NCCARF 2008–2013: The first five years

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The National Climate Change Adaptation Research Facility (NCCARF) is a unique venture established by the Australian Government in 2008 to generate and communicate the knowledge decision-makers need to effectively adapt Australia to climate change.

NCCARF is a consortium made up of Griffith University together with funding partners drawn from across the country:

- Queensland Government
- James Cook University
- Macquarie University
- Murdoch University
- The University of Newcastle
- Queensland University of Technology
- University of Southern Queensland
- University of the Sunshine Coast

In its Operational Phase, NCCARF was overseen and guided by a ten-member Advisory Board.

Our Vision
Decision-makers have the information needed to adapt Australia successfully to climate change.

Our Mission
To lead the research community in a national interdisciplinary effort to generate the information needed by decision-makers in government and in vulnerable sectors and communities to manage the risks of climate change impacts.

Our Core Objectives
- To identify knowledge needs of end-users
- To build and harness the capacity of the research and end-user community
- To generate the knowledge to meet end-user needs
- To make knowledge available to end-users

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<td>ACCARNSI</td>
<td>Australian Climate Change Adaptation Research Network for Settlements and Infrastructure</td>
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<tr>
<td>ACELG</td>
<td>Australian Centre of Excellence for Local Government</td>
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<td>ALGA</td>
<td>Australian Local Government Association</td>
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<td>APO</td>
<td>Australian Policy Online</td>
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<td>ARC</td>
<td>Australian Research Council</td>
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<tr>
<td>ARGP</td>
<td>Adaptation Research Grants Program</td>
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<td>ARN</td>
<td>Adaptation Research Network</td>
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<td>AusSMC</td>
<td>Australian Science Media Centre</td>
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<td>COAG</td>
<td>Council of Australian Governments</td>
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<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
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<tr>
<td>DAFF</td>
<td>[Commonwealth] Department of Agriculture, Fisheries and Forestry</td>
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<td>DCC</td>
<td>[Commonwealth] Department of Climate Change</td>
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<tr>
<td>DCCEE</td>
<td>[Commonwealth] Department of Climate Change and Energy Efficiency</td>
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<tr>
<td>DIICCSRTE</td>
<td>[Commonwealth] Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (formerly Department of Climate Change and Energy Efficiency)</td>
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<tr>
<td>ECR</td>
<td>Early Career Researcher</td>
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<td>EM</td>
<td>Emergency Management</td>
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<tr>
<td>EOI</td>
<td>Expression of Interest</td>
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<tr>
<td>FORNSAT</td>
<td>Forum for interaction between NCCARF, States and Territories</td>
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<tr>
<td>FRDC</td>
<td>Fisheries Research and Development Corporation</td>
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<tr>
<td>FTE</td>
<td>Full-time Equivalent</td>
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<tr>
<td>FWB</td>
<td>Freshwater Biodiversity</td>
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<tr>
<td>GU</td>
<td>Griffith University</td>
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<tr>
<td>HH</td>
<td>Human Health</td>
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<tr>
<td>IC</td>
<td>Indigenous Communities</td>
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<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>LG</td>
<td>Local Government</td>
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<tr>
<td>MDBA</td>
<td>Murray Darling Basin Authority</td>
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<tr>
<td>MBR</td>
<td>Marine Biodiversity and Resources</td>
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<tr>
<td>NARP</td>
<td>National Adaptation Research Plan</td>
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<tr>
<td>NCCARF</td>
<td>National Climate Change Adaptation Research Facility</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
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<tr>
<td>NIWA</td>
<td>National Institute of Water and Atmospheric Research (New Zealand)</td>
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<td>NLA</td>
<td>National Library of Australia</td>
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<tr>
<td>NRM</td>
<td>Natural Resource Management</td>
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<td>NSW</td>
<td>New South Wales</td>
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<td>NWC</td>
<td>National Water Commission</td>
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<td>PAG</td>
<td>Partner Advisory Group</td>
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<td>PGB</td>
<td>Policy Guidance Brief</td>
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<td>PI</td>
<td>Primary Industries</td>
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<td>PIARN</td>
<td>Primary Industries Adaptation Research Network</td>
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<tr>
<td>PRG</td>
<td>Priority Research Question</td>
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<tr>
<td>PROVIA</td>
<td>Program of Research on Climate Change Vulnerability, Impacts and Adaptation</td>
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<tr>
<td>Qld</td>
<td>Queensland</td>
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<tr>
<td>RDC</td>
<td>Research and Development Corporation</td>
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<tr>
<td>S&amp;I</td>
<td>Synthesis and Integrative</td>
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<tr>
<td>SA</td>
<td>South Australia</td>
</tr>
<tr>
<td>SI</td>
<td>Settlements and Infrastructure</td>
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<tr>
<td>SEID</td>
<td>Social, Economic and Institutional Dimensions</td>
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<tr>
<td>SIRP</td>
<td>Synthesis &amp; Integrative Research Program</td>
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<tr>
<td>SREX</td>
<td>IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation</td>
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<tr>
<td>SRP</td>
<td>Science Review Panel</td>
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<tr>
<td>Tas</td>
<td>Tasmania</td>
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<tr>
<td>TB</td>
<td>Terrestrial Biodiversity</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>UKCIP</td>
<td>United Kingdom Climate Impacts Program</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Program</td>
</tr>
<tr>
<td>Vic</td>
<td>Victoria</td>
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For Australia to position effectively to tackle the threat of climate change action must be taken on two fronts. One line of action is to reduce national emissions of greenhouse gases – an area where considerable progress is being made. The other critical line of action involves efforts to make Australia resilient to the growing impacts resulting from changing climate patterns, particularly occurrence of extreme weather events. Only the very beginnings of this national climate adaptation response have been undertaken so far.

Yet the need for action by governments, businesses, professions and communities is increasingly urgent. Each day that goes by with investment and other decisions premised upon past climate patterns, instead of the projected future climate patterns, creates ever-greater exposure and risk for Australia from damaging future climate events.

Making Australia resilient to climate change impacts is a very challenging task. To achieve efficient and effective outcomes, decision-makers and communities throughout the nation must have access to sound information about the climate risks to which they will be exposed and to knowledge about the practical steps they need to put in place to limit and minimise those risks.

In 2008, the National Climate Change Adaptation Research Facility (NCCARF) was established with bipartisan support at Commonwealth level and with combined support from States and Territories Governments. Its purpose was to create the knowledge necessary for decision-makers in governments, businesses and communities to plan and implement actions on climate resilience. The institutional model and strategy for NCCARF was crafted within COAG to serve the needs of Australia in the near and longer terms. The Commonwealth provided underpinning financing for NCCARF in its first term to 2013 with $50 million, and research institutions and others have contributed significant resources. Griffith University was selected by competitive process to host a small strategic hub to plan and lead the venture.

In its first term to 2013, NCCARF delivered:

- strategic plans across thematic fields identifying initial priorities for building knowledge and capability
- partnerships across many research institutions and disciplines throughout Australia in delivering a major research investment portfolio
- engagement with adaptation practitioners in each tier of Governments, businesses, professions, communities and NGOs; for example through the 5500 participants in NCCARF Adaptation Networks
- communication to promote uptake of NCCARF products into climate adaptation practice.

The achievements of NCCARF and the need for its continuation beyond the initial term are recognised widely – including in the 2013 Productivity Commission report on climate change adaptation and in the 2012 independent program review commissioned by the Climate Change Department. The NCCARF Board submitted to the Commonwealth Government a Budget proposal for NCCARF to proceed next to a bridging phase, with much reduced Commonwealth funding of $3 million annually, to capitalise the first term investment through uptake of products and to further build the framework for the future, including through strengthened investment from non-Commonwealth sources.

However, the 2013–14 Budget of the Commonwealth Labor Government made zero provision for NCCARF, therefore causing its (now temporary) termination. Government Budget circumstances are very tight, but NCCARF is a case where a small saving now is likely to generate far greater and growing costs for Australia, and especially for the Commonwealth Government. Commonwealth leadership is vital, in line with the roles and responsibilities agreed by the Select Council on Climate Change in 2012.

Fortunately, partner universities put together a small amount of funding to enable basic elements of NCCARF to survive for a year. This step was taken with the intent of allowing the incoming Government after the Federal election to renew a commitment to the NCCARF venture.

At the time of completing this report, the Federal election was being held with the resultant election of a Coalition Government. The Coalition announced its commitment to provide ongoing funding for NCCARF – $9 million over 3 years from 2014. This is a critically important and welcome development in enabling Australia to progress its efforts to be ready to cope with the impacts of a changing climate.

Ian Carruthers, PSM
Director’s report

I am delighted to present this report on activities in the first phase of operation of NCCARF, which completed 30 June 2013. NCCARF was set up in mid-2008, with the mission to develop and deliver the knowledge needed by decision-makers to effectively adapt Australia to climate change. Our achievements since then have been considerable and substantial. They include:

- nine thematic research plans setting out critical end-user knowledge needs for effective adaptation in Australia
- over 150 research reports on every aspect of adaptation
- eight Networks bringing together over 5000 practitioners and researchers in adaptation to build capacity
- three major conferences: the Gold Coast international conference in 2010 with over 1000 participants from 52 countries; a national conference in 2012 in Melbourne with almost 700 participants; and the very recent Sydney conference with more than 550 people attending
- three books based on our activities: the first, a collection of papers from the 2010 conference published by Wiley; the second, a set of case studies of historical weather extremes, seeking parallels between the responses to those events and climate change adaptation, and to be published by Cambridge University Press in November 2013; the third, a collection of summary papers from our research portfolio, to be published by Wiley in 2014
- twelve Policy Guidance Briefs addressing critical topics in adaptation for Australia, based on practitioner workshops held in every state and territory.

We have identified 14 Adaptation Champions in business, government and the community. These Champions are taking concrete steps to change behaviour, techniques, practices and policies to adapt to climate variability and change. We have held numerous, even uncountable seminars, workshops, early career events, master classes, webinars and symposia. We have published newsletters, factsheets, guidance notes and discussion papers by the score. Already, and in a growing stream, our researchers are publishing in the peer-reviewed literature. Our website, www.nccarf.edu.au, carries information on all these activities and more.

NCCARF is a unique organisation – not only is it responsible for generating knowledge, it also has the task of effectively communicating knowledge to decision-makers. These responsibilities have been paramount considerations in all aspects of NCCARF’s work, and the strategies we have evolved to engage with our stakeholders hold lessons for any boundary organisation seeking to make a bridge between the research and practitioner communities.

I am extremely proud of what we have achieved. Together with initiatives such as the CSIRO Climate Adaptation Flagship, we have built a skilled community prepared to take decisions and act to make Australia ready for climate change. The NCCARF conferences and the NCCARF Networks have ensured that this community has the opportunities and frameworks to thrive. With the right governance in place to encourage action, Australia could take a world-leading position in adaptation.

It has always been clear to me that NCCARF’s role is an on-going one – to build and support a robust and self-sustaining community of researchers and practitioners in adaptation through knowledge generation and communication, capacity building and networking. Therefore, the commitment by the incoming Australian Coalition government to provide three years of funding for NCCARF, starting in 2014, is a very welcome development, recognising NCCARF’s significance in supporting the nation to address the challenges presented by Australia’s present-day and future climate.

I would like to take this opportunity to thank NCCARF staff, past and present, for their dedication and hard work over the years. They have been part of something important, that has made a difference to the adaptation landscape here and internationally. Without them, NCCARF could not have happened.

Professor Jean Palutikof
1 Setting the scene

The National Climate Change Adaptation Research Facility (NCCARF) was established in 2008 to develop and deliver the knowledge needed by decision-makers to effectively adapt Australia to the impacts of climate change.

What is adaptation? In its Fourth Assessment, the Intergovernmental Panel on Climate Change (IPCC) defines it as:

... the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

The severity of climate change impacts, and how much we will have to adapt, will depend on the amount and rate of climate change, which in turn is partially dependent on our success at mitigation. It is increasingly clear that current mitigation efforts will not limit global temperature increases to less than 2°C – widely accepted as the threshold of ‘dangerous’ climate change, making adaptation essential.

Amongst the developed nations, Australia already has one of the most variable climates, and Australians are skilled in managing the impacts of drought, floods, bushfire and cyclones. As a recent example, the summer of 2010–11 was the wettest on record in Victoria and most of south-east Queensland, bringing widespread flood damage estimated to have cost the country in the region of $5.6 billion. But this was not the only severe weather event to affect Australia in 2010–11: wet and humid conditions in south-eastern Australia led to locust plagues, there were bushfires and extreme heat waves in Perth and Sydney, and the Category 5 Cyclone Yasi struck Australia’s north-east coast.

How is future climate change likely to affect Australia? With considerable confidence we can expect that some extreme weather events will become more common, such as heat waves and coastal flooding associated with sea-level rise and storm surge. There is a strong likelihood that severe bushfire-risk days will occur more frequently, associated with hotter weather. In south-west Australia, climate models tell us that the long-term reduction in rainfall, and hence water resources, is probably linked to climate change, and is very likely to persist into the future. Elsewhere, and with less confidence, we can expect droughts and flooding to become more common.

NCCARF is a uniquely Australian response to these current and projected climate change impacts – established by the Australian government to ensure that the nation is properly prepared for the challenge of climate change.

NCCARF’s role has been three-fold:

• first, to identify the most important gaps in our knowledge and understanding about our vulnerabilities to climate change, and the possibilities for adaptation
• second, to manage a portfolio of research projects that would address these gaps
• third, to communicate the results from this research to policy makers and other end-users to ensure their decisions about adaptation are based on the best possible information.

To undertake these three roles successfully, NCCARF had a fourth role – to evaluate and where necessary develop capacity amongst researchers to carry out adaptation research, and capacity amongst policy makers to effectively utilise research outputs.

This Final Report describes how NCCARF carried out these four roles between 2008 and 2013, and evaluates the extent to which it was successful in achieving its objectives. It closes with three independent reviews of NCCARF’s activities. A commitment by the incoming Australian government means that NCCARF will receive financial support for a further three years, commencing in the 2014-15 financial year.

Lessons identified through the evaluation process will support NCCARF’s operations during this next phase.
2 Introduction to NCCARF

2.1 A short history

2.1.1 Introduction
Adaptation to climate change consists of actions to reduce the adverse consequences on human and natural systems, as well as to harness any beneficial opportunities.

NCCARF was established by the Australian Government in May 2008 to fill a gap in Australia’s capacity to coordinate, manage and deliver climate change adaptation research. NCCARF is a consortium led by Griffith University together with eight Australian universities and the Queensland Government. NCCARF is hosted by Griffith University at its Gold Coast campus.

2.1.2 Establishment Phase: 2008 to 2010
From its commencement in May 2008, NCCARF embarked on an ambitious work program to:
• establish climate change adaptation research programs addressing identified knowledge gaps
• improve collaboration between researchers and research end-users
• ensure access for practitioners and decision-makers to existing and emerging research about climate change adaptation.

In its Establishment Phase, NCCARF achieved a number of key outcomes (NCCARF 2010). The organisation:
• finalised National Climate Change Adaptation Research Plans (NARPs) for seven of eight nominated thematic areas (see Box 1), to identify critical gaps in the information available to decision-makers, and to set research priorities
• identified and initiated a NARP for a ninth thematic area for Australian Indigenous Communities
• developed Implementation Plans for each completed NARP that identified the scale of Australian research capacity and funding opportunities for that thematic area
• managed research calls for those NARPs that had been approved by the Australian Government to identify research projects that would best address the priorities identified by the NARPs
• established a program of synthesis and integrative research
• established eight Adaptation Research Networks, one for each of the nominated thematic areas
• established the NCCARF website, seminar series and quarterly newsletter, and ran symposia addressing the knowledge needs of practitioners
• engaged with key stakeholders and developed mechanisms to improve access to, comprehension of and use of climate change adaptation research
• organised and hosted (with the Commonwealth Scientific and Industrial Research Organisation [CSIRO]) the first International Climate Change Adaptation Conference.

2.1.3 Operational Phase: 2010 to 2013
The Department of Climate Change and Energy Efficiency (DCCEE) commissioned an operational review of NCCARF in 2010. The review was to focus on NCCARF’s national impact, quality of outputs, operational timeliness and value for money.

The review found that:
• NCCARF’s purpose remained appropriate and realistic, albeit ambitious
• NCCARF’s model was conceptually sound in most respects
• NCCARF’s Networks and research planning coordination were valuable
• Australia was better placed to determine and implement sound climate change adaptation responses as a result of NCCARF’s work.
The review recommended, and DCCEE accepted, a model for the next phase of NCCARF that would expand NCCARF's role and management capacity, extend its term, establish an advisory board and reduce day-to-day oversight by DCCEE. NCCARF’s Operational Phase Strategy 2010-2013 (NCCARF 2011) set out five changes arising from the Operational Review:

1. A new governance structure headed by an NCCARF Board would be established, with DCCEE's role becoming strategic rather than operational or regulatory.
2. The centre of gravity of NCCARF's activities would be shifted to more effectively address the needs of end-users.
3. NCCARF's internal capacity would be expanded with the addition of two deputy directors and other changes.
4. NCCARF’s active life was extended by 12 months to June 2013.
5. NCCARF took on management of all research projects previously managed by DCCEE and all Adaptation Research Grants Program (ARGP) projects for themes other than Human Health and Marine Biodiversity and Resources.

Progress towards NCCARF's objectives and work programs in the Operational Phase was assessed through specification of milestones and deliverables in annual work plans, delivery of progress reports which evaluated progress against those benchmarks, and annual independent 'customer surveys' of all stakeholders (Nielsen 2011, 2012, 2013).

