

Desert Knowledge Symposium Plenary Talk

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Dynamic deserts and future research

Desert Australia may be dry but, per head of population, it is the nation's richest region. Desert people generate billions of dollars of export income and run 39,000 small businesses. They cradle the world's oldest living human culture and generate a creative explosion in art, music, desert culture, food and design. The DKCRC has succeeded in realising some of this potential and a consortium of partners want to improve on those successes. The principles of how research is conducted are as important as what is done. Examples of success and indications to future research topics will be given.

When Australians consider the desert lands which make up three fourths of this continent, their overwhelming impression is often one of a vast emptiness. An environment too dry, harsh, sparse and remote from 'the world' for most people to inhabit.

They seldom see, as we who live in the deserts see, the richness, the complexity, the beauty, the challenges and the opportunity.

The ebb and flow of life across a wondrous landscape.

The timeless interplay of rock, soil, wind and water.

These are the things which inspire us, guide us and motivate us, from which we of the deserts draw new life, inspiration and inner wealth.

My talk today is about the nature of deserts and the people who inhabit them.

Particularly it is about their future in a world where features of desert life could well become the norm, rather than the unusual exception.

It is about what we of the deserts can bring to our land Australia, not only in material wealth and resources, but also in a sense of our own national identity: a spiritual connection with our country, the wisdom of understanding the place we live.

Our desert origins

If we go back in time to our earliest origins as a species, we find that all humans – no matter where we may think we come from – are children of the deserts, of drought, of profound climatic change.

Four million years ago the Earth was gripped in a drought so fierce the Mediterranean dried out. It was possible to walk, dry-foot, from North Africa to France across a glittering bed of salt crystals.ⁱ The removal of this vast weight of water caused the crust to buckle, and volcanoes erupted like firecrackers all down the Great Rift Valley, blanketing the land in ash. Forests on the African plains were scorched back into tiny refugia.

Certain apes faced a tough decision – go out into the open grasslands, or cling to the few remaining patches of forest.

Eat fruit, or eat meat.

When we ventured out onto the open savannah, still vulnerable and weaponless, our only defence was community. To protect our helpless babies we had to form a society that was so close-knit and co-operative it could outsmart the fierce predators of the open grassland.

Other animals move in flocks, herds or packs, but none of them work together like humans or form rules for living and survival as we do.

None of them foresee danger so far into the future as we do and take steps to avoid it.

Our desert origins have endowed us with long sight.

By 1.75 million years pre-humans had pushed up into Asia as far as Georgia. A million years ago we were hunting elephant and hippopotamus on the grasslands of Java – long before they became rainforest. Three quarters of a million years ago *Homo erectus* made the world's first sea-crossing, to the island of Flores, preparing the way for one of the most momentous achievements in human history – the settlement of the Australasian continent by sea in the last 100,000 years by Aboriginal ancestors.

Quite a journey for a desert creature.

The deserts have never ceased to challenge us.

The first great civilisations, those of the Tigris-Euphrates, Indus, Nile and Yellow valleys, arose amid desert landscapes where water was plentiful – not on the moist, fertile and forested soils of the temperate regions.

Agriculture and irrigation, the keystones of urban civilisation, are based on grain production, which itself originates in the grasslands.

The continual stresses and pressures which the deserts exert on their inhabitants have been the drivers of all that we are today. Thanks to them, the drylands remain a fountainhead of knowledge and innovative ideas for how to live well, now and in the future.

Over history the deserts saw the birth of cities, which in turn brought pottery, textiles, metalworking, writing, architecture and building, social, legal, political, philosophical and religious systems many of which persist to this day.

Sciences such as mathematics and astronomy were born among desert peoples. Religions such as Judaism, Christianity, Islam and Zoroastrianism had their genesis in the drylands. Steel, gunpowder and weapons of conquest also seem to have originated with desert people.

