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The Committee Secretary
House of Representatives Standing Committee
on Science & Innovation
Suite R1-116
Parliament House
Canberra ACT 2600

Submission Brief

Inquiry into coordination of the science to combat the nation's salinity problem

Executive Summary

The current Federal and State government programs under the National Action Plan for Salinity and Water Quality (NAP) to combat salinity are the most comprehensive and forward thinking that have ever been developed on the issue. These programs attempt to integrate understanding of social, environmental and economic drivers combined with greater community ownership. The government is congratulated for the creation of the National Action Plan for Salinity and Water Quality including the provision of significant funds to execute it. It is difficult to fault the system and processes that have been put into place through the National Action Plan in order to combat salinity.

Despite our best efforts however, there is still uncertainty as to whether these programs under NAP are, and will be, effective now and in the future. NAP is just over two years into the program and we do indeed need to review and ask the hard questions of its ability to deliver the expected outcomes for combating salinity.

This submission prepared by the Australian Salinity Action Network (ASAN) has identified a number of key issues that this Inquiry should consider in order to improve our ability to combat the nation's salinity problem. Some key points outlined in this paper are as follows:

- Are we choosing the *best* salinity science base and research data available? Or are government programs utilising data sources and a select group of scientists and organizations that strategically align their research to the political agendas of the day rather than the true scientific need in order to ensure funding for their own survival? As such, good and innovative science can be all too often unrecognised and the result of second rate science leads to policy developed on poor foundations, and ultimately poor decisions we have to live with for along time.

- Most natural resource data sets relevant to salinity are held in State Government agencies and are often archaic, difficult to extract from, and often collected in an unscientific manner. As such, analysis of such data becomes not only a difficult exercise but also the results and interpretation of the data is often questionable. Once again, the outcome of this is policy and legislation poorly conceived.
- The private sector should be called upon more often to advise on matters of innovative solutions to the salinity problem. It is the private sector that thrives on innovation out of necessity, very different to the culture developed in the public sector, whereby there is less of a need for public servants to be innovative. Public servants find it difficult to understand the true nature of innovation which is the basis of commercialisation and wealth for the nation.
- The sharing of data between agencies is a complex matter centred around ownership and professional career paths.. Community does not generally have access to the databases or if so, there is no clear mechanism to understand how to access the data.
- Government products from salinity programs are often irrelevant to the stakeholders who are the primary decision makers.

This submission provides several important recommendations as follows:

- *There are no current methods available that do not require field validation. ASAN recommends that the Committee considers in its Inquiry the need for allocating a higher proportion of Commonwealth funds to the collection of scientifically valid field hydrogeological data, which will give more credibility to the maps and models being produced, and policy developed from.*

ASAN recommends that the Committee consider in its Inquiry:

- *The value that other science conducted outside the core Nap projects has to offer, and to provide greater opportunity for organisations to access funds for research or even assist them with ways to access funding from other sources in a proactive way.*
- *The need to show organisations how the funding structure works*
- *ASAN recommends that the Committee considers the need for the Commonwealth Government to develop a strong partnership with an independent community-based body, such as ASAN which can assist at all levels of coordination and information dissemination across industry and community sectors and is independent and non-political in approach.*
- *ASAN recommends that the Committee considers the need for accessing more experienced staff for advising communities and developing a longer term, more secure career structure for young professional technical and scientific staff in the public service.*
- *Furthermore, engaging the skills of the private sector in applying salinity options is recommended, since this sector actively deals with developing solutions and is often more credible with landholders.*
- *Councils need to be better informed and provided with more resources by other tiers of government.*

ASAN invites the Australian parliament and relevant departments to consider utilising ASAN as a central community repository of salinity information on behalf of the Australian community, and to consider ASAN as an adviser to government.

Preamble

This preamble summarises the essence of the House of Representatives Standing Committee on Science and Innovation's inquiry into "*the Commonwealth government's role in managing and coordinating the application of the best science in relation to Australia's salinity programs*". It outlines the role of the Commonwealth Government, the general system that has been put in place under the National Action Plan for Salinity and Water Quality (hereon referred to as NAP) for the delivery of salinity science, its implementation by state governments and regional communities, and discusses also the funding arrangements.

Commonwealth Government role in Salinity

The role of the Commonwealth Government is to provide a) standards across the states and territories, b) the overall coordination of best practice management of salinity, c) facilitation of partnerships, d) public funds and resources, and e) policy and legislation that is in the best interest of the nation.

The NAP provides the framework and delivery mechanism for the Commonwealth Government in combating salinity nationally.

