Salinity and sustainability: institutional and intellectual responses

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This paper is about salinity, but I will not deal with the scientific and technical details of salinity as others can do that far better than I can. I will argue that responding effectively to salinity is only in part a technical or scientific issue, and more a political and institutional one. This involves exploring the movement of salinity between two domains: a substantive issue and technical problem, and a policy and institutional problem.

I will discuss salinity as one issue amongst a set of interrelated issues that can be – and I argue should be – gathered under the integrative framework of sustainability or sustainable development. I will focus on policy and institutional aspects, because they are important, and because that is my area of expertise. I will take an historical perspective on salinity, which I believe can be informing in the case of a problem which operates over time frames of many decades. The perspective is largely an Australian one, and I leave judgment as to its international relevance to others.

Throughout this talk there is an underlying assumption – that, despite much good work and much we know that should be done, there is a significant implementation deficit in the case of salinity, and that those concerned with salinity find this frustrating, especially in recent years as the issue has become less topical. I hope to at least prompt some thought about why that might be the case and what might correct that situation.

Note that I am not saying that nothing has been done about salinity, but I know that many scientists and practitioners believe that much more could and should be done. In the long run, in major agricultural areas of Australia, serious attempts to manage water and salt in an *ecologically sustainable* manner would require major transformations in patterns of production and consumption, and in our approach to settlement and land use. Towns would fade away, the diets of urban dwellers would change, property rights would be radically revised, and much bigger compensation and buyouts than ever before envisaged would be needed. Whether that would be *socially or economically* sustainable, or politically possible, is another matter.

Knowledge and policy

This conference, like many such meetings, is dominated by scientific and technical offerings of knowledge – very good ones, and absolutely needed – and to a lesser degree discussions of management at local and regional scale. There is much less about the broader scale policy processes and institutional systems within which knowledge is formed and acted on, and that can enable or constrain on-ground management. Those processes and systems are the domain of disciplines such as public policy and administration, law, institutional theory and political science, and it is from these disciplines that I draw.

In science and often in other discourses, there is a common assumption and desire that the development of scientific or other "objective" knowledge will have a linear impact on policy and political decisions. This is the assumption of *instrumental utilization* of knowledge to directly inform policy decisions. This is attractive, but often baseless. From a large body of work in information and policy, we can recognise other forms of information utilization including (eg. Hezri and Dovers 2006):

> *Conceptua*l, informing the understanding and framing of problems but not informing action in a direct way.
>
> *Symbolic*, where information is gathered, displayed and/or used to create an impression of activity or concern, independent of action.

Political/tactical, where information is used as a measure deployed in political maneuvering.

From empirical exploration, these three forms are often more common than instrumental utilization. This may not be an agreeable observation from the point of view of a salinity scientist. There will no doubt be those here who find the notion of scientific knowledge – for example regarding salinity risk in a catchment – being thus used as wrong. Perhaps, but if we consider salinity as a *sustainability* problem, as I will expand on in a moment, then the strictly environmental is not the only factor to be considered – the social and economic must be factored in as well. Whether to take serious action on salinity, or any other environmental issue, is nothing if not a political question:

> 'Politics is *the* essential ingredient for producing workable policies, which are more publiclyaccountable and politically justifiable ... While some are uncomfortable with the notion that politics can enhance rational decision-making, preferring to see politics as expediency, it is integral to the process of securing defensible outcomes. *We are unable to combine values, interests and resources in ways which are not politica*l.' (Davis et al 1993: 257, emphasis added)

Knowing in a technical sense that salinity is a problem in a particular place, perhaps a very serious problem, is the first step. Establishing that realization as a problem recognized and worthy of action is the next step, and demands trust in scientific opinion being established, and a negotiation between scientific and other burdens of proof in the face of inevitably uncertain data. Then the problem enters the policy and political domain. But that has us only halfway there, as salinity in the sense of rising water tables and so on is not a *policy problem*, but an interpretation of biophysical processes and the likely consequences of human-induced environmental change. The problem of salinity has to be translated into a series of policy problems at a number of levels of resolutions, in terms of jurisdiction, statutory tractability, available policy instruments capable of delivering trustworthy technical innovations, institutional settings to implement these, distributional impacts, and so on. (This discussion follows the problem framing schema of Dovers 2005.)