An independent evaluation of DCCEE's National Climate Change Adaptation Program, including NCCARF, was undertaken in 2012. It found significant evidence that NCCARF’s activities boosted Australia's capacity to develop information and knowledge required for sound and effective decision-making about climate change adaptation, and concluded that this knowledge responds directly to information gaps and priorities. The evaluation found that NCCARF had demonstrated a capacity to coordinate the research community, build adaptation research capacity and focus adaptation research effort.

2.1.4 Completion: June 30, 2013
By the time NCCARF's Operational Phase finished in June 2013, NCCARF had completed all of its contracted milestones with the Commonwealth Government (as described elsewhere in this report). It had:

- published reports from all research projects that it had commissioned and managed (72 ARGP projects and 46 Synthesis and Integrative Research (SIR) projects)
- prepared NARPs for nine key themes, of which six had been updated
- held three major adaptation conferences
- supported and guided eight Adaptation Research Networks having about 5000 members in total, drawn from both the researcher and end-user communities
- held or supported many workshops and master classes throughout Australia
- produced policy briefs and information sheets on a range of key topics
- established and maintained a website and several social media platforms having considerable traffic.

NCCARF also contributed to many climate change adaptation initiatives during the Operational Phase, including:

- the Fifth Assessment and Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) of the Intergovernmental Panel on Climate Change (IPCC), as well as other international climate change adaptation programs and activities
Box 1: NCCARF priority themes

The following priority themes were the focus of the National Climate Change Adaptation Research Plans (NARPs) and the Adaptation Research Networks.

**Freshwater biodiversity and water resources:**
the impacts of climate change on surface and groundwater, inland aquatic and semiaquatic ecosystems. The associated social and economic impacts of changing water regimes and adaptation strategies for managers and users.

**Marine biodiversity and resources:**
the biophysical impacts of climate change and the variability, on coastal, estuarine and marine ecosystems including fisheries. The social and economic impacts and adaptation strategies for industries and sectors that depend on the marine environment.

**Terrestrial biodiversity:**
the species and ecosystem level impacts of climate change, and the adaptive capacity of ecosystem and ecological communities and the implications for biodiversity management strategies.

**Primary industries:**
the impacts of climate change on horticulture, viticulture, livestock, cropping, intensive and extensive farming practices and forestry. The social and economic impacts of climate change on these industries and sector and region specific adaptation strategies.

**Settlements and infrastructure:**
the impacts of climate change on coastal settlements, public and private infrastructure including building and facility design and construction; urban water security; flooding and stormwater overflow. The social, economic and institutional implications of these impacts, and the implications for planning design and management.

**Indigenous communities:**
recognising that the impacts of climate change are already being felt by Indigenous communities, and that there are particular challenges and opportunities that climate change presents to Australian Indigenous communities.

**Human health:**
changes to the range and persistence of vector and food-borne diseases, the physical and mental health impacts of heat waves, and other extreme events and the social, economic and management implications of these impacts for the Australian health care system.

**Emergency management:**
the implications of changes in frequency and intensity of extreme weather events for disaster mitigation, preparedness, response and recovery and the strategies for building community and organisation resilience in the disaster and emergency management sectors.

**Social, economic and institutional dimensions of climate change:**
a cross cutting analysis of issues such as methods for understanding whole-of-economy trends for vulnerability to climate change. Understanding and developing adaptation strategies for vulnerable communities and the institutional challenges of adaptation to climate change.
2.2 NCCARF governance and funding

2.2.1 Governance

In its Establishment Phase (2008-2010), NCCARF was governed through an Executive Group consisting of three members: the First Assistant Secretary from the Department of Climate Change, the Deputy Vice-Chancellor (Research) from Griffith University, and the NCCARF Director. The Operational Review in 2010 recommended that the Executive Group be replaced by a Board (see Box 2). This recommendation was accepted and in its Operational Phase (2010-2013) NCCARF was governed by a Board with an independent chair and nine members drawn from federal and state government, business and the community, as well as from NCCARF’s partnership. The NCCARF Director is an ex officio Board member.

The partners in the NCCARF consortium are represented through a Partner Advisory Group (PAG), meeting three times yearly and reporting to the Board at each of its meetings.

2.2.2 Financial performance

The financial performance of NCCARF during its five-year term is summarised in Table 2.1. The grant from the Australian government, through the Department of Climate Change and its successor departments, to support NCCARF activities was for $47 million. In addition, NCCARF leveraged $1 million from the National Water Commission to support research in the area of Freshwater Biodiversity.

Not all the $48 million was managed by NCCARF itself:

- $3 million went to the National Health and Medical Research Council (NHMRC) as co-funding for research projects in the ARGP on human health and adaptation
- $4 million went to the Fisheries Research and Development Corporation (FRDC) as co-funding for research projects in the ARGP on adaptation for marine biodiversity and resources
- $1 million was expended by the DCC on ARGP projects before management of the ARGP passed to NCCARF in 2010.

Further information on the $7 million used to leverage matching funds from FRDC and NHMRC is given in Section 5 (see Table 5.6). In addition, NCCARF partner institutions contributed $6.2 million in cash and $15 million in-kind.

This investment supported NCCARF and its activities as follows:

- The Adaptation Research Grants Program (ARGP): a $20 million program focused on delivering research in the nine thematic areas (see Box 1).
- The Synthesis and Integrative Research Grants Program (SIRP): a $6 million research program drawing on existing information relevant to key topics in climate change adaptation to address issues or research needs identified by end-users.
- Networks: $10 million provided to support eight Adaptation Research Networks.
- Core Operational Activities: $11 million to support the core activities of NCCARF (establishing research agenda, managing research grant programs and the Networks, as well as communication and outreach activities).

At the end of the five-year funding program NCCARF had a positive financial position. Cash contribution targets were achieved and in-kind contributions exceeded original budgets. Cash received from all sources was in excess of $47 million and in-kind support was $16.5 million against a contractual commitment of $15.6 million. The additional in-kind support received from our partners significantly reduced the demand on cash expenditure.

Overall this is a good result for NCCARF and is due to sound finance management and the commitment of all our partners and the Board. Detailed audited financial statements and six-monthly financial progress reports have been submitted to DiICCSRTE as part of the Funding Agreement contractual reporting requirements.
### Table 2.1: Summary financial information on NCCARF

<table>
<thead>
<tr>
<th></th>
<th>Cash ($’000)</th>
<th>In Kind Support ($’000)</th>
<th>Total ($’000)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government funding</td>
<td>40,122</td>
<td>0</td>
<td>40,122</td>
</tr>
<tr>
<td>Partner Contributions</td>
<td>7,508</td>
<td>16,511</td>
<td>24,019</td>
</tr>
<tr>
<td><strong>Total Income</strong></td>
<td>47,630</td>
<td>16,511</td>
<td>64,141</td>
</tr>
<tr>
<td><strong>Expenditure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Activities</td>
<td>26,752</td>
<td>14,548</td>
<td>41,300</td>
</tr>
<tr>
<td>Research Networks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and the Synthesis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and Integrative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Program</td>
<td>20,272</td>
<td>1,963</td>
<td>22,235</td>
</tr>
<tr>
<td><strong>Total Expenditure</strong></td>
<td>47,024</td>
<td>16,511</td>
<td>63,535</td>
</tr>
</tbody>
</table>

Note: Government funding includes $1 million provided by the National Water Commission for investment in the ARGP

Table 2.1 relates only to direct funding received by NCCARF in accordance with the Commonwealth Funding Agreement. This core funding was used to pursue additional opportunities to leverage further funding, research capacity and resources. Further information relating to additional financial leveraging support received by NCCARF through the Networks, partners and research community is provided in Section 5 (see, for example, Table 5.7).

### 2.2.3 Strategy and Objectives

The NCCARF Strategy 2010-2013 identified four Objectives, to be delivered through fifteen Strategies (see Box 3). Each Objective has a set of Key Performance Indicators (KPIs) that together evaluate the extent to which the Objective was successfully achieved.

Activities to achieve the Objectives were identified in Annual Operating Plans, which were endorsed by the NCCARF Board and approved by the Department of Climate Change and Energy Efficiency (DCCEE), later DIICCSRTE. Each Operating Plan contained milestones against which activity performance could be evaluated. All milestones were met, and in many instances surpassed, by the end of the Operational Phase of NCCARF.
Box 2: NCCARF Board membership and partnership

Board membership

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Member</th>
<th>Tenure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ian Carruthers</td>
<td>Independent Board Chair</td>
<td>12/4/11 – 30/6/13</td>
</tr>
<tr>
<td>Jean Palutikof</td>
<td>NCCARF Director</td>
<td>12/4/11 – 30/6/13</td>
</tr>
<tr>
<td>Harinder Sidhu</td>
<td>DCC &amp; DCCEE Representative</td>
<td>12/4/11 – 14/10/12</td>
</tr>
<tr>
<td>Benedikte Jensen</td>
<td>DCCEE &amp; DIICCSRTE Representative</td>
<td>15/10/12 – 30/6/13</td>
</tr>
<tr>
<td>Allan Jones</td>
<td>Independent Board Member</td>
<td>12/4/11 – 30/6/13</td>
</tr>
<tr>
<td>Amanda McCluskey</td>
<td>Independent Board Member</td>
<td>12/4/11 – 30/6/13</td>
</tr>
<tr>
<td>Stephanie Ziersch</td>
<td>Independent Board Member</td>
<td>12/4/11 – 26/9/12</td>
</tr>
<tr>
<td>Christopher Lee</td>
<td>Independent Board Member</td>
<td>27/9/12 – 30/6/13</td>
</tr>
<tr>
<td>Ned Pankhurst</td>
<td>Griffith University Partner Board Member</td>
<td>12/4/11 – 30/6/13</td>
</tr>
<tr>
<td>Chris Cocklin</td>
<td>James Cook University Partner Board Member</td>
<td>12/4/11 – 30/6/13</td>
</tr>
<tr>
<td>Jim Piper</td>
<td>Macquarie University Partner Board Member</td>
<td>12/4/11 – 30/6/13</td>
</tr>
<tr>
<td>Greg Withers</td>
<td>Queensland Government Partner Board Member</td>
<td>12/4/11 – 19/8/11</td>
</tr>
<tr>
<td>Yolande Yorke</td>
<td>Queensland Government Partner Board Member</td>
<td>20/8/11 – 11/11/12</td>
</tr>
<tr>
<td>Fiona Rafter</td>
<td>Queensland Government Partner Board Member</td>
<td>12/11/12 – 30/6/13</td>
</tr>
</tbody>
</table>

NCCARF Partnership:
- Queensland Government
- Griffith University
- James Cook University
- Macquarie University
- Murdoch University
- The University of Newcastle
- Queensland University of Technology
- University of Southern Queensland
- University of the Sunshine Coast
Box 3: Summary of objectives and strategies of NCCARF Strategy 2010–13

Objective 1: Identify knowledge needs of end-users

Strategy 1.1: Identify and engage with end-users.
Strategy 1.2: Understand and articulate end-user climate change adaptation knowledge needs.
Strategy 1.3: Understand and articulate gaps in existing knowledge.
Strategy 1.4: Promote knowledge needs to potential funding organisations and researchers.

Objective 2: Build and harness the capacity of the research and end-user community

Strategy 2.1: Build climate change adaptation research and end-user capacity.
Strategy 2.2: Build the best interdisciplinary and collaborative teams to undertake research in the NCCARF research programs.
Strategy 2.3: Pursue opportunities to leverage additional funding, capacity and other resources, building on the Australian Government investment in NCCARF.

Objective 3: Generate the knowledge to meet end-user needs

Strategy 3.1: Identify research projects to be supported by NCCARF through the two research activity streams.
Strategy 3.2: Initiate and manage research programs to address identified national research needs around the NCCARF priority themes.
Strategy 3.3: Initiate and manage research programs to address identified national research needs for synthesis and integrative research knowledge.
Strategy 3.4: Evaluate the contribution made by NCCARF research to national capacity, and re-visit understanding of knowledge gaps and research needs.

Objective 4: Make knowledge available to end-users

Strategy 4.1: Identify effective approaches to the communication and delivery of climate change adaptation knowledge to end-users.
Strategy 4.2: Identify and address barriers to the effective communication of climate change adaptation knowledge.
Strategy 4.3: Collate, synthesise and communicate existing climate change adaptation knowledge.
Strategy 4.4: Communicate and disseminate climate change adaptation research outputs.

1 In this document, researchers are defined as the community of knowledge generators, and end-users as the community of knowledge users. Typically, but with many exceptions, a knowledge generator will work in a research organisation (such as CSIRO) or a university, and an end-user will work in government, industry, business or community sectors.


3 Structure of report

This report outlines the achievements of NCCARF over the first five years. It evaluates the appropriateness of the approaches taken to meet NCCARF Objectives (see Box 3), and the degree to which NCCARF has effectively met those Objectives.

In essence, the Objectives were addressed through four areas of work, as follows:

- identifying knowledge needs
- commissioning of research and delivery of results
- NCCARF’s Adaptation Research Networks
- communication and capacity building.

The inter-relationships of these four work areas are shown in Figure 3.1.

In this Report, Section 4 describes the activities undertaken in these four work areas in order to achieve the NCCARF Objectives. It sets out how each work area relates to the Strategies, and hence to the Objectives. Then, Section 5 takes each Objective in turn, provides an indication of the activities taken to deliver on that Objective and its Strategies, and reports on NCCARF’s performance against its KPIs. Finally, Section 6 summarises NCCARF achievements, and provides independent assessments of NCCARF from three stakeholders. It considers the collective outcomes of NCCARF’s activities, and makes an evaluation of the extent to which NCCARF achieved its mission.

Figure 3.1: Inter-relationships of NCCARF activities and objectives.
4 NCCARF activities

4.1 Identifying knowledge needs

4.1.1 Introduction

A key objective for NCCARF was to identify the information, knowledge and tools required by practitioners to make sound decisions about climate change adaptation. Achieving this objective would support NCCARF’s own research investments and also provide guidance for other research investors in Australia. This process was iterative, as new knowledge would help support adaptation decisions, and also help define further knowledge needs, as shown in Figure 4.1.

As a first step, information, knowledge and tools for adaptation were categorised into: (a) new knowledge resulting from research and (b) information and knowledge products synthesised from published research. The former was managed through NCCARF’s Adaptation Research Grants Program (ARGP); the latter through NCCARF’s Synthesis and Integrative Research Program (SIRP).

For each program, NCCARF performed three steps: (a) identifying critical information gaps and research priorities, (b) commissioning research projects to address the gaps and priorities, and (c) managing the research projects as part of an overall research portfolio to deliver the knowledge required by end-users.1

This section describes step (a): how NCCARF identified the key gaps and research priorities for the two programs. Section 4.2 describes steps (b) and (c): how NCCARF commissioned and managed research to address these gaps and priorities.

Figure 4.1: Climate change adaptation research cycle.

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1 Where an end-user is defined simply as the person for whom NCCARF creates knowledge on climate change and climate change adaptation, and to whom NCCARF delivers that knowledge (see also Box 3).
4.1.2 Adaptation Research Grants Program

4.1.2.1 Identifying critical information gaps and research priorities

A National Climate Change Adaptation Research Plan (NARP) was written for each of nine key sectors. The purpose of a NARP is to provide a national blueprint for research investment in climate change adaptation by research organisations and knowledge user stakeholders. The nine sectors are:

1. Marine biodiversity and resources
2. Terrestrial biodiversity
3. Freshwater biodiversity and resources
4. Primary industries
5. Settlements and infrastructure
6. Human health
7. Emergency management
8. Adaptation in Indigenous communities
9. Social, economic and institutional dimensions of adaptation.

Each NARP identified critical information gaps and priority research questions for the most urgent and important climate change adaptation issues for the relevant sector. Development of NARPs involved the active participation of both the research community and adaptation stakeholders, through several steps:

1. A writing team was formed from Australian research and end-user experts in the relevant sector and in climate change adaptation.
2. The writing team prepared and released a discussion paper that summarised available information, knowledge and tools about climate change adaptation, adaptation issues, and priority information gaps and research questions for the sector.
3. NCCARF and writing team members held a stakeholder workshop to build on the discussion paper and gain broader input to the priority research questions.
4. The writing team prepared a draft NARP and released it for stakeholder input.
5. On the basis of the input received from stakeholders, the writing team prepared a final NARP, which was approved by the Minister for Climate Change (2008 to 2010) or the NCCARF Board (2011 to 2013).

NCCARF provided secretariat support for each writing team.

NCCARF was originally contracted to support the preparation and delivery of eight NARPs, but identified the need for and value of a ninth NARP (and research stream) concerned with adaptation and Indigenous communities.

Key elements in the development of NARPs include:

- involvement of both research and end-user communities
- input from a broad cross-section of stakeholders through both workshops and circulation of draft documents
- a research gap analysis based on a set of objective criteria which took into account urgency and practicality, as well as the severity of the potential impact.

4.1.2.2 Implementation plans

Implementation plans are produced for each NARP to identify how Australia’s research investment opportunities and research effort can be directed towards the identified priority research questions (see below). Implementation plans have several purposes:

- To identify available research capacity for the priority research questions.
- To identify actual and potential investment options to support research into the priority questions for the sector.
- To identify mechanisms to promote collaboration between researchers and end-users.
4.1.2.3 Updating NARPs and Implementation Plans

NARPs and Implementation Plans need to be revisited and updated on a regular basis to maintain their currency as a blueprint for national climate change adaptation research and knowledge development. NCCARF updated each NARP after two years, meaning that the six NARPs that had been completed earliest, and their associated implementation plans, were updated in this reporting phase (see Table 4.1).

A stakeholder-driven process was used to ensure the priority research questions were relevant and up to date, and thus able to provide guidance for research investment over the following five years. Updated priority research questions were identified, based on changes in:

- stakeholder information needs
- relevant research published
- areas of current research focus.

