DESERT KNOWLEDGE COOPERATIVE RESEARCH CENTRE

SUBMISSION TO

THE PRODUCTIVITY COMMISSION INQUIRY INTO PUBLIC SUPPORT FOR SCIENCE AND INNOVATION

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EXECUTIVE SUMMARY

The Desert Knowledge Cooperative Research Centre (DK-CRC) is pleased to be invited to contribute to The Productivity Commission Inquiry into Public Support for Science and Innovation.

The DK-CRC submission notes that:

- large national research centres are being established in populous coastal cities;
- necessary overlaps between the natural and social sciences are ignored or avoided;
- commercial outcomes in the form of wealth creation for business through royalties, licensing deals and trade-sales are becoming a major driver for publicly funded science and innovation; and
- research leading to the direct benefit or "public good" of individuals - including those who, due to circumstances frequently beyond their control, would be unlikely to benefit from the commercial outcomes of such research - is under-funded or ruled ineligible.

The DK-CRC recommends that the Productivity Commission review Commonwealth funding for science and innovation to ensure that future programs administered by the Commonwealth:

- invest heavily in desert Australia's research capacity to help establish critical mass in a range of desert research initiatives;
- better support Indigenous and non-Indigenous APA-funded research students working in desert areas to help offset the necessarily high expenses that these students incur while doing research;
- establish the equivalent of the CERF scheme for public good cooperative research and, in establishing the scheme, give particular consideration to supporting research operating at the interface between the social and natural sciences;
- better recognise the need for and value of multidisciplinary research focussed on broad livelihoods rather than on narrow technology push outcomes; and
- provide greater recognition, value and reward to research that produces outcomes of *direct* benefit to people, without passing through a traditional commercialisation phases.

Further, the DK-CRC recommends that the Productivity Commission oversee the Commonwealth's implementation of the Research Quality Framework to ensure that it is done in such a manner as to not diminish:

- the importance of research addressing domestic, rather than international, needs such as those of Australians living in desert and remote areas;
- interest in producing research outcomes of direct benefit to end-users through the publication of industry reports for users, commercialisation or rapid industry adoption, rather than exclusively through publication in international peer-refereed academic journals; or
- the value of applied research, such is the normal practice of research collaborations between end users and research providers.

Finally, the DK-CRC recommends that the Productivity Commission intervene in any actions by the Commonwealth to amend the funding regime for university research that would reallocate funds to a small number of "research intensive universities", as this would reduce funding for Australian universities currently addressing domestic and relevant research needs, such as those of desert Australia.

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CONTEXT

Desert Australia

Australia (excluding Antarctica) is the driest continent on earth with more than 69% of its 7.7 million square kilometres classified as desert (which includes arid and semi-arid lands). Our 5.3 million square kilometres of desert is 11% of the world's desert area and our deserts are occupied by 574,000 people, 3% of the Nation's population.

Almost 180,000 Australians (0.9% of the population) reside in the "arid zone" of the continent that covers the inner 3.5 million square kilometres. This arid core is surrounded by a "semi-arid zone" that covers 1.8 million square kilometres and supports 394,000 people, or 2% of the total population.

Aboriginal people reside in as many as 1300 discrete communities widely distributed across their traditional lands, with many communities supporting fewer than 50 persons.

Desert Knowledge

Desert Knowledge is the unique knowledge Australians have about prospering in the hot, dry and isolated island that makes up two-thirds of their continent. Australians value these heartlands for their unspoilt and unique environments, the products they do or could obtain from them, and the remarkable range of cultures that they support.

Desert Knowledge CRC

The Desert Knowledge CRC (DK-CRC) was established in 2003 as a virtual network of researchers from 27 partner organisations nationwide. The CRC links traditional knowledge and local desert skills with current Western science. It seeks to contribute the findings of excellent research to improve the livelihoods of all desert people.

The DK-CRC is working on research projects that aim to find solutions for people and their businesses throughout desert Australia.

The DK-CRC is supported by $20.7 million of DEST funding through the Commonwealth's CRC Program, as well as cash and in-kind commitments from its 27 partners across 5 jurisdictions, to create a research effort worth a total of $90.5 million over 7 years.

The DK-CRC is headquartered in Alice Springs. Its Managing Director is Ms Jan Ferguson and the Chair of the Governing Board is Mr Paul Wand.

The inaugural CEO of the CRC, Dr Mark Stafford Smith, was the joint recipient of the inaugural Northern Territory Research and Development Award, presented in Darwin in May 2005. In 2004/05 alone, the CRC's personnel published 16 journal articles, book chapters or books, and contributed to 29 research presentations in Australia and overseas. In addition, 10 industry and user reports have been published to date on research and consultancy outcomes.

