Salinity in the context of other Australian environmental challenges

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Throughout the 1990s, land and water salinisation took centre stage among Australians' concerns about their environment. This prominence as a national issue reflected our growing understanding of the threatening trends in salinisation, their projected extent and likely impact, and the serious technical, social and economic difficulties in mitigating these impacts. In that era, salinisation processes were the focus of technical discussion and consideration, and closely associated drivers and processes (e.g., land use change, climate, hydrology and water management, and soil health) were viewed as important in having a relationship to salinity hazard or management.

For example, widespread soil acidification was highlighted as a risk to increased groundwater recharge and hence salinisation. The arguments for retaining native vegetation, or increasing the extent of new tree plantings, revolved around the perceived benefits to managing salinisation risk. Much of the impetus and emphasis on the management of the Murray-Darling Basin was focused explicitly on salinity outcomes. Early speculation on changing rainfall patterns associated with climate change was the source of concern with respect to how it might affect groundwater recharge and other salinity-related processes. Salinisation was seen as a (if not *the*) prime threat to Australia's biodiversity. Salinisation was highlighted as a major risk to urban infrastructure, either in the form ofrising saline watertables or through accelerated depreciation of infrastructure due to salty water supplies. Estimates of the eventual annual costs of salinisation ran to hundreds of millions of dollars per annum (e.g., National Land and Water Resources Audit 2001).

Clearly, other environmental issues were in front of the Australian community at that time and received due attention. The nation was nevertheless confronted by an unprecedented barrage of quantitative, serious and multifarious depictions of the environmental challenges posed by salinisation from a variety of articulate quarters including scientists, government agencies, local governments, peak agricultural bodies, conservation groups and individuals. The lion's share of resources arising from large government initiatives such as the Natural Heritage Trust and the National Action Plan on Salinity and Water Quality (aimed at conservation issues at large across Australia) consequently went to combat salinity. A set of national and state research and development initiatives were launched to improve our understanding of the threat and to provide the means to meet the challenges posed.

The drive to redress Australia's salinity challenge has been tempered by emerging science showing the relative and general infeasibility or ineffectiveness of biological or engineering solutions for most salt-affected landscapes (e.g., Hatton and Nulsen 1999, Hatton and Salama 1999). These early conclusions have been consistently reinforced by further biophysical and economic research (e.g., Pannell and Ewing 2006). Following seven years' efforts (2001-2007) of the Cooperative Research Centre for Plant-Based Management of Dryland Salinity, Goss (2007) concluded "It is now clear that actions to reverse salinity have had limited impact", and that strategies based around the propositionthat re-introducing perennial plants would turn dryland salinity around had too few documented successes. As such advice emerged over the past decade, so did priorities for focussing reclamation efforts (triaging"), with an emphasis on protesting or recovering key water resource assets.

A new set of emerging environmental concerns has to a large extent either overshadowed, or even turned around, worries about land and water salinisation. Chief among these is a prolonged, extensive and unprecedented drought. Across southern Australia, including the supply catchments for all major metropolitan areas, serious declines in storage inflows have resulted on prolonged or permanent water use restrictions. Australia's food bowl, the Murray-Darling Basin, is experiencing record low flows and irrigators have consequently suffered from minimal water allocations. Dryland agriculture, particularly grain production and livestock production, has suffered successive years of low yields. The natural environment is suffering as well, particularly groundwater-dependent ecosystems, floodplain vegetation and wetlands. River pools that normally provide biotic refugia during droughts have dried up.

On top of the current drought is new research that indicates the long-term trend for southern Australia is hotter and probably drier. In fact, the regions around the cities of Perth and Adelaide are two for which science has concluded that a climatic shift has already occurred. The catchments that supply half of Perth's water have been de-rated (that is, planning is now based on a lower long-term yield). Estimates of the impacts of forecast climate change on the Murray-Darling Basin indicate long-term declines in flows of 15-30%. The broad conclusion is that droughts such as the current one may become more frequent.

Coupled with these climate forecasts are anticipated rises in sea level and the consequent flooding of low-lying coastal lands. Given that Australians are predominantly coastal-dwellers, the implications to infrastructure and lifestyle are confronting if as yet poorly understood. The implications of sea level rise extends to a wide variety of coastal ecosystems around Australia. There are a host of other climate change threats to Australians' health and well-being, and as a set of challenges has effectively captured the nation's environmental concerns.

