinity training program to develop national competency standards in salinity.[61]

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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*, p. 18, accessed on 9 February 2006 at: www.daff.gov.au/salinity.

60 Land & Water Australia, *Submission 26*, p. 6.

61 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, p. 17, www.aph.gov.au/house/committee/scin/salinity/govtresponse/govtresponse.pdf, (accessed 31 January 2006).

5.67 Mr Goss, CEO of the CRC for Plant-Based Management of Dryland Salinity also reported the growing role of private extension services and provided information on the CRC's role in training extension professionals on NRM issues:

> The best estimates are that there are about 4,000 professionals in Australia at the moment that are servicing agriculture in an extension capacity and, of the 4,000, about 1,200 are in the private sector. The 1,200 figure is growing and the 4,000 figure is probably static. That says something about the shifting balance of where farmers are going for their information and for knowledge that supports their decision process. So we have the AWB Landmark company involved in the CRC and they have about 300 crop agronomists in the field. We are working closely with the company by assisting the agronomists, through training and field experience, to understand salinity, to understand the natural resource management issue facing farmers …[62]

5.68 The WA Farmers Federation emphasised the need for more extension services. However, Mr Trevor De Landgrafft, President, told the Committee that it would be preferable to reinvest in public sector extension services:

> We call it the retail sector versus the wholesale sector, which is really what the government is, which has traditionally been closer to the research and the development and the ones who probably have worked with the farmers. To have it rolled out via a retail sector I think loses a fair bit. Our organisation, whilst an avid user of consultants, does not necessarily believe that they are the people who should hold the right to deliver the outcomes of public research. Taking it out via the retail sector, you certainly will not get the spread. You will have people who are averse to paying consultants for what they believe they have contributed to, in any case.
>
> Of course, during a phase of moving this way—which is to favour that method of extension—we have seen the running down of extension services within the Department of Agriculture. Sure, we have a problem, but we believe that turning that around is a better idea. I think that the private consultants certainly have a place, but I think the closer farmers are to the Department of Agriculture and that extension, the better.[63]

5.69 While there were strong concerns about the decline of extension services, not all witnesses agreed that an increase in traditional extension services is the solution to improved communication of information to regional bodies and landholders. As regional bodies and Landcare groups mature, their own level of expertise also develops to the point where they require greater levels of technical and scientific support. These groups are increasingly seeking expert information directly from the expert:

> It can be argued now that it is not extension staff we need – rather hydro-geologists and specialist technical and scientific staff whose knowledge – if

62 Mr Kevin Goss, *Committee Hansard*, 18 November 2005, p. 18.

63 Mr Trevor De Landgrafft, *Committee Hansard*, 18 November 2005, p. 53.

> not themselves are available to the community. We are seeking to understand the flow of sub-surface water, its quality, spatial and temporal attributes in often very complex contexts. The opportunities for many of us to access "extension type" information directly through the power of technology and our own increased understandings have increased, without the need for the middle "man"…on many/most occasions. We're increasingly seeking the expert information direct from the expert. The need for brokering functions between the expert and the community I believe is diminishing in the traditional sense of face-to-face extension.[64]

5.70 The ALGA submitted that local government plays an increasing role in the provision of extension services but is not adequately resourced to do this:

> Whilst councils have the tools to manage salinity, they are not always adequately resourced. As such, their potential to manage salinity is not fully realised...
>
> Increasingly, councils are being asked to provide a whole range of environmental extension services without additional funding, due to the demise of state agency extension staff. Some councils already provide their community with education and extension services in relation to salinity.[65]

A national coordination body

5.71 In 1993 Land & Water Australia and its partners[66] established the National Dryland Salinity Program (NDSP). The program was a collaborative research, development and extension (R, D & E) program, which investigated the causes of, and solutions to, the national problem of dryland salinity. It was funded in three phases over 11 years, commencing in 1993 and concluding in 2004. Land & Water Australia outlined the three phases:

> The initial phase had a strong technical focus and it aimed to improve the knowledge of causes and impacts of salinity. It made significant headway in developing better research methods, coordinating research efforts and engaging rural communities in catchment management planning.
>
> Phase 2 examined catchment processes, industry, engineering, policy, local government, environmental and regional dimensions of salinity.
>
> The final phase in 2003-04, focused on enhanced communication during which the partners in the program drew together the R&D knowledge that they had accumulated over the past ten years and developed six specific

64 Central Riverina Landcare Network and Murrumbidgee Landcare Association, *Submission 48*, p. 2.

65 Australian Local Government Association, *Submission 13*, p. 4.

66 The partners included: Grains Research & Development Corporation, National Land and Water Resources Audit, Murray-Darling Basin Commission, Department of Agriculture, Fisheries and Forestry, Rural Industries Research and Development Corporation, CSIRO and the state governments of NSW, Qld, SA, Tasmania, Victoria and WA.

> resource kits and communication modules for land and water managers across Australia.[67]

5.72 The House of Representatives Report highlighted the valuable and critical role played by the NDSP and recommended that the NDSP be continued beyond 2004 with an expanded role to include irrigation and urban salinity. Recommendation 3 states:

> The Committee recommends that the Australian Government ensure the continuation of the National Dryland Salinity Program (NDSP) as a matter of urgency, and that:
>
> (a) the role of the NDSP be expanded to address irrigation and urban salinity, with the Program renamed the National Salinity Program (NSP) or similar;
>
> (b) the NSP be managed within Land & Water Australia (LWA);
>
> (c) the NSP adopt research, coordination and communication strategies that assist the regional delivery of natural resource management programs and the requirements of the National Action Plan for Salinity and Water Quality specifically;
>
> (d) the functions of the NSP have regard for those identified in this report;
>
> (e) the NSP/LWA be adequately resourced to perform its functions by the Australian and state governments;
>
> (f) relevant Research and Development Corporations, Cooperative Research Centres, national science agencies, universities, state agencies and the private sector be strongly encouraged to partner the NSP; and
>
> (g) there be a continuing role for an Operations Committee, or equivalent, in providing independent scientific advice with that advice coming from a broad cross-section of scientific personnel from both the government and non-government sectors.[68]

5.73 In 2004, due to stagnant funding, Land & Water Australia and NDSP partners made the decision to discontinue the program. This decision was necessary in order to fund other critical areas of research:

> I know that it is always crass for agencies to appear before committees such as this and lament their budgets, so I will not do that. But our corporation has had a static appropriation for about the last 14 years and the only way the board has been able to invest in new areas of research, such as Australia's northern rivers or new work on vegetation and biodiversity or on the social aspects of natural resource management, has been to discontinue work that we have been funding for 10 years. So the corporation took a very hard decision to stop funding the National Dryland

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67 Land & Water Australia, *Submission 26*, p. 4.

68 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. 158.

> Salinity Program but did invest in this final year to ensure that we at least had good legacy products from all that wonderful research.[69]

5.74 The Committee notes the Government response to the House of Representatives Report recommendation 3 that:

> Land & Water Australia and the other National Dryland Salinity Program partners have decided not to continue the program.[70]

5.75 Whilst the decision was made to discontinue the program, Mr Campbell spoke of Land & Water Australia's willingness to restore the NDSP if adequate funding was made available:

> We stand ready to do that but, on a fixed appropriation—and, given that the board has had a very hard look at research priorities and has decided that it needed to be investing more in Northern Australia, particularly on the water resources of Northern Australia—we had to make a very hard decision after 11 years to stop funding the NDSP. … Nevertheless, I believe that it was a terrific vehicle and if we had additional resources we would love to continue doing it.[71]

5.76 Mr Campbell went on to explain that if the NDSP were reinstated it would need to be modified to better meet the needs of the regional model. He further noted that it would be 'stretching' Land & Water Australia's 'mandate', as a rural R&D corporation, to take on urban salinity.[72]

5.77 A wide range of stakeholders in the scientific community keenly felt the loss of NDSP. The CSIRO submitted:

> 2004 witnessed the demise of the National Dryland Salinity Program (NDSP), the only salinity research funding and coordinating entity operating across Australia. Its principal aim was to initiate and coordinate relevant research at a national level and to play a major role in developing communication networks between researchers, regional groups and policy.[73]

5.78 Similarly, the Australian Conservation Foundation noted:

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69 Mr Andrew Campbell, Land & Water Australia, *Committee Hansard*, 6 September 2005, p. 24.