Table 4.1: Publication dates of NARPs and Implementation Plans, and their updates

<table>
<thead>
<tr>
<th>Theme</th>
<th>Date published</th>
<th>Date update published</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Management</td>
<td>2010</td>
<td>2012</td>
</tr>
<tr>
<td>Human Health</td>
<td>2009</td>
<td>2012</td>
</tr>
<tr>
<td>Marine Biodiversity and Resources</td>
<td>2010</td>
<td>2012</td>
</tr>
<tr>
<td>Settlements and Infrastructure</td>
<td>2010</td>
<td>2012</td>
</tr>
<tr>
<td>Terrestrial Biodiversity</td>
<td>2011</td>
<td>2013</td>
</tr>
<tr>
<td>Primary Industries</td>
<td>2010</td>
<td>2013</td>
</tr>
<tr>
<td>Freshwater Biodiversity</td>
<td>2011</td>
<td>Not updated</td>
</tr>
<tr>
<td>Social, Economic and Institutional Dimensions</td>
<td>2011</td>
<td>Not updated</td>
</tr>
<tr>
<td>Indigenous Communities</td>
<td>2012</td>
<td>Not updated</td>
</tr>
</tbody>
</table>

4.1.2.4 Synthesis and Integrative Research Program (SIRP)

The SIRP was established, scoped, supported and managed by NCCARF. The purpose of the SIRP was to deliver tailored reports and other products (such as decision-support tools) that could be directly applied to the needs of end-users working in climate change adaptation. Therefore, the development of priority areas for this program was primarily determined through stakeholder involvement, collaboration and input.

To define the priority research areas, NCCARF met and held workshops with broad groups of stakeholders, including end-users and practitioners, from all levels of government, business and non-governmental organisations. Through facilitated discussions, stakeholders nominated key decision challenges, information gaps and knowledge needs, leading to research areas being identified for the SIRP. Participants were encouraged to consult with their organisations and provide ongoing input to identify further research areas for the SIRP.

The SIRP had three phases, each of which covered major adaptation issues as well as information and insight about more focussed topics. Phase One synthesised information about (a) historical experiences of extreme weather such as cyclones, floods or drought to develop insight about critical adaptation challenges, (b) the multiple factors affecting the vulnerability of forest ecosystems and industries, and (c) understanding adaptive capacity. Phase Two was mainly concerned with synthesising information about (a) limits to adaptation, and (b) coastal ecosystems, but also provided easily assimilated and applied information about climate impacts and post-disaster adaptation strategies. Phase Three addressed a wide range of end-user-focused topics, including: planning for and recovery from floods, support for climate change decision-making in local government, management of uncertainty in climate change projections, food security under climate change, effective communication to decision-makers and costs of climate change impacts and adaptation. A major component of Phase Three was the delivery of integrated and synthesised climate change adaptation information for (and to) each state and territory.
4.2 Commissioning and delivery of research

Three case studies of research projects and their reports are provided in this section of the report. These are:
- Case Study 1: Climate change adaptation strategies for Australian birds.
- Case Study 2: South East Coastal Adaptation (SECA): Coastal urban climate futures in SE Australia.
- Case Study 3: Analysis of damage to buildings following the 2010-11 Eastern Australia floods.

4.2.1 Adaptation Research Grants Program (ARGP)

4.2.1.1 Procurement

As described in Section 4.1.2, research priorities for the ARGP were identified through the development of nine thematic National Climate Change Adaptation Research Plans (NARPs). Research to address these priorities for seven of the themes was commissioned by NCCARF through open calls and peer review of submitted proposals. The research portfolio of successful projects was then managed by NCCARF through to final report delivery. Research for the remaining two themes was commissioned and managed by the National Health and Medical Research Council (NHMRC) (for the Human Health theme) and by the Fisheries Research and Development Corporation (FRDC) (for the Marine Biodiversity and Resources theme) under agreements between those parties and the Department of Climate Change. Research for the Marine Biodiversity and Resources and Human Health themes is not discussed further in this section.

The research call and selection process is outlined in Figure 4.2, and involved two stages: (a) a short Expression of Interest (EOI) that briefly set out the objectives, methods and deliverables of the proposed research, the capacity of the team to undertake the research and the cost and then, for successful applications (b) a longer proposal that provided greater detail about all aspects of the proposed research activity. A Science Review Panel (SRP) was established for each theme to evaluate proposals at each stage. The composition of each SRP was designed to achieve certain outcomes: (a) consistency between panels (achieved through a certain level of common membership of people expert in climate change science), and (b) understanding of the relevant theme (achieved through including researchers and end-users expert in that area). Proposals were assessed against criteria, as follows: (a) the degree of focus on the priority research questions identified in the relevant NARP, (b) project design, challenge, innovation and feasibility, (c) the track record of the research team, (d) co-funding available for the project (other than the ARGP funds requested), (e) capacity building, especially of early career research scientists, (f) end-user relevance, and (g) value for money.

From 2008 to 2010, recommendations from science review panels were submitted to the Minister for Climate Change for approval. The Minister confirmed science review panel recommendations in most cases. From 2011 to 2012, recommendations from science review panels were submitted to the NCCARF Board for approval; SRP recommendations were endorsed in all cases.

The resources of NCCARF Adaptation Research Networks (ARNs) were strongly engaged at all points in the project call and selection process. In particular, ARNs were asked to provide advice on developing research proposals, to identify key researchers and encourage them to submit proposals, and to support brokering of research consortia.

Seventy-two research projects were commissioned through this process; twelve were contracted and managed by the (then) Department of Climate Change (DCC) until the start of NCCARF's Operational Phase in 2011. In the Operational Phase, NCCARF contracted sixty new projects and took over the twelve managed by the Department, giving a total of seventy-two ARGP projects managed. As noted earlier, ARGP-supported projects for the human health and marine biodiversity and resources themes were contracted and managed by the NHMRC and FRDC respectively.
4.2.1.2 Delivery
Research project management by NCCARF was tailored to ensure that quality was maintained and that projects worked to ensure stakeholder engagement throughout the research cycle. It included:
- the preparation of an ‘End-user Engagement Plan’ as the first deliverable of each project
- preparation of reader-friendly summaries of research findings
- publication by NCCARF of full reports for each project, peer-reviewed by two scientific reviewers, and freely available to the public from the NCCARF website
- participation by research teams in annual meetings for each theme, to promote awareness of the other projects and to identify the potential for collaboration where beneficial
- stakeholder awareness activities, ranging from workshops to training days (for example, in the use of decision support tools), to promote awareness, understanding and uptake of research findings and products.

4.2.2 Synthesis and Integrative Research Program (SIRP)

4.2.2.1 Procurement
Phase one SIRP projects were carried out by NCCARF partner organisations. Topics were identified and agreed with the DCC, and partner organisations were asked to submit proposals. A small Stakeholder Advisory Group was formed, with representation from the DCC, partners and ARNs, to evaluate proposals and allocate funding.

For Phases two and three, SIR projects were awarded via open research calls and assessed by Science Review Panels, in a process broadly similar to that used for the ARGP, and as shown in Figure 4.2. Because most SIR research priorities were cross-cutting in nature, the role of the (thematic) ARNs was less clear, and ARNs were less actively involved than for the ARGP processes.
4.2.2.2 Visiting Fellows program

As part of the SIRP, NCCARF held calls for two Visiting Fellowships per year for the period 2010-2013. The goal was to give the opportunity for adaptation researchers, primarily from overseas, to interact with the Australian adaptation community to exchange knowledge and experience. Visiting Fellows were expected to give a program of seminars, and were encouraged to write at least one paper for a peer-reviewed journal during their Fellowship, which would acknowledge the support of NCCARF.

The NCCARF Visiting Fellows were:
- Dr Nova Mieszkowska, Marine Biological Association of the UK
- Professor Declan Conway, University of East Anglia, UK
- Dr Jim Salinger, ex-NIWA, New Zealand
- Dr Meg Parsons, University of Melbourne, now University of Auckland
- Dr Pauline Dube, University of Botswana
- Dr Wade Hadwen, Griffith University, Australia
- Professor Rob Glennon, University of Arizona, USA
- Dr Saleemul Huq, International Institute for Environment and Development, UK.
Research Project Case Study 1: Climate change adaptation strategies for Australian birds

Lead Institution: Charles Darwin University

Principal Investigator: Stephen T. Garnett

Project aims
- To understand the vulnerability of all species and subspecies of birds that are resident in Australia or visit on migration to climate change.
- To develop tailored adaptation strategies for those species and subspecies of birds most at risk.

This includes 708 species of birds and 926 subspecies.

Impacts of climate change on Australian birds
Among terrestrial and inland water birds, exposure is likely to be greatest for those species and sub-species confined to Cape York Peninsula, the Wet Tropics, the Top End of the Northern Territory (particularly the Tiwi Islands), the central and southern arid zone, southern South Australia (particularly Kangaroo Island) and King Island. Some birds are vulnerable to effects of projected increases in bushfire intensity and frequency.

Many seabirds are potentially highly sensitive to climate change, particularly off eastern Australia, including around Norfolk and Lord Howe Islands, and around the Houtman Abrolhos in south-western Australia. Beach-nesting and saltmarsh birds are likely to be exposed to sea-level rise.

Adaptation strategies
The report concludes that by far the most important actions are to continue to manage the current stressors to birds including fire, feral herbivores and predators, weeds and fishing. A few bird groups threatened with extinction will require assistance to colonise new climate space. The total cost of management for climate change over a 50-year period, without imposing a future discount rate or calculating net present value, is estimated to be $945 million.


Research Project Case Study 2: SECA: Coastal urban climate futures in SE Australia

Lead Institution: University of Canberra

Principal Investigator: Barbara Norman

Project aims

- To explore coastal urban futures from a range of perspectives by studying a region with a range of coastal settlements and diverse coastal governance arrangements.
- To extend the knowledge on climate change adaptation by applying an interdisciplinary approach to ‘coastal urban futures’ experiencing climate change.

Impacts of climate change on coastal settlements

The combined consequences of climate change over the next 20 years and urban coastal settlement patterns suggest increasing risk to coastal communities including impacts on housing and infrastructure, water resources, natural resource management (including biodiversity), health and economic futures. The impact is likely to vary according to the size and nature of coastal settlement.

Adaptation strategies

The adaptive capacity of coastal communities will differ according to scale, demography and other local characteristics.

Regional governance that enables implementation of a shared vision will be a hallmark of what an adapted climate community will look like in 2030. An evidence-based shared vision that can take a long-term view and allow for local interpretation and circumstance will provide the framework for appropriate local decision-making. Adaptation actions in coastal communities will require the cooperation and agreement from all levels of government who own and manage infrastructure and services in the coastal environment.


Research Project Case Study 3: Analysis of building damage following the 2010-11 floods

Lead Institution: Risk Frontiers, Macquarie University
Principal Investigator: Mathew Mason

Project aims

- To report the number of flood-damaged properties/homes in Queensland and Victoria.
- To outline the multiple ways floodwaters can damage buildings and the approaches to mitigate these damages.
- To collate and analyse flood-damage data collected by multiple agencies in order to develop damage and fragility functions for different building types.
- To review building controls in Queensland and Victoria.

Impacts of floods on properties

The Queensland cities of Brisbane and Ipswich were the worst affected by the floods. Flash flooding was a problem in a number of councils. In all, more than 28,000 properties were inundated in Queensland and around 2500 buildings affected in Victoria.

The type of damage differed depending on the nature of the flood (duration, depth etc.) and how it affected the building, for example, the different pressure forces. Flood actions affected each building differently depending on its elevation, structural shape, building materials, water transferability, and surrounding structures and terrain.

Adaptation recommendations

Recommendations included (for a full list please go to the report):

- Continue to develop accurate flood maps to identify expected flood levels and characteristics including depth, flow velocity, rate of rise, and origin.
- Consider introducing independent flood assessment bodies in all states to assess development proposals with respect to flood risk.
- Set minimum freeboard restriction of at least 300 mm to ensure habitable floor levels, taking into account uncertainties in flood depth predictions.
- Include storm surge and coastal wave areas in the Building Codes of Australia.


4.3 The Adaptation Research Networks

The role of the Networks was initially, as the name suggests, to grow capacity in the research community to carry out adaptation-related research. A further, and finally dominant, role was added in response to the findings of the Operational Review in 2010, and was to enable and empower decision-makers to use the outputs of that research by raising their awareness of the challenge of climate change and of the necessity for action to address the challenge. Over time, therefore, the balance shifted away from a focus on researchers and towards an emphasis on the capacity and knowledge needs of decision-makers.

Through the work of the Networks, a broad, varied and theme-specific body of work was carried out in parallel and often together with the activities of the NCCARF headquarters. Each Network was a large, inclusive and diverse community of researchers, practitioners and decision-makers from universities, government, the private sector and civil society, coordinated around a priority theme and hosted by research institutions around Australia.

The Networks made a unique contribution to both research and decision-making for adaptation in Australia and internationally. The Networks have significantly broadened the outreach and communication activities of NCCARF, have fostered Early Career Researchers (ECRs) in adaptation, have raised the profile of adaptation research and broadened stakeholder engagement in adaptation research and activities.

4.3.1 The formation and operation of the Networks

NCCARF established eight Adaptation Research Networks around its priority themes (listed in Box 1 – note that the Indigenous Communities theme forms a sub-network within the Social, Economic and Institutional Dimensions Network). Each Network host was selected through a competitive bidding process held in 2008 through a call for proposals from research institutions.

Figure 4.3: Locations of Networks and their associated Nodes highlighting the extent of NCCARF Network activities across Australia.
Applicants were selected on the basis of:

- the skills and capacity of the hosting institution and convenor
- their ability and willingness to engage key researchers and organisations in the network
- their ability to encourage the integration of different disciplines and institutions
- alignment to one of the NCCARF key priority themes (see Box 1)
- co-funding contribution
- value for money.

The objectives of the eight Adaptation Research Networks, as set out in the Call document, were to:

- promote and facilitate open exchange of information and sharing of resources
- contribute to the synthesis of existing and emerging research
- contribute to the development and implementation of the NARPs
- build research capacity.

Improved stakeholder engagement was added by NCCARF after the 2010 Operational Review. The locations of Network headquarters are shown in Figure 4.3. The Networks commenced activities in 2009.

The Networks were funded with $10 million over four years from NCCARF. In addition, the Networks leveraged over 70% of their resources, on average, in cash and in-kind contributions. Almost one quarter of the Networks’ cash income was through direct contributions by hosting institutions and their affiliates.

Although the Networks had a common purpose, and sought to fulfil a set of agreed roles, they differed substantially in their focus, approach, funding, structure, and management and governance arrangements. Networks had the flexibility to develop their own set of activities and individual work programs, which encouraged innovation and allowed Networks to tailor activities that were best suited to their particular sector.

Each Network was headed by a convenor, usually a senior academic in the relevant sector, and managed on a day-to-day basis by a coordinator. Each Network offered free membership and worked actively to attract a broad representation of stakeholders. While all Networks were hosted by a principal institution, all made arrangements to ensure that their networking activities spread throughout Australia. To enable this geographical spread, some of the Networks established sub-themes or nodes coordinated from other institutions. For example, Australian Climate Change Adaptation Research Network for Settlements and Infrastructure (ACCARNSI) had four nodes: Coastal Settlements based at Griffith University, Gold Coast; Urban Planning, Transport and Inclusion at University of South Australia and Adelaide University; Built Environment, Innovation and Institutional Reform at University of New South Wales (UNSW); and Infrastructure at UNSW.

Networks combined membership has grown from about 1500 in June 2009 to over 5200 by June 2013. Although the Networks were originally designed to connect the research community in Australia, by the end of five years of operation more than 53% of the membership did not identify specifically as researchers and this majority included policy makers, government representatives, private industry, practitioners and community members. Each Network developed its own unique program of activities designed to effectively target their stakeholders and membership. Key highlights are summarised in Box 4. The Marine Biodiversity Research Network is notable for having achieved the broadest, most well-rounded program of activities and engagement, with strong industry links, newsletters and factsheets, seminars, and a very successful early career researcher program.
Box 4: Snapshots of the Adaptation Research Networks

**Emergency Management Network (EM)**
- **Hosted by:** RMIT University
- **Convened by:** Professor John Handmer
- **Funding:** $765,500 over 4 years
- **Membership:** 398
- **Website:** http://emergencymanagement.org.au/
- **Objectives:** To foster information exchange and to support and undertake research to inform the way the emergency management sector responds to climate change. To be active across prevention, preparedness, response and recovery activities and organisations with consideration of all climatic hazards.
- **Key Activities:** Strong end-user focus and interaction, running several workshops with professional organisations and industry bodies.

**Human Health Network (HH)**
- **Hosted by:** Australian National University
- **Convened by:** Professor Tony Capon/ Professor Liz Hanna
- **Funding:** $872,700 over 4 years
- **Membership:** 293
- **Website:** http://climatehealthresearch.org/
- **Objectives:** To improve knowledge about climate change adaptation and human health to enable decision-making by government, industry and communities; to foster interdisciplinary research, build capacity, and facilitate collaboration between all stakeholders; to communicate research findings broadly.
- **Key activities:** Science-writing workshops for early career researchers and students; building health sector knowledge through a set of discussion papers; special issues of the journals “Asia-Pacific Journal of Public-Health” and “Health Promotion Journal of Australia”.