DESERT KNOWLEDGE RESEARCH MANDATE AND SCOPE

Desert Australia needs to grow to encourage self-reliant regional economic development and reduce its long-term dependence upon public funding. To achieve this long-term objective, however, it needs to attract and retain people who can sustain the region's services, create wealth and ensure its equitable distribution across the population.

The aspirations of people living in desert Australia will be compatible with national priorities if the benefit of people living in desert Australia exceeds the costs, especially if the net benefits steadily increase. These principles have informed the DK-CRC's strategic research requirements and they underpin the six Core Projects as described below.

Benefiting Australia through livelihoods from desert resources

Core Project 1 aims to understand how to value, and capture the value, of managing public goods, such as natural and cultural heritage, including the appropriate institutional arrangements. This project maximises national benefits by targeting better investment in remote areas.

Key industry opportunities in remote areas

Core Project 2 aims to lift remote area industries, in particular bush products, 4WD self-drive remote tourism and smarter pastoralism.

Supporting the emergence of small business in desert Australia

Core Project 3 aims to understand and overcome the constraints on remote businesses and to make small businesses more resilient, profitable and able to engage with the wider economy, with an emphasis on Indigenous involvement.

Core Projects 1, 2 and 3 contribute to the overarching *Outcome 1: Sustainable livelihoods for desert people*.

What makes desert settlements sustainable?

Core Project 4 aims to help communities to understand what would make their settlement more sustainable and to inform the debate about the sustainability / viability of remote settlements. The pre-conditions for a sustainable remote community include the institutional and governance frameworks that most clearly express demand for services.

Demand-responsive access to services for settlements

Core Project 5 aims to improve access to better services and reduce the public costs of these. This includes non-welfare approaches to facilitating access to services, reducing costs and increasing efficiencies, models for business and institutional structures, and for policy and investment responses.

Core Projects 4 and 5 contribute to the overarching *Outcome 2: Sustainable remote desert settlements, particularly remote Indigenous communities*.

Desert regions as integrated systems

Core Project 6 aims to facilitate regional economic development. This includes understanding a desert region as an integrated system, designing a thriving sustainable region, and projecting future trajectories of different desert regions.

Core Project 6 contributes to the overarching *Outcome 3: Thriving desert regional economies*.

The execution of the above research projects involves extensive engagement of end-users and stakeholders, including those in remote settlements and transient camps. As a result, the outcomes are highly applicable and will transform practice in desert Australia rather than solely add to the existing knowledge sets held by academic researchers in coastal cities.

EXAMPLES OF DESERT KNOWLEDGE SCIENTIFIC RESEARCH LEADING TO INNOVATION

The DK-CRC's research is unique in Australia and highly valued by its participants and stakeholders. It applies multidisciplinary research to social and scientific challenges across an immense geographic area. It challenges prevailing paradigms by bringing together Western and Traditional knowledge. It benefits from the collaboration of classically trained scientists with local researchers and data collection methods avoiding some of the pitfalls of ill-conceived practices of western practice in Indigenous spaces[1]. It utilises social science processes to help make practical sense of scientific research outcomes and it brings to bear scientific processes upon socially constructed and determined challenges and opportunities.

Within the six Core Projects, the DK-CRC has 25 ongoing research (sub) projects. Three of the research projects currently underway are particularly noteworthy in that they typify the uniqueness of the DK-CRC's research profile and practices and will foster innovation within desert areas.

Sustainable bush produce systems for the arid zone

The arid zone native foods industry is in the early stages of development. The sustainable bush produce systems project aims to utilise a whole-of-chain approach to underpin the contribution of Indigenous people to the native foods industry and the benefits they may gain from it. It seeks also to assist the development of the native foods value chain.

Specific research activities within the project consider: (i) sustainable wild harvest systems, (ii) horticultural production systems, (iii) genetics and plant improvement, (iv) post-harvest storage and produce quality, (v) market and consumer issues, and (vi) the positive impacts of the industry on Indigenous communities, including health impacts.

The vision of the project is for a demand-driven native foods industry that has strong Indigenous participation, with clear benefit streams returned to Indigenous people and others in arid zone communities.

Design and thermal performance in the desert built environment

Australian desert regions experience particularly large temperature ranges, which greatly affect liveability in desert communities and the effectiveness of the buildings in those communities. This project is studying the internal climates of buildings in desert communities, their design and passive climate control characteristics, and the energy used for active heating and cooling.

This research is expected to result in more efficient and effective energy utilisation in desert buildings. This will in turn improve building amenity and reduce energy consumption and cost. These outcomes will influence planning for electricity generation infrastructure, and lead to enhanced cooperation between researchers and stakeholders and, ultimately, more sustainable Australian desert communities due to lower cost, more liveable and more sustainable community infrastructure.