70 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).

71 Mr Andrew Campbell, Land & Water Australia, *Committee Hansard*, 6 September 2005, pp 24-25.

72 Mr Andrew Campbell, Land & Water Australia, *Committee Hansard*, 6 September 2005, p. 24.

73 CSIRO, *Submission 15*, p. 5.

> The closure of the Australian Government's chief integrative body for salinity management R&D – the National Dryland Salinity Program (NDSP) – leaves a hole in the Australian Government's NRM programmes. The country is now left without an institution with a proven track record to minimise competition between agencies and to effect good collaborative work, tailored to meet the needs of different users at different scales.[74]

5.79 The CRC for Plant-based Management of Dryland Salinity highlighted the valuable role played by the NDSP in promoting the use of scientific knowledge to those on the ground:

> We still get feedback praising the knowledge output of the former National Dryland Salinity Plan and lamenting no adequate replacement for it as a national network of salinity stakeholders. Although the CRC Salinity and Land & Water Australia have taken over NDSP's communication products, its former constituency don't have the same access to a coherent knowledge network.[75]

5.80 The closure of the NDSP raised concerns over the lack of a national coordinating institution. Dr Bruce Munday told the Committee that with the loss of the NDSP, national research was no longer being coordinated:

> At the end of the program, there was no national coordination of the research. The cooperative research centre for salinity is probably the nearest thing, but it really deals only with plant based solutions. It does not deal with hydrogeology, it does not deal with engineering solutions and it does not deal with airborne geophysics. It has a peripheral interest in those things but it is not actively involved in them. Therefore the national research is not being coordinated. Obviously, the knowledge brokerage is not being coordinated nationally either.[76]

5.81 Mr Andrew Campbell also drew attention to the loss of research coordination:

> The gap that the NDSP leaves is with the coordination of the research activities and some of the communication of that science in ways that advisory services, catchment bodies, and policymakers can pick up and find accessible.[77]

5.82 The CSIRO noted a pressing need for a national coordinating body:

> The benefits of a coordinating research and implementation structure across Australia are undeniable and with the demise of the NDSP and no obvious succession strategy, there is a pressing need for a similar initiative.[78]

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74 Australian Conservation Foundation, *Submission 19*, p. 58.

75 The CRC for Plant-based Management of Dryland Salinity, *Submission 18*, p. 1.

76 Dr Bruce Munday, *Committee Hansard*, 16 November 2005, p. 57.

77 Mr Andrew Campbell, Land & Water Australia, *Committee Hansard*, 6 September 2005, p. 25.

78 CSIRO, *Submission 15*, p. 5.

5.83 Similarly, ACF highlighted the need for a national body with a high-level strategic focus:

> As yet, there is no indication of what, if any, institution will replace the NDSP. ACF's preference is for a national body, with a focus on integrated and ecologically sustainable landscape management, to take on this role.[79]

5.84 The Committee was told that without any coordination at either state or Commonwealth level, there is a real risk of:

- disconnection between science providers and NRM implementation; lack of investment in strategic research required to overcome knowledge gaps underpinning regional plans;
- lack of uptake of new technology;
- lack of coherence between different regional plans and monitoring;
- failure to learn from mistakes made by others;
- lack of acceptance of lessons coming from science;
- greater influence of local interest groups; and
- of a regulatory framework to ensure best management practice for engineering schemes.[80]

5.85 The States have responded differently to the vacuum left by the closure of NDSP.

Table 3: Overview of state bodies responsible for salinity research coordination in the absence of the NDSP[81]

South Australia	Centre for Natural Resource Management (CNRM) – broker research on NRM issues
Queensland	Centre for Integrated Research Management (CIRM) has existed for a number of years, but its role has changed recently to be similar to the CNRM
Victoria	State-wide (non-regional) programs have been formed to transcend regional investigation priorities
New South Wales	State-wide Salinity Strategy operating through Catchment Management Authorities

5.86 Mr Roger Wickes from the Department of Water, Land and Biodiversity Conservation, South Australia told the Committee about the Centre for Natural Resource Management:

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79 Australian Conservation Foundation, *Submission 19*, p. 58.