If one does not engage in this kind of translation of biophysical observation to policy problem, then one cannot complain about a lack of societal response. It is easy to fall into the popular Australian malady of "Ortism" – that the government, or someone else, "orta" do something about it, but not to engage in the hard yards of trading off and allocating values, interests and scarce resources.

Delivering the scientific knowledge is one thing. It is much harder to be the Minister who places a statutory ban on certain land uses, imposes a revolutionary water market, or shift financial incentives to favour one land use over another – those decision might shut down a rural town. If a Minister leans toward the medium term future of the town rather than protecting the long term sustainability of the ecological system underpinning the livelihood of the town, is that grubby politics or a considered opinion that tilts the balance toward a social rather than an ecological rationality? It would be a decision that makes the farmers, rural counselors and local school kids happy – the school was going to shut with any fewer students – but makes the salinity scientists unhappy.

But let's go back to the start of the process – problem recognition. It is often said that we have known about salinity for decades, centuries even, and thus have been tardy in responding. That is true to some extent. But when do we really *know* something, to the extent that there is a basis for acting, recognizing the costs in terms of other values? *Who* needs to know? How *certain* do they have to be to act; what is the burden of proof? Is there sufficient agreement around the best technical and management solutions? What degree of salinity threat outweighs other factors when a responsible authority balances values, interests and resources – and how do we make that calculation? Let us consider possible insights from some brief historical vignettes involving salinity.

Insights from history?

(In order, the following draws on Boyden 1987; especially on Proust 2008; and on the author's interpretation of the recent history and politics of Australian salinity.)

Salinity has been with us for a long time: witness the impacts on the kingdoms of Sumer and Akkad millennia ago, where the cultural adaptation to salinity was to give up and move on (Boyden 1987). More recently, in the 19th Century the British expanded and modernised the irrigation systemsestablished from the 16th Century by the Mughal Empire, salinity issues emerged and were describedwith reasonable accuracy from 1863 by H.B.Medlicott, and evidence was brought together and widely discussed through the work of the Reh Committee in the late 1870s (Proust 2008). Salinity and its causes and effects were understood, scientifically, and there were difficult trade-offs between soil and water health, poverty alleviation and economic development. It was recognized that insufficient attention had been paid to agricultural and soil science, with irrigation development being driven by engineering possibilities, and by social and economic imperatives.

This knowledge was available in the late 19th Century to those who were considering the hydrological reality and irrigated future of Australia, and indeed suspicions of lurking salt were voiced earlier – Sturt tasted the saltiness of the Darling's water in 1829. Trollope in 1874 stated that "though the saltbush may go, the salt remains", and Abbott opined in 1884 that trees "died as soon as their roots reached the salt subsoil". The settler Henshilwood informed a Victorian inquiry in the 1890s that "wherever there is mallee growing there is salt", and other inquiries in the 1880-1890s were given similar evidence.

The analytical chemists Dixon, Mingaye and Guthrie knew the Indian experience, drew on American work, and conducted Australian investigations. They warned of potential dangers and recommended that irrigation development be preceded by careful chemical analysis of soil and water, and that management of eventual water application be similarly careful – applying what we might now call the Precautionary Principle. Were the scientists ignored by influential politicians, in the early years of what Joe Powell (2000) termed the "engineered ascendancy" in Australian water history? Not always: the father of Australian water and irrigation policy, Alfred Deakin, on basis of his own international and Australian research and tours of inspection, stated in 1893 that:

> The lessons of over-watering, of the necessity for adequate drainage, of the value of unremitting cultivation … will bear much repetition and continuous illustration … [T]he reiteration of warnings … may have become trite and commonplace, but nevertheless, the manner in which writers in agricultural journals still find it necessary to repeat them, is an evidence that, often as inattention has been called to them, these simple principles are still ignored…"

Some familiar with overseas experience and the science were more sanguine. Hugh McKinney came to Australia from India well credentialed as an irrigation engineer, an admired and influential class of people, and played a crucial role in promoting irrigation. He had salt on his boots, or more precisely *reh*, from his Indian experience, yet in 1892 and 1895 respectively he stated that:

> "The statement that artesian water is fatal to vegetation is generally baseless. Even if the cumulative effect of the water should in some instances prove temporarily injurious, new land could be cultivated while the old recovered. So far, this cumulative effect is only a fear."
>
> "The rise in the level of the underground water has doubtless a tendency to carry up the salts in the subsoil; but admitting all this, it is necessary to state that some writers have exaggerated the mischief done, and have quite overlooked the compensating benefits conferred."

In the middle of this, in 1893, McKinney reflected on the Indian experience and what it might

mean for Australia, evidencing a somewhat different position:

> "… irrigation was adopted as the best of a choice of evils – possible privation on the one hand and probable injury to the land on the other. A similar choice of evils may have to be met sometimes in the western districts of this Colony."

In Australia, the engineers and those who desperately wanted development won, the precautious chemists went largely unheard: their careful science had to wait. Irrigation blossomed, at times in direct ignoring of land capability assessments. Notwithstanding ongoing discussions such as those informing salinity's key part of the CSIR's initial mandate in the 1920s, it was not until the early 1970s that a whole system understanding of and serious attention to irrigation salinity in Australia emerged. That realization and call for action came a century after initial and widespread scientific warnings.

Away from irrigation salinity, it has been often noted that Australia "knew" of dryland salinity threats early in the 20th Century, with common citation of Wood (1924) and various statements of the threat in the immediate post WWII period. Yet dryland salinity only featured fully in policy debates in the last twenty years. Again, it took an inordinate time.

Is there someone we should blame? Medlicott in the 1870s before the Reh Committee forgave engineers for not understanding "the many conditions involved in the production of Reh", noting their specialist and thus partial perspective, and laid blame elsewhere:

> "The responsibility rests with higher authorities who had not intelligence to see that the *reh* question is not primarily one of engineering."

Three important points arise from this selective historical tour. The first is that the interplay of scientific problem recognition with countervailing knowledge and in balance with other factors in decision making has always been the case. A scientific problem is not a policy problem. McKinney's choice of evils regarding Indian irrigation is precisely the dilemma of modern sustainability – the integration of or trade-off between environmental, social and economic imperatives. The second point regards who actually "knew" something – an article in *Journal of the Royal Society of WA* in the 1920s does not equate to an IPCC-like scientific consensus and is not quite front page in the *Weekend Australian*.

It is easy, in retrospect, to cast those in the past as ignorant or willful, but I seriously challenge anyone here to have done much better in that very different time and place. But will we be as easily forgiven if salinity worsens and we leave a legacy of environmental damage and diminished productivity? The third point picks up Medlicott's observation that no single perspective can ever grasp complex problems. This tells us that integrative analysis and understanding was seen as necessary more than a century ago, and that creating the conditions for such integrated approaches is a policy and institutional more than scientific issue, his "higher authorities".

Fast forward and the focus on salinity has waxed and waned in recent years in Australia. Irrigation salinity moves up and down scientific and political agendas – the two are closely related – in line with climate variability. The rise in alarm over dryland salinity, and the rise of the Dryland Salinity Research Industry, was remarkable from the late 1980s on. But now, with a prolonged drought, it is little mentioned. Like much of Australia's flora and fauna, water and salinity policy activity is closely adapted to El Nino cycles, booming and busting with wet and dry periods as we become alarmed when there is not enough water or too much salt. In between our spasmodic alarms, we don't even stay alert.