Many of the most influential discoveries and innovations which have directed the course of history are thus the products of a dry landscape whose variability confronts its inhabitants with continual survival challenges – forcing them to use their brains, creativity and instinct for co-operation.

These are qualities humanity now needs, more than ever.

Deserts today

According to the United Nations' Millennium Ecosystem Assessmentⁱⁱ, drylands occupy 41 per cent of the Earth's land surface and are home to

about two billion people, as well as countless valuable and unusual animals and plants.

Most of the world's rural poor inhabit these dry areas, and birth rates there continue to be high relative to advanced countries and to cities. If present population growth is sustained, natural increase alone will lift desert populations to more than 3 billion by the mid-century.

At the same time the drylands themselves are expanding physically due to climate change.

As global warming takes hold, the Hadley cells – vast vortices of warm air which rise over the equator, lose their moisture, and then descend as dry, cloudless air over the world's deserts and rangelands – are expected to broaden outwards towards the poles. The UK's Hadley Centre for Climate Prediction and Research expects a 40-50 per cent expansion in the area of the Earth's surface under regular drought by the latter part of this century.ⁱⁱⁱ

The deserts are also growing due to human overexploitation and mismanagement: the UN Environment Program says that desertification has reduced productivity on 6-12 million square kilometres – an area between one and one-and-a-half Australias in extent.

Due to these three factors of growing populations, desertification and climatic drying the world's drylands and deserts may have more than 4 billion inhabitants by the second half of the 21st century. A number of studies have warned about the threat this poses to global stability and security if these populations cannot be sustained.

Yet the deserts and drylands are still immensely productive.

They are home to three quarters of the worlds' 3.6 billion ruminant livestock and generate most of its mineral wealth.

They account for 43 per cent of cultivated farmland and so provide a significant slice of the global grain supply.

They yield many valuable commodities and skills which create trade and employment in cities and temperate regions.

Their ecosystems recycle about a quarter of the world's carbon. They are a primary source of the nutrients which sustain humanity and – contrary to what you might think – they are huge exporters of water, either directly in rivers and irrigation canals, or else as 'virtual water' embodied in the meat, timber, grain, metals, tourism, energy and other products and services they provide to the rest of humanity.

Quite simply, human civilisation as we know it today, would be impossible without the deserts, their people and their communities.

It needs them now, and will need them more in future.

The Aboriginal experience

Here in Australia we are uniquely blessed with a desert culture that extends back tens of thousands of years, that understands the nature of deserts and has adapted to their rhythms and their pulses of scarcity and plenty over millennia.

For all this time Aboriginal people have moved through the arid Australian landscape, acquiring deep understanding of its plants, animals and natural features.

Their intricate lacework of song lines that braid together landscape and relationships across a continent are an astonishing strategy and body of knowledge for survival and prospering within the uncertainty of desert conditions.

The first European pastoralists to settle the inland gleaned a little of this understanding from their Aboriginal stockmen, and today scientists continue to learn much through the generous sharing by many Aboriginal people and communities of their prodigious knowledge of the deserts.

This knowledge, we are coming to appreciate, is one of the keys to the sustainability of humans in Australia. If we aim to live here in the long term we must, above all, understand how our continent functions and what drives all life in it.

Australians sometimes think of Aboriginal traditional knowledge as being mainly about bush foods and medicines, plants and animals. There is certainly a great deal of this wisdom - but there is much more, and deeper, cultural knowledge beside.

There is the almost mystic bond between a people and their country.

There are the ties of skin or kinship which define your place in the desert world and relationship to its other inhabitants.

There is the Law with its potent guidance about how best to live, derived from the interwoven experiences and memories of countless human lifetimes, passed down word-for-word over generations.

There is the division of responsibility for different totemic animals and plants, a system that ensures the knowledge held by the group is never lost or compromised, even across a hundred generations.

This Aboriginal desert knowledge is completely compatible with, and essential to, the scientific knowledge our society is building about how deserts work.

