



Taking the long view on water use in Australia

A submission to

**Senate Rural and Regional Affairs and Transport
References Committee Inquiry into Rural Water Usage
in Australia**

Prepared by

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1. Background

- 1.1 For many decades it has been recognised that the patterns of water use in Australia were leading to environmentally, socially and economically unsatisfactory outcomes. These are well documented in numerous reports including those of the National Land and Water Resources Audit and State and Commonwealth State of the Environment Reports. Over the last decade there have been attempts to reform the institutional arrangements governing water use in Australia (eg, Murray–Darling Basin Commission and “The Cap” [on diversion of water for the Basin]), and there have been many improvements in the physical management of water for urban, industrial and agricultural uses. Despite these reforms and improvements, over this time there have been: increases, not decreases, in water use; continuing impacts on the environment; and community and industry demand for better management of the nation’s water.
- 1.2 In response to the state of Australia’s water resources, on 21 October 2002 the Senate referred an Inquiry into the Rural Water Usage in Australia to its Rural and Regional Affairs and Transport References Committee with the following terms of reference:
1. current rural industry based water resource usage;
 2. options for optimising water resource usage for sustainable agriculture;
 3. other matters of relevance that the committee may wish to inquire into and comment on that may arise during the course of the inquiry, including the findings and recommendations from other inquiries relevant to any of the issues in these terms of reference.
 4. the Committee to make its report to the Senate on this matter by the last sitting day in 2003.

2. This submission

- 2.1 In this submission we draw the Committee’s attention to a recent CSIRO research report, *Decision points for land and water futures* (Dunlop et al. 2002), that specifically explores the long-term future of land and water use in Australia, with a focus on agriculture as the dominant user of these resources (section 3).
- 2.2 We summarise in this submission some of the key water-use related findings of the research that underpinned the report (section 4).
- 2.3 We also indicate that we would be happy to answer any questions that the Committee, or individual members, may have about the research and its findings.

3. *Decision points for land and water futures*

- 3.1 The research leading to the report was conducted by the National Futures Group in CSIRO Sustainable Ecosystems (see section 5). It was funded jointly by Land & Water Australia (LWA), through their Social and Institutional Research Program, and CSIRO.
- 3.2 The research project set out to explore long-term future options for land and water resources in Australia. It aimed to provide tools and information that could be used to assist people faced with strategic choices about natural

resources at the State or national level. The primary vehicle for doing this was developing and exploring three alternative scenarios for the future use of land and water in Australia using the Australian Stocks and Flows Framework (sections 6 and 7). The report includes the rationale for developing scenarios, descriptions of the methods used and the scenarios, and discussion of some implications that were drawn from the exercise. As well as demonstrating the use of the technique, it is hoped the scenarios will help provoke community-wide debate about the long-term future of Australian landscapes.

- 3.3 The project had four main outcomes:
- ❑ it developed and successfully tested an active learning method for exploring the 50–100 year future that uses a combination of scenario planning and quantitative modelling and transparently accommodates uncertainty in the future;
 - ❑ it compiled and integrated a vast array of national land and water data in an analytical framework that can be used for exploring future scenarios;
 - ❑ it highlighted a range of long-term implications for natural resource management, agriculture and rural communities; and,
 - ❑ it demonstrated how Australia could benefit from taking a long-term perspective in planning the future use of natural resources.
- 3.4 A preliminary copy of the draft research report is attached. The report has not been publicly released at the time of this submission. It is planned for release jointly by CSIRO and Land & Water Australia in mid 2003.

4. Key water related findings of the research

- 4.1 The report demonstrated that taking a 50–100 year perspective in assessing the future of water use is both possible and useful. Doing so enables the planner to move beyond a preoccupation with the constraints of short-term imperatives and the difficulties of current usage patterns. Critically, this enables the planner to explore and assess alternative objectives for the future of water use. After recognising a problem and the need for policy intervention, as has been done with water use in Australia, assessment of long-term objectives is an important, and sometimes overlooked, pre-requisite to designing the policy mechanisms required to fix the problem.
- 4.2 One of the most stark, but least recognised, features of the history of agriculture in Australia has been the ever increasing rate of use of land and water resources. The area of land used for crops and sown pastures in Australia has increased at an average rate of 2% per year for the last 150 years (i.e., doubling every 35 years). While less detail is known about national water use, the available information suggests that the recent rate of increase has been much greater than for land: 76% increase in water use for irrigation between 1985 and 1996–67, an equivalent annual rate of increase of almost 5%. It is unclear exactly how important the constant increase in water use may have been agronomically or economically for different irrigation areas, for particular industries, or for the sector as a whole. However, it is clear that the past rates of increase of land and water will not continue in most regions.
- 4.3 It must be recognised that slowing or stopping these increases would constitute significant changes from the long-term situation experienced by the farm sector. It should also be noted that change is an ever present

component of Australian agriculture, be it the result of government policy, market developments, research and development, or other factors. The research emphasises that, in accepting that some change is inevitable, there is enormous opportunity to achieve a range of positive outcomes over the long term. Furthermore, such outcomes are unlikely to be achievable through strategies of resisting change to avoid short-term costs. This is not to say short-term issues should be ignored, rather they can be managed in the context of equitably distributing the costs and benefits of changes to water use across sectors of society and across generations.