When we get very worried about salt, over things get ignored. Soil acidification was a big issue in the 1970s and 1980s, then disappeared from the policy agenda (and from scientific investigation), overshadowed by dryland salinity, only to re-emerge as a serious issue recently. The more integrated agenda of "land degradation", communicated effectively by Woods (1984) on the back of the 1970s collaborative state-Commonwealth soil erosion inquiries, where multiple forms of land and water change could be cross-referenced, has

given way to a cycling of narrower research and policy agendas. This is similar to the loss of the more integrative idea of instream flows in water management, to the narrower definition of environmental flows. While the indisputable logic of an integrated approach to natural resource management problems is now core to the mandate of Catchment Management Authorities and similar regional scale arrangements, there are significant questions over the adequacy of the resources, purposefulness and skills being invested in them (eg. Robins and Dovers 2007a, b).

Why do we ignore, forget, fail to read warning signs? The simple answer is that other things – agricultural development, near term economic returns, rural electorates, and so on – are given more weight. True, but a simplistic reading, and we can at least note some greater complexity in the cause and effect of *policy ad hocery and amnesia*. In a globalised world, salinity cannot compete with climate change on policy and media agendas: salinity is more of a local problem. Increasing short term and economic focused R&D investment patterns do not suit long term public good investigation, and the on-and-off character of major policy programs in natural resource management does not help. Fashion-driven arguments over policy instrument choice – market mechanisms are all the rage at present, just as community-scale programs were a few years ago – has equaled a cycling of policy interventions insufficiently maintained and rarely properly evaluated. Policy learning and improvement suffers accordingly. The lack of robust framework policy to coordinate sector- and issue-specific programs reinforces fragmentation and disintegration, whether that be in land degradation, rural policy, or sustainable development. A relative lack of policy and institutional R&D compared to (very important) biophysical research sees an insufficient understanding of options for maintaining persistence and improvement, not helped by a matching lack of policy skills imparted through resource and environmental management training (Sherren 2004).

These issues apply to salinity, and more broadly to the suite of inter-related problems that make up the sustainability agenda. I will now consider that domain, salinity's place in it, and what might be done to promote salinity in the current operating environment.

Salinity as a sustainability policy

Sustainable development or sustainability was first enunciated officially as a social and policy goal in 1992, when the bulk of countries of the world agreed to: integrate environmental, social and economic policy; be precautious in the face of possible serious environmental damage; engage communities in policy and management; and decouple economic growth from environmental damage. But a large implementation deficit is evident, especially in terms of reforming policy processes and institutional systems. Many have tired of the overarching framework of sustainable development – too vague, too hard, too general, not yet achieved. I would propose three reasons why this has been the case:

- First, the countervailing pressures of short-term economic policy works against long run sustainability, with many interests fearful of the impact on their values of a switch to sustainable development.
- Second, people unreasonably expected quick gratification, as if a transition to sustainability could be achieved in a few years. Sustainability is a higher-order social goal that suggests a generational or longre scale of change in understanding and institutions (Connor and Dovers 2004). Other, comparable social goals – the rule of law, democracy, equity – have been around much longer, are contested and under-achieved, yet few would argue to abandon them in fits of impatience.
- Third, sustainability problems are different in kind and perhaps in degree than the more familiar policy problems around which our policy understanding and capacities have been fashioned, and are thus plain hard to address (Dovers 1997).

This third reason invites expansion. The underlying attributes of major sustainability problems – salinity, desertification, climate change, urbanization, biodiversity conservation, environmental health, integrated water resource management, etc – have problem attributes

that make them very difficult to deal with. These attributes include: causes embedded in the foundations of modern economies; possible ecological limits to human activities; broadened temporal and spatial scales; the prospect of sudden thresholds; irreversible and cumulative impacts; pervasive uncertainty; multiple values and interests; complexity and connectivity within and between problems; key assets not traded in markets and thus not valued economically; poorly defined policy and property rights and responsibilities; and mixed public and private costs and benefits.

