Department of Innovation, Industry, Science and Research

Submission to the Senate Inquiry into the Effects of Climate Change on Training and Employment Needs

Introduction

The Innovation, Industry, Science and Research portfolio is involved in formulating research training policy in close tandem with the Department of Employment, Education and Workplace Relations, and has indirect influence on policy for industry skills and training.

This submission outlines portfolio activities to monitor and/or respond to demand for climate change related skills, and provides general information about identified skills shortages and likely areas of future demand. It also briefly describes work being undertaken by research agencies to assist understanding of climate change in the Asia-Pacific region.

- The Industry and Small Business Policy Division monitors broad trends in labour supply, and works with DEEWR on industry skills issues.

- The Science and Research Division administers research block grant funding to universities. Funding for research is also provided through the Australian Research Council. This funding is largely delivered in a way that allows universities to determine teaching and research priorities in relation to climate change.

- The Science and Research Division also administers research infrastructure funding, which is important in the development of capabilities, and funding for international research collaboration.

- The portfolio has responsibility for research agencies, including the CSIRO, ANSTO and AIMs, and administers the CRC program, all of which have climate change related activities.

Industry and Small Business

It is worth noting that the Australian economy is experiencing a tight labour market with strong demand for skilled workers in general. This is being addressed by initiatives across the Government such as the *Skilling Australia for the Future* program; the establishment of Skills Australia to provide advice on skills needs; the establishment of trade training centres in secondary schools; an increase in skilled migration; and incentives to increase workforce participation such as tax cuts and an increase in the Child Care Tax Rebate.

Small Business

Small businesses are being affected by general skills shortages. The 'National CEO Survey—Skilling for Innovation' report released by the Australian Industry Group and

Deloitte in April 2008 indicated that 60 per cent of small firms had been impacted by skills shortages in the past year.

On 16 July Senator Penny Wong, Minister for Climate Change and Water, announced that the Government will establish a Climate Change Action Fund (CCAF) to help business transition to a cleaner economy. It will provide partnership funding for a range of activities, including dissemination of best and innovative practice among small the medium sized enterprises.

Automotive Industry

The Government's new Green Car Innovation Fund, together with the carbon pollution reduction scheme, will boost domestic innovation and investment in fuel-efficient and low-emission vehicles. This is likely to stimulate demand for skills in a range of relevant technologies such as vehicle weight reduction, new materials, power-trains, production systems, alternative fuels, and exhaust systems.

Built Environment

There is concern about chronic shortages of construction workers in the building and construction industry generally.

As focus shifts to the built environment and the capacity to reduce Greenhouse Gas emissions there will be a requirement to ensure that Australian trades and professions are able to deliver energy efficient outcomes. Whilst energy efficiency training is being incorporated into a number of trade and professional courses and several short courses are now available to practitioners, there are considerable gaps in the availability of training to promote energy efficient practices and outcomes.

The National Framework for Energy efficiency (NFEE) has recognised this need and as part of its Stage 2 Implementation Plan has earmarked a trade professional training and accreditation project for implementation. The project will seek to develop engineers and architects training packages.

At the same time NFEE is embarking on several other initiatives at a sub-sectoral level such as the heating, ventilation and air conditioning (HVAC) sector in developing relevant training packages.

The recently announced Green Building Fund (GBF) will also have a stream dedicated towards training. The Government in announcing the GBF has indicated it will work with the commercial building sector to enhance building operator training and develop energy efficient operating and maintenance advisory guides. The GBF will have a limited funding stream to enable industry associations to develop such training guidelines.

The strategy of the CRC for Construction Innovation includes efforts to train climate change professionals and other industry training and skill development.

The Department understands that the CRC for Construction Innovation will be making its own submission to the Inquiry and that it will contain data on skill vacancies based on current DEEWR data.

The Department also understands that the CRC is currently preparing a bid to create a CRC for a Sustainable Built Environment. One of the five programs it is proposing for the new CRC is Delivering Knowledge and Skills into Practice. This program includes themes around future industry skill needs and integrated skills development. Proposed outputs include training modules, industry skills exchange programs, sustainability scholarships and a skills forecasting tool. The outcomes they are aiming for include more effective recruitment and retention of women, young and older workers, greater skills alignment between national curricula and industry needs and more industry ready graduates.