Science

The science that underpins the NAP is based on airborne geophysical methods which provide three dimensional maps of salt stores, calibrated by hydrogeological drilling programs, followed by the development of digital elevation models that utilise this information to calculate water and salt movements through the landscape and into streams. This work is primarily being implemented by the Commonwealth Government's Department's of Agriculture, Fisheries and Forestry through the Bureau of Rural Sciences (BRS), Geosciences Australia and the CSIRO, and also a number of organisations through the CRC for Landscapes, Environment and Mineral Exploration (CRC LEME).

Implementation:

The NAP provides a comprehensive system for implementing the science through "*clearly articulated roles for the Commonwealth, State/Territory, local government and community*". These are expressed through bilateral agreements between the Commonwealth and the States. Agreements to meet certain targets and actions at the regional/catchment scale through Catchment Management Authorities. Catchment Management Authorities provide the catchment action plans (eg. Catchment Blueprints in the case of NSW). The NAP also includes the provision of capacity building for communities and landholders in order to assist them to develop and implement integrated catchment/region plans, together with the provision of technical and scientific support and engineering innovations.

Funding

Through the NAP the Commonwealth Government has committed \$700 million over 7 years to be matched by the States through bilateral agreements, building on the \$1 billion Natural Heritage Trust funds and from other state and intergovernmental initiatives. Funds will be distributed via Catchment Management Authorities who will establish regional priorities for the investment of Commonwealth and State funding under the National Action plan. Funds will only be provided to projects that align themselves to these priorities.

Introduction

The Australian Salinity Action Network (ASAN) is Australia's only premier, independent and holistic community-based organisation providing a national and centrally coordinated effort to combat salinity. ASAN aims to work closely with the national government programs such as the NAP and investigates international salinity perspectives on salinity with a view to identifying innovative solutions for Australia.

ASAN's role in society is to be an independent, non-political organisation which seeks to coordinate and share information between all stakeholders involved in addressing the impact of salinity at all levels including social, economic, environment, cultural and spiritual. ASAN "connect the dots" between the different stakeholders impacted by salinity.

After 14 years of involvement in salinity science and its management, ASAN was founded in February 2001 by Dr John Bradd who understood the need for better coordination of science and on ground solutions for regional communities. Since this time, ASAN has formed a Steering Committee to guide the direction and initiatives of ASAN, and has designated voluntarily state coordinator representatives for every state and territory in the absence of funding. Profiles of the founder, and Steering Committee member's are found in Appendix 1.

During this same time period that ASAN has been evolving, the NAP was also created by the Commonwealth Government which has provided a government framework for combating salinity nationally. ASAN congratulates the work of the Commonwealth in developing this most comprehensive approach to salinity and invites the Commonwealth to developing a closer relationship with ASAN who is the peak national community representative body combating salinity.

This submission was prepared on behalf of, and with contributions from some members of the Australian Salinity Action Network (ASAN). In its current form, ASAN is a network of organizations and individuals who are provided with salinity information services, networking and promotional opportunities and an interactive forum for creating synergies between stakeholders.

ASAN welcomes the initiative of the House of Representatives Standing Committee on Science and Innovation for undertaking this Inquiry which is based on the very essence of the formation and objectives of ASAN. More information about ASAN can be found on the website at www.asan.net.au

Issues considered by the Inquiry

ASAN commends the Federal Government in the establishment of the National Action Plan for Salinity and Water Quality. This program is by far the most comprehensive and well developed plan for combating salinity that has ever been prepared in Australia to date. There are limitations however, and there is always means for improvement in order to ensure that excellence is maintained. This submission aims to add value to the current salinity programs in how we can more effectively address the salinity issue in Australia.

The submission addresses all three points of the terms of reference and has been organised under those headings. The issue will be described followed by ASAN's recommendation.

Term of Reference 1.

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

As described in the preamble, the NAP is very prescriptive in the type of science it is prepared to invest Commonwealth Funds in. Funds are directed towards the science of airborne geophysical techniques and related technologies which provides 'ultrasound' salinity mapping in priority catchments/regions. A list of some projects this relates to can be found in Appendix 2. As stated by the BRS who are the primary drivers of the implementation of the Commonwealth science for NAP:

"A combination of cutting-edge airborne geophysical survey techniques, rigorous calibration on the ground, and a multi-disciplinary approach is used to build a three-dimensional map of salt stores and the conduits for salt delivery to rivers. Using this information the rate of delivery of salt to streams is predicted for alternative land use scenarios and with feasible engineering interventions. This will be the basis for catchment management."