**Marine Biodiversity and Resources Network (MBR)**
- **Hosted by:** University of Tasmania
- **Convened by:** Associate Professor Neil Holbrook
- **Funding:** $1,470,500 over 4 years
- **Membership:** 797
- **Website:** http://arnmbr.org/
- **Objectives:** Delivering its mission to build adaptive capacity and adaptive response strategies for the effective management of marine biodiversity and natural marine resources under climate change.
- **Key activities:** Running a series of state and territory focused strategy meetings, the National Marine Climate Change Adaptation Graduate Schools, and public forums; development of the Oyster Project; supporting and contributing to the Marine Climate Change Impacts and Adaptation Report Card; preparation of a number of toolkits (Community Based Participatory Research Toolkit, Markets Toolkit and a Diagnostics User Guide).

**Primary Industries Adaptation Research Network (PIARN)**
- **Hosted by:** University of Melbourne
- **Convened by:** Professor Snow Barlow
- **Funding:** $1,068,800 over 4 years
- **Membership:** 563
- **Website:** http://piarn.org.au/
- **Objectives:** Seek to establish an enlightened adaptation research philosophy and ethos in the Australian Primary Industries Research community.
- **Key activities:** Establishment and delivery of two Master Classes on adaptation, hosting of nine interactive, online Webinars on key topics; establishment of an acknowledged group of leaders on research issues related to adaptation.
Social, Economic and Institutional Dimensions Network (SEID)

Hosted by: University of Melbourne
Convened by: Professor Jon Barnett
Funding: $1,367,300 over 4 years
Membership: 611

Objectives: Driving thinking across sectors and disciplines in the complex social, economic and institutional dimensions of climate adaptation. Assisting decision-makers to develop more effective adaptation measures.

Key activities: Ran a series of national workshops to further the knowledge and networks of researchers and decision-makers; established and ran the early career development Adaptation College; provided funding for ECR travel grants, Indigenous and community travel grants and Adaptation Leadership Awards.

Settlements and Infrastructure Network (ACCARNSI)

Hosted by: University of New South Wales
Convened by: Associate Professor Ron Cox
Funding: $1,645,500 over 4 years
Membership: over 250
Website: http://www.nccarf.edu.au/settlements-infrastructure/

Objectives: Initiating and developing effective strategies to respond to climate change through mitigation and adaptation implementation. Bringing together researchers and stakeholders with an interest in climate change adaptation for coastal settlements, public and private infrastructure, the built environment and urban regional planning.

Key activities: An extensive series of discussion papers addressing all aspects of the sector, a Research Nurture Program and annual early career workshops; nationwide benchmarking survey of households.

Terrestrial Biodiversity Network (TB)

Hosted by: James Cook University
Convened by: Professor Stephen Williams and Professor Lesley Hughes (Macquarie University)
Funding: $1,469,500 over 4 years
Membership: 1032
Website: http://nccarf.jcu.edu.au/terrestrialbiodiversity/

Objectives: Developing explicit and practical strategies that increase the resilience of terrestrial ecosystems and maximise their adaptive potential under climate change. Collating knowledge, coordinating expertise and synthesising these inputs into recommendations and frameworks that will guide the way forward for Australia to adapt to global climate change.

Key activities: Launch of the inaugural Terrestrial Biodiversity Report Card (terrestrialclimatechange.org.au); a series of capacity-building workshops on terrestrial adaptation management; Roadshows across Australia to engage stakeholders; development of Information Sheets.

Water Resources and Freshwater Biodiversity Network (FWB)

Hosted by: Griffith University
Convened by: Professor Stuart Bunn
Funding: $1,454,500 over 4 years
Membership: 826
Website: http://www.nccarf.edu.au/water/

Objectives: Bringing together Australia’s top water scientists and managers with interests and skills in water resources, freshwater biodiversity and climate change. Synthesising relevant knowledge to give Australian water and biodiversity managers the best chance of coping with a difficult climate future.

Key activities: Ten synthesis workshops bringing together groups of Australian and international experts to discuss key topics of relevance to adaptation and to produce a report of findings; regional node-based workshops.
4.3.2 Impact of the Networks

4.3.2.1 Impact on early career development
All Networks engaged strongly in capacity-building activities targeted at early career researchers and practitioners (see Box 5).

As an example, the Adaptation College of the Social, Economic and Institutional Dimensions Network (SEID) was a group of twenty early career professionals from across Australia working in research, government, and civil society, and selected at the outset of the Network through a competitive process. They met annually for one week for debate and discussion focussed on a single topic e.g. in April 2013, the college met in Fiji to explore and discuss cultural and economic impacts of adaptation and adaptation policies, and saw firsthand efforts in adaptation. The College sought to build a community of future leaders in adaptation and to foster a lasting network.

The Networks actively supported graduate students through workshops, and programs of small grants for travel and research. Collectively the Networks sponsored over two hundred scholarships, top-up grants and travel bursaries in support of students and ECRs.

4.3.2.2 Impact on research
The Networks supported NCCARF in its research management activities, including through contribution to writing of the NARPs and their updates, and to the associated consultation processes. Utilising their widespread membership, the Networks effectively circulated funding calls for Research Programs; they encouraged researchers and stakeholders to apply for grants; they brokered consortia to bid for grants. They hosted information sessions for prospective funding applicants to encourage strong, collaborative proposals.

The Networks prepared discussion papers and synthesis papers. Research articles, especially review papers, were published in peer-reviewed journals or less formal channels such as Network web sites. The Human Heath and Marine Biodiversity and Resources Networks edited special journal issues (Health Promotion Journal of Australia, Asia-Pacific Journal of Public Health and Reviews in Fish Biology and Fisheries respectively). A large number of individual research papers from all Networks were published, including in the high ranking journals Nature Climate Change and Science.

Many Networks assembled web-based annotated bibliographies related to adaptation. The Terrestrial Biodiversity Network made available to its membership information on a ground-breaking spatial and ecological meta-database currently being developed within Australia.
Box 5: Summary of early career capacity development by the Adaptation Research Networks

**SEID Network Adaptation College:**
Held annually for five years with 20 early career professionals from across Australia. Themes included Vulnerability and Adaptation, Adaptive Management and Policy, Legal Frameworks, and Cultural and Economic Impacts of Adaptation. In addition the College secured a meeting with the Minister, Department of Climate Change and Energy Efficiency.

**ACCARNSI Early Career Researcher Workshops/Forums:**
Held twice yearly with up to 30 participants, open to all early career researchers on a first-come first-served basis. They provided an opportunity to network, support and exchange ideas with fellow researchers in other Australian institutions and facilities. Abstracts and presentations were distributed among participants.

**Marine Graduate School:**
The Marine Biodiversity and Resources Adaptation Research Network ran two intensive two-day graduate schools.

**Primary Industries Masterclass:**
PIARN brought together early and mid-career researchers with producers at the coal-face of adaptation to explore how research, policies and new knowledge could help the sector manage climate change risks and opportunities.

**Freshwater Biodiversity Masterclass:**
This was a technical masterclass run by the Water Resources and Freshwater Biodiversity Network, covering topics such as climate projections and water scenarios; modeling climate change impacts on freshwater species; Bayesian networks for impacts modeling; science to policy; and science communication.

**Human Health Writing Workshops:**
The Human Health Network held two scientific writing workshops for post-graduate students and early career researchers.
Networks were active in promoting research and funding opportunities, and facilitating funding applications among members. For example, the Primary Industries Network assisted in development of collaborative research applications to the Department of Agriculture, Fisheries and Forestry (DAFF) Carbon Farming Futures Research Call, and the Human Health Network promoted the NHMRC Better Health Program.

4.3.2.3 Impact on collaboration and interdisciplinarity

Cross-Network communication was facilitated directly by NCCARF through twice yearly meetings of Network Convenors and Coordinators. Between-Network collaborations became increasingly important through the lifetime of the Networks, as the necessity for cross-sectoral interactions to ensure effective adaptation became clear. As examples, the SEID and EM Networks developed a cross-network workshop on *Legal and Institutional Dimensions of Adaptation and Extreme Event Management*; and the Settlements and Infrastructure, Terrestrial Biodiversity, Water Resources and Freshwater Biodiversity, and Marine Resources Networks held two cross network workshops to consider the scenarios under which various engineering options should be used to effectively protect estuarine settlements whilst simultaneously minimising ecological impacts and maintaining ecosystem function.

Visiting researchers and travel exchanges allowed the Networks to develop and foster international links (e.g. Nick Macgregor from Natural England to the Terrestrial Biodiversity Network; Sotiris Vardoulakis from the United Kingdom Health Protection Network to the Human Health Network). The opportunities presented by experts visiting Australia for other purposes were maximised, for example the Emergency Management Network organised a workshop for practitioners with participants from an international meeting organised by the IPCC to prepare the Special Report on Extremes (SREX).

The Networks were well represented at national and international meetings, including as plenary and parallel session speakers, through session sponsorship, symposium sponsorship and having exhibition stands. Finally, collaborations were fostered between Networks and external organisations or member organisations.

For example ACCARNSI provided in-kind support to Sydney Coastal Council Group for three Catchment Action Plan projects, and the Water Resources and Freshwater Biodiversity Network collaborated with the Murray Darling Basin Authority (MDBA) to look for opportunities to coordinate adaptation work across the basin.

4.3.2.4 Impact on end-user communication and engagement

The Networks engaged at various levels with stakeholders including:

- With the general public, for example the Marine Biodiversity and Resources Network organised a public seminar in Hobart with international speakers from a Tasmania-based IPCC Lead Author meeting for the Fifth Assessment, which attracted over 300 attendees.
- With practitioners and end-users, for example, the National Climate Change Adaptation Workshop for Professionals held by the Marine Biodiversity and Resources Network and the Building Resilient Communities workshop supported by the Emergency Management Network.
- In policy development and guidance. The SEID Network and ACCARNSI made submissions to the Productivity Commission Inquiry into Barriers to Climate Change Adaptation. The Marine Biodiversity and Resources Network partnered with CSIRO and FRDC to produce the Marine Report Card in 2009 and an update in 2012. The Terrestrial Biodiversity Report Card was an initiative of the Terrestrial Biodiversity Network and represents a first attempt at summarising current knowledge of climate change impacts on terrestrial and freshwater ecosystems and identifies potential adaptation responses and knowledge gaps in Australia.

NCCARF coordinated meetings between Network Convenors and Coordinators and representatives from NCCARF’s Forum for interaction between NCCARF, States and Territories (FORNSAT) (see Section 4.4.1.1 for a description of FORNSAT). Across all Networks, 89 newsletters and 33 information sheets were produced between 2009 and 2013, and over 70 workshops were conducted.
4.4 Communication and stakeholder capacity building

A critical part of NCCARF’s activities was communication to deliver adaptation knowledge with the goal of building capacity to adapt amongst the decision-making and practitioner communities. As noted in Section 4.3, the Adaptation Research Networks were a crucial component of NCCARF’s knowledge delivery and capacity building activities. In this section, we highlight the activities undertaken by the NCCARF headquarters in this arena.

Our approach to communication and capacity building was informed by an end-user analysis, an evaluation of channels by which knowledge and information products were accessed and used, best practice examples and case studies of knowledge communication, and direct feedback from priority end-user groups. We made knowledge available to end-users in a systematic and targeted way, with a focus on providing the right information to the right people at the right time, in the most effective way. To this end, NCCARF sought and received guidance on communication activity from groups such as the NCCARF Board, the NCCARF Partner Advisory Group, and the Forum for Interaction between NCCARF, States and Territories (FORNSAT). NCCARF contributed to the international community through our innovative conference programs and information exchange with peak bodies including the Intergovernmental Panel on Climate Change (IPCC), United Nations Environment Program (UNEP) and the United Kingdom Climate Impacts Program (UKCIP).

4.4.1 Stakeholder engagement

NCCARF identified a number of sectors with critical information needs to bring climate adaptation into policy development and implementation, and business planning. NCCARF addressed these stakeholders with tailored products and approaches to engage with state government, local government and business and industry.

4.4.1.1 State government engagement

NCCARF built a strong working relationship with representatives from each state and territory. We needed to liaise regularly with these important stakeholders to understand their research needs, to disseminate results from research, and to involve them in the many and diverse activities of the Facility. To address this need for engagement, NCCARF established FORNSAT as a mechanism for all Australian state and territory governments to interact with the Facility, and also with each other, to progress climate change adaptation research and activity in Australia. Each state and territory was invited to nominate a representative to sit on the Forum. FORNSAT met four times a year, and with the NCCARF Network Convenors and Coordinators once a year.

FORNSAT was highly supportive of all NCCARF activities. Members participated in all aspects of NARP development, sat on Science Review Panels for all of NCCARF’s research calls, publicised calls for research proposals, and reviewed reports in the SIR Program. They were involved in organising and facilitating NCCARF seminars, workshops and events, and were a guiding light in the successful development of NCCARF’s series of Policy Guidance Briefs.

4.4.1.2 Local government engagement

The very great diversity of local government entities in Australia meant that our engagement with local governments was slower to get off the ground. However, much of the ‘coal-face’ activity in adaptation in Australia takes place at the local government level, making it imperative for NCCARF to develop strong links into this community.

It became clear that none of the traditional mechanisms such as workshops, seminars and representative committees could reach effectively across the great diversity of local governments. Our primary mode of engagement was therefore through an online mechanism, the Local Government Portal (www.localgov.nccarf.gov.au). This portal carries good practice examples of adaptation, snapshots of relevant NCCARF research and news and views on adaptation in Australia.
We engaged with local government through the Australian Local Government Association (ALGA) and associated state and territory associations, the Australian Centre of Excellence for Local Government (ACELG), and through the Seachange Taskforce. NCCARF exhibited and made presentations at annual conferences and promoted climate adaptation research activities and products through these organisations. We invited local government speakers to give plenary presentations at our annual conferences.

On completion of our research portfolio, we brought key local government representatives together for a workshop to publicise relevant research products. We produced a Policy Guidance Brief on Challenges of adaptation for local governments and a second, on Building resilient coastal communities and ecosystems focussed strongly on the needs of local government for policy frameworks to support action to address the risks of sea-level rise.

4.4.1.3 Business and Industry engagement

We increased our private sector reach considerably in the last two years. The funding of a number of research projects relevant to this sector initiated increased engagement with specific business and industries. NCCARF also facilitated significant one-on-one engagement and a number of boardroom meetings, lunchtime meetings, forums, seminars and a dedicated business briefing breakfast during the NCCARF 2013 conference.

We established an online Business Portal (www.nccarf.edu.au/business) to ensure that tailored information and relevant research could be provided directly to business stakeholders. NCCARF developed strong links and engagement with industry representative groups such as the Infrastructure Sustainability Council of Australia, the Investor Group on Climate Change and the Australian Sustainable Built Environment Council. The Chief Executive Officer of the Investor Group on Climate Change, Nathan Fabian, has stated:

“Business is largely still working out what it knows and what it doesn’t know about the physical impacts of climate change and to us. NCCARF has played an important interpretive role between the science of climate change and its impacts on regions and resources and in some cases the assets that we invest in, so there is still an important role to be played.”

(Australian Broadcasting Corporation 26 February 2013).
4.4.1.4 NCCARF’s Climate Adaptation Champions

As part of its stakeholder engagement, NCCARF launched the annual Climate Adaptation Champions Awards in 2011 to highlight the achievements of people taking concrete steps to change behaviour, techniques, businesses practices and policies to adapt to an uncertain future. We looked for people, businesses and organisations who are champions of practical and innovative ways to adapt to climate change. Full details are available on the NCCARF website.

The 2013 winners were:
• Business: Sydney Water for incorporating climate risks into their long term planning to deliver water to more than 4 million people annually.
• Community: Green Cross for the Harden Up Program providing innovative online resources to assist Queenslanders to prepare for and manage severe weather events.
• Government: South Australia State Government and South Australia Local Government Association for their partnership in the South Australia Climate Adaptation program which has shown long term commitment to enact climate adaptation policies for South Australia.
• Individual: Brian Foster for his continued service to Natural Resource Management (NRM) groups and farm communities on the Eyre Peninsula.

4.4.1.5 NCCARF Adaptation Action Stories

To increase stakeholder engagement with the challenge of adaptation, NCCARF produced a collection of seven success stories of actions and achievements by organisations working to adapt their sector. These ‘Adaptation in Action’ stories, available on the website, are:
• Effective adaptation policy making: A case study from the Eyre Peninsula
• Benefit or burden? How to leave a positive legacy in local climate change adaptation – City of Mandurah
• Look, listen and feel the country: Learning adaptive management with traditional owners – Kakadu
• Small in size yet big reasons to adapt – how Tasmania translates climate change science into adaptive decision-making
• Lake Macquarie City Council’s planned response to sea-level rise
• Resilience to inland flooding: Queensland flood risk management framework
• Grantham relocation: responding to the 2011 Queensland floods.

4.4.2 NCCARF knowledge products

NCCARF produced tailored print and online products designed to reach a wide range of stakeholders. A high priority was to assist end-users to access the information most relevant to their needs. Some examples of how we achieved this goal are given below.

4.4.2.1 Research reports

NCCARF research programs have produced some 148 peer-reviewed final reports (see Appendix 1). These reports are all published on the NCCARF website as well as on the Australia Policy Online website. They will appear on the Terra Nova web-based repository for adaptation knowledge. They are registered with the National Library of Australia and the State Library of Queensland.

4.4.2.2 Research Portfolio Factsheets

It is not sufficient to simply place the research reports on the website and hope that stakeholders will find them. There need to be mechanisms to alert people to what is relevant to their knowledge needs, and to make sure that the necessary knowledge is readily accessible. Apart from conference presentations, seminars and workshops to publicise research outputs, NCCARF produced a number of summary publications.
Research Portfolio Factsheets cut across the thematic boundaries of NCCARF’s research programs to highlight collections of projects that address key topics, or geographical regions, relevant to the sectoral or place-based interests of decision-makers. These two- or four-page summaries listed relevant projects, provided a brief summary, and identified where to go for further information.