Science and Research

Research Block Grant Funding

The Science and Research Division administers research block grant funding to universities. This funding is delivered in a way that leaves universities free to determine their own teaching and research priorities in relation to climate change. A number of universities are taking action in this area, as noted in the Universities Australia submission to this Inquiry.

Australian Research Council

The Australian Research Council (ARC) is a statutory authority within the portfolio. Its mission is to advance Australia's research excellence to be globally competitive and deliver benefits to the community.

The ARC *National Competitive Grants Program* (NCGP) has two main streams of research funding: the Discovery element, which funds research projects and fellowships; and the Linkage element, under which research projects, infrastructure, fellowships, centres and networks are funded jointly with universities or other partner organisations.

The ARC does not administer specific 'climate change' programs or initiatives under the NCGP. Funding is awarded competitively on the basis of research excellence. On this basis a number of climate change related research projects are currently supported. The ARC found that the terms 'climate change' and 'biodiversity' were among the five most commonly cited keywords on the applications received by ARC in 2008.

The ARC *Centres of Excellence* scheme brings together leading researchers from around the world to work collaboratively on specific research programs. The centres build scale and focus in particular research areas, including through the attraction of excellent students and researchers.

Selection rounds under the scheme were conducted for funding commencing in 2003 and 2005. A number of centres successful in obtaining funding in these rounds conduct research relevant to climate change. They include:

- the ARC Centre of Excellence for Advanced Silicon Photovoltaics and Photonics (established in 2003) – advancing silicon photovoltaic research.

- the ARC Centre of Excellence for Solar Energy Systems (established in 2003) – focusing on the development of improved silicon concentrator solar cells for 10-50 sun linear concentrators.
- the ARC Centre of Excellence for Coral Reef Systems (established in 2005) – researching the sustainable use and management of coral reefs, including the effects of evolutionary and environmental change.
- the ARC Centre of Excellence for Plant Energy Biology (established in 2005) – discovering and characterising the molecular components and control mechanisms that drive energy metabolism in plant cells. This new knowledge is expected to enable better management of such things as tolerance of plants to environmental stresses such as excess light and drought.
- The ARC also co-funds a Centre of Excellence with the Grains Research and Development Corporation – the Australian Centre for Plant Functional Genomics (ACPFG), which is focusing on stresses that impact agriculture in Australia, including drought, salinity and high or low temperatures.

The ARC's submission to the *Inquiry into research training and research workforce issues in Australian universities* (May 2008) provided details of the contribution of the ARC's funding schemes to research training and career development in Australia. A copy of the submission can be found on the ARC website (www.arc.gov.au).

Research Infrastructure

The National Collaborative Research Infrastructure Strategy (NCRIS) funds a number of projects related to climate change.

The $50 million Integrated Marine Observing System (IMOS) is a distributed set of equipment and data and information services that will support the research activities that build our understanding and management of the marine environment and related industries and enhance our ability to predict climate variability and change. IMOS facilities are in early implementation phase with majority of the infrastructure ready or being made ready for deployment/operation.

The $20 million Terrestrial Ecosystem Research Network (TERN), which is currently being developed under NCRIS, will provide the underpinning infrastructure required for the coordination of ecological research in Australia. TERN will be a distributed set of equipment and data and synthesis and information services that will support research activities to strengthen our understanding of terrestrial ecosystems (encompassing soil, landscape, climate, biodiversity and water) and their key drivers. This is vital to improving the information base that underpins Australia's environmental research and management efforts and our ability to understand and deal with environmental change.

One of the key challenges for IMOS has been the recruitment of staff with e-research specialist skills for the management and operation of the IMOS data management facility e-Marine Information Infrastructure (eMII). The recruitment of a Director for the eMII and staff to achieve critical mass of expertise was slower than desirable. The eMII director was recently recruited from the UK (July 2008).

A range of eResearch skills are required to ensure that the outcomes of Australian research are relevant, timely and developed with the latest available technology. There

is a deficit of eResearch skills across the spectrum, at the application level for scientists unfamiliar with eResearch technology, through to the ICT skills required for an eResearch service provider.