These attributes are well displayed by salinity, not surprisingly as salinity is a classic sustainability problem. Salinity cuts across jurisdictions and portfolios of policy responsibility, is long term, considerable uncertainty attaches to the magnitude of impacts, it is unable to be neatly addressed by familiar policy instruments, is highly connected to other policy sectors such as agriculture, water and infrastructure, and the causes are deeply embedded in established production and settlement systems. It is to be expected that our traditional structures of knowledge and policy would struggle with such a problem.

There are policy and institutional and intellectual challenges presented by such problems. Specialization in disciplines and in policy brings benefits of focus, efficiency and expertise, but in the case of integrated problems can produce fragmentation and disintegration. To some degree the chronic implementation deficit with sustainability is because it is the business of everyone but no one, relevant to every portfolio of government and discipline of research, but no one has full carriage. Not only small things slip through the cracks. Salinity is bedeviled by such relevance to multiple areas of responsibility and expertise.

The sustainable development policy agenda has lain somewhat dormant, especially in terms of an integrated approach across sectors. This is similar to the loss of the integrative framework of land degradation which has seen a lack of connection between salinity, water allocation, soil management, vegetation management, and so on. But sustainability is on the rise again, carried on a rising swell of climate worries.

Hitching a ride to policy relevance?

Salinity may be a typical sustainability problem, but climate change is the classic one, on the basis of displaying, in spades, all the problematic attributes identified a moment ago. Sustainability has been revived as a broader idea by the emergence of climate change, which is the sustainability issue par excellence – serious consequences, long term, global in scope, pervaded by uncertainty, and tied in cause and effect to virtually every jurisdictional, sector and portfolio. As such, it can to some extent be a proxy for sustainable development. Humankind, we are told by the new climate warriors, has never faced a challenge of these proportions. Is that true?

Let me put forward a proposition – *adapting to climate change is easy, up to a point*. Leaving aside mitigation, consider adaptation to likely climate change. Human societies have always lived with variable climate, and now we strongly suspect that this variability will increase somewhere between a bit and an alarming lot. If we characterize this range broadly, we can consider three scales of climate change and adaptation challenge:

1. First, not too dissimilar from existing variability over recent centuries, within institutional and societal memory, but to which we have not adapted always well and could do much better.
2. Second, an exacerbated degree of variability – significantly more droughts, floods, cyclones, heatwaves, vector-borne diseases, etc – not outside our lived and historical experience, but very challenging nonetheless.
3. Third, change and variability beyond human experience, threatening the productive base of societies, the health of large parts of the population, economic stability, and the integrity of ecosystems.

I am concerned with the first two levels, not the big, scary and uncertain third level. The

proposition is that, in many areas, there are things that we already know we should be doing – or indeed should have done years ago – independent of climate change, that also would have climate adaptation benefits. These things would take us halfway, or even perhaps two-thirds of the way, to a believable climate adaptation response. Consider the following sectors that are often identified as sensitive to climate impacts:

- *Water management* in Australia has always been about climate variability, and if we implemented the spirit and intent of the National Water Initiative vigorously we would significantly enhance our ability to cope with increased variation. The NWI reflects the accrued wisdom of unimplemented past ideas and policy, and addresses climate issues already.
- Investigations of *local and regional economic vulnerability* to climate change invariably recommend a familiar list of strategies that already should arguably be pursued – diversification of the employment base, market niche development, local skills enhancement, increased collaboration amongst firms, etc.
- The vulnerability of *biodiversity* to climate change would be addressed by some very familiar, existing proposals – landscape-wide approaches to vegetation management, a representative and properly resourced reserve network, more comprehensive long term monitoring, etc.
- The impacts of climate change on *health and well-being in remote communities* invites the implementation of things we should have done already – proper medical services, decent education services, development of local resource-based enterprises, and so on. Nothing new there.
- Australia's gross neglect of strategic and operational *energy reform* sees us continuing practices that make climate mitigation and adaptation more difficult, and have ensured that innovation has been retarded. Do not build wrongly oriented houses dependent on air-conditioning; do no continue to build private car reliance into the structure of cities; do not stifle independent local scale energy production – the list goes on.
- At the sharpest end of climate adaptation, *emergency and disaster management*, there is a wellknown list of options, including better communications, sensible prescribed burning regimes, enhanced community scale capacity, improved building standards, and urban planning that reduces rather than increases vulnerability. These reforms are known, well-evidenced and would enable us to handle familiar events better, and would enhance capacities to adapt to greater frequency or intensity of events under climate change.