One Research Portfolio Factsheet was produced for each state and territory. The factsheets for key topics were:

<table>
<thead>
<tr>
<th>Local councils</th>
<th>Business and Industry</th>
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<tbody>
<tr>
<td>Coastal management</td>
<td>Policy and Regulation for Effective Adaptation</td>
</tr>
<tr>
<td>Water Resources</td>
<td>Decision Support Tools</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Natural Ecosystems: Landscapes, regions and conservation</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Natural Ecosystems: Specific Ecosystems</td>
</tr>
<tr>
<td>Vulnerable Communities</td>
<td>Extreme Weather</td>
</tr>
<tr>
<td>Emergency Management</td>
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NCCARF worked with researchers to produce plain language summaries drawn from SIRP and selected ARGP research projects. We identified a key topic of relevance to decision-makers, collected together the relevant projects that addressed the topic, and prepared a policymakers’ summary on each. The topics covered by these factsheets are listed below and a full list of the titles is provided in Appendix 3.

- Adaptation lessons from flooding impacts in Australia
- Exploring the limits to climate change adaptation
- Living with climate change: climate change impacts and adaptation factsheets for Australia
- Food security
- Adapting to climate change in the coastal zone
- Learning from experience: historical case studies of extreme events in Australia and the lessons for adaptation
- Public risk perceptions, understandings and responses to climate change in Australia and Great Britain

4.4.2.3 NCCARF highlights

Particularly in the early years of NCCARF, it was important to inform stakeholders about our mission, goals and activities. To do this, we produced a set of factsheets under the general title Promoting Excellence in Adaptation. The factsheet titles are:

- Developing knowledge to adapt: Key achievements of the National Climate Change Adaptation Research Facility
- NCCARF research programs: Delivering a portfolio of research to support climate change adaptation in Australia
- Climate Adaptation Futures: The 2010 international climate change adaptation conference
- The Forum for interaction between NCCARF, States and Territories (FORNSAT)
4.4.2.4 Policy Guidance Briefs

NCCARF’s evidence-based Policy Guidance Briefs were developed to address key topics relevant to the challenge of effectively adapting Australia to a variable and changing climate. Each Policy Guidance Brief was developed in consultation with teams of adaptation practitioners and policy makers, and included a face-to-face workshop. Each workshop was held at a location that confronts challenges associated with climate risk, variability and change.

Twelve Policy Guidance Briefs were delivered in 2012–13, as follows:

- Building resilient coastal communities and ecosystems
- Ensuring Australia’s urban water supplies under climate change
- Supporting decision-making for effective adaptation
- Adapting agriculture to climate change
- Challenges of adaptation for local governments
- Adaptation and First Australians: lessons and challenges
- Climate proofing Australia’s infrastructure
- Adapting ecosystems to climate change
- Managing heatwave impacts under climate change
- Emergency management and climate change adaptation
- Ensuring business and industry are ready for climate change
- Policy and regulatory frameworks for adaptation

4.4.3 Information delivery

NCCARF and its Networks used a very wide range of delivery mechanisms including master-classes, symposia and seminars. Further detail on these is provided in Section 5.4. Here, we highlight some of the more innovative and high-profile approaches to information delivery.

4.4.3.1 Website and social media

The NCCARF website was NCCARF’s primary tool for communication. Between 2018 and 2013, we had over 119,000 visitors and 247,000 visits. Our traffic is global, with visitors from 207 different countries. More information is provided in Section 5.4.1.

We improved the website over time to ensure that the output of all of NCCARF’s activities was easily available to stakeholders and end-users. The website was completely redesigned in 2012 with a focus on better delivery of information. This included a search function that allowed the user to search for and access all of NCCARF’s research reports as well as information about projects, Networks and other publications.

Social media was used to alert people to NCCARF events, NCCARF products and to share happenings with our colleagues. Twitter was used extensively during the 2013 conference and a very energetic and active forum was established which discussed presentations and key findings. NCCARF’s Twitter feed (http://twitter.com/#!/nccarf) had 461 followers, and its Facebook page (http://www.facebook.com/NCCARF) currently has more than 1000 ‘likes’ NCCARF has a YouTube channel (http://www.youtube.com/user/nccarf) and a Vimeo page for longer videos (http://vimeo.com/nccarf).
4.4.3.2 Annual conferences
We ran conferences in each of our five years of operation, although the first, 2009, event in Brisbane was for partners and Network convenors and coordinators only, with a few invited guests and speakers. In the following year and together with CSIRO, we organised the first international Adaptation Futures Conference at the Gold Coast in 2010. This was our largest with over 1000 attendees from 52 countries. It was intended by NCCARF that the Gold Coast conference would become the first in a biennial series of international conferences devoted to climate change adaptation. It is a major success for NCCARF that this has proved to be the case, with the second international Adaptation Futures Conference in Tucson, Arizona, in 2012, and the third scheduled for Fortaleza, Brazil, in 2014. The conference series now has international support from PROVIA, the Program of Research on Climate Change Vulnerability, Impacts and Adaptation.

In 2011, a smaller annual conference was held in Cairns in conjunction with Greenhouse 2011. NCCARF and CSIRO co-hosted a larger conference in Melbourne in 2012 with 688 attendees, and NCCARF ran the Sydney event in 2013, with sponsorship from CSIRO amongst others, and 569 attendees.

These conferences attracted researchers, end-users and practitioners and were an opportunity for NCCARF to showcase its activities.

4.4.3.3 Video resources
NCCARF uses multimedia as a means of accessing a diverse audience. Examples of videos developed include:

- summary information on findings of each of the NARPs
- interviews with our Adaptation Champions
- plenary conference presentations.

Our YouTube channel hosts over 80 video resources and had 3,940 views up to 30 June 2013.

4.4.3.4 Press coverage
Through a long-term association with the Australian Science Media Centre (AusSMC) we had credible conduits to science journalists and used them to publicise our SIR and high profile ARGP reports. This provided a mechanism to circulate media alerts to a broad range of national media outlets. Our media coverage reached across radio, television, print and online; sectoral publications, including print and e-newsletters; industry publications, both online and print; national and international research-related publications, both online and print; and relevant blog and social media sites such as The Conversation, where NCCARF staff and researchers published articles.

Members of Sydney Water receiving their Climate Adaptation Champion award, June 2013
5 Achieving NCCARF’s objectives

The NCCARF Strategy 2010-2013 is structured around four key objectives designed to guide the work of NCCARF between 2010 and 2013:
1. Identify knowledge needs of end-users
2. Build and harness the capacity of the research and end-user community
3. Generate the knowledge to meet end-user needs
4. Make knowledge available to end-users.

These Objectives were to be achieved by implementing a number of Strategies. To evaluate performance, for each Objective a set of Key Performance Indicators (KPIs) was defined in the NCCARF Strategy 2010-2013.

In Section 5, we use a range of quantitative and qualitative measures to assess NCCARF’s performance against its KPIs. Three surveys carried out by Nielsen to provide us with an independent evaluation of NCCARF’s performance form an important component of the evaluation. NCCARF contracted Nielsen to conduct three independent surveys of stakeholder satisfaction between March and May in 2011, 2012 and 2013. The survey was widely distributed to over 5000 stakeholders. Numbers of respondents increased each year, with 485 in 2011, 530 in 2012, and 595 in 2013. Additional data to report on KPIs were also collected from NCCARF’s own files and, to evaluate the website performance, from Google Analytics. Table 5.1 summarises, for all Objectives, the quantitative measures used to evaluate the KPIs, as well as performance against those measures.

Table 5.1: Summary of measures used to evaluate KPIs for the four NCCARF Objectives.
Source: NCCARF files, Stakeholder survey (as indicated), Google Analytics (as indicated).

<table>
<thead>
<tr>
<th>OBJECTIVE 1: Identify knowledge needs of end-users</th>
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<tbody>
<tr>
<td><strong>KPI 1a:</strong> Number, profile (where available, e.g. seniority etc.) and representation (government, industry and community) of end-users engaged through NCCARF activities including via the Networks and responding to the survey (overlaps with similar KPI for Objective 2).</td>
</tr>
<tr>
<td>Measure:</td>
</tr>
<tr>
<td>End-user membership of NCCARF’s Adaptation Research Networks</td>
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<tr>
<td>End-user attendance at NCCARF’s annual conferences</td>
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<tr>
<td>End-user attendance at NCCARF seminars</td>
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<td>End-user participation in Policy Guidance Brief workshops</td>
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<td>End-user participation in NARP drafting and consultation</td>
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<tr>
<td>End-user engagement in NCCARF funded research projects</td>
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<tr>
<td>Financial contribution of end-user organisations to NCCARF-funded research projects</td>
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</tbody>
</table>

| KPI 1b: Levels of satisfaction of end-users with engagement processes – specifically, do they feel as if they have been adequately engaged in identifying and prioritising the information and knowledge products that are being developed (via end-user survey) (overlaps with similar KPI for Objectives 3 and 4). |
| Measure: | Key finding: |
| Stakeholder survey: respondents asked to rate NCCARF’s performance in involving end-users with research activities and outputs | In the 2013 survey, 61% (of 409 respondents) gave NCCARF an excellent or good rating |
| Stakeholder survey: respondents asked to rate whether NCCARF understood their climate change adaptation information and knowledge needs | 61% of respondents in 2013 rated NCCARF as excellent or good, up from 54% in 2012 and 47% in 2011 |
### KPI 1c: Extent to which the portfolio of research projects commissioned by NCCARF (SIRP and ARGP) matches the research priorities identified through end-user consultation (also for Objective 3).

<table>
<thead>
<tr>
<th>Measure:</th>
<th>Key finding:</th>
</tr>
</thead>
</table>
| Number of NARP priority research questions addressed by ARGP research projects | • Of 73 priority research questions in 9 NARPs, 62 (85%) were addressed by at least 1 project in the ARGP  
• For the 7 ARGP themes managed by NCCARF, 48 (96%) of 50 high PRQs were addressed by at least 1 project in ARGP |
| Number of SIRP projects addressing priorities identified through end-user consultation | All (out of 46) |
| Stakeholder survey: respondents asked to rate NCCARF’s ability at identifying suitable climate change adaptation research projects | 61% of respondents in 2013 rated NCCARF as excellent or good |

### KPI 1d: Number of and levels of cash and in-kind investment in research projects which address NARP priorities or S&I research priorities initiated and/or funded by other research agencies, such as ARC (also for Objective 2).

<table>
<thead>
<tr>
<th>Measure:</th>
<th>Key finding:</th>
</tr>
</thead>
</table>
| Number and value of projects in climate change adaptation funded by other agencies (identified by inspection of research agencies web sites)  
n.b. data on in-kind investment were not available | • Between 2008 and 2013, c. $295 million was allocated to projects relevant to NARP and SIRP research priorities  
• The ARC funded 102 projects relevant to adaptation between 2006 and 2013, increasing from 9 in 2008 to 34 in 2012 |

### OBJECTIVE 2: Build and harness capacity of the research and end-user community

### KPI 2a: Extent to which NCCARF has mobilised and extended the capacity of the Australian research community to address climate change adaptation research needs as measured by, for example:

a) Total number of researchers actively involved in climate change adaptation research, and % of their time, as determined by questionnaire to Network members (will include data on early and mid-career researchers);

b) Levels of collaboration in total and across disciplines in SIRP and ARGP projects (qualitative);

c) Number and distribution of universities involved in NCCARF research-related activities (including average number of institutions working together on a single project).

<table>
<thead>
<tr>
<th>Measure:</th>
<th>Key finding:</th>
</tr>
</thead>
</table>
| General information on NCCARF research project human resources | Number of Australian researchers involved = 657  
Number of FTEs = 288  
Spend on salaries = c. $20 million |
| Information on employment of ECRs | 47 projects surveyed employed 112 ECRs, an average of 2.5 ECRs per project |
| Number of Australian universities working on NCCARF funded research projects | 34 |
| Inter-institutional researcher collaboration | As many as 8 organisations involved in 1 project; an average of 1.7 organisations per project |

### KPI 2b: End-user involvement (profiled across government, industry and community) in NCCARF activities, including the planning, implementation and evaluation of research projects (SIRP and ARGP) (overlaps with similar KPI for Objective 1).

<table>
<thead>
<tr>
<th>Measure:</th>
<th>Key finding:</th>
</tr>
</thead>
</table>
| See KPI 1a for information on research planning and implementation | Evaluation of research through peer review  
One end-user reviewed each SIRP project final report |

### KPI 2c: Funds leveraged directly against the NCCARF (SIRP) and ARGP funds for research.

<table>
<thead>
<tr>
<th>Measure:</th>
<th>Key finding:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARGP program-level leveraging</td>
<td>$3.1 million from FRDC, $1 million from NWC, up to $3 million from NHMRC</td>
</tr>
<tr>
<td>ARGP project-level funding</td>
<td>$32 million cash and in-kind support for projects managed by NCCARF</td>
</tr>
</tbody>
</table>

### KPI 2d: Number of and levels of cash and in-kind investment in research projects which address NARP priorities or S&I research priorities initiated and/or funded by other research agencies, such as ARC (also for Objective 1).

<table>
<thead>
<tr>
<th>Measure:</th>
<th>Key finding:</th>
</tr>
</thead>
<tbody>
<tr>
<td>See identical KPI 1d</td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVE 3: Generate the knowledge required to meet end-user needs

**KPI 3a:** Extent to which the portfolio of research projects commissioned by NCCARF (SIRP and ARGP) matches the research priorities identified through end-user consultation (identical to KPI 1c).

Measure:  
Key finding:

See KPI 1c

**KPI 3b:** Levels of satisfaction of end-users:

a) in the processes of engagement - specifically, do they feel as if they have been adequately engaged in the process of identifying and prioritising the information and knowledge products that should be developed, including the NARPs (via end-user survey) (also for Objective 1);

b) with NCCARF research products in terms of relevance, timeliness and ease of adoption and application;

c) with the information and knowledge products provided by NCCARF – specifically, the extent to which the products meet their needs, and have been used to support and strengthen policy and decision-making (via end-user survey) (overlaps with similar KPIs for Objectives 1 and 4).

Measure:  
Key finding:

a) See KPI 1b

b) 2013 Stakeholder survey: respondents asked to rate relevance and timeliness of NCCARF’s research projects
   - 82% of respondents rated relevance as excellent or good
   - 75% of respondents rated timeliness as excellent or good
   - 65% of respondents rated NCCARF’s research projects as excellent or good at meeting their information needs
   - 74% of respondents rated NCCARF’s research projects as excellent or good at supporting adaptation decision-making
   And see (c)

   c) 2013 Stakeholder survey: respondents asked to rate performance of NCCARF reports/workshops
   - 69% of respondents rated performance as excellent or good at meeting their information needs
   - 64% of respondents rated performance as excellent or good at supporting adaptation decision-making

**KPI 3c:** Number of and levels of cash and in-kind investment in research projects which address NARP priorities or SIRP priorities initiated and/or funded by other research agencies, such as the ARC (similar to KPI 1d).

Measure:  
Key finding:

See KPI 1d

**KPI 3d:** The number of SIRP projects being undertaken as a result of a specific end-user group request.

Measure:  
Key finding:

See KPI 1c

**KPI 3e:** Number of peer-reviewed papers and book chapters resulting from the Thematic and Synthesis and Integrative Research streams.

Measure:  
Key finding:

- Number peer-reviewed NCCARF reports: 148
- Number external peer-reviewed publications (journal articles etc.) resulting from NCCARF projects: 248 (at September 2013)
- Number edited books produced by NCCARF: 3
## OBJECTIVE 4: Make knowledge available to end-users

### KPI 4a: Levels of satisfaction of end-users with the information and knowledge products provided by NCCARF (including the Annual Conference) (specifically, the extent to which the delivery of products support policy and decision-making and ease of adoption and application) (via end-user survey) (overlaps with similar KPIs for Objectives 1, 3).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Key finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 Stakeholder survey: respondents asked to rate performance of NCCARF and Networks on use of effective communication methods to share climate change adaptation knowledge</td>
<td>43% respondents rated performance as good, and 18% as excellent</td>
</tr>
<tr>
<td>2013 Stakeholder survey: attendees of 2010 and 2012 NCCARF conferences asked to rate their satisfaction</td>
<td>80% of respondents rated performance as excellent or good for relevance of the topics, speakers and papers, and for provision of useful knowledge</td>
</tr>
<tr>
<td>Stakeholder survey: Respondents asked to rate usefulness of NCCARF website</td>
<td>• 66% of respondents in 2012 and 72% in 2013 rated the site as excellent or good with respect to containing the information they sought • 77% of respondents in 2012 and 79% in 2013 rated the site as excellent or good with respect to ease of navigation</td>
</tr>
</tbody>
</table>

### KPI 4b: Usage rate (including downloads and other traffic monitoring indicators) of NCCARF website and other online climate change adaptation information resources developed by NCCARF or as a result of NCCARF activities.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Key finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google analytics: number of visits and visitors to NCCARF website from 24/11/08 to 30/06/13</td>
<td>118,000 unique visitors and 246,000 visits</td>
</tr>
<tr>
<td>Google analytics: number of downloads from NCCARF website from 24/11/08 to 30/06/13</td>
<td>57,944 publication downloads from almost 300 downloadable products</td>
</tr>
<tr>
<td>Google analytics: number of countries visiting the NCCARF website</td>
<td>204</td>
</tr>
<tr>
<td>Google analytics: Number of visits and visitors to Local Government portal from 1/11/12 to 12/08/13</td>
<td>9179 unique visitors and 13,003 visits</td>
</tr>
<tr>
<td>Google analytics: Number of visits and visitors to Business portal from 17/03/13 to 12/08/13</td>
<td>340 unique visitors and 1,176 visits</td>
</tr>
</tbody>
</table>

### KPI 4c: Number of peer-reviewed papers and book chapters resulting from the Thematic and Synthesis and Integrative Research streams.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Key finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>See KPI 3e</td>
<td></td>
</tr>
</tbody>
</table>
5.1 Objective 1: Identify knowledge needs of end-users

Table 5.2 shows the strategies and KPIs for Objective 1. This objective was addressed primarily through the development of National Climate Change Adaptation Research Plans (NARPs) and the strategy for NCCARF’s Synthesis and Integrative Research Program (SIRP), with other NCCARF activities contributing, as detailed below. The key activities were:

- the development and review of the National Adaptation Research Plans (NARPs) and their Implementation Plans, which together identified research priorities and pathways for funding and capacity building
- the building of a Synthesis and Integrative Research Program strategy to implement a research program closely tailored to end-user requirements
- the establishment of a state and territory representative body (FORSAT) to identify and engage with end-users
- the development of twelve Policy Guidance Briefs in collaboration with key end-users to provide policy guidance to decision-makers in federal, state and local government.