Providing for eResearch career pathways is a matter that remains to be addressed, as does the means for effective exposure to eResearch techniques and resources early in a researcher's career. A key principle for any strategy is that there should be a process whereby more eResearchers are encouraged to take up the tools of the trade in future.

International collaboration

Between 2002 and 2008 the International Science Linkages program has supported 24 climate change related projects worth $4,175,033 (GST exc). Eighty six researchers have engaged in collaborative research activities, with another 127 participating in conferences, workshops and symposia. Project details are provided in the table at **Attachment A**.

Cooperative Research Centres Program

Since the establishment of the CRC program in 1990 the Australian Government has committed nearly $3 billion to establish 168 CRCs. CRCs have also produced over 4,650 industry-ready postgraduates, including over 2,460 graduates with PhDs.

The Australian Government funds each CRC between $20-40 million for up to seven years. This funding must be matched by cash and/or in-kind contributions (such as expertise and research facilities) from CRC participants.

The CRC Program promotes long-term strategic collaborations between publicly funded researchers and research end users undertake long term user-drive research that results in high levels of outcomes in research adoption and commercialisation and industry-ready graduates that enhance Australia's economic growth.

The Government has committed to restoring public benefit as one of the primary objectives of the CRC Program. The independent review of the CRC Program: *Collaborating to a purpose,* released by Senator Carr on 5 August 2008, also endorsed restoring public benefit as a key objective of the Program.

There are presently 49 CRCs in operation. Of these 11 operate in the environment sector (See **Attachment B** for funding details). The environment sector CRCs are:

- Bushfire CRC
- CRC for Antarctic Climate and Ecosystems
- CRC for Australian Weed Management (concluding in 2008)
- CRC for Contamination Assessment and Remediation of the Environment
- CRC for Irrigation Futures
- CRC for Sustainable Tourism
- CRC for Tropical Savannas Management
- Desert Knowledge CRC
- Environmental Biotechnology CRC
- eWater CRC
- Invasive Animals CRC

Every CRC must have at least one Australian higher education institution (or research institute affiliated with a university) among its core participants. Each CRC has an

Education and Training program as part of its activities. The Education and Training programs are expected to have an end-user focus, including industry PhD supervision.

In the years 1992-93 to 2006-07 environmental sector CRC students have been granted 685 PhDs, 444 Masters degrees and 247 other postgraduate degrees. Over the same period of time 415 undergraduate courses have been run for 10,026 students, (See **Attachment C**).

CRCs participate in a wide range of educational activities both in Australia and overseas. While the environment sector CRCs have a strong focus on university-based education there are also many programs delivered to industry and other interested groups. Details of international collaborations and the delivery of education programs are available in the Annual Reports of individual CRC's.

Research Agencies

Australian Institute of Marine Science

Climate research and monitoring needs to be underpinned by integrated observations on the marine environment around Australia's continental landmass. The importance of the AIMS Long-Term Monitoring Program and Reef Water Quality Monitoring on the Great Barrier Reef has been noted in several reviews[1].

There is also a need for increased capacity in marine microbiology to improve understanding of the role of marine microbes. These abundant and tiny organisms are largely unknown but have a controlling influence on the earth's climate and their processes will determine the extent and impact of climate change. Microbial communities also provide the basis of the ocean's food webs and facilitate the flow of nitrogen, phosphorous, carbon, and energy in the ocean. Another area of possible impact as oceans warm is the spread of disease - marine microbes cause diseases of marine organisms as well as humans and there are already signs of the spread of warm water viruses into previously temperate waters.

AIMS' recruitment experience has revealed a very tight market for oceanographic professionals (physical oceanographers, marine engineers and technicians) and biostatisticians. Low numbers of maths-focussed graduates combined with ongoing, in some cases increased, demand for researchers with these skills is creating a recruitment dilemma for research agencies such as AIMS. It is widely accepted that there is a skills shortage in maths that is not being met by the universities. The issue for the science is further impacted by the pull of current numerical modelling graduates into the financial sector.