ASAN believes that this may well be the best scientific approach for identifying the national priority areas for salinity action and implementation of catchment plans. Whilst these words articulate clearly what needs to be achieved scientifically, in practice this is far more difficult to achieve. The salinity maps that are produced from these investigations are very impressive and highlight in red what are interpreted as salt stores. This form of visualisation is excellent for non-scientific decision makers to see clearly where the hot spots are for more localised investigation and management. The question is whether these hot spots represent salt stores or not.

On closer inspection and through discussions with the scientists involved however, the airborne geophysical methods still require significant validation with field studies. For example Dent et al., 2002 state:

"Mapped occurrences of salinity do not everywhere coincide with high conductivities suggesting that inverted TEMPEST data may not adequately represent conductivity variations in the very near surface (<5m). However, results from the early time amplitude data indicate that the system may be influenced by conductivity variations at the near-surface, suggesting promise in the application of AEM data for salinity mapping."

Problems arise when managers use these maps as if they represent facts of salt occurrence before they have been validated. These zones that are marked red on salinity maps in reality may be highly conductive zones related to other geological material and not necessarily salt stores. Furthermore, although these methods may identify salt stores, the maps do not indicate the hydrogeological dynamics required for salinity occurrence. Salt stores are not necessarily an issue. In themselves, they are static. Salinity issues arise when the more dynamic hydrological system changes, causing the salts to mobilise and concentrate in locations that cause negative impact to the environment or to land use. The estimation of these processes requires rigorous field investigations followed by the development of conceptual models and then mathematical models (which need to be calibrated and validated also against field data) that can be used in risk management and prediction analysis.

In addition to this, the sites for which the airborne geophysical techniques have been chosen are on the basis of the salinity hazard findings from the National Land and Water Resources Audit. The 21 priority catchments are based on this too. The raw data for which the Audit has used to prepare its report has numerous flaws inherent with how the data has been collected over the decades without any consistent framework or scientific integrity. Nevertheless, the exercise was still valuable and the best that could be achieved under the circumstances.

Recommendation

There are no current methods available that do not require field validation. ASAN recommends that the Committee considers in its Inquiry the need for allocating a higher proportion of Commonwealth funds to the collection of scientifically valid field hydrogeological data, which will give more credibility to the maps and models being produced, and policy developed from.

There is currently some excellent scientific research being undertaken both nationally and internationally in relation to salinity outside the Commonwealth NAP key players, and yet either contribute to the science collaboratively without funding or recognition, or are conducting independent research. Organisations in this category come from both private and public sectors. The author can relate one example from first hand experience as an employee of the Australian Nuclear Science and Technology Organisation (ANSTO). ANSTO has developed innovative techniques of salinity mapping and characterisation using tools such as Electrokinetic sounding (EKS) and geochemical and isotopic techniques. EKS maps the dynamics of salinity flow under the ground, and hence is useful in conjunction with the airborne geophysics which is used to highlight salt stores. Hydrogeochemical and isotopic methods are used to characterise the salinisation processes.

The NAP agenda also discusses salt movement to streams from groundwater flow paths as an important component to measure and quantify. Dr Bradd has conducted research in the early 1990's (Bradd et al., 1993), and also part of his PhD (Bradd, 1996) on the partitioning of streamflow into groundwater and rain wash off components using stable isotopes, with the additional measurement of salt to determine the salt export from catchments. This work has never been fully utilised and yet could provide the NAP with very useful data on catchments in terms of quantifying the salt export from catchments from groundwater sources. Such information will assist model development and hence provide better policy decisions based on real data. There are also a large number of other organisations that are conducting excellent science research and have little recognition, particularly in the form of accessing funds.

Australian Salinity Action Network is concerned by the fact that a large number of highly motivated and skilled scientists, innovators, and others from a wide range of disciplines, who have tried to access funds under NAP, will never gain access to funds allocated under the NAP in its current form. The reasons why they will not gain access to funds vary and are complex. It is suspected that funding however, is primarily built on strategic relationship building with the right people. That is, NAP funds tend to be directed to a core group of organisations. The same process occurs through the Catchment Management Authorities.

Recommendation

ASAN recommends that the Committee consider in its Inquiry:

- 1. The value that other science conducted outside the core Nap projects has to offer, and to provide greater opportunity for organisations to access funds for research or even assist them with ways to access funding from other sources in a proactive way.*
- 2. The need to show organisations how the funding structure works.*

Term of Reference 2.

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

The NAP proposes a very effective system of communication and management of salinity through all levels via a whole of government approach, utilising bilateral agreements, agreements between a community-based catchment management authority and the relevant state agencies, and finally mechanisms to engage local stakeholders.