5.1.1 Key Performance Indicators for Objective 1

Four Key Performance Indicators (KPIs) were defined in the NCCARF Strategy 2010-2013, as listed in Table 5.2. Below, we provide quantitative measures of NCCARF’s performance against each KPI.

KPI 1a: Number, profile (where available, e.g. seniority etc.) and representation (government, industry and community) of end-users engaged through NCCARF activities including via the Networks and responding to the survey

Network membership and engagement

The Adaptation Research Networks built strong links between the research and end-user community and were a key vehicle for NCCARF end-user engagement. They did this through the activities described in Section 4.3.

By 30 June 2013, the Networks had over 5200 members. More than half the Network membership was made up of end-users from government, the private and industry sectors and community (Figure 5.1).

Table 5.2: Strategies and Key Performance Indicators for Objective 1.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Key performance indicators*</th>
</tr>
</thead>
</table>
| 1.1: Identify and engage with end-users | KPI 1a  
Number, profile (where available, e.g. seniority etc.) and representation (government, industry and community) of end-users engaged through NCCARF activities including via the Networks and responding to the survey (overlaps with similar KPI for Objective 2); |
| 1.2: Understand and articulate end-user climate change adaptation knowledge needs | KPI 1b  
Levels of satisfaction of end-users with engagement processes - specifically, do they feel as if they have been adequately engaged in identifying and prioritising the information and knowledge products that are being developed (via end-user survey) (overlaps with similar KPI for Objectives 3 and 4); |
| 1.3: Understand and articulate gaps in existing knowledge | KPI 1c  
Extent to which the portfolio of research projects commissioned by NCCARF (SIRP and ARGP) matches the research priorities identified through end-user consultation (also for Objective 3); |
| 1.4: Promote knowledge needs to potential funding organisations and researchers | KPI 1d  
Number of and levels of cash and in-kind investment in research projects which address NARP priorities or S&I research priorities initiated and/or funded by other research agencies, such as ARC (also for Objective 2). |

* KPIs may be relevant to more than one strategy.
Stakeholder survey respondents
NCCARF commissioned three stakeholder surveys in 2011, 2012 and 2013 to evaluate satisfaction with NCCARF’s performance. There was an increase in the number of respondents from 458 in 2011 to 595 in 2013. Stakeholders from government, business, industry and the community made up over half the survey respondents.

NCCARF conferences
NCCARF hosted annual conferences between 2010 and 2013 (see Section 4.4 for more information). The conferences attracted a strong presence from stakeholders, with approximately 45% of delegates affiliated with Natural Resource Management groups, Catchment Management Authorities, NGOs, business and industry and all levels of government. Figure 5.2 shows the representation of end-user delegates at the 2013 NCCARF annual conferences.

NCCARF seminar series and policy guidance brief workshops
NCCARF’s National Seminar Series was designed to share Australian and overseas adaptation expertise with a broad audience including end-users. More than 60 seminars were held throughout Australia. Invitations were made through Networks and the NCCARF contact database for the region. Attendance was free and open to all. Audiences were representative of a diversity of organisations and end-user groups (Figure 5.3).

Policy guidance briefs were developed by NCCARF in consultation with teams of adaptation practitioners and researchers. The teams were assembled from recommended practitioners and were purposely built primarily from end-users with limited input from researchers. In total, 137 end-users (of a total of 169 participants) contributed to the drafting and development of twelve policy guidance briefs.

Adaptation research planning
NCCARF ensured that end-users had substantial input into the development of the NARPs, through participation in the writing team and through the consultation carried out for each NARP (Table 5.3).

Table 5.3: Number of end-users involved in the drafting of the nine NARPs and the consultation process. Note in some instances governments collated departmental inputs to the consultation, so that the metric is likely to be an underestimate

<table>
<thead>
<tr>
<th>NARP Theme</th>
<th>*Drafting</th>
<th>*Consultation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial Biodiversity</td>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td>Marine Biodiversity and Resources</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>Settlements and Infrastructure</td>
<td>6</td>
<td>34</td>
</tr>
<tr>
<td>Primary Industries</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Social Economic and Institutional Dimensions</td>
<td>3</td>
<td>32</td>
</tr>
<tr>
<td>Human Health</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Freshwater Biodiversity</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Emergency Management</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>Indigenous Communities</td>
<td>7</td>
<td>15</td>
</tr>
</tbody>
</table>

*Includes update report writing team members where applicable

End-user collaboration and co-investment in NCCARF research
From the outset NCCARF ensured that end-users were engaged throughout the research process. ARGP research teams were required to prepare end-user engagement and communication plans within the first month of research commencement. SIRP investigators were required to engage end-users at all stages of the research process from proposal writing through to communication of results.

The extent of co-investment by end-user organisations at the project level is a measure of their engagement. Across the ARGP, 91 end-user organisations were involved in the 72 projects managed by NCCARF. In total, these organisations contributed co-funding of $1.3 million in cash and $12.8 million in in-kind contributions.
**Figure 5.1:** Stakeholder membership of the Adaptation Research Network as at June 2013.

**Figure 5.2:** Participants by affiliation in NCCARF’s 2013 Annual Conference.

**Figure 5.3:** Participants by affiliation at NCCARF seminars, 2011-2013.
KPI 1b: Levels of satisfaction of end-users with engagement processes - specifically, do they feel as if they have been adequately engaged in identifying and prioritising the information and knowledge products that are being developed (via end-user survey) (overlaps with similar KPI for Objectives 3 and 4)

In the annual Nielsen stakeholder survey, respondents were asked to rate NCCARF’s performance in involving end-users with research activities and outputs. In the 2013 survey, 61% (of 409 respondents) gave NCCARF an excellent or good rating for this question.

When asked whether NCCARF understood their climate change adaptation information and knowledge needs, 61% of respondents in 2013 rated NCCARF as excellent or good (Figure 5.4). This was up from 54% in 2012 and 47% in 2011, a statistically significant trend.

KPI 1c: Extent to which the portfolio of research projects commissioned by NCCARF (S&I Research and Thematic Research) matches the research priorities identified through end-user consultation (also for Objective 3)

As noted under KPI 1a, there was extensive consultation with end-users during the preparation of the NARPs and their updates, in order to identify the knowledge gaps and therefore the research priorities. The ARGP research calls always stated that project proposals should address the identified NARP priorities. The NHMRC calls for Human Health and the FRDC call for Marine Biodiversity and Resources also included the NARP research priorities.

Evaluation of projects funded by NCCARF, NHMRC and FRDC showed that, of the 73 high priority research questions (PRQs) identified across nine NARPs, 62 (85%) were addressed by at least one project. For the seven ARGP themes that were NCCARF managed, 48 (96%) of 50 high PRQs were addressed by at least one project.

For the SIRP, NCCARF undertook substantial end-user consultation to underpin investment. Calls for proposals were each accompanied by a scoping document that detailed the requirements from the project. These scoping documents were prepared by NCCARF in response to needs identified during consultation. There were two phases of the SIRP. Phase 1 addressed needs identified by the Commonwealth, and Phase 2 addressed needs

\[\text{Figure 5.4: Responses to Nielsen survey on end-user engagement. The question asked was "How would you rate the NCCARF and Network performance on …?" Source: Nielsen 2013.}\]
identified through an Australia-wide consultation process. All of the 46 SIRP projects addressed needs identified by end-users.

Using the results from the annual stakeholder survey (Figure 5.4), 61% of respondents in 2013 rated NCCARF as good or excellent at identifying suitable climate change adaptation research projects.

KPI 1d: Number of and levels of cash and in-kind investment in research projects which address NARP priorities or S&I research priorities initiated and/or funded by other research agencies, such as ARC (also for Objective 2).

The development of capacity around adaptation is evidenced by the increasing number of research grants funded in the area of adaptation by organisations other than NCCARF. NCCARF analysed research support by large funding agencies in Australia, including the ARC, Research and Development Corporations, CRCs, CSIRO and federal, state and territory governments. This report Climate Change Adaptation Research Funded in Australia by Programs other than NCCARF’s ARGP and SIRP is available on request from NCCARF.

In summary, in the period 2008-2013, around $295 million in funding was allocated by non-NCCARF funding agencies to projects relevant to the NARP and SIRP research priorities (note that data on in-kind investment are not available). The largest funding agency, the ARC, funded 102 research projects relevant to adaptation between 2006 and 2013, with an increase during the period of NCCARF’s operation from 9 adaptation-relevant ARC projects funded in 2008 to 34 funded in 2012.
5.2 Objective 2: Build and harness capacity of the research and end-user community

Table 5.4 shows the strategies and KPIs for Objective 2. This objective was addressed primarily through the building of the ARGP and SIRP and the activities of the Adaptation Research Networks, although other NCCARF activities contributed.

Table 5.4: Strategies and Key Performance Indicators for Objective 2.

| Objective 2: Build and harness the capacity of the research and end-user community
Capacity building is an essential part of NCCARF activities to fulfil its vision. Australia is not alone in needing to build the necessary intellectual capacity to adapt to climate change. In this very rapidly growing field of activity, it is an international problem. NCCARF through its Phase 2 activities will make an important contribution to building Australian climate change adaptation capacity. |
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Key performance indicators*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1: Build climate change adaptation research and end-user capacity.</td>
<td></td>
</tr>
<tr>
<td>KPI 2a</td>
<td>Extent to which NCCARF has mobilised and extended the capacity of the Australian research community to address climate change adaptation research needs as measured by, for example:</td>
</tr>
<tr>
<td></td>
<td>a. Total number of researchers actively involved in climate change adaptation research, and % of their time, as determined by questionnaire to Network members (will include data on early and mid-career researchers);</td>
</tr>
<tr>
<td></td>
<td>b. Levels of collaboration in total and across disciplines in SIRP and ARGP projects (qualitative);</td>
</tr>
<tr>
<td></td>
<td>c. Number and distribution of universities involved in NCCARF research-related activities (including average number of institutions working together on a single project).</td>
</tr>
<tr>
<td>KPI 2b</td>
<td>End-user involvement (profiled across government, industry and community) in NCCARF activities, including the planning, implementation and evaluation of research projects (SIRP and ARGP) (overlaps with similar KPI for Objective 1).</td>
</tr>
<tr>
<td>KPI 2c</td>
<td>Funds leveraged directly against the NCCARF (SIRP) and ARGP funds for research.</td>
</tr>
<tr>
<td>KPI 2d</td>
<td>Number of and levels of cash and in-kind investment in research projects which address NARP priorities or S&amp;I research priorities initiated and/or funded by other research agencies, such as ARC (also for Objective 2).</td>
</tr>
</tbody>
</table>

5.2.1 Key Performance Indicators for Objective 2

Four Key Performance Indicators (KPIs) were defined in the NCCARF Strategy 2010-2013, as listed in Table 5.4. Below, we provide quantitative measures of NCCARF’s performance against each KPI.

KPI 2a: Extent to which NCCARF has mobilised and extended the capacity of the Australian research community to address climate change adaptation research needs as measured by, for example:

a. Total number of researchers actively involved in climate change adaptation research, and % of their time, as determined by questionnaire to Network members (will include data on early and mid-career researchers);

b. Levels of collaboration in total and across disciplines in Synthesis & Integrative and Thematic Research projects (qualitative);

c. Number and distribution of universities involved in NCCARF research-related activities (including average number of institutions working together on a single project).

Capacity building through adaptation research programs

Together with the FRDC (co-investor in the Marine Biodiversity and Resources theme) and the NHMRC (co-investor in the Human Health theme), NCCARF commissioned a research portfolio of around 142 projects with a combined value of around $29.5 million.

Through NCCARF alone, project teams brought together researchers from 34 of Australia’s 41 universities (and see Figure 5.5), from 61 Commonwealth, state and local government entities and from 25 private institutions. In total, 657 Australian researchers were involved in climate change adaptation research. These amounted to 288 full time equivalent posts (FTEs), accounting for a spend of around $20 million.
Almost all projects employed early career researchers (ECRs) in some capacity. We surveyed five of the nine thematic areas in the ARGP and determined that, on average, 2.5 ECRs were employed per project (see Table 5.5). Although not all of these ECRs were employed full-time, their capacity to carry out research in climate change adaptation was substantially enhanced.

Many projects involved considerable inter-institutional researcher collaboration, with as many as 8 organisations involved in a single project and an average of 1.7 organisations per project.

**Table 5.5:** Early career researchers involved in NCCARF ARGP projects for five thematic areas.

<table>
<thead>
<tr>
<th>Thematic Area</th>
<th>Research Projects</th>
<th>Early Career Researchers</th>
<th>Average per Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Management</td>
<td>11</td>
<td>23</td>
<td>2.1</td>
</tr>
<tr>
<td>Settlements and Infrastructure</td>
<td>15</td>
<td>38</td>
<td>2.5</td>
</tr>
<tr>
<td>Primary Industries</td>
<td>3</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Freshwater Biodiversity</td>
<td>9</td>
<td>*23</td>
<td>2.8</td>
</tr>
<tr>
<td>Terrestrial Biodiversity</td>
<td>9</td>
<td>*16</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>47</td>
<td>112</td>
<td>2.5</td>
</tr>
</tbody>
</table>

* no data for one project
Achieving NCCARF’s Objectives

Section 5

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NCCARF 2008–2013:
The first five years

Capacity building through sharing knowledge and experience

NCCARF undertook a wide range of activities to build capacity through sharing knowledge and experience. Examples include:

- the Annual Conference series (see Section 4.4.3.2)
- the seminar series with both national and international speakers (see statistics under KPI 1a)
- the visiting researcher program (Section 4.2.2.2)
- 13 thematic workshops for Principal Investigators of ARGP projects.

On the day preceding the opening of each annual conference, we held an early career workshop at which some of the plenary speakers gave presentations on their career development, and attendees were encouraged to practice their presentations. In 2013 we funded 19 graduate students to attend the conference.

“The conference]… reinforced the value of collaborative research, visual communications and narratives in engagement.”
Respondent to 2013 Conference survey.

“From the Brisbane conference to now social science and practitioners are now firmly engaged.”
Respondent to 2013 Conference survey.

The Adaptation Research Networks carried out numerous capacity building activities, as described in detail in Section 4.3. Of particular relevance to research capacity building were such activities as the appointment of five research fellows to individual Networks, development and release of issues papers, training workshops and masterclass series, travel grants to support conference attendance, and small research grants, e.g. for honours projects and masters dissertations. Collectively the Networks sponsored over two hundred climate change adaptation scholarships, top-up grants and travel bursaries to a value of over $1 million.

KPI 2b: End-user involvement (profiled across government, industry and community) in NCCARF activities, including the planning, implementation and evaluation of research projects (S&I Research and Thematic Research).

This KPI overlaps with similar KPI 1a. Under KPI 1a, we present data on end-user involvement in the Adaptation Research Networks, in NCCARF conferences and seminars, in NARP drafting and consultation, and in NCCARF research projects. The final part of KPI 2b is the evaluation of research projects. All of the Final Reports from NCCARF’s research programs were peer-reviewed by two reviewers. For the ARGP, we used two reviewers chosen for their scientific knowledge of the topic. These reviewers might have been end-users, but this was not a primary consideration. However, for the SIRP, at least one of the reviewers was selected because of the experience and knowledge they would bring to the review through being an end-user.

KPI 2c: Funds leveraged directly against the NCCARF (SIRP) and Adaptation Research Grants program funds for research.

ARGP program-level funding:
For three of the ARGP thematic research areas, significant cash contribution of up to $7.1 million was leveraged from external institutions, as set out in Table 5.6.

ARGP project-level funding:
Of the $27 million dollars allocated to ARGP research funding, NCCARF directly managed over $20 million. This leveraged almost $32 million in cash and in-kind contributions, as shown in Figure 5.6. This direct and measurable amount represents additional investment of one and a half times government funding.

Table 5.6: Leveraging achieved at a program level.

<table>
<thead>
<tr>
<th>Thematic Area</th>
<th>Co-investor</th>
<th>ARGP Allocation ($)</th>
<th>Co-investment ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Health</td>
<td>National Health and Medical Research Council (NHMRC)</td>
<td>3,000,000</td>
<td>Up to 3,000,000</td>
</tr>
<tr>
<td>Marine Biodiversity and Resources</td>
<td>Fisheries Resources and Development Council (FRDC)</td>
<td>3,500,000</td>
<td>3,100,000</td>
</tr>
<tr>
<td>Freshwater Biodiversity</td>
<td>National Water Commission</td>
<td>1,800,643*</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>

* funds expended
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NCCARF 2008–2013: The first five years

SIRP project level funding:

At the proposal stage, applicants were not required to address their financial contribution to the project (cash or in-kind), and this was not measured by NCCARF. Nevertheless, institutions did make considerable contribution to their NCCARF projects, most clearly and consistently through the time of Principal Investigators. NCCARF required SIRP projects to engage extensively with end-users, and the time of these end-users was generally an in-kind contribution.