80 CSIRO, *Submission 15*, p. 5.

81 CSIRO, *Submission 15,* p. 6.

> We set about creating a centre of natural resource management. We put some of the national action plan money into that centre so they could run the projects. We then formed a committee to run that centre headed by an independent person, and it has on it some scientists from the universities, the department and the Commonwealth. It also has three natural resource management boards. We had two—and we expanded out to include NHT and we put three natural resource management board representatives on it. We are connecting that group to the Natural Resource Management Council. The idea was to have the funds for our research and development, and then the regional boards and people from the science fraternity met and worked through their issues. They came up with a series of projects that meet the outcomes that the community want to make that connects science with the regional community. It is working fairly well.[82]

5.87 The Committee commends South Australia for establishing the Centre and notes that while nationally research ability and goodwill are not lacking, there remains a need for cohesion and coordination with regards to salinity funding and research across the country. Mr Andrew Campbell from Land & Water Australia told the Committee that while NDSP partners sought to maintain communications networks after the closure of the NDSP the mechanisms for information sharing are significantly diminished in the absence of specific resources:

> The partners in the National Dryland Salinity Program, which include the Murray-Darling Basin Commission, several states and territories and several agricultural industries, including meat and grains, are all promoting this through their networks. A communication network was set up through the National Dryland Salinity Program. As we said in our submission to the last salinity inquiry, the National Dryland Salinity Program is no longer continuing as it was. We put in place some mechanisms to promote this information but it is fair to say that, in the absence of some specific resources being dedicated to it, this work will not be promoted as well as it could or should have been.[83]

5.88 However, not all submitters argued the need for the NDSP to continue. The Grains Research and Development Corporation (GRDC) stated in their submission that:

> The GRDC is not convinced that a continuation of the National Dryland Salinity Program is the appropriate vehicle for coordination. The CRC for Plant based Management of Dryland Salinity can fulfil their role to some extent. However, the CRC does not cover all aspects of salinity management. The National Action Plan for Salinity and Water Quality

82 Mr Roger Wickes, Executive Director, Natural Resources Management, Department of Water, Land and Biodiversity Conservation, South Australia, *Committee Hansard* 16 November 2005, pp 5-6.

83 Mr Andrew Campbell, Land & Water Australia, *Committee Hansard*, 6 September 2005, p. 23.

> could take a more active national role in coordinating broader salinity management issues.[84]

5.89 The GRDC also argued that information on salinity management could be made accessible to those who wish to implement land use change via a national database that is freely accessible, interactive and free of institutional bias:

> A web-based information retrieval system that allows salinity workers and catchment authorities to assess information from all sources will help to allay the need for high level national coordination.[85]

5.90 The House of Representatives Report recommended the establishment of a database of interpretative material, scientific research and data, related to salinity and its management (recommendation 15). The Australian Government noted that it supported this recommendation, through the following data management arrangements: The National Dryland Salinity Program "Enhanced Communication Year" publications; the National Land and Water Resources Audit, Australian Natural Resources Atlas; and through salinity science information available from the Australian Government Natural Resource Management web site and the web sites of the National Dryland Salinity Program, Cooperative Research Centre for Plant-Based Management of Dryland Salinity, Cooperative Research Centre for Landscape Environments and Mineral Exploration, Land & Water Australia and the Murray Darling Basin Commission.[86]

5.91 However, the Committee heard evidence from land managers who argued that current information on salinity management was not in a format that was most accessible:

> I see no evidence that recommendation 15 has been implemented down to my level of community access. We would welcome access to such a database and its contents. Currently there remains to my knowledge no one stop shop … or an agreed national broker of salinity data – inclusive of dryland and urban salinity.[87]

NDSP products

5.92 As discussed earlier in this chapter, the Committee heard a significant amount of evidence which highlighted the valuable role and the significant achievements of

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84 Grains Research and Development Corporation, *Submission 5*, p. 5.