ANSTO

ANSTO is Australia's national nuclear research and development organisation and the centre of Australian nuclear expertise. ANSTO's nuclear infrastructure includes the Open Pool Australian Light-water reactor (OPAL), Australia's new $430 million research reactor, particle accelerators, radiopharmaceutical production facilities, and a range of other research facilities.

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[1] Batterham, R (2001) *Review of Marine Research in Tropical Australia*. Commonwealth of Australia; Insight Economics (2006) *Marine Imprint: the crucial impact of 33 years of AIMS research in the public interest*. Insight Economics, August 2006

ANSTO has a number of Research Institutes, one of which is the Institute for Environmental Research (IER). It is through the IER that ANSTO carries out its research into climate change.

ANSTO is improving Australia's knowledge on atmospheric transport, ocean circulation and source histories of greenhouse gases, leading to a better understanding of the mechanisms of abrupt climate changes. In particular, IER is improving understanding of past climate variability and environmental conditions in the Southern Hemisphere. Understanding the past climate will lead to better predictions of future climate changes in our region.

Atmospheric and oceanic radiocarbon systems: Variations in atmospheric transport, ocean circulation, sea-surface temperatures and rainfall histories for the past 30,000 years can be analysed through measurements of radiocarbon, stable isotopes and trace elements in tree-rings, corals and speleothems (cave formations). Inter-comparison of these records across continental and oceanic sites can then be used to better understand the mechanism of abrupt climate changes, Asian monsoon variability, and how frequent El Nino/Southern Oscillation (ENSO) was in the past.

Radiocarbon signatures of greenhouse gases: Radiocarbon signatures of greenhouse gases measured directly in air samples or extracted from bubbles in the ice are vital clues in describing climate change, the global carbon cycle and sources of urban air pollution.

Fine particle monitoring: The term 'fine particles' refers to small airborne dust particles which are no bigger than 2.5 millionth of a metre (or 2.5 micrometers) in size. Most fine particle dust originates from sources such as car and truck exhausts, smoke from fires and industrial processes. These fine particles can penetrate deep into the lung, leading to health problems, reduce visibility on 'smoggy' days and can also have a wider effect on global climate. ANSTO has a unique capability to determine the concentration and origin of fine particles.

Water management: ANSTO is developing a methodology for assessing the impact of climate change on groundwater recharge in warm arid zones. For example, we are using isotopes to calculate the threshold rainfall intensity for effective recharge in Alice Springs. These studies are linked to the development of strategies for the sustainable use of groundwater in arid regions challenged by climate change.

Globally, ANSTO has also used isotopes to evaluate model predictions of changes of water balance within the Amazon basin as a result of deforestation.

Training and Employment Needs
Selected Universities are in a good position to carry out research and training on climate change. These include Monash, Tasmania, ANU and UNSW. There is a need to educate individuals to converse across the fields of the science and into policy adaptation, mitigation and institutional structures.

There is a real shortage of scientists who work on the roles of oceans, atmosphere, land cover and economics in the Asia Pacific region. There is a very small group of

individuals who work in Asia (including Indonesia) and the Pacific islands who are generating data sets on climate variability and the main functions that drive variability.

ANSTO is one of the key players in this field, along with CSIRO (Aspendale and Hobart), ANU, Wollongong University and Monash. Asian countries such as China and Japan are investing heavily in human resources, infrastructure and training in these areas. The USA has been a major player and continues to be. Australia is slipping behind, especially as several key scientists are approaching retirement and there is no clear succession cohort of scientists evident.

In the scheme of things it is very important that the Indian Ocean and Antarctica form part of the science mix. These are key drivers of our regional climate change – especially for western and southern Australia. The oceans are very understudied in this regard and the nation is retreating on infrastructure (research vessels, computing power, monitoring capacity and data sharing). It is important that Australia has a place in international collaborations and big science programs to maintain influence and agenda setting for our region.

CSIRO

The CSIRO has made a separate submission to the Inquiry.

The Department notes the CSIRO suggestion that, in addition to augmenting specific areas of scientific endeavour, we need to equip all professionals required to make decisions affected by climate change with skills in systems thinking and managing uncertainty.

