SALINITY HAZARD MAPPING METHODOLOGIES: THE PAST, PRESENT AND FUTURE

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Dryland salinity is a key environmental issue in Australia. Over the last 30 years, numerous studies have been undertaken in an attempt to increase our understanding and to try to remedy this growing problem. However, the extent of primary, secondary and urban salinity continues to expand. Various salinity hazard mapping methodologies have been tried, and published hazards maps and 'risk assessments' have been produced. The first major attempt to compile at a national scale, the extent of the dryland salinity hazard, was by the National Land and Water Resource Audit (NLWRA). The aim of the NLWRA was to initiate a way forward collaborating work from all the States. Groundwater level and trend data as well as the classification and incorporation of Hydrogeomorphic Units (HGUs) were the main focus for the salinity hazard assessments. This work of the NLWRA was brought together in the report *Australian Dryland Salinity Assessment* (NLWRA 2001).

In 2000, the NLWRA was the end of a chain connecting a series of studies and reports which primarily focused on using groundwater data and HGUs for assessing salinity hazards. The NLWRA salinity hazard assessments were carried out on a state by state basis with no standard methodology or required data sets. These studies included individual State Dryland Salinity reports prepared directly for the NLWRA, the Salinity Audit of the Murray Darling Basin and various State Salt Load Reports.

The range of methodologies used throughout the NLWRA Audit included: mapping salt stores from aerial photographs, determining HGUs and assigning to them an average groundwater depth from bore data, kriging, relating groundwater depth to topography and land systems mapping. Mapping occurred on all scales from regional and catchment, to local. The quality of data also varied as well as the Digital Elevation Models (DEMs) used. Each States' methodology and data sets varied, as did the quality of data. As a result, there is considerable doubt as to the full usefulness of the NLWRA results as comparisons across the States cannot be made due to major data gaps and methodology limitations.

Since the NLWRA, many of the States have redeveloped their methodologies for mapping salinity hazards and risks. Shallow watertables and groundwater trend data are no longer the primary focus due to the absence of substantial relevant data to map on this basis in many parts of Australia. Instead, the more common methodology being adopted involves a GIS Composite Index Approach, where a variety of biophysical factors are ranked and weighted for salinity hazard. These factors are then summed up to form a salinity hazard map. In tandem with this spatially explicit hazard mapping approach, there is ongoing numerical modelling of processes to provide a more quantitative and predictive basis to hazard and risk assessment (Gilfedder & Walker 1998).

Currently, work is being undertaken by the CRC LEME Salinity Hazard Mapping Program at Geoscience Australia, to value-add to the GIS Composite Index methodology. CRC LEME are utilising their expertise in landscape and regolith studies and geophysical interpretation, to develop some additional biophysical data layers to integrate into future Composite Index assessments. The layers include: regolith architecture, salt storage and path of groundwater movement.

A key issue that has emerged from our investigations into the methodologies of mapping salinity hazards has been the use and definition of the terms 'hazard' and 'risk'. In the Australian salinity 'industry' these terms have often been used interchangeably. The NLWRA identified this confusion and laid out some clear definitions for each of these terms. Since then, there has been some improvement in the standard application of these terms, although some uncertainty remains. Based on the definitions of the NLWRA and also on definitions used in risk assessment in other Australian and international environmental arenas (Granger & Hayne 2001, ISDR 2002), salinity hazard mapping focuses on a biophysical assessment whereas risk assessment incorporates hazard assessments *and* impacts on socio-economic factors. The work of GSHARP in Victoria (Heislers *et al*. in prep) appears to be one of the more progressive salinity studies in Australia to look at the impacts of salinity hazard on the regions assets to derive an ‘asset risk assessment’. Standardisation of hazard and risk terminology will enable more consistent evaluations and increased confidence levels in the use of salinity hazard maps.

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