85 Grains Research and Development Corporation, *Submission 5*, p. 5.

86 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, p. 16, www.aph.gov.au/house/committee/scin/salinity/govtresponse/govtresponse.pdf, (accessed 31 January 2006).

87 Central Riverina Landcare Network and Murrumbidgee Landcare Association, *Submission 48*, p. 2.

the NDSP. During the final phase in 2003-04, the NDSP drew together the R&D knowledge that they had accumulated over the past ten years and developed six specific resource kits and communication modules for land and water managers across Australia:

- Dryland Salinity: On-farm Decisions and Catchment Outcomes – a guide for leading producers and advisors.
- Dryland Salinity and Catchment Management – A Resource Directory and Action Manual for Catchment Managers.
- Managing Dryland Salinity – a report on the key research findings.
- Breaking Ground - Salinity Key Findings and Research Outcomes – An Overview Report.
- Breaking Ground – Key findings from 10 years of Australia's National Dryland Salinity Program – the full report.
- PRISMS – Practical Index of Salinity Models – a CD ROM incorporating information on over 90 practical tools, models and frameworks for natural resource management and planning at the regional scale.[88]

5.93 The value of these resources is that they were developed and tailored to specific audiences, both in terms of the questions tackled and the language used. In effect, more than 400 separate research reports were distilled and brought together in one accessible and searchable package.[89] As Land & Water Australia noted in their submission:

> These products represent the state of the art in Australian knowledge of the salinity problem – and the best such compendium in the world at this time.[90]

5.94 Despite the usefulness of this material, the Committee was concerned to learn that some regional bodies were unfamiliar with the NDSP products and resources.

5.95 On hearing the response of one regional body to the question of the NDSP's usefulness, Dr Bruce Munday, who was involved in the production of the NDSP products, commented:

> needless to say, my jaw dropped when Dan said he had not seen it. It just goes to show that it is one thing to produce it and another to distribute it.[91]

5.96 Mr Campbell from Land & Water Australia told the Committee that all (former) partners of the NDSP were promoting the products through their respective

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88 Land & Water Australia, *Submission 26*, p. 4.

89 Land & Water Australia, *Submission 26*, p. 4.

90 Land & Water Australia, *Submission 26*, p. 3.

91 Dr Bruce Munday, *Committee Hansard*, 16 November 2005, p. 54.

networks. However, in the absence of further NDSP funding, promotion of the products was not as comprehensive as it should be.[92]

Gaps in the research

5.97 While a great deal of research into salinity management has been undertaken the Committee was told there remained areas where more research and more up-to-date research was needed. The two areas emphasised were salinity hazard and risk mapping and research and development into profitable salinity solutions.

Mapping

5.98 As discussed in Chapter 2, salt is stored in the ground and may be mobilised by water where it is then transported causing damage to major assets – vegetation, soil, water and infrastructure. The management of salinity is assisted by a range of tools of which mapping to provide a three-dimensional understanding of the landscape and the hydrological processes is one. Spies and Woodgate explain:

> Mapping is the means by which we gain an understanding of what lies on and beneath the Earth's surface. The major uses of mapping in the studies of dryland salinity are to delineate areas affected by surface or vegetation expressions of dryland salinity, and to identify areas not yet affected but at risk of salinisation. At least 30 satellite, airborne and ground mapping techniques are available for mapping and delineating soil, landforms, water flow and pathways through the subsurface.[93]

5.99 In late 2003, the Australian Academy of Technological Sciences and Engineering in conjunction with the Australian Academy of Science, undertook a review of salinity mapping methods. The focus of the review was to produce a technical report on salinity mapping methods and a user guide to their application. In a submission to the inquiry Professor Ian D. Rae, the Technical Director from the Australian Academy of Technological Sciences and Engineering, noted the need to continue to develop technologies, and to further their application to salinity mapping and related national problems:

> It was evident during the review that a range of salinity mapping methods was available in Australia and that, in some cases, depended on very advanced technology… Innovative scientists will need access to support for research and development, and potential users of the technology will likewise need support - at least in the early stages of application - if we are to get full benefit from the scientific and technological effort already expended in this work. In short, a lot has been achieved, but more is needed.[94]

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92 Mr Andrew Campbell, *Committee Hansard*, 6 September 2005, p. 23.