> The global environmental changes that we face today…are qualitatively different to the sustainability challenges of the past. To a degree not seen previously, these changes and their impacts are *systemic*, *global*, and *uncertain*:
>
> - they are *systemic*, in that every sector and field of human endeavour at every scale is affected by them, and there is an immense complexity in the feedbacks and interactions among these effects;
> - they are *global* in nature, in that they are driven by and affect human activities everywhere in the world; their *global systemic* nature requires systems thinking, to help identify solutions that do not cause further problems; and
> - they are *uncertain*, in that, even with better science, there will always be irreducible uncertainty in how humans will respond in the future, and in new complex interactions in the global system that catch us by surprise (e.g. Carter *et al.* 2007). This demands skills, tools and ways of thinking that provide confidence in the face of uncertainty, rather than old ways of assuming that uncertainty will eventually go away." (CSIRO submission, p4).

The CSIRO submission goes on to suggest that

> 'As a generic requirement, Australia should support schools, universities and in-career training activities to embed skills in systems thinking and with tools to deal with uncertainty in every day life of all Australians, particularly all professionals. The goal should be to create an Australia which is a flexible, adaptive learning society at all levels. …At present organisations such as CSIRO struggle to find sufficient numbers of people with such skills, and there is a significant dearth of these skills nationally. (CSIRO submission, p6)
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> 'In the absence of a strong majority of the population having a reasonable understanding of systems, uncertainty and the global complex nature of the challenges we face, policy making on these issues will be contentious. (CSIRO submission, p6)

International Science Linkages Program:

Since 2002 the program has supported 24 climate change related projects worth $4,175,033 (GST exc).

Project Activity	Project Title	Australian Partners	Number of Australian Researchers	Partner Countries	International Partners
Collaborative research	CG020183 - Emissions of volatile organic compounds from eucalypts: contributions to climate change (Active)	– Department of Sustainability and Environment – University of Melbourne	2	Germany	– Institut fur Forstbotanik und Baumphysiologie Albert Ludwigs University Frieburg – Fraunhofer Institute for Atmospheric Environmental Research IFU
Conference	CG070076 - Joint Scientific Assembly of the IAG, IAPSO and IABO (Finalised)	– Spatial Sciences Institute	100	Denmark USA New Zealand	– International Association of Geodesy (IAG) – International Association for the Physical Sciences of the Oceans – International Association for Biological Oceanography
Collaborative research	CG080110 - Distributed Sensor Networks (Active)	– The University of Melbourne – Queensland Parallel Supercomputing Foundation Ltd – Defence Science and Technology Organisation – Australian Institute of Marine Science – University of Technology Sydney	10	Netherlands USA England	– University of Twente – Louisiana State University – University of Southern California – Syracuse University – University of Kent
Collaborative research	CG110007 - Novel Technology to Produce Biodegradable Polymer and Electrical Energy from Sewage Treatment Biosolids (Active)	– The University of Queensland – Gold Coast Water – Brisbane Water	3	Sweden Norway Belgium	– AnoxKaldnes Biopolymer AB – Cambi AS – University of Gent
Collaborative research	CG120174 - Genomics for Triticeae improvement for food, feed and non-food uses (Active)	– Australian Centre for Plant Functional Genomics	7	France Germany Scotland Italy	– Institut National de la Recherche Agronomique (INRA) – Leibniz Institute of Plant Genetics and Crop Plant Research – Scottish Crop Research Institute – University of Bologna

