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THE SCIENCE OF DESERT LIVING

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ABSTRACT

Life in desert regions of Australia (and indeed worldwide) is affected by a combination of factors: variability in climate, markets and policy that is outside the control of local people; sparse and often mobile populations; natural, human and cultural resources that are patchy in space and time; and relatively poor scientific understanding despite significant local and traditional knowledge, among other factors. These '*desert drivers*' affect not only ecology and natural resource management, but also service delivery, enterprise development, governance systems and many other aspects of desert living. This paper outlines moves towards consolidating these issues into an integrated, inter-sectoral new discipline – the Science of Desert Living – and the benefits this could deliver.

INTRODUCTION

The seed of an idea of a consolidated Science of Desert Living was introduced two years ago at a previous Australian Rangelands Society Conference (Ward and Stafford Smith, 2004). Over the intervening period this seed has begun to germinate in the fertile ground of the Desert Knowledge Cooperative Research Centre. In this paper we report on this progress and prospects for future growth.

Life in desert regions of Australia is affected by a number of features, including: variability in climate, markets and policy that is outside the control of local people; sparse and often mobile populations; natural, human and cultural resources that are patchy in space and time; and relatively poor scientific understanding in regions that nonetheless are the home to significant local and traditional knowledge. These features, collectively referred to in this paper as "*desert drivers*", are not at all unique to desert regions individually, but together represent a syndrome of effects that characterise desert environments. They affect not only ecology and natural resource management, but also the delivery of key services, enterprise development, governance systems and many other aspects of desert living.

The *desert drivers* demand that we pay particular attention to variability and extremes, small numbers, and engagement with local knowledge in a wide variety of disciplines, such as rangelands ecology, anthropology, social geography, political science, business, economics, linguistics, service delivery technologies, visual arts, engineering, indigenous studies, ecosystem management, law, and evolutionary biology, among many others. Since there are relatively few people working on the problems of desert regions in each of these disciplines, it is hard to get a strong focus on managing for these *desert drivers*. We argue, therefore, that it is time to consider defining a new discipline that puts the *desert drivers* at its centre.

This paper outlines initial thoughts in these areas, and invites input from researchers and practitioners with interests in the Australian rangelands.

APPROACHES

To justify a new discipline, it is necessary to (i) demonstrate how cutting edge work in existing disciplines is having to deal with common issues across the disciplines, but that these issues are not being handled easily; (ii) show how theory or solutions in one discipline, suitably abstracted, may lead to solutions in another disciplinary area, in relation to factors which are readily related to the *desert drivers*; and (iii) identify some methodologies which characterise this work.

FOCAL TOPICS IN THE SCIENCE OF DESERT LIVING

As a useful organising principle, the portfolio of research projects in the Desert Knowledge CRC is centred around: application to sustainable livelihoods and business opportunities; viable desert settlements at all scales; and thriving regions in which the economic flows and institutions are arranged such that the whole is greater than the sum of the parts. The goal is that the outputs of this portfolio will contribute across many sectors in society – natural resource management, social and technical service provision, infrastructure, business development, governance, policy design, human well-being and cultural maintenance, among others. The outputs may also be seen through the lenses of a variety of different research disciplines, whether rangelands ecology, social geography, economics or law. The purpose of a Science of Desert Living must be to draw out the cutting edge research in any of these areas inasmuch as it responds to the key challenges of desert living. With such a potentially complex base to draw on, some structure is required. An initial option is to adopt some of the priority areas which DK-CRC has determined through extensive consultation, and assess the Australian contribution in these arenas; for example:

- *Managing natural and cultural resources in desert environments* – this arena has been an area of major work in Australia over many decades, where significant international intellectual leadership can legitimately be claimed in various fields. These include the use of remote sensing for natural resource management purposes in areas with a sparse population, particularly for drought warnings and fire tracking in recent years; the development of new ecological theory relating to discontinuous change and resilience; and analysis of the peer group management institutions such as Landcare, to mention but a few. Notable developments within the Desert Knowledge movement recently include the understanding and modelling of dust production in desert regions over time and space; institutional arrangements around bush products to enhance production and protect local interests; and the development of market-based instruments to support biodiversity management in desert conditions (see DK-CRC, 2005).
- *Accessing technical and social services on desert settlements* – this arena has been one of intensive policy development over recent years, which has led to a number of projects exploring the governance of service provision (eg. the Indigenous Community Governance project of ANU and Reconciliation Australia, see <http://www.anu.edu.au/caepr/governance.php>) as well as the technical implementation of various services such as power (eg. Bushlight, see <http://www.bushlight.org.au/>) and telecommunications. Notable developments within the Desert Knowledge movement recently include the evolution of the idea of ‘technacy’ – solving problems in their own context, here that of all the *desert drivers*; understanding the ways in which resource flows in remote communities differ greatly from larger towns and cities; and identifying successful ways of delivering education services in sparsely-settled regions (see DK-CRC, 2005).