They are two strands of the same rope of human understanding which, braided together, offer us a stronger, more sustainable path forward as the world again re-enters a time of heat, aridity and climatic instability.

It is essential that we do all in our power to help Aboriginal people to preserve it, for our common future.

Our desert future

Desert knowledge, in all its forms, is in its essence about survival, about living sustainably amid resources that come and go.

It is about understanding and managing scarcity.

It thus has prodigious relevance and value to the 21st century which ecologist Richard Heinberg has called ‘the century of peaks’ ^{iv}– peak oil, peak water, peak land, peak fish, peak grain, peak metals and peak population.

The current DK CRC has sought to play a central role in better understanding and defining how we manage scarcity well. In particular we have sought to translate this into sustainable livelihoods, viable communities, stronger regional economies and more resilient and adaptable people.

One of the most important things we have learned in five years of intensive study of many aspects of deserts and desert life is that we are still far from appreciating their true potential.

From the opportunities of bush foods, precision pastoralism, desert art and tourism and business networks that criss-cross the continent, to the understanding of landscape, fire and climate, the provision of reliable community water, energy and housing and the needs of remote governance, we have barely opened the door. The full magnificence remains to be explored.

To highlight just one aspect: sunlight. The large engineering firm Worley Parsons recently announced a proposal to build 34 of the world’s largest solar thermal power plants in the Australian deserts, because they

receive more sunlight than anywhere on earth. This could supply 10% of Australia's total energy needs by 2020 and more beyond. Indeed, Worley Parsons points out, we could meet the nation's entire energy requirements from an area of desert no more than 50 kilometres square.

Such ideas have been around for a while. Indeed a solar solution to the nation's energy needs was proposed by Sir Mark Oliphant back in the 1960s. However, in a greenhouse world, this is now starting to look like an idea whose time has arrived.

If the deserts can provide a substantial portion of our future clean energy needs, via solar, hot rocks or other sources, it is going to change how Australia sees them, and the outlook for their inhabitants, profoundly.

To illustrate a second opportunity: communication. Mining company Rio Tinto plans to operate up to 27 mines in the Pilbara robotically within a couple of decades, in what is thought to be the largest civilian automation project anywhere in the world. These signal a major change to fly-in/fly-out operations, with mine operations run largely from Perth and only maintenance and supervision on site. Nevertheless this immense application of information technology and robotics foreshadows great changes in the way we monitor, manage and care for other desert resources and has implications for the whole of desert society, in one way or another. We need to capture the benefits.

A third opportunity, as deserts expand worldwide and grain belts shrink, is to develop precision pastoralism using satellites and remote management technologies to improve the sustainability of livestock grazing in arid and semi-arid lands. World demand for meat is forecast by FAO to grow by 185 million tonnes by 2050. As there isn't sufficient

new land on which to grow the grain for feed, the world may well need to depend on extensive grazing based on sustainable systems, led by Australia.

A fourth opportunity revolves around art, culture and the desert experience. There is a wellspring of creativity in the deserts epitomised by Aboriginal art and cultural tourism and the surging global demand for them, but which is also reflected across all desert communities, which has only just begun to blossom forth and which we can nurture.

A fifth lies in developing the sustainable water, energy, communications, housing and waste recycling systems that will be the infrastructural backbone of remote communities, not only in the Australian deserts, but all over the world, to take advantage of the immense export opportunities that beckon.

A sixth lies in pioneering the novel educational systems and infrastructure that met the needs of people with desert livelihoods, living in remote communities and on country – a field also with exciting prospects as we export our knowledge to the world

In all these areas it can be seen, the deserts have much to offer not only their inhabitants but the whole of Australia and indeed much of humanity globally.

The new CRC

The new CRC proposal is founded on a view that desert communities are at the heart of these great opportunities.

The 560,000 people and 1200 permanent settlements which span the dry three-quarters of our continent are the underpinning of all this knowledge, resilience and creativity.

The deserts may be dry – but, per head of population, they are the nation's richest and most productive region.