Project Activity	Project Title	Australian Partners	Number of Australian Researchers	Partner Countries	International Partners
Conference	CG120192 - World Hydrogen Energy Conference 2008 (Active)	– The Australian Institute of Energy – CSIRO – Luigi Bonadio and Associates – The University of Queensland – Blue Cell Energy Pty Ltd	7	-	-
Collaborative research	CH050099 - Coral bleaching, mortality and recovery: modern signatures and past occurrences (Active)	– The University of Queensland	3	China	– South China Sea Institute of Oceanology Chinese Academy of Sciences
Collaborative research	CH060089 - Evolution of palaeo- lake systems on the Tibetan plateau and formation of terraces along Yangtze river using cosmogenic exposure dating (Active)	– Australian Nuclear Science and Technology Organisation (ANSTO)	5	China	– Institute of Geology and Geophysics Chinese Academy of Sciences
Collaborative research	CH060119 - Enzyme Enhancement of Biosolids Dewatering (Active)	– The University of Melbourne	2	China	– Shandong University
Collaborative research	CH060136 - Characterisation of Australian and Chinese calibration sites for current and future satellite sensors and validate applications (Active)	– The University of Melbourne – CSIRO	20	China	– Chinese Academy of Sciences
Collaborative research	CH060149 - Characterisation of Australian and Chinese calibration sites for current and future satellite sensors and validate applications (Active)	– CSIRO	7	China	– Institute of Remote Sensing Applications - Chinese Academy of Sciences
Collaborative research	CH060165 - Shelterbelt structure and water relations (Active)	– The University of New South Wales	2	China	– Institute of Applied Ecology Chinese Academy of Sciences
Collaborative research	CH070172 - Development of An Integrated Modelling System for Water Quality Monitoring and Assessment (Active)	– NSW Department of Environment and Climate Change	6	China	– Institute of Remote Sensing Applications - Chinese Academy of Sciences
Collaborative research	FR040170 - Origin of elevated Southern Ocean productivity and its influence on atmospheric carbon dioxide (KEOPS project) (Finalised)	– Antarctic Climate and Ecosystems CRC	5	France	-
Collaborative research	FR050175 - Eddy mixing and water mass formation in the Southern Ocean in a global 1/4° model (Active)	– The University of New South Wales – CSIRO Marine Research – Antarctic Climate and Ecosystems CRC	3	France	– Laboratoire de Physique des Oceans

ATTACHMENT A

Project Activity	Project Title	Australian Partners	Number of Australian Researchers	Partner Countries	International Partners
Collaborative research	FR070016 - Determinants of water-use efficiency of plants (Active)	– The University of Sydney – The University of New South Wales	3	France	– Institut National de la Recherche Agronomique – Universite Henri Poincare – CNRS-CEA
Collaborative research	FR070048 - Coping with uncertainty in stormwater quality models; new insights through the sharing of data and analytical methods (Active)	– Monash University	3	France	– Institut National des Sciences Appliquées
Collaborative research	FR070059 - Production and fate of dissolved organic matter in forest ecosystems (Active)	– James Cook University	4	France	– Institut National de la Recherche Agronomique – Universite de Bourgogne
Collaborative research	FR070126 - Evolution of habitats and biodiversity in coral reefs (Active)	– The University of Queensland	1	New Caledonia France	– Institut de Recherche Pour le Developement – Universite de la Reunion
Workshop	SP050006 - Energy Workshop (Finalised)	– Australian Academy of Technological Sciences and Engineering	10	India	-
Workshop	SP050013 - Australia/Germany Science and Technology Collaboration Workshops (Finalised)	– Australian Academy of Science	-	Germany	-
Symposium	SP050031 - 12th Australia-Japan Symposium (Finalised)	– Australian Academy of Science	10	Japan	-
Collaborative research	SP070017 - FEAST Extension, Enhancement and Demonstration Project (FEED) (Active)	– The Australian National University	-	EU	-
Collaborative research	SP070018 - Support for researcher mobility through contribution to Australian research organisations participating in the International Research Staff Exchange Scheme (IRSES) and early career researcher exchange (Active)	– Australian Academy of Science	-	EU	-

Cooperative Research Centre Program

Environment sector CRCs

Bushfire CRC
Centre Established: 1 Jul 2003
Round No: 8
Grant Period (yr): 7
Incorporated: Yes
Postgraduate target for CRC: 22
CRC Program Funding: $28.9m
Total participant contributions (for 7 yrs) $78.2m

Antarctic Climate and Ecosystems CRC
Centre Established: 1 Jul 2003
Round No: 8
Grant Period (yr): 7
Incorporated: No
Postgraduate target for CRC: 55
CRC Program Funding: $23.5m
Total participant contributions (for 7 yrs) $100.5m

CRC for Australian Weed Management
Centre Established: 1 Jul 2001
Round No: 7.5
Grant Period (yr): 7 + 2 (extension granted)
Incorporated: No
Postgraduate target for CRC: 32
CRC Program Funding: $20.3m
Total participant contributions (for 7 yrs) $60.6m