Sparse ad hoc communications networks for desert (SAND) environments

The SAND project is building an affordable, low maintenance and easy to use voice network for communication between language groups and among local communities.

[1] See for example, Michon, G. (2000). Indigenous forestry: how to turn localised knowledge into a relevant forestry science. In A. Lawrence (Ed.), Forestry, forest users and research: new ways of learning. The Netherlands: ETFRN, Wageningen.

It will provide a cost effective communications infrastructure in desert Australia. The communication system is suitable for mobile and sparse populations and it requires minimal skills in configuration and maintenance of the infrastructure. It allows communication within the communities as well as to the outside world. It is resilient to failures and its performance degrades gracefully under adverse conditions.

Although the principal outcome is to provide voice services, the resulting IP network will also enable a range of other useful services e.g. medical alerts, emergency services, text messaging, banking and payment systems.

THE NEED FOR SUCH RESEARCH

The Nation is in great need of research that utilises combinations of social and natural science approaches, and where the benefits of research lead to lifestyle enhancements and improved sustainability for the 3% of Australians who are often disadvantaged due to their geographic isolation.

However, recent approaches to the funding of science and technology in this country have amended schemes such that:

- large national research centres are being established in populous coastal cities;
- necessary overlaps between the natural and social sciences are ignored or avoided;
- commercial outcomes in the form of wealth creation for business through royalties, licensing deals and trade-sales are becoming a major driver for publicly funded science and innovation; and
- research leading to the direct benefit or "public good" of individuals - including those who, due to circumstances frequently beyond their control, would be unlikely to benefit from the commercial outcomes of such research - is under-funded or ruled ineligible.

This paper identifies a number of areas in the National Innovation System where the above aspects are having deleterious effects.

AGGREGATION OF RESEARCH FACILITIES

The establishment of large-scale research centres, such as NICTA and Australian Stem Cell Centre, helps put the country "on the map" in such disciplines. However, while the Commonwealth utilises public funding to establishing large-scale scientific research centres in popular coastal cities, it becomes increasingly difficult to retain and grow a critical mass of research capability within less popular locations, including inland Australia.

After only three years, the DK-CRC has drawn together previously disparate teams, individual researchers and research users. It has aggregated the efforts of 250 researchers, 22 PhD students - including 6 Indigenous PhD students - and 6 Masters/Honours students into 25 ongoing research projects of benefit to desert Australia. However, to assemble this team has proven extremely challenging, as personnel are often reluctant to commit for periods long enough to maintain and grow the research program and the CRC is required to contribute to the higher remuneration and travel costs associated with desert living. Without such commitment, the momentum on needed research will be lost and a generation of Australians will fail to benefit from the outcomes that this research will bring.

The release on 18 July 2006 of the Commonwealth Minister for Education, Science and Training's response to the report *Improving Indigenous Outcomes and Enhancing Indigenous Culture and Knowledge in Australian Higher Education*, is welcomed as is the announcement that an immediate $1.73 million investment will be made to support several key priorities in the report.

However, more can be done and the Commonwealth must invest heavily in desert Australia's research capacity to help critical mass in a range of desert research initiatives. For example, the Commonwealth should pay a regional allowance and provide greater project support for Indigenous and non-Indigenous APA-funded PhD students working on desert areas to help offset the necessarily high expenses that these students incur while doing research.

CHANGES TO CRC PROGRAM FUNDING

Recent changes to the CRC program guidelines towards preferentially funding those expected to produce commercial outcomes have made it more difficult for CRCs such as the DK-CRC to gain funding.

The political issue created by the failure of the "Queensland" or "Environmental CRCs" to be refunded in the 2004 Round led to the creation of the Commonwealth Environment Research Facilities (CERF) program in 2005. Unfortunately, the absence of the equivalent of the CERF scheme for other public good CRCs has created a gap in Australia's innovation system that needs to be addressed. In addressing this gap, particular consideration should be given to supporting research operating at the interface between the social and natural sciences.

Changes to the CRC program guidelines act also against the funding of multi-disciplinary, issues- or locality-based research in favour of intra-disciplinary, technology- and development-based research.

The Commonwealth should better to recognise the need for and value of multidisciplinary research focussed on broad livelihoods rather than on narrow technology push outcomes.

RESEARCH QUALITY FRAMEWORK (RQF)

The Research Quality Framework (RQF) scheduled for implementation in 2008 will introduce many challenges for CRCs and in particular those that address principally domestic issues. The challenges are centred around the need to recognise research impact, retain recognition for nationally focussed research, and to retain some emphasis on research leading to commercialisation.