- 4.4 A large proportion of irrigation water is used to produce crops and meat that provide relatively low returns per unit of water (Smith 1998, NLWRA 2001, 2002). In analysing the history of irrigation, and in a previous scenario exercise (Dunlop et al. 2001), it became clear that, even without increases in diversions of water for irrigation, there is enormous potential for growth in higher-value uses through re-allocation of irrigation water. The higher value uses could include other crops (eg, horticulture), domestic and industrial use, or increased environmental flows. This was further demonstrated in the scenarios developed and explored for the attached report. The three scenarios included reductions in the volume of water used for irrigation of at least 800 GL in southern Australia, and a marked increase in the volume of production of high-value products. Indeed, a reduction of 8700 GL was achieved over 50 years in one scenario, mainly through reductions in the area of irrigated pasture and rice, and improvements in water use efficiency in other crops. This scenario included very strong growth in horticultural production and levels of production corresponding to at least double domestic demand for all irrigated crops. This research demonstrates that, in many regards, irrigation in southern Australia suffers from a resource *allocation* problem not a resource *constraint* problem.

5. CSIRO Sustainable Ecosystems and the National Futures Group

- 5.1 CSIRO Sustainable Ecosystems undertakes research focused upon challenges of social, economic and environmental sustainability in Australia. A key CSE strategy has been to apply systems approaches to problems of sustainability whether they, for example, emerge at global, national, regional, or local scales, are primarily urban or rural in impact, or can be practically confined to major issues or sectors. CSE also recognises that systems need to be viewed from a deliberately transdisciplinary perspective in order for responses to be situated in the appropriate institutions and to be effective across the necessary scope and term. As a result, core CSE initiatives include the examination of the broader value of agricultural, natural and urban ecosystems and the engagement of communities and stakeholders to examine their management and development options, including corresponding governance arrangements.
- 5.2 The National Futures Group comprises an interdisciplinary group of researchers with skills in systems modelling and scenario planning. The Group has successfully applied their expertise to analysis of national futures for the Australian population (Foran and Poldy, 2002) and its land and water, forests, agriculture, fisheries, urban systems, and tourism industries, as well as triple bottom line accounting. The Group also has expertise in global and domestic energy futures and draws on wide ranging expertise in sister groups, including social science, climate change, biodiversity, regional development and economics.

6. The CSIRO Australian Stocks and Flows Framework

- 6.1 Physical analysis involves understanding and enumerating the movements and transformations of physical entities that have a function within the economy. The Australian Stocks and Flows Framework (ASFF) is a system for conducting integrated physical analyses of the Australian physical economy (Conroy et al. 2000; Poldy et al. 2000; Turner & Poldy, 2001). ASFF has been designed specifically to explore long-term (50–100 year), economy-wide and national-scale policy issues using a “design approach” (Gault et al 1987; Foran & Poldy, 2001). It tracks the important physical stocks (such as population numbers) throughout the Australian economy by accounting for all the yearly changes (flows) in the stocks. It is highly disaggregate. For instance, population is provided by gender, age, location and time (in five-year steps).
- 6.2 Key components of ASFF include a simulation framework and an integrated historical database of the physical economy covering the period 1941 to 2001. Scenarios are developed based on trends and historical bindings, aspirations for the future, and constraints imposed by physical relationships between variables in the framework. The analyst plays an active role dealing with constraints while iteratively developing physically feasible scenarios for the future development of the economy. Scenarios thus developed reveal and demonstrate long-term resources constraints, trade-offs and opportunities that may result from alternative futures.
- 6.3 The agricultural components of ASFF, which have recently been revised, include crop and pasture production, animal production, land degradation, water use and other agricultural inputs (Dunlop et al. 2002). Future area and production of 11 crop types and sown pasture are simulated taking into account genetic improvements, fertiliser, irrigation and loss of production due to land degradation in 58 statistical divisions over the period 1861 to 2001. Soil acidification, dryland salinity, irrigation salinity and soil structural decline are similarly simulated, taking into account the history of agricultural activity in each statistical division.

7. Scenarios and Futures Analyses

- 7.1 Futures analysis conducted by the National Futures group are distinguished from other approaches by being strongly grounded in quantitative analysis of the Australian physical economy. The principle tool for this analysis is development and exploration of alternative scenarios with the Australian Stocks and Flows Framework. ASFF was developed to build physically consistent scenarios, including as much predictability and physical reality as is possible in an environment that allows transparent exploration of uncertainties. The approach combines elements of traditional scenarios planning (as pioneered by Royal Dutch Shell corporation) and simulation modelling, and is a major advance over trend analysis and statistical extrapolation. Many aspects of the future are dominated by irreducible uncertainty, hence the scenarios are plausible futures, not predictions of what is most likely to happen. Nevertheless, scenario analyses can provide significant insights into the future. In particular, they are useful for challenging preconceptions about the future, and enabling the analyst to step beyond short-term imperatives while exploring solutions to long-term issues.

8. References

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