CRC for Contamination Assessment and Remediation of the Environment
Centre Established: 1 July 2005
Round No: 9
Grant Period (yr): 7
Incorporated: Yes
Postgraduate target for CRC: 75
CRC Program Funding: $30m
Total participant contributions (for 7 yrs) $60.3m

CRC for Irrigation Futures
Centre Established: 1 Jul 2003
Round No: 8
Grant Period (yr): 7
Incorporated: No
Postgraduate target for CRC: 50
CRC Program Funding: $16m
Total participant contributions (for 7 yrs) $59.6m

CRC for Sustainable Tourism
Centre Established: 1 Jul 2003
Round No: 8
Grant Period (yr): 7
Incorporated: Yes
Postgraduate target for CRC: 66

CRC Program Funding: $26.7m
Total participant contributions (for 7 yrs) $128.3m

CRC for Tropical Savannas Management
Centre Established: 1 Jul 2003
Round No: 8
Grant Period (yr): 7
Incorporated: Yes
Postgraduate target for CRC: 66
CRC Program Funding: $26.7m
Total participant contributions (for 7 yrs) $66.6m

Desert Knowledge CRC
Centre Established: 1 Jul 2003
Round No: 8
Grant Period (yr): 7
Incorporated: No
Postgraduate target for CRC: 28
CRC Program Funding: $20.7m
Total participant contributions (for 7 yrs) $67.9m

Environmental Biotechnology CRC
Centre Established: 1 Jul 2003
Round No: 8
Grant Period (yr): 7
Incorporated: Yes
Postgraduate target for CRC: 50
CRC Program Funding: $19.5m
Total participant contributions (for 7 yrs) $35.8m

eWater CRC
Centre Established: 1 Jul 2005
Round No: 9
Grant Period (yr): 7
Incorporated: Yes
Postgraduate target for CRC: 20
CRC Program Funding: $40.3m
Total participant contributions (for 7 yrs) $100.9m

Invasive Animals CRC
Centre Established: 1 Jul 2005
Round No: 9
Grant Period (yr): 7
Incorporated: Yes
Postgraduate target for CRC: 26
CRC Program Funding: $29.6m
Total participant contributions (for 7 yrs) $62.0m

Environment CRCs – Educational Outcomes **ATTACHMENT C**

(Please note that as CRCs operate for a period of 7 years the numbers of CRCs operating in any one year will vary over time)

Year	No. of CRCs	Doctoral research students		Masters by research students		Other postgraduate students		Supervision of research postgraduates		Other postgraduate education activities	Undergraduate educational activities	
		Number of new PhDs	Number of PhD degrees awarded	Number of new Masters	Number of Masters degrees awarded	Number of new other postgraduates	Number of other postgraduate degrees awarded	Number of staff members supervision	Number of non-university staff supervision	Number of non-university members involved	Number of undergraduate courses	Number of students taking the courses
2006-07	13	104	60	4	7	35	26	355	233	54	24	438
2005-06	17	132	54	8	6	19	9	419	205	48	12	237
2004-05	17	119	72	8	15	34	46	462	165	68	16	317
2003-04	17	140	81	15	19	50	59	495	184	70	14	381
2002-03	14	127	47	21	10	65	41	396	203	55	12	447
2001-02	15	109	76	14	13	67	26	384	150	62	20	435
2000-01	13	75	42	14	7	56	40	382	146	49	19	395
1999-00	12	74	64	70	51	0	0	25	149	87	16	290
1998-99	12	83	35	68	47	0	0	0	189	48	19	704
1997-98	12	68	54	57	62	0	0	0	216	48	26	751
1996-97	12	62	27	60	48	0	0	0	164	60	46	727
1995-96	12	72	38	41	48	0	0	0	155	55	81	2,162
1994-95	9	79	22	45	34	0	0	0	139	68	49	1,049
1993-94	9	64	8	43	40	0	0	0	81	37	46	1,039
1992-93	5	0	5	0	37	0	0	0	49	35	15	654
Total	**189**	**1,308**	**685**	**468**	**444**	**326**	**247**	**2,918**	**2,428**	**844**	**415**	**10,026**