Recognise research impact

The DK-CRC welcomes new thinking (16 June 2006) from the Commonwealth Minister for Education, Science and Training around the need for the RQF to reward not only research excellence but also to measure and reward research impact.

If implemented without an impact measure, the RQF will reduce the attractiveness of the CRC program, which is founded upon co-investment in research by the Commonwealth and the research users. Any move away from rewarding research impact through the RQF will make industry-focussed research less attractive for research providers and therefore research users are less likely to engage.

Reward nationally relevant research

The research being conducted by the DK-CRC is of excellent quality. By nature of its mandate, however, it focuses on domestic issues in the first instance. The research findings will often have applicability beyond Australia but the principal applications will, for example, lead to increased sustainability of desert livelihoods in Australia, policy development for Australian Government, improved practices for Australian businesses operating in remote areas of Australia, etc.

The application of an RQF based principally on citation figures will reward to a greater extent research reported in international research media and lessen the importance of research conducted for the benefit of Australia and in particular, the minority of Australians who are living in desert and remote areas.

Retain some emphasis on research leading to commercialisation

Outcomes, such as commercialisation products, the establishment of spin-off companies and the creation of wealth from licensing revenues are the hallmark of many successful CRCs.

The RQF application, however, will refocus Australian research on the generation of new knowledge, as measured by academic publication rates and citations, regardless of its applicability. It will diminish interest in producing research outcomes of direct benefit to end-users through publication of industry reports for users, commercialisation or rapid industry adoption.

Full implementation of the RQF may lead Australia to return to its 1980s position of generating a higher than expected volume of knowledge, as measured through historic methods, but having a lower than expected commercialisation output and attendant lack of patents, spin-offs and licensing revenues.

Support applied research as a necessary part of the research spectrum

Due to the nature of partnerships between researchers and end-users, CRC research profiles are generally skewed toward the applied end of the research spectrum, compared to research that might otherwise be conducted in a university or publicly funded research agency. This is similarly the case for the DK-CRC.

Performance assessment methods under the RQF initially proposed would have reduced the attractiveness of applied research for research staff affected by the RQF regime and consequently adversely impacted upon CRC participation and performance.

"RESEARCH INTENSIVE" UNIVERSITIES

Members of the Innovative Research Universities (IRU) and the Australian Technology Network (ATN) collectives of universities have engaged heavily with the DK-CRC's research agenda over the past five years.

Some of these universities have campuses in the semi-arid zone and many have developed focuses on the research needs of regional and remote Australia. Any shift in the overall level of public funding for research towards a smaller number of so called "research intensive universities" would lead to a migration of the best ATN and IRU researchers to sandstone universities making it more difficult to attract academics, let alone their attention, to the research needs of central Australia.

ALTERNATIVE ROUTES TO TRADITIONAL COMMERCIALISATION

While the RQF needs to ensure research remains focussed on useful research outputs, there is a need for the Commonwealth to provide greater recognition, value and reward to research that produces outcomes of *direct* benefit to people, without passing through traditional commercialisation phases.

Such research outcomes, as are expected of the DK-CRC's research programs, enhance local knowledge, strengthen participatory decision making, provide knowledge intensive "tool-kits" for small business, enhance sustainable livelihoods in remote regions, etc., without being patented or licensed. Further, the application of such research directly into the hands of the user and stakeholder will lead to direct benefit accruing to people who, due to circumstances frequently beyond their control, would be unlikely to benefit from such research if it were commercialised through patents or license agreements.

RECOMMENDATIONS

The DK-CRC recommends that the Productivity Commission review Commonwealth funding for science and innovation to ensure that future programs administered by the Commonwealth:

- invest heavily in desert Australia's research capacity to help establish critical mass in a range of desert research initiatives;
- better support Indigenous and non-Indigenous APA-funded research students working on desert areas to help offset the necessarily high travel expenses that these students incur while doing research;
- better recognise the need for and value of multidisciplinary research focussed on broad livelihoods rather than on narrow technology push outcomes; and
- provide greater recognition, value and reward to research that produces outcomes of *direct* benefit to people, without passing through traditional commercialisation phases.

Further, the DK-CRC recommends that the Productivity Commission oversee the Commonwealth's implementation of the Research Quality Framework to ensure that it is done in such a manner as to not diminish:

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- the value of applied research, such is the normal practice of research collaborations between end users and research providers.

Finally, the DK-CRC recommends that the Productivity Commission intervene in any actions by the Commonwealth to amend the funding regime for university research that would reallocate funds to a small number of "research intensive universities", as this would reduce funding for Australian universities currently addressing domestic and relevant research needs, such as those of desert Australia.