Other arenas to be explored include regional economics, business development, and the linkages between traditional knowledge and science.

CROSS-CUTTING THEORY IN THE SCIENCE OF DESERT LIVING

A new discipline must have its own axioms and concepts that help explain things that other disciplines do not. Key potential themes based on the desert drivers that may be developed in this regard include the following examples:

- *Living with variability, unpredictability and extremes* – an extensive understanding of how plant and animal life histories respond to climatic variability could help inform how small businesses should respond to unpredictability in markets and policy (biomimicry);
- *Living with sparse and patchy resources in space and time* – an understanding of the concept of meta-populations in conservation biology may help to inform networking in business and governance systems in remote areas; and
- *Living with local and traditional knowledge in times of change* – local knowledge has immense capacity to inform policy and natural resource management activities, but a strong emphasis on the links between science and local knowledge systems may also be more crucial for the future of deserts than for that of other regions.

Two examples in which we have begun exploring issues from one discipline which may give rise to fundamental concepts that can be applied across disciplines (and business sectors) are:

- **Vegetation-response models can be applied to desert businesses.** The ways in which different plant life history strategies (ephemeral, annual, perennial, etc) respond to variability has been studied extensively by ecologists. Analogously, different business models also respond differently to drivers: for example, the effectiveness of marketing campaigns may increase exponentially (initially at least); the returns from bidding for mining contracts have a threshold; and the benefits from communications infrastructure may be logarithmic. Demand and input supply (as well as competition and margins) are the drivers of business, and patterns of variability predispose different business models to surviving desert variability. Over time, the composition of successful businesses reflects local variability in the same way as that of vegetation (eg. Stafford Smith and Pickup, 2003). Therefore studying business composition can tell us about local variation, and understanding business models can help build stable businesses in response to this variation.
- **Social network analysis and theory can be used to effectively network isolated desert businesses.** Research into agistment networks indicates that variation affects pastoral networks, and that making information more available can stimulate network 'connectivity' and greater reciprocal cooperation (McAllister *et al.*, 2006). For deserts there are lessons for ongoing and future networking efforts. Presently, Desert Knowledge's Linked Business Networks Project is creating hubs for business, and the desert art network DESART is centralising community art marketing (cf. <http://www.desart.com.au>). Applying existing models to specific desert contexts will guide sensible investments in networking.

We anticipate numerous other topics emerging to provide a sound theoretical basis for a Science of Desert Living, and welcome input from readers on this.

METHODOLOGIES FOR THE SCIENCE OF DESERT LIVING

A given discipline has methodologies that characterise how it is carried out. In the case of the Science of Desert Living, methodologies must consider how variables will respond to the *desert drivers*. For example, climatic unpredictability makes simple replication of experiments over time impossible in rangelands ecology, so that classical ANOVAs are

usually inappropriate. The large spatial scales at which management occurs mean that replicates in space are also usually hard to obtain. Issues such as these highlight the need to use a particular suite of experimental, data collection and statistical analysis tools in conjunction with specific underlying conceptual models.

DISCUSSION

Over the coming two years, the Science of Desert Living project is aiming to create a solid basis for establishing this new discipline, and to prove its worth by helping to provide findings for management, policy and research itself at different scales. We are embarking on a series of workshops to draw together the best desert science understanding in different current disciplinary areas over the next year, gradually synthesising general principles out of these.

Aside from helping to consolidate an otherwise small and disparate research effort in desert lands, this new discipline will help to develop a solid underlying theoretical basis for developing solutions to applied desert living problems more rapidly and confidently. Whilst the initial focus is on Australia, these principles will be applicable in other desert lands of the world, and indeed have relevance in other environments where the *desert drivers* apply individually. We welcome any inputs.

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