93 B. Spies & P. Woodgate, *Salinity Mapping Methods in the Australian Context*, Natural Resource Management Ministerial Council, June 2005, p. xi.

94 Australian Academy of Technical Science and Engineering, *Submission 1*, p. 1.

5.100 As part of the review, *Salinity Mapping Methods in the Australian Context* [95] was published in June 2005. The book outlines various methods that can be used in the Australian environment to acquire and present information about dryland salinity. In covering 26 different methods of salt mapping it presents natural resource managers with options as to how their mapping needs can be best met. Mr Malcolm Forbes from the Department of the Environment and Heritage told the Committee that:

> Community land care groups, regional authorities and government agencies will benefit from new guides that help decide how to map, predict and monitor salinity in the Australian landscape.[96]

5.101 The Committee heard evidence on the success of salinity mapping to identify where the salt is occurring on the land. Airborne electromagnetic mapping has allowed a much better understanding of where salt is stored in the landscape therefore allowing a more targeted approach to management:

> Using this whole approach we have come down from 300,000 hectares—only knowing that there was an outlet here spitting salt—to actually being able to identify down to about 20,000 hectares where this salt was stored in the landscape. … We can target where we need to do the work. We can make sure that we are putting that excellent work that has been done in the past in exactly the right place and maximising the bang for our buck where we do it.[97]

5.102 Mr Daniel Meldrum from the River Murray Catchment Water Management Board also told the Committee of the usefulness of airborne geophysics and ground based electromagnetic surveys for the management of salinity:

> In terms of the scientific knowledge base that has been developed, the airborne geophysics and ground based electromagnetic surveys I find are very beneficial in producing some good on-ground information.[98]

5.103 But Mr Meldrum went on to argue that that national land use mapping did not provide enough resolution to provide useful, practical information for growers.[99]

5.104 While airborne and ground mapping techniques have delivered significant benefits, the Hunter-Central Rivers Catchment Management Authority submitted that there are currently no mechanisms to investigate large-scale salinity sources and

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95 B. Spies & P. Woodgate, *Salinity Mapping Methods in the Australian Context*, Natural Resource Management Ministerial Council, June 2005, p. 7.

96 Mr Malcolm Forbes, *Committee Hansard*, 6 September 2005, p. 3.

97 Mr Peter Baker, Integrated Water Sciences, Bureau of Rural Sciences, *Committee Hansard*, 6 September 2005, pp 4&6.

98 Mr Daniel Meldrum, Senior Project Officer, Salinity and Water Use, River Murray Catchment Water Management Board, *Committee Hansard*, 16 November 2005, p. 47.

99 Mr Daniel Meldrum, Senior Project Officer, Salinity and Water Use, River Murray Catchment Water Management Board, *Committee Hansard*, 16 November 2005, p. 47.

transportation issues in that region. Specifically the submission noted that there is no investment in large-scale aerial electromagnetic surveys of saline catchments in the Hunter. Consequently, investigations occur on a small scale and concentrate on areas where saline impacts are currently known.[100]

Hazard mapping and risk mapping

5.105 Dr Vervoort, from the Centre for Salinity Assessment and Management, University of Sydney, explained that hazard mapping in itself tells you where the salt is but it does not tell you the likelihood of it being mobilised and hence becoming a problem:

> I think there was confusion for the public between what is risk and what is hazard. There is a difference between those two things. Up until now, most of the approaches have been based on hazard, on looking at hazard. But the fact that there is a large hazard does not actually mean that there is a risk.[101]