For both the ARGP and SIRP, NCCARF gathered significant in-kind support in the assessment of research proposals by independent referees. Science Review Panels (SRPs) typically had a membership of at least five, which included the Director of NCCARF, 2-3 science experts (depending on the scope and complexity of the Call) and 1-2 practitioners. Generally, SRP participants from universities, government, CSIRO, ARC and the RDCs (around 80% of the total) gave of their time without payment.

Science Review Panels for the ARGP generally had more science experts whereas SIRP Review Panels had more practitioners. Early ARGP research calls had two stages: Expressions of Interest followed by full proposals. Later ARGP and all SIRP calls had a single stage. Some idea of the contribution made by the SRPs to NCCARF activities is given in Table 5.7, which shows numbers of proposals received for each NCCARF-managed Call in the ARGP. The in-kind contribution of our SRPs was an important asset in the sparsely populated area of climate adaptation. The willingness of expert senior scientists and practitioners to participate is a measure of NCCARF’s reputation for credible and independent science.

Table 5.7: Numbers of expressions of interest and full proposals received for the ARGP Calls

<table>
<thead>
<tr>
<th>Thematic area</th>
<th>EOIs</th>
<th>Full proposals</th>
<th>Funded projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM</td>
<td>104</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>PI</td>
<td>82</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>SI</td>
<td>162</td>
<td>37</td>
<td>13</td>
</tr>
<tr>
<td>SEID</td>
<td>192</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>TB</td>
<td>60</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>FWB</td>
<td>67</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>IC</td>
<td>-</td>
<td>32</td>
<td>8</td>
</tr>
<tr>
<td>Combined Call**</td>
<td>-</td>
<td>58</td>
<td>14</td>
</tr>
<tr>
<td>TOTAL</td>
<td>667</td>
<td>210</td>
<td>72</td>
</tr>
</tbody>
</table>

* Due to time pressures, these calls went straight to the full proposal stage.

** A final call inviting proposals to address NARP priority research questions not addressed by successful proposals in previous calls.

KPI 2d: Number of and levels of cash and in-kind investment in research projects which address NARP priorities or S&I research priorities initiated and/or funded by other research agencies, such as ARC.

This KPI is identical to KPI 1d, and is evaluated there.

Figure 5.6: Make up of funding support for the ARGP.
5.3 Objective 3: Generate the knowledge required to meet end-user needs

Table 5.8 shows the strategies and KPIs for Objective 3. This objective was addressed primarily through the activities to commission, manage and deliver research through the ARGP and SIRP programs, although other NCCARF activities also contributed.

Table 5.8: Objectives and Key Performance Indicators for Objective 3.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Key performance indicators*</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1: Identify research projects to be supported by NCCARF through the two research activity streams.</td>
<td>KPI 3a: Extent to which the portfolio of research projects commissioned by NCCARF (SIRP and ARGP) match the research priorities identified through end-user consultation (similar to KPI 1c).</td>
</tr>
<tr>
<td>3.2: Initiate and manage research programs to address identified national research needs around the NCCARF priority themes.</td>
<td>KPI 3b: Levels of satisfaction of end-users: a. in the processes of engagement - specifically, do they feel as if they have been adequately engaged in the process of identifying and prioritising the information and knowledge products that should be developed, including the NARPs (via end-user survey) (also for Objective 1); b. with NCCARF research products in terms of relevance, timeliness and ease of adoption and application; c. with the information and knowledge products provided by NCCARF - specifically, the extent to which the products meet their needs, and have been used to support and strengthen policy and decision-making (via end-user survey) (overlaps with similar KPIs for Objectives 1 and 4).</td>
</tr>
<tr>
<td>3.3: Initiate and manage research programs to address identified national research needs for synthesis and integrative research knowledge.</td>
<td>KPI 3c: Number of and levels of cash and in-kind investment in research projects which address NARP priorities or SIRP priorities initiated and/or funded by other research agencies, such as the ARC (similar to KPI 1d).</td>
</tr>
<tr>
<td>3.4: Evaluate the contribution made by NCCARF research to national capacity, and re-visit understanding of knowledge gaps and research needs.</td>
<td>KPI 3d: The number of SIRP projects being undertaken as a result of a specific end-user group request. KPI 3e: Number of peer-reviewed papers and book chapters resulting from the Thematic and Synthesis and Integrative Research streams.</td>
</tr>
</tbody>
</table>

* Each KPI may be relevant to more than one strategy.

5.3.1 Key Performance Indicators for Objective 3

KPI 3a: Extent to which the portfolio of research projects commissioned by NCCARF (SIRP and ARGP) match the research priorities identified through end-user consultation.

The extent to which the portfolio of research projects commissioned by NCCARF matches ARGP research priorities is addressed under KPI 1c.

With respect to the SIRP, research priorities were identified in the SIRP Strategy. At least one SIRP research project addressed each SIRP research priority.

KPI 3b: Levels of satisfaction of end-users:
- a. with the processes of engagement - specifically, do they feel as if they have been adequately engaged in the process of identifying and prioritising the information and knowledge products that should be developed, including the NARPs (via end-user survey) (also for Objective 1);
- b. with NCCARF research products in terms of relevance, timeliness and ease of adoption and application;
- c. with the information and knowledge products provided by NCCARF - specifically, the extent to which the products meet their needs, and have been used to support and strengthen policy and decision-making (via end-user survey) (overlaps with similar KPIs for Objectives 1 and 4).

End-user satisfaction was measured quantitatively through the three Nielsen stakeholder surveys taken in 2011 (baseline), 2012 and 2013, and was qualitatively inferred from end-user participation in NCCARF activities.
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Relevance to national adaptation priorities

Produced in a timely manner

Meeting your information needs

Supporting decision-making about adaptation

1 - Poor  2 - Fair  3 - Satisfactory  4 - Good  5 - Excellent

Figure 5.7: End-user satisfaction with NCCARF research projects.
The question was “How do you rate the research projects funded by NCCARF...?” Source: Nielsen 2013.

Satisfaction with the processes of engagement

Satisfaction of end-users with their involvement in identifying end-user knowledge needs is described in Section 4.1 (in relation to the development of the NARPs and SIRP Strategy) and is addressed as part of KPI 1b.

Satisfaction with research products – relevance, timeliness and ease of use

Results from the 2013 Nielsen survey indicate that end-users were satisfied with the relevance, timeliness and ease of adoption and application of NCCARF’s research projects, as shown in Figure 5.7. In the 2013 stakeholder survey 82% of respondents rated NCCARF at good or excellent for relevance and 75% for timeliness. Sixty-five per cent of respondents considered that we were at least good at meeting their information needs, and 74% thought that we were at least good at supporting adaptation decision-making. Below and in Figure 5.8, we evaluate the extent to which NCCARF’s reports and workshops met end-user requirements.

Satisfaction with extent to which NCCARF information and knowledge products meet end-user needs

This performance indicator was addressed by the stakeholder survey, and the responses are shown in Figure 5.8. When asked how NCCARF reports/workshops rated with respect to meeting information needs, 69% of respondents gave a rating of at least good. With respect to supporting decision-making in adaptation, 64% of respondents gave a rating of at least good.
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KPI 3c: Number of and levels of cash and in-kind investment in research projects which address NARP priorities or SIRP priorities initiated and/or funded by other research agencies, such as the ARC.

KPI 3d: The number of S&I Research projects being undertaken as a result of a specific end-user group request.

KPI 3e: Number of peer-reviewed papers and book chapters resulting from the Thematic and Synthesis and Integrative Research streams.

All 46 SIRP projects resulted from end-user input and requests. These needs were identified through a variety of processes that included surveys, discussions and meetings with key end-user groups from business, all levels of government and the community, FORNSAT and the NCCARF Board. The results of these processes were brought together in the SIRP Strategy, finalised in 2011.

NCCARF asked each Principal Investigator to notify us of external peer-reviewed publications (journal papers, book chapters) resulting from their project. Appendix 2 sets out the result, amounting to 248 peer-reviewed papers, either published, in press or in review. Note that this is a non-exhaustive list, since not all investigators responded and because articles and book chapters arising from the NCCARF research programs will continue to emerge in the years to come. NCCARF did not approach projects being carried out under the FRDC and NHMRC programs.

NCCARF has produced three edited books in its Establishment and Operational Phases, as follows:

Climate Adaptation Futures, a collection of papers arising from the 2010 conference, and published by Wiley in 2012.

Natural Disasters and Adaptation to Climate Change, a collection of case studies based on the SIRP historical case studies of climate extremes, and expanded to include extreme events from around the world, published by Cambridge University Press and to appear in late 2013.

Practical Adaptation Studies, a collection by principal investigators of ARGP and SIRP projects setting out their principal findings relevant to an international audience. This book will be published by Wiley in 2014.

---

Figure 5.8: End-user satisfaction with NCCARF reports and workshops.
The question was “How do you rate the NCCARF reports/workshops on...?” Source: Nielsen 2013.

<table>
<thead>
<tr>
<th>Meeting your information needs</th>
<th>Poor</th>
<th>Fair</th>
<th>Satisfactory</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>6</td>
<td>7</td>
<td>17</td>
<td>50</td>
<td>19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supporting decision-making about adaptation</th>
<th>Poor</th>
<th>Fair</th>
<th>Satisfactory</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>7</td>
<td>8</td>
<td>21</td>
<td>43</td>
<td>21</td>
</tr>
</tbody>
</table>
**Table 5.9: Strategies and Key Performance Indicators for Objective 4**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Key performance indicators*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1: Identify effective approaches to the communication and delivery of climate change adaptation knowledge to end-users</td>
<td>KPI 4a: Levels of satisfaction of end-users with the information and knowledge products provided by NCCARF (including the Annual Conference) (specifically, the extent to which the delivery of products support policy and decision-making and ease of adoption and application) (via end-user survey) (overlaps with similar KPIs for Objectives 1, 3).</td>
</tr>
<tr>
<td>4.2: Identify and address barriers to the effective communication of climate change adaptation knowledge</td>
<td>KPI 4b: Usage rate (including downloads and other traffic monitoring indicators) of NCCARF website and other online climate change adaptation information resources developed by NCCARF or as a result of NCCARF activities.</td>
</tr>
<tr>
<td>4.3: Collate, synthesise and communicate existing climate change adaptation knowledge</td>
<td>KPI 4c: Number of peer-reviewed papers and book chapters resulting from the Thematic and Synthesis and Integrative Research streams.</td>
</tr>
<tr>
<td>4.4: Communicate and disseminate climate change adaptation research outputs</td>
<td></td>
</tr>
</tbody>
</table>

* KPIs may be relevant to more than one strategy.

**5.4.1 Key Performance Indicators for Objective 4**

KPI 4a: Levels of satisfaction of end-users with the information and knowledge products provided by NCCARF (including the Annual Conference) (specifically, the extent to which the delivery of products support policy and decision-making and ease of adoption and application) (via end-user survey) (overlaps with similar KPIs for Objectives 1, 3).

There were high levels of satisfaction of end-users with the information and knowledge products provided by NCCARF, as demonstrated by the stakeholder surveys. When asked to rate NCCARF with respect to its use of effective communication to share climate change adaptation knowledge, 43% rated its performance as good, and 18% as excellent (Figure 5.4).

Figure 5.9 reports on satisfaction levels for the two large NCCARF conferences held in 2010 and 2012. Consistently, 80% of respondents gave a good or excellent rating for relevance of the topics, speakers and papers, and for provision of useful knowledge.

NCCARF’s website was the primary repository of knowledge and communication products, including all final research reports. When respondents to the 2013 stakeholder survey were asked how they would rate the website in terms of usability, the response was very positive, as shown in Figure 5.10. When asked whether the site contained the information they sought, 66% of respondents in 2012 and 72% in 2013 gave a ‘good’ or ‘excellent’ response. With respect to ease of navigation, the ‘good’ and ‘excellent’ responses amounted to 77% (2012) and 79% (2013).

KPI 4b: Usage rate (including downloads and other traffic monitoring indicators) of NCCARF website and other online climate change adaptation information resources developed by NCCARF or as a result of NCCARF activities.

Google Analytics began tracking visitors to www.nccarf.edu.au on Monday 24 November 2008. Since then (until June 2013), our website has had over 118,000 unique visitors and 246,000 visits. Traffic fluctuated in response to activities such as research calls and the approach of the annual conference, but shows a steady increase over time (Figure 5.11).
### Conference Attendee Satisfaction

**Figure 5.9:** Conference attendee satisfaction. *Source: Nielsen 2013.*

<table>
<thead>
<tr>
<th>Conference year</th>
<th>Topics, speakers &amp; papers were relevant to me</th>
<th>Promoted the conference to the right end-users</th>
<th>Provided information &amp; knowledge that you’ve been able to use</th>
<th>Successfully linked the research community with the decision makers in government, industry and the wider community</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
</tr>
<tr>
<td>2012</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
</tr>
</tbody>
</table>

### Nielsen Survey Feedback on Website

The question asked was “How do you rate the website in terms of …?” *Source: Nielsen 2013.*

**Figure 5.10:** Nielsen survey feedback on website.

<table>
<thead>
<tr>
<th>Ease of navigation</th>
<th>Providing access to reports and products</th>
<th>Providing project information</th>
<th>Containing the information you are looking for</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
</tr>
<tr>
<td>2013</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
<td>![Pie Chart]</td>
</tr>
</tbody>
</table>
In total, there were 57,944 publication downloads from the almost 300 downloadable products (reports, factsheets, etc.) available on the NCCARF website.

The website attracted a global audience, with visitors from 204 different countries. The five most frequent countries of origin were:
- Australia (192,577 visits)
- United States (9676 visits)
- United Kingdom (5355 visits)
- India (3170 visits)
- Canada (2823 visits)

Of all visitors to the NCCARF site, 54.4% entered through a search engine, 18.8% were referred through a third-party site and 26.6% came directly. The site had strong referral traffic from visitors that click on a link hosted by another website.

The following websites are the top providers of referral traffic:
- climatechange.gov.au
- griffith.edu.au
- facebook.com
- apo.org.au

NCCARF developed two sector-specific web-portals, one for Local Government (established in 2012) and one for Business (established early in 2013). Traffic to these reached close to 10,000 visitors during the period of operation (see Table 5.10). This figure is encouraging, but the relatively brief periods of time over which these portals have operated makes it difficult at present to judge their long-term contribution to NCCARF’s mission.

**Table 5.10: Use of NCCARF’s targeted web portals.**

<table>
<thead>
<tr>
<th></th>
<th>No. visitors</th>
<th>Total visits</th>
<th>Period of evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local government portal</td>
<td>9,179</td>
<td>13,003</td>
<td>1 Nov 2012 to 12 Aug 2013</td>
</tr>
<tr>
<td>Business portal</td>
<td>340</td>
<td>1,176</td>
<td>17 Mar 2013 to 12 Aug 2013</td>
</tr>
</tbody>
</table>

The Adaptation Research Networks hosted their own websites and recorded significant visitor and download rates for their products. For example, the Marine Biodiversity and Resources Network recorded an average of 1300 people accessing their site each month from its commencement in August 2009.

**KPI 4c:** Number of peer-reviewed papers and book chapters resulting from the Thematic and Synthesis and Integrative Research streams.

See KPI 3e for consideration of NCCARF performance against this KPI.

![Figure 5.11: Visits to the NCCARF website each month from June 2008 to June 2013. Source: Google Analytics.](image-url)
6 Did NCCARF achieve its objectives?

NCCARF’s four objectives were to:
1. Identify knowledge needs of end-users.
2. Build and harness the capacity of the research and end-user community.
3. Generate the knowledge to meet end-user needs.
4. Make knowledge available to end-users.

As we have discussed at length through Sections 4 and 5.1-5.4, against all measures NCCARF has demonstrably met its Objectives.

Here, we explore the extent to which the approaches we used to achieve the Objectives were the most appropriate, and whether NCCARF effectively met those objectives.

6.1 Appropriateness of the approaches

Objective 1: Identify knowledge needs of end-users
The major areas of activity to address this objective were the production of the NARPs and the SIRP Strategy.

The NARPs were produced by a standardised approach necessitated by the need to produce one for each thematic area, nine in total. This required, in summary:
1. producing a baseline ‘Issues Paper’
2. setting up a writing team of experts in research and practice
3. producing a consultation draft and making this publicly available for comment, as well as targeting key stakeholders for review
4. finalising the NARP based on stakeholder comments and review.

This process worked well. Probably the greatest weakness lay in the engagement of stakeholders, especially from the end-user community. The Courage Partners review in 2012 confirms this, noting that feedback was received to the effect that “researchers dominated the development of the research plans” (Courage Partners 2012, p. 37).

Nevertheless, the evidence from Section 5 of this Report suggests that, by the time of the final Nielsen survey in the first half of 2013, the majority of stakeholders were satisfied with NCCARF’s performance in understanding their adaptation information and knowledge needs (see Figure 5.4). The figure of 61% of respondents rating NCCARF's performance as good or excellent was up from 54% in 2012, and 47% in 2011, a statistically significant trend.

A submission by the South East Councils Climate Change Alliance to the Productivity Commission inquiry into Barriers to Effective Climate Change Adaptation noted that:

“NCCARF … is performing much needed support for the adaptation work in which [the South East Councils Climate Change Alliance] is involved. The strength of their approach is the close links with local government as end-users of the research where the evidence base for adaptation responses is built.”