This particular point to be addressed can be assessed from two perspectives. Firstly, are we considering that those conducting research are those that are already apart of the NAP process, or are we also including all salinity science researchers? Are we considering those that are implementing salinity solutions or those who are recipient of Commonwealth funds, or all stakeholders making genuine attempts to combat the problem? These could include not only farmers, but a wide range of innovative entrepreneurs from the private sector.

The first hurdle that must be overcome is between researchers. Researchers are possessive of their data and their work because the system they work within to gain credibility and promotion is one that requires them to publish their work in credible journals. This means that the work needs to be confidential until the work is published.

Private sector researchers have similar problems in sharing information but for different reasons. The main reason here is related to company intellectual property. Research work conducted by the private sector is commercially driven, and therefore is more likely to be oriented towards salinity solutions. ASAN believes that the private sector is under utilised by governments in terms of the capacity for this sector to deliver innovative solutions that can provide commercial benefit. Public servants often do not have the capacity to think in terms of true innovation and commercialisation. The author has included a paper prepared discussing the issues in relation to commercialising salinity in Appendix 3.

The need for co-ordination and dissemination of scientific and research data in addressing environment and sustainability issues is well documented. Principle 9 of the Rio Declaration (UNCED, 1992) says that, "States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies. Dovers (1995) discusses the relationship between information and policy decision-making. Harding (1998) looks at the issues of 'imperfect' data and managing uncertainty in decision-making.

How best should the principles and policies above be applied to Australia's salinity problem? ASAN believes that the Committee could consider the following in its inquiry:

1. "Best Science" and Economics

"Best science" should consider all definitions of "best". That is the collection of data and the undertaking of research should: be according to the highest scientific principles; cover all aspects of the salinity problem; and consider the most useful practical applications. In regards to the last point, ASAN would like to emphasise that both practical and theoretical programs should be pursued as these both have a role to play.

Economics should also be considered in looking at the development of scientific and innovative solutions to salinity problems. A study (Stafford Smith et al, 1997) into Australia's rangeland management shows that both a better understanding of the ecological impacts and the economics of pastoralism is required.

2. Practical applications and incentives for end users

The technological and business operational requirements of end users, such as landholders, is critical in managing, co-ordinating and implementing salinity programs. The criteria for useful application of the "best science" should consider:

- The cost of implementation;
- Practical application. New or improved technologies should be readily adaptable with existing business/operational practices or allow for improved land management techniques;
- Programs and technologies that prevent as well as address salinity;
- The type of assistance required for implementation; and
- Incentives to ameliorate or prevent salinity.

On this last point, ASAN notes there are a number of programs addressing environmental problems such as emissions, which have been successful in terms of reducing or ameliorating environmental damage. For example, the NOx and SOx programs in the US. These schemes are incentive based and similar schemes could be used in Australia. For example, under a salinity credit scheme land users could be awarded with credits for addressing salinity. Customers would be required to purchase these credits. This would provide land users with cash incentives to reduce salinity and flexibility to select the best option for implementation based on the unique requirements of their land and catchment areas.

This would be similar to the Renewable Energy Credit scheme. In this scheme, the generators of renewable energy are provided with incentives to create emissions free electricity. The consumers, the electricity retailers, are encouraged to consume a set amount

of electricity from renewable sources through the requirement to purchase a set number of credits.

3. Industry Networks

One method for disseminating research is to use industry bodies, such as ASAN, which have a trans-disciplinary network and whose goal is to build a central repository of salinity information.

Recommendation

ASAN recommends that the Committee considers the need for the Commonwealth Government to develop a strong partnership with an independent community-based body, such as ASAN which can assist at all levels of coordination and information dissemination across industry and community sectors and is independent and non-political in approach.

Terms of Reference 3.

c) adequacy of technical and scientific support in applying salinity management options

Under the NAP, technical and scientific support in applying salinity management options will be operated by salt response teams. These teams are only beginning to form now and therefore there is insufficient time to review the success or otherwise of this approach. However, within the complete package of the NAP, this approach seems to be an effective strategy. There are several issues to consider as described below.

There is a large divide between those who conduct salinity scientific research and those that have to implement practical solutions. One such example is the practical application of airborne geophysical mapping (or any other salinity mapping for that matter) to the farm scale. It is noted that these broad scale maps are used more for prioritising regional funds and places of action, but is there a right mix of funds supporting each component? Should more funds be directed toward the on ground works?

