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# SUSTAINABLE DEVELOPMENT OF NEW SOUTH WALES RANGELANDS: THEORY AND PRINCIPLES

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## ABSTRACT

Pastoral use of the New South Wales rangelands has not been sustainable. Change in land use policy is required to achieve sustainability. Yet without understanding how this evolving social-ecological system responds to interventions change may not succeed. Working with knowledgeable stakeholders in the NSW rangelands we have explored land use options, their suitabilities and compatibilities. Working with policy makers we have developed policies to support sustainable land use and are now refining strategies for implementing these policies. To do this we draw from theories of complex adaptive systems and social psychology. Critical to our success will be strategies that build shared knowledge, seek negotiated rather than legal solutions, and work within the system to be changed not external to it.

## HAS LAND BEEN USED SUSTAINABLY

In the past grazing pressure and the proliferation of water points has caused reduction of perennial ground cover, shifts in the distribution of native species, increase in soil movement, and in some range types replacement of perennial with annual pasture (Baker *et al.*, 1999). Woody weeds have dominated large tracts of land (Gardner *et al.*, 1998) and our modelling suggests that many range types are at risk from further invasion. Extensive clearing of some vegetation has occurred. There has been a loss of fauna from the landscape, particularly amongst the small mammals, 64 species of vascular plants are listed as endangered in the NSW rangelands and 15 are presumed extinct. (Baker *et al.*, 1999). Within the Great Artesian Basin bore pressures are falling. Irrigation salinity from the southern rivers has necessitated expensive engineering controls and these actions have only marginally reduced the problem. Salt loads in the Darling at Menindee are expected to rise by 40 percent by the year 2050 (MDBC, 1999). Ephemeral lakes systems have been targeted for opportunistic cropping, which under certain regimes can have significant impact on lakebed fauna (Briggs and Jenkins, 1997). Rangeland social and economic systems suffer from low commodity prices, declining terms of trade for agriculture, and high levels of pastoral debt. The human population is ageing and reducing, services are declining, employment levels are low, and social security payments high and increasing. Conflicts have arisen over Aboriginal land rights, nature conservation, irrigation and river condition. There is little indication that that these conflicts will diminish under our current way of operating.

To our project team, "sustainable use" means that the social, economic and ecological systems of a region persist indefinitely without decline in human welfare, degradation of land and water resources, or reduction of options for future generations. Seen in these terms, human use of the NSW rangelands has not been sustainable.

We assert that, to achieve sustainable development we must make changes to the policy and legislative framework that guides the use of land in the rangelands. Fundamental to this process is an understanding of the social/biophysical systems that influence land use. In the context of this paper we use this understanding to improve the form of policy proposals and how they are implemented, not to define the specific content of policy.

## **A SYSTEMS VIEW OF NSW RANGELANDS**

To help our understanding of NSW rangelands we draw heavily on theories of complex adaptive systems (CAS). A complex system is one having multiple interacting components. An adaptive system is one which has components able to adapt to stresses, causing the system to change. Human interactions with the environment are rich and complex, involving multiple components continuously responding to changes in each other so that the system evolves over time. Understanding and predicting this behaviour depends on an integrated and transdisciplinary view of these social and biophysical interactions (Abel *et al.*, 2000; Gunderson *et al.*, 1998).

CAS's tend to be hierarchical with influences and effects flowing between levels of the hierarchy (O'Neill *et al.*, 1986; Pahl-Wostl, 1995; Holling and Sanderson, 1996). Each level may operate at different temporal and spatial scales. Larger, slower processes tend to control smaller, faster ones when variables have numerous feedbacks to other variables (Holling *et al.* 1998) - for example topography defines and restricts movement of soil, nutrients and water which in turn controls distribution of vegetation. At other times, smaller, faster processes, released by the breakage of feedback loops, may take control - for example increase in vegetation supports localised fire, and the loss of cover allows subsequent redistribution of soil and nutrients. This generates adaptation, hence evolution in the system and the system becomes more resilient because of the "memory" it has gained. An important tool in CAS analysis is to recognise two types of critical points in the evolution of the system. One is when intervention may be vital for the avoidance of irreversible and unwanted change. The other is when and how intervention is likely to be most effective. At such times human interventions become the "levers" by which the system can be manipulated. Such concepts of system change are as applicable to social systems as they are to biophysical ones.