Table 5.3 shows the number of end-users who were involved in NARP drafting and consultation. The numbers are considerable: 45 end-users were involved in NARP and NARP update drafting, and at least 223 took part in consultation activities.
Objective 2: 
Build and harness the capacity of the research and end-user community

The major area of activity to address this objective was the creation and engagement of the Adaptation Research Networks. The Networks were organised by priority themes (see Box 1) based broadly on the sectoral and regional vulnerabilities identified in the National Climate Change Adaptation Framework (DCCEE 2007). Overlaps in areas of interest between Network themes and cross-cutting issues were apparent and arguably any number of alternative theme structures could have been used. Nevertheless, the themes worked well as an organising framework in the initial stages and we found that, increasingly as time went on, the Networks were coming together spontaneously to organise inter-network cross-cutting events and activities (e.g. the SEID and EM Network workshop on the legal and institutional dimensions of adaptation and extreme event management).

Within the Networks, climate change adaptation and Indigenous communities was considered as a component of the Social, Economic and Institutional Dimensions Network, and funding was explicitly provided to allow this Network to engage staff and carry out activities directed towards Indigenous communities. This proved to be a highly successful strategy and, for example, the topic for the first meeting of the Adaptation College of the SEID Network was on Vulnerability and adaptation in Indigenous Australia, held in November 2009 (see Section 4.3).

The Network hosts were decided during the initial phases of NCCARF by a competitive process. Research organisations were invited to bid and this meant that, initially, the Networks had very much a research-oriented ‘flavour’, and indeed this is indicated by their name – Adaptation Research Networks. This title was prescribed in the Griffith University-Commonwealth Funding Agreement – a preferable title would simply have been Adaptation Networks, or perhaps Adaptation Community Networks. Over time, and with encouragement from NCCARF itself and the Operational Review, the Networks shifted to be much more user oriented, with varying degrees of success. Although we may consider that organisations other than universities might give the Networks a more user-oriented flavor, it is the case that it is probably only universities that have the capacity and the will to host a network. Their initial mandate should, however, have pointed them more clearly towards a mission that would engage and build capacity amongst researchers and practitioners equally.

The bidding process for the Networks was open and responsive, and the Network hosts were selected on merit alone. This gave a somewhat geographically biased distribution of network hosts. An alternative approach might have been to make geographical distribution a stronger criterion for host selection, with the specific aim of ensuring that one network was hosted out of each state and territory. In the longer-term this might have served NCCARF’s goal of becoming the national leader in adaptation capacity-building better. Nevertheless, the approach that was used ensured the quality of Network activities, and served the organisation well over time.

There is no doubt that the Networks achieved ground-breaking results over time in building and harnessing the capacity of the research and end-user communities to carry out and utilise adaptation research. We have listed a few areas above where approaches might be improved but these are very small compared to the overall success of this activity.

Objective 3: Generate the knowledge to meet end-user needs

NCCARF used open formal mechanisms (described in Section 4.2) to generate the knowledge required to meet end-user needs, and thus achieve Objective 3. These mechanisms built on the outputs and outcomes of Objective 1 (see Section 5.1), through which end-user knowledge needs were defined and prioritised. They built on and utilised the stakeholder involvement processes established through the activities and outcomes of Objective 2 (see Section 5.2).
The mechanisms for Objective 3 can be conveniently partitioned into two stages.

The first stage, identifying the research activities that would generate the knowledge required to meet end-user needs, consisted of four steps:

1. Preparing a clear and concise Call for research proposals that address specified high priority end-user information needs for climate change adaptation, as set out in the NARPs (or SIRP Strategy).
2. Ensuring the Call was available to all interested parties, including researchers and end-users, through web announcements by NCCARF and ARNs, through the NCCARF Newsletter and through announcements to NCCARF partners etc.
3. In the early Calls, first asking for and evaluating Expressions of Interest (EoI), to encourage applications without requiring large effort for a low success rate; successful EoIs then proceeded to a Full Proposal stage. In later Calls, time considerations did not permit this extra step and a single Full Proposal stage was used.
4. Objective evaluation of each proposal by a Science Review Panel that included experts in climate and adaptation research as well as end-users.

These mechanisms proved to be appropriate for several reasons:

• the process was demonstrably fair and objective
• researchers were familiar with the mechanisms as they were substantially similar to those used by other Australian research procurement programs
• the processes remained essentially the same throughout the research commissioning period, so researchers were able to apply learning from one research call to subsequent calls
• the proposal assessment included end-users, enabling this aspect of NCCARF’s program to contribute to end-user engagement.

The second stage, managing to completion the selected research activities, consisted of three activities:

1. contracting each research group in accordance with their successful proposal and NCCARF and Australian Government requirements
2. managing each research activity to ensure time lines and deliverables progressed as contracted
3. ensuring each research report was independently reviewed and all review comments address in the final accepted report for each project.

These mechanisms also proved to be appropriate for reasons including:

• researchers were familiar with the contracting arrangements as they were substantially similar to processes used by other research procurement programs
• the processes remained essentially the same throughout, so that researchers and their institutions became familiar with management and reporting requirements.

Several factors of both stages generated concern and even opposition on the part of some researchers, especially NCCARF’s requirements:

• for levels of final reporting that would enable NCCARF to publish the research findings, and that all outputs be freely and globally available
• for ongoing end-user involvement throughout the research process
• for active communication of research findings to relevant end-users.

However, these same factors ensured that the commissioned and delivered research outputs were suitable for end-user application and freely available to interested end-users. The majority of researchers embraced NCCARF’s requirements, and by so doing took enormous steps to deliver truly end-user relevant reports. By participating with NCCARF in communication of their outputs, they learned much about the issues confronting practitioners in adaptation, and how research can be used to support effective decision-making.
Objective 4: Make knowledge available to end-users
NCCARF used a multi-channel, targeted approach for communication of adaptation knowledge.

At the commencement of the Operational Phase, and at the recommendation of the Operational Review, a Knowledge Adoption and Communication Strategy was developed to identify target audiences, map their knowledge needs, refine key NCCARF messages and set out the means of delivering such messages in influential ways. The Strategy was a living document that ensured it was flexible and changed as new or different audiences were identified or as knowledge needs changed.

NCCARF sought guidance about communication activities from key stakeholders including the DCCEE, the NCCARF Board, the NCCARF Partner Advisory Group and FORNSAT. This ensured that our communication activities remained relevant and flexible. We learned early on that, for example, holding full-day events in Canberra did not enable us to attract a sufficiently high-level audience and that short lunch-time meetings were more effective. Similarly we learned to hold business- and industry-focused events at breakfast, over lunch or in the evenings.

Methods of communication included:
- Events and activities to involve stakeholders and end-users in research development and inform them of research outcomes. We adjusted our approaches over time to ensure that we were relevant to attendees. Rather than a series of presentations directly at audiences, we included local panels and discussion sessions to ensure audience interactions. We worked with key people at the location at which the event was being held to ensure there was local ownership, including discussion about the subjects being discussed or presented.
- Three websites, one aimed at a general audience, and two focused on important stakeholders for NCCARF: local government and business. The websites were updated regularly and were a highly regarded means of delivering information. A comprehensive update of the main NCCARF website in 2012 made it easier to navigate and granted an effective, improved user experience. We used Google Analytics and Nielsen Survey responses to determine success and to guide changes.
- NCCARF annual conferences provided a significant opportunity to make information available to end-users and engage more broadly with stakeholders. They were well attended and achieved consistently high approval ratings in surveys (whether end-of-conference or Nielsen surveys). We learned lessons and evaluated performance at each conference. Certain audiences were more difficult to engage, especially the business sector. At the 2013 conference we addressed this by holding an early morning breakfast event to cater to business, which attracted around 40 attendees. This was followed by a day of presentations and sessions with content focused on the interests of this community.
- We worked hard at getting comprehensive media coverage of NCCARF’s outputs, activities and achievements. This had varying levels of success, dependent upon the amount of interest in other current news items.

Overall, the flexibility of approach of NCCARF’s communication and knowledge delivery strategies delivered successful outcomes. We used our experiences to improve our approaches, and this resulted in increasing success over time, as demonstrated by our levels of engagement with stakeholders (as measured, for example, by willingness to engage in NCCARF activities such as preparation of Policy Guidance Briefs, attendance by end-users at NCCARF annual conferences, support by the States and Territories for FORNSAT etc.)
6.2 Effectiveness of NCCARF in meeting its objectives

As we have discussed at length through Sections 4 and 5.1-5.4, against all measures NCCARF has effectively met its Objectives.

As a further means of evaluation, we may draw on the evidence of NCCARF’s external reviews to consider whether NCCARF has performed well in terms of meeting its objectives, in particular the Courage Partners review in 2012. In considering the conclusions of that review, it should be borne in mind that it took place a year before NCCARF completed its activities, and therefore did not have a complete picture of what we went on to achieve in the remaining twelve months.

To obtain holistic expert opinions about the scope of NCCARF and its activities, we approached three stakeholders who have been involved in NCCARF activities over the complete lifetime of the institution. Their evaluation of the effectiveness of NCCARF is included in Section 7. Here, we explore NCCARF’s effectiveness in delivering to the four individual Objectives. In thinking about NCCARF’s effectiveness, there are two important points that should be borne in mind. First, it is the case that the outcomes from NCCARF’s activities are still maturing, and will continue to mature. We can only judge NCCARF’s effectiveness from where we stand – the judgement will change as the maturation process proceeds. Second, NCCARF is a ground-breaking activity, with little guidance to inform its judgements about what will work and what will not. Those who follow NCCARF will benefit from our experience, but we have had little if any opportunity to do the same.

Objective 1: Identify knowledge needs of end-users

With respect to the NARPs, the 2012 Courage Partners review noted that several stakeholders interviewed were of the opinion that “these plans were a global first and recognised as goals that others should aspire to” (Courage Partners 2012, p. 35). Courage Partners identified a risk that the NARPs would be seen as “owned by the NCCARF and the research community” (Courage Partners 2012, p. 36), whereas there is an additional need for them to be “recognised and driven by key users of the research for investment to be forthcoming” (Courage Partners 2012, p. 36). They went on to state that “the development of the NARPs is an achievement” (Courage Partners 2012, p. 37) but that there is an “on-going role to ensure they are communicated and understood by wider audiences” (Courage Partners 2012, p. 37).

Objective 2: Build and harness the capacity of the research and end-user community

The Courage Partners review noted that the “Networks play a key role in communicating knowledge and information exchange” and that “the informal learning and knowledge development… appears to be valued” (p. 39). The review also commented on NCCARF’s work to build relationships with local and state and territory governments (through FORNSAT), and considered that “the effort and value of these relationships will influence adaptation decision-making” (p. 42).

From the local government perspective, the review received feedback that “the sentiment from… the research community to involve them [local government] was appreciated but impractical” (Courage Partners 2012, p. 43). And this highlights an issue for NCCARF – that however much we work to involve end-users in our activities, we are limited by the fact that end-users have their ‘day jobs’ that must be addressed first and foremost, and that there is only limited time left over to engage in NCCARF activities. This was a limiting factor for NCCARF especially with respect to local government and the business sectors. In both cases, we have addressed this issue by setting up web-based portals as a primary engagement mechanism, and this has worked to an extent but probably requires more input from NCCARF to achieve its full potential. The comment from the Courage Partners review is that the Local Government portal was ‘a good start’. Note that the Business portal did not exist at the time of the review.
FORNSAT, the engagement mechanism with the states and territories, delivered very effectively to Objective 2. Amongst its achievements we should note:

a. Through its meetings, capacity building through engagement with NCCARF and its Networks, and the opportunities to engage with one another in a neutral environment;

b. Supporting NCCARF in its activities, including the annual conference, science review panels, review of SIRP final reports, and organising workshops.

The existence of FORNSAT and the involvement of its members has been a major contributing factor to NCCARF’s effectiveness in meeting Objective 2. It is encouraging that a number of the states have now set up their own research programs in adaptation, and that the capacity that NCCARF has built is likely to ensure the quality of these programs.

**Objective 3: Generate the knowledge to meet end-user needs**

The Courage Partners review expected “a significant boost in core understanding and a range of foundational knowledge” as a result of NCCARF’s investment in research, creating “a solid platform for future…decision-making” (Courage Partners 2012, p. 37-38). Nevertheless, the review, in thinking about the link between the research gaps identified by the NARPs and the funded projects, considered that “it can be hard to draw the direct link to how these projects are fulfilling gaps in research” (Courage Partners 2012, p. 38). The review received feedback that “it was difficult to see how it [the research] would inform decision-making” (Courage Partners 2012, p. 38).

There is no doubt that, in setting up and managing its research programs, NCCARF walked a narrow path to maintain and demonstrate research quality while at the same time focussing on perceived stakeholder needs. NCCARF was conscious of the need, during these five initial years of operation, to build a demonstrable reputation for high-quality research outputs, which we did through competitive open calls, science review panels for evaluation of proposals, and peer review of final reports. To maintain focus on end-user needs, we required projects in the ARGP to prepare and implement End-user Engagement Plans, and projects in the SIRP to involve end-users at every step in the research chain from proposal to final reporting and dissemination.

What we did not do is solicit sector/problem-specific research topics from individual categories of end-users. NCCARF is a national organisation which was established with funding from the Australian Government with a mission to address adaptation at the national level. Given the scale of the adaptation challenge, and the level of understanding around this challenge, this was not considered to be an appropriate approach. The Courage Partners review recognises this, saying “if no investment goes into developing the key understanding and underpinning science then the value of the short term and applied research will diminish over time” (Courage Partners 2012, p. 39). There is no doubt that as NCCARF moves into the future having built a solid reputation and with growing authority, and engaged with a community of researchers which interacts confidently and comfortably with end-users, it will be able to shift the balance increasingly towards stakeholder-driven research without jeopardising the quality of the outputs from that research.

**Objective 4: Make knowledge available to end-users**

Mark Stafford Smith, in Section 7.1, notes, with respect to Objective 4, that “the conferences were among the most successful parts of this effort” but that this was “probably the weakest area of achievement, although it requires more maturation time”. The Courage Partners review was carried out more than 12 months before NCCARF completed its work in mid-2013, and while the bulk of NCCARF’s research projects were still underway, giving no real opportunity for the review to evaluate NCCARF performance under this Objective. Nevertheless, the review concluded that NCCARF has “enabled on-going often intangible learning and knowledge development between researchers and research users” (Courage Partners 2012, p. 35) and it pointed in particular to the activities of the Networks in this respect.
7 External view of NCCARF’s overall achievements

The Courage Partners review in 2012 reached the conclusion on NCCARF’s overall achievements that “there is significant evidence that NCCARF has boosted Australia’s ability to develop foundational knowledge required for confident and effective decision-making”.

For an up-to-date, informal yet expert view of the totality of NCCARF achievements, we approached three stakeholders who have been involved in NCCARF activities over the complete lifetime of the institution. Our request to them is as follows:

“... to write a short (half page - say 500 words) piece on NCCARF’s impact on adaptation activities, capacity and awareness in Australia. Whatever is written, we would undertake to print, and to print as is, with no editing, deletions, insertions - no tampering whatsoever. ... ...if you will kindly undertake this task, we in NCCARF undertake to include your piece in the main body of the NCCARF final report as delivered to us, with no editing, deletions or insertions. We would send you a copy of that section of the final report as and when we deliver it to the Department.”

The ‘opinion pieces’ of these three expert stakeholders follow.
7.1 Contribution from Dr Mark Stafford Smith

Mark is Science Director of the CSIRO Climate Adaptation Flagship and Chair of the inaugural Science Committee for Future Earth. His piece reads:

“NCCARF came into existence, like CSIRO’s Climate Adaptation Flagship, at a time when public climate scepticism was rife, yet researchers were more clear than ever that climate change was happening. As a result I think there was a widespread sense that the research community had better get on with work on adaptation because there was little sign that mitigation had a chance, a sentiment that still has considerable currency. In this atmosphere, the new spotlight on adaptation lacked any focus, and was dominated by individual researchers looking at the potential impacts of climate change on their favourite organism or community or bridge. By luck or great design, the government’s significant commitment to establishing NCCARF put in place a critical element of research infrastructure at precisely the right moment to provide guidance in this absence of focus. Nonetheless, as the now-extended experience of creating new networks in the Cooperative Research Centre program has shown, it takes at least 4-5 years for a complex new entity to establish a modus operandi among its participants, along with a clear direction and value proposition. It can also take this long to sort out governance issues. The success of NCCARF therefore needs to be assessed with these realities in mind.

Its first objective, of systematically identifying knowledge needs, was achieved reasonably consistently across its Research Priority domains; my appraisal is that the details of these NARPs were somewhat idiosyncratically affected by the particular membership of writing teams, and in some cases the domains themselves were not yet sufficiently sophisticated to be able to articulate what their real knowledge needs were. Nonetheless the NARPs stand as a unique set of consistently articulated cases, which a process of on-going iterations would gradually hone. I count this objective as well met within the time constraints of the Program, and I am not aware of any other country in the world with adaptation needs so well resolved.

The second objective, of harnessing the research and end-user communities, was achieved through networks, meetings, and the engagement of both communities in research projects. My assessment is that the adaptation networks (NARNs) were a mixed bag, some operating very effectively to bring a strong community together, others less so. The activities of NCCARF in supporting a series of national adaptation conferences were very powerful, indeed assisting the generation of the international series of adaptation conferences also. The Australian conferences were especially effective in bringing researchers and users together, in a way not replicated elsewhere in the world.

The harnessing of researchers was also associated with the third objective of generating knowledge through the suite of commissioned research projects, since this permitted considerable direction of the research; this was also a mixed bag – I think that there was an undersupply of good research proposals, coupled with some disillusion at process difficulties in earlier years. As a result there were many excellent projects, but there were also poor ones. The overall portfolio of projects, if treated a little selectively, nonetheless constitutes an impressive oeuvre, again unmatched around the world.

The fourth objective was to make this knowledge available to users, an effort which intensified in the most recent years. In fact I would say that the conferences were among the most successful parts of