The reality is that farmers do not use these maps for their decision-making. Farmers obtain the services of a soil or agricultural consultant who can interpret soil EC maps that were conducted specifically for their farm, not for the region. Should the Commonwealth develop better links with such consultants who have better relationships with farmers. Unfortunately government's often have poor credibility with the community and lack of trust is the biggest issue or hurdle to overcome. This only further justifies the need for a national community organisation like ASAN.

There are still only a select few landholders who engage in the government process. The majority remain unaware of this whole process and would prefer to work their land in the way they choose to work it. Furthermore, many salinity advisors and extension officers within government are inexperienced on the land, young, on short contracts and therefore have little time to build rapport and credibility with the landholder. Farmers rightfully believe that they know more about their land than the person from government knocking on their doors to discuss technical support. ASAN has heard this complaint from farmers frequently.

An additional stakeholder that often lacks support from other tiers of government is local government. This sector has potentially one of the greatest mechanisms to influence change

on the land through its planning instruments at the local scale required. Often councils lack the funds and are not briefed sufficiently on matters of salinity within their jurisdiction. This issue needs to be addressed. Local government perhaps is a more effective instrument of bringing about change than Catchment Management Authorities.

Recommendation

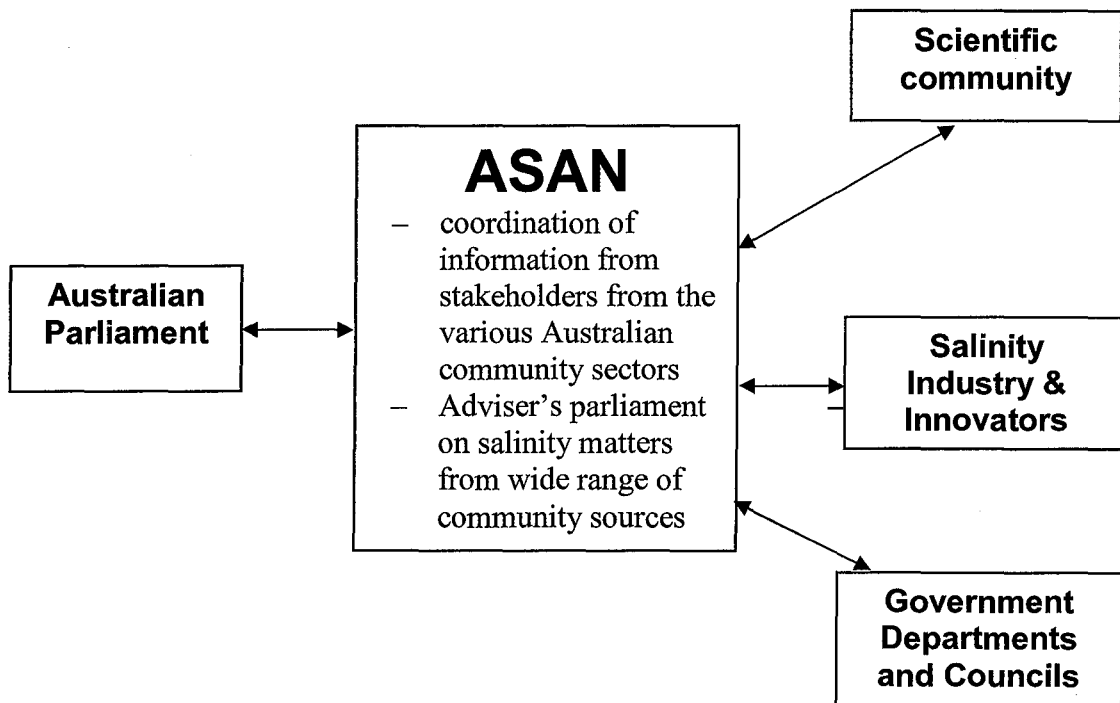
ASAN recommends that the Committee considers the need for accessing more experienced staff for advising communities and developing a longer term, more secure career structure for young professional technical and scientific staff in the public service.

Furthermore, engaging the skills of the private sector in applying salinity options is recommended, since this sector actively deals with developing solutions and is often more credible with landholders.

Councils need to be better informed and provided with more resources by other tiers of government.

ASAN's Proposed Model for the best management and coordination of science in relation to Australia's salinity program's.

The following draft model is proposed by ASAN as a mechanism for delivering the best management and coordination of science in relation to Australia's salinity programs. ASAN invites the Australian parliament and relevant departments to consider utilising ASAN as a central community repository of salinity information on behalf of the Australian community, and to consider ASAN as an adviser to government.



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