Desert people generate \$90 billion a year in gross revenue for Australia, mainly from minerals, energy, pastoralism, cultural and eco-tourism and art.

This means the typical desert resident put around \$80,000 in goods and services to the Australian economy each year - 50% more than the national average.

Desert people are among our most entrepreneurial citizens: they own 39,000 small businesses, one for every 14 people – compared with one for every 32 in Australia as a whole.

They also cradle the world's oldest living human culture and its hopes for the future, along with a creative explosion in art, music, desert culture, food and design for living in dry and uncertain times.

We believe that human heartbeat of the deserts is its communities – Aboriginal, mining, pastoral, tourism and service settlements and centres.

They are what makes all the prosperity, creativity and sustainability possible.

The proposed new CRC will focus on ways to strengthen and develop desert communities small and large, accessible and remote as a basis for the future development and sustainability of the deserts.

The stakeholders in the proposed CRC agree that its research should focus on six areas:

Smart Settlements will develop integrated solutions for the housing, water, energy, communications and waste challenges facing desert communities of all types, but especially the 900 Aboriginal outstations and settlements, pastoral stations and regions in the economic 'catchment' of large mining enterprises. To improve services and their lifecycles in these communities it is necessary to understand population and mobility trends, so this project will explore and document desert demography and mobility as a primary resource for future government and local decision-making for the deserts.

Desert Biz™ will help develop the scope for integrated desert economies based on art, cultural tourism, food products, and pastoral enterprise futures. This research is all about developing sustainable livelihoods and economies in desert regions.

Regional Wealth will explore the infrastructure, employment and other needs of the mining, pastoral, tourism, small business and service sectors and, in particular, the way wealth today can be translated into infrastructure, prosperity and livelihoods for remote areas tomorrow. The aim is to avoid the boom-bust cycles that have driven desert economies in the past and build enduring value from current activity into them.

Sharing Knowledge will take an original approach to overcoming one of the desert's greatest challenges: how to deliver quality education, learning and practical skills to all communities fairly and well across a vast area.

Community Identity will help to perpetuate the ways of thought and understandings of people within desert landscapes, particularly the management of, access to and use of the cultural wealth of the world's oldest living cultures. Preserving and building this heritage for future generations is about remembering where we've come from and how we define who we are in the future. The challenge is to map this cultural heritage so that it benefits all Australians.

Environmental Opportunity will develop better ways to care for the natural resource of the desert as an integral part of pastoral and mining economies, but also to ensure the deserts play a role in the future carbon economy.

In all of its work, the proposed CRC will use evidence-based methods to discover new ways of thought and practical ways of building resilient desert communities which can cope with change and enrich our nation culturally, economically and environmentally.

We will help to share that knowledge throughout the Australian deserts, across the nation and around the world.

Conclusion

The deserts, as we have seen, are both our past as a species – and our future.

They teach us things about the nature of the place we inhabit, and things we need to know about ourselves.

They instruct us in how to live with, and manage, scarcity and unpredictable change.

They lead us to co-operate within our group, but also to join hands with others across a continent and around the world. To share knowledge and be more inter-dependent.

They bring out our qualities of creativity and innovation in a way few other environments can.

The heart of the Australian desert is its people.

And the heart of the people is the desert.

Our wish and our aim is to see that heart strong, vibrant and beating with optimism, so it can sustain a better future for all Australians.

ⁱ This refers to the Great Messinian Salinity Crisis 6-4 my BP.

ⁱⁱ Millennium Ecosystem Assessment: Dryland Systems, Safriel U, Adeel Z et al, <http://www.maweb.org/documents/document.291.aspx.pdf>

ⁱⁱⁱ Burke EJ, Brown SJ and Christidis N, *Modelling the recent evolution of global drought and projections for the 21st Century with the Hadley Centre climate model*, 2007

^{iv} http://globalpublicmedia.com/richard_heinbergs_museletter_peak_everything