5.106 The report, *Salinity Mapping Methods in the Australian Context*, defines hazard as: 'anything that can potentially cause harm to an asset. Salt is a hazard as it has the potential to cause harm to an asset if mobilised by water and transported to the asset'. Risk is defined as: 'the chance of something occurring that will affect the achievement of objectives. In the context of salinity we can define the level of risk as the degree of severity of a hazard as it adversely affects a defined asset multiplied by the probability of occurrence of that hazard at a specific time in the future. Thus the level of risk that is assessed in this way gives a measure of the level of unwanted consequences'.[102]

5.107 The report states that:

> Risk should be assessed in the context of the assets to be protected, which include agriculture, water quality, infrastructure and the environment. Cost-benefit analyses in salinity management should take into consideration total cost and total benefit in context with the value of all assets.[103]

5.108 A clear understanding of hazard versus risk allows a more targeted and refined approach to salinity investment and management. Spies and Woodgate define both hazard and risk maps:

> A salinity hazard map defines the spatial location (both vertically and horizontally) and concentration of salt load. Salinity hazard maps are

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100 Hunter-Central Rivers Catchment Management Authority, *Submission 2*, p. 3.

101 Dr Rutger VerVoort, McCaughey Senior Lecturer, Hydrology and Catchment Management, Faculty of Agriculture, Food and Natural Resources, University of Sydney, *Committee Hansard*, 14 October 2005, p. 37.

102 B. Spies & P. Woodgate, *Salinity Mapping Methods in the Australian Context*, Natural Resource Management Ministerial Council, June 2005, p. 24.

103 B. Spies & P. Woodgate, *Salinity Mapping Methods in the Australian Context*, Natural Resource Management Ministerial Council, June 2005, p. xii.

> normally presented in summary form and do not include whether the salt can or cannot be mobilised.
>
> Salinity risk maps should identify the actual class of asset under threat, the timing of the impact of that threat, the level of anticipated impact should it occur, and the geographic location of both the risk and the asset.[104]

5.109 Dr Vervoort told the Committee that the value of hazard mapping is limited and more attention should be given to risk:

> Hazard mapping is purely static and it needs to also take into account those dynamic components which deal with land use and different effects on the ground which actually deliver the risk analysis. So that is an important component that has not been developed.[105]

5.110 Advances in mapping clearly facilitate a more targeted approach to salinity management. The Committee would like to see updated assessments of the salinity risk accelerated across the states and territories, followed by more detailed mapping of high-risk areas. In particular, the Committee believes more attention should be directed to urban areas at risk of salinity and rural lands being considered for urban development. As discussed in the following chapter, urban salinity remains a largely neglected area in salinity management.

R & D into profitable solutions

5.111 Providing land managers with up to date salinity science is only part of the equation in achieving sustainable land practices that are able to mitigate dryland salinity. Alternative profitable farm systems must be developed to allow land managers to migrate to more sustainable land practices. The Saltland Pastures Association submitted:

> The concept of adapting to salinity, rather than controlling or preventing it is relatively recent, and comes with the realisation that there is no 'silver bullet' solution to salinity. SPA however, believes that the saline environment should not be treated as wasteland, and that there are ways to manage this land to make it profitable.[106]

5.112 Mr Goss from the CRC for Plant-Based Management of Dryland Salinity emphasised the need to develop new industries that were profitable and provided alternative farm systems:

> If you were to look across agricultural areas today, for many parts of the agricultural areas there are not profitable options for farmers to address

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104 B. Spies & P. Woodgate, *Salinity Mapping Methods in the Australian Context*, Natural Resource Management Ministerial Council, June 2005, p. 31.

105 Dr Rutger Vervoort, McCaughey Senior Lecturer, Hydrology and Catchment Management, Faculty of Agriculture, Food and Natural Resources, University of Sydney, *Committee Hansard*, 14 October 2005, p. 37.