Australia's response is still emerging. At a minimum, some $30B of new urban water infrastructure is either under construction, planned or anticipated in the next decade. This investment is aimed solely at increasing urban water security. Another $10B is aimed at improving rural water supply and use efficiencies while securing more water flow allocations for the environment, mainly in the Murray- Darling Basin. Two billion dollars is an initial investment in the National Water Initiative, aimed ataccelerating the necessary transformations of water policy, management, and supply to redress Australia's water crisis. Additional large investments in climate change mitigation and adaptation are being made at every level of government. It is not possible at this time to see the eventual response to these pressures.

So where does consideration of salinisation fit into the merging environmental consciousness of Australia? To begin with, there is some indication that the drought has dramatically curtailed land salinisation; shallow groundwater levels appear to be generally falling across salinity-prone regions. Although the implications of a changing climate (even if it is drier overall) are not entirely clear, thereis a widespread belief that the rate of spread, and perhaps eventual extent, of salinised land will be less that previously forecast.

While land use prescriptions to combat salinisation almost invariably included revegetation with perennials (particularly trees), it is now recognised that where these plantations are placed can potentially reduce (fresh) water yields and even increase downstream salinity by denying dilution flows from fresh (high rainfall) country. With the serious water supply crisis, the greater concern is the impact on catchment water yields regardless of salinity issues. In fact, existing policies aimed at encouraging plantation forestry are being reconsidered and may in the end require that water allocations be required for new developments in water supply catchments (as they are in South Africa for a similar reason). Indeed, there are proposals under consideration (and already subject to trial) to thin native forests to yield *more* water. It will be interesting to see where the balance is struck between tree planting for carbon capture, tree planting for salinity and restrictions on tree planting to maintain water yields.

When the focus was on rising saline groundwater, proposals emerged to help redress this threat by developing water supplies (particularly for rural towns) based on desalination. These proposals came at a time when desalination for potable supply was restricted to a few isolated locations with no other feasible supply options. Australian water utilities had little or no experience with the technology, and pioneering municipal-scale desalination was considered unattractive or risky. As a result of the prolonged drought and forecast climate change, in the past four years Australia has gone from <10GLof annual desalination to a point where some 350GL is now built or planned. All of the feedstock for this capacity is seawater, which is more reliable, cheaper to access and of more predictable and benign chemistry than saline groundwater. Thus, desalination has become a mainstream reality but is entirely decoupled from the issue of land and water salinisation.

River operations previously focussed on meeting salinity targets have been greatly compromised by the need to supply very limited allocations during a severe drought to keep (a) town water supplies assecure as possible and (b) permanent horticultural plantings at least alive if not productive over the dry season. Thus, the historical flow management to keep water supplies fresh through dilution flowsis changing as a result of issues of water security. In this sense, the long-term prioritisation of salinity remediation on water resources was wise then and is wise now.

Biodiversity concerns associated with a changing climate, and with a parallel emerging awareness of other biodiversity threats such as weeds, feral animals and disease, now far outweigh those associated with salinisation. Indeed, the drought, and the possibility that a drier climate may reduce salinity risks in the longer term has also reduced the sense of urgency around protecting biodiversity from salinity.

Similarly, the threat of salinity to agriculture is far outweighed by drought and a drying landscape. Australian agriculture and associated farm businesses are in a parlous state across the continent at present due to a variety of economic and environmental stressors, and it is difficult to see salinisation as a major component of that stress except in a highly local context. Other fundamental dimensions of soil health (acidification, nutrient debt, and structural decline) are arguably more widespread and economically threatening to agriculture than salinisation and in some cases more amenable to remediation and management.

In a sense, there is as much salt as ever in Australia's landscapes. Perhaps over the recent years it is moving around a little less dramatically, but the original picture painted of its significance to our wellbeingwas not greatly over-exaggerated. However, these impacts must be placed in a contemporary context of a host of environmental issues that affect more Australians in more fundamental and challenging ways. Salinity will increasingly be seen as a component of these other processes and trends.

References

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