Across such sectors, we know what we should do already to address existing challenges of climate variability, ecological sustainability and human development – one-third of the task. It is likely that this would take us some way into Level II of enhanced variability, which might get us halfway or even two-thirds the way to believable adaptation. That leaves Level III, where ice-shelves dissolve, cities go under, regions become unlivable and millions of species disappear. But half or two-thirds is better than the very little we have on the scoreboard right now. This proposition, if half correct, invites a refocus of climate adaptation debates, away from a blank canvas and toward a rich menu of known options.

Crucially, this offers adaptation options that are already described, well-researched, tested and are even promised in official policy statements – climate adaptation (and to some extent mitigation) measures that do not have to be developed from a low base of evidence. We can already do evidencebased climate adaptation.

The last sector above – emergency and disaster management – is a useful focus. Vulnerable communities, those that lack resilience, are not sustainable environmentally, socially or economically, whether their vulnerability is to disasters, fickle trade flows, disease, warfare, or threats to their resource base such as salinity (Handmer and Dovers 2007). Enhancing the resilience of communities and their resource base is what salinity management, emergency

management, climate adaptation and sustainable development are about. Many of these issues are linked and invite double dividends. Remote community resilience can be increased through sustainable resource based enterprises, water conservation and biodiversity can both be served by clever revegetation, floodplain management can address flood mitigation and wetland enhancement, energy management can make cities more livable and affordable, and so on.

I put the question to those who know salinity better than I do – does this proposition apply? Does it give us half or two-thirds? There are three questions here that might benefit from close consideration, and then wide communication of the answers:

- What institutional, policy and management reforms have been on the agenda to handle salinity for some time, well-argued and likely to succeed, but which have been poorly implemented?
- Of these, which would contribute to either mitigation of climate change or adaptation to increased climate variability?
- And, are there benefits also accruing in terms of other issues, such as water management and biodiversity, adding to the attractiveness of available options?

A few right answers and we have salinity responses with added logic and imperative in a climatefixated world, and salinity can hitch a ride to topicality and influence. If "hitching a ride" on the climate and water policy and research bandwagons feels uncomfortably opportunistic, all I can say is that everyone else is doing it, shamelessly. Put in a positive light, it entails climate change becoming – maybe – a belated proxy for the integrative agenda that sustainable development offered and which societies have, as yet, failed to interpret and turn into real institutional change. Furthermore, if climate variability does increase significantly as is predicted, then closer linkage between climate change and salinity (and much else besides) will be a sensible thing in both research and policy.

In conclusion

Is the proposition that "adaptation to climate change is easy, up to a point…" as applicable to salinity as it is to other sectors? That question I leave to you, with the argument that if it is then that offers a point of leverage for promoting the salinity issue on ever-changing, fluid policy agendas, in the hope pushing for the creation of R&D and policy process and institutional arrangements that will be more consistent, informed and effective than in the past. Salinity might be then mainstreamed in the landscape of policy and institutions.

One lesson from the history of salinity is that scientific or even community knowledge is insufficient to ensure action, and that the complicated world of policy, politics and institutions is where the real challenge lies. I have not suggested how that messy reality can be avoided, but a strategy for engaging with it. Those concerned with salinity might even teach those concerned with climate change that adapting to a changing environment may not be as hard as they think, up to a point.

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