To implement change we must also understand why human social systems resist change. Social theories, such as personal construct psychology (Kelly, 1955) and mental model concepts ( Craik, 1952; Johnson-Laird, 1983) provide us with insights. Humans tend to accept information that confirms pre-existing perceptions and shed that which contradicts. Personal construct psychology predicts that in these circumstances people construct mental models of nature that are simple and comfortable. Such models are misleading when systems, like the rangelands, are highly variable and difficult to predict (Abel *et al.*, 1998).

## **INFORMING POLICY FOR SUSTAINABLE DEVELOPMENT**

To overcome this form of social inertia we work closely with the people involved in rangeland management and policy formulation so that there is mutual learning and teaching about system behaviour. In this fashion the communal view evolves to a shared understanding. A side effect is that the resulting communal ownership increases the likelihood of successful implementation of new policies. The broad community and policy maker support arising from the mutual learning process can act to rapidly breakdown organisational resistance. We discuss this in greater detail later.

Our project has addressed five stakeholder sectors (Aboriginal, agro-pastoral, conservation, mining and tourism). Within each, stakeholders formulated guidelines of how land attributes make land suitable for the uses their sector advocated. These guidelines were used to generate suitability maps for those land uses. Outputs from this process were given to policy makers. Policy makers generated system models that described the relationships between biophysical variables (e.g. range type, rainfall, geology) and social variables (e.g. policies, legislation, markets, demographics) that either advanced or impeded the interests of each of the stakeholder sectors. With this knowledge policy makers have developed policies designed to promote each sector, with resilience and sustainability as core performance criteria.

We work with only forty stakeholders spread unevenly across the sectors. These stakeholders cannot be expected to represent the values and negotiate land use outcomes for each of the sectors they

represent. As a consequence we have not produced land use maps. However, we are confident that the guidelines relating land attributes to land use suitability do accurately capture the decision logic of people working in these sectors. As such these land suitability surfaces potentially represent a key resource for regional planning. More localised sub-regional work is needed to refine these surfaces and they will be enhanced by any future improvements in attribute data.

An important step in our process was overcoming territoriality for land by the stakeholders who developed the suitability maps. We did this by developing matrices of land use compatibility. We asked the question whether land uses could co-exist in the same space, either at the same time or in the future, without impacting on the values and performance of other land uses. Output is in the form of a table listing various levels of compatibility - fully compatible land uses from the same sector; fully compatible land uses from different sectors; potentially compatible with negotiated conditions; no compatibility; or agreement not reached on capability. Of the 1920 possible interactions between land uses 1561 (81%) were either potentially or fully compatible. This highlights the strong potential for multiple land use in the rangelands. Much more work is required to negotiate the conditions of compatibility and there is a critical need for regional planning agencies in the NSW rangelands to finish this task.

## **STRATEGIES FOR IMPLEMENTING POLICY CHANGE**

Strategies for implementing policy change must account for impediments to change that exist in our social systems, in part the social inertia described previously. For the NSW rangelands this is applicable in two major areas, one is how to resolve disputes over access to and use of land, the other is organisational resistance to change.

Critical to implementation of policies is that policies be designed to minimise negative impact on other sectors and where possible maximise "win-win" scenarios. The same is true for impacts on sectors that have not been directly represented in our project. Without such consideration backlash from disenfranchised sectors may generate sufficient political pressure to impede the implementation of policy through the legislative system.