106 Saltland Pastures Association, *Submission* 40, p. 1.

> salinity. That is just a reality we face. An astute national program has to recognise that and address it.[107]

5.113 Similarly, a submission from the Saltland Pastures Association argued the need for continued R & D into productive and profitable saline tolerant pastures:

> …we believe there is a need for much more research in this area, particularly in light of the fact that several research initiatives, such as the National Dryland Salinity Program, SGSL and the CRC for Plant-based Management of Dryland Salinity have finished or have a limited life. The potential for increased production and profitability of the saline areas and therefore the whole farm is immense. This increase will come from improved pasture species, both new and enhanced existing species, improved management techniques as well as improved understanding and appreciation of the value of the increasing areas of saline land.[108]

5.114 Mr Gregory Fraser from the Grains Research and Development Corporation highlighted a range of R & D projects that the corporation is currently undertaking, which have an emphasis on both sustainability and profitability:

> These include projects that investigate whole-of-catchment approaches to integrated water and nutrient management and other projects that identify ways to improve nutrient availability and uptake under new cropping systems such as no-tool or legume rotational systems while reducing nutrient loss. Related projects aim to improve the management of raised bed and non-raised bed cropping systems in high rainfall zones to achieve improved water quality and productivity outcomes. [109]

5.115 Dr Martin Blumenthal from the Grains Research and Development Corporation told the Committee:

> Whilst there are bigger environmental issues nationally, salinity is the one that really does impact on the grains industry and economic sustainability much more than any other. So with that in mind we have invested and continue to invest in salinity management.[110]

5.116 Land managers and farmers are supportive of the need to develop profitable farm systems. Mr Alex Campbell, the Chairman of the Cooperative Research Centre for Plant-Based Management of Dryland Salinity, told the Committee:

> The CRC, as it was being developed, had a very strong focus on profitable perennials and profitable farm systems to enable that large-scale

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107 Mr Kevin Goss, *Committee Hansard*, 18 November 2005, p. 18.

108 Saltland Pastures Association, *Submission* 40, p. 5.

109 Mr Gregory Fraser from the Grains Research and Development Corporation, *Committee Hansard*, 28 February 2006, p. 3.

110 Dr Martin Blumenthal from the Grains Research and Development Corporation, *Committee Hansard*, 28 February 2006, p. 3.

> implementation activity. As a farmer, that was my attraction to being part of the CRC.[111]

5.117 However, as yet the suite of profitable farm systems across the wide range of salinity problems is limited. The Committee concurs with the House of Representative Report that there is a greater need for R & D into profitable salinity management methods.

Conclusion

5.118 The Committee heard evidence that research needs to be conducted at different scales and effectively communicated or translated across these scales. Importantly, research and data must not only be accessible to regional bodies and land managers, it must also be presented in a meaningful and applicable way so that it can be incorporated into their salinity management efforts.

5.119 The Committee further heard that current funding arrangements through the national programs limit research at both a national level and a regional level. This was of particular concern for a number of regional bodies who argued that research gaps at the regional level inhibited targeted salinity management.

5.120 In this chapter the Committee found there remains a need to better target and communicate salinity science and research to land mangers and regional bodies on the ground. The Committee heard a significant amount of evidence which argued the need for improved funding to extension services. The Committee is disappointed that there has been little effort to address the difficult situation that many extension officers find themselves in, in regard to their employment conditions. The continued lack of support for these valuable professionals is undermining the NRM programs themselves.

5.121 While the Committee acknowledges that some extension services are being provided by the private sector, there remains a need for greater government involvement and funding of extension services in the natural resources sector. State-based extension services are not necessarily the 'best fit' for the regional delivery model. The Committee believes that the Australian Government has a strong role to play in improving employment and training for extension workers to meet the needs of regional groups.

5.122 The Committee also heard that the closure of the NDSP has left a research coordination vacuum, which is yet to be filled. Further, the lack of a national body has meant that useful salinity management tools are not being adequately promoted and remain underutilised resources. The Committee acknowledges the high standard of salinity research available in Australia but is concerned that unless governments commit adequate resources to the support, communication and dissemination of this research, considerable capacity will be lost at the grass roots level.

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111 Mr Alex Campbell, *Committee Hansard*, 18 November 2005, p. 14.

5.123 Finally, the Committee heard that while valuable research is underway, there is a need for much greater investment in research and development on profitable solutions for salinity management and a demand for updated salinity mapping.