Disputes over access to and use of land are not new in Australia and provide a major impediment to land use change. The dominant mechanism for dispute resolution has been through legislation. Have these legal mechanisms provided a solution to conflict over land use and access? Aboriginal people still conflict with pastoralists despite much effort in the courts. Conservation groups still conflict with pastoralists over how much land should be included in conservation reserves and are potentially in conflict with the minerals industry over loss of mineral rights in those reserves. Legal approaches are inherently divisive and typically lead to continuing challenges escalated to higher jurisdictions by the losing parties. This happens because usually in a legal contest only the winning party is satisfied. In a contrasting approach, the minerals industry although having significant legislative ability to access land for exploration and mining now stresses the need for negotiated solutions to conflict over land use. For example, the NSW Minerals Council publishes an extensive document that outlines the steps to take in public consultation and negotiating access agreements (NSW Minerals Council, 1997). As a guiding principle policy that is founded on and promotes the process of negotiated agreement is more likely to be successful than policy which is dictatorial and reliant on regulatory control.

We strongly support this concept and give three examples of similarly constructive approaches for regional planning that have emerged during our project. They are not the only ones. First, land use compatibility matrices have reduced conflict between stakeholder sectors and forced the realisation that much of the perceived conflict did not exist or could be resolved through negotiated solutions. Second, land use suitability surfaces have the potential to highlight areas where although land uses are incompatible no conflict exists because the highly suitable map units for each land use are spatially separated. Third, Indigenous Land Use Agreements where access and use is negotiated between parties have the potential to minimise Native Title conflict. They would be further enhanced by the

grouping of land attributes and land uses so classes of predetermined ILUAs could be used as a starting point for negotiations or as guidelines in development approval processes.

There is a tendency for government departments to act for their individual benefit instead of the common good. The social aims they are expected to pursue under the law can become subservient to the accumulation of resources and power, and the persistence of the organisation for its own sake (Gunderson *et al.*, 1995). A department is thus unlikely to accept downsizing, amalgamation or closure without sophisticated opposition. Departments (and ministers) compete with each other for resources and power, and this limits their co-operation over issues that cross sectoral boundaries (e.g. sustainable development).

What is the solution to these organisational impediments? Again our approach is to work with officials from departments with responsibilities in natural resource management (NRM). They have developed a shared understanding of the NSW rangelands alongside sectoral lobbyists and representatives from the stakeholder process. They have explored the consequences of policy proposals not only on the sector their department supports but on the sectors supported by other departments. They have sought policy options that provide win-win's for the sectors they represent and, we suggest, for their own departments. They have explored the political implications of the policies that have been proposed and are hopefully prepared for the modifying influences that may come from competing sectors via ministers in the Government.

The next phase in our implementation strategy is to facilitate adoption of policies by developing champions for proposed policies within the NRM departments. We have identified key individuals to represent each department on an implementation committee. They have been chosen based on their level of influence within their department and their continued participation and support for our project. Their task is twofold. Firstly, to provide a mechanism for communication between departments about land use policy. Secondly, to facilitate support within their own departments for the policies developed by our project participants. Hopefully, given the right triggers they will become the small scale, fast acting variables that can bring about system change and renewal as described by Holling *et al.* (1998).

## **OUR VISION OF NSW RANGELANDS IN THE NEXT MILLENNIUM**

Evolving from our exploration of how to inform policy design and successfully implement policy change is a vision for the rangelands of NSW. In the year 2050 multiple land use options will exist and will be actively supported by legislation and policy. They will be sustainable over subsequent years without degrading human welfare, land and water resources, or the options of future generations. They will provide for resilient social and biophysical systems that can respond and adapt to disturbance and variability. They will, perhaps most importantly, express the values and visions of all stakeholders in the NSW rangelands through a negotiating land use planning process. However, as we have described in this paper, change cannot occur without knowledge of what is being changed and how that change works. Our understanding of social systems suggest that change is best achieved through building of shared knowledge, seeking negotiated rather than legal solutions, and generating mechanisms for change within the system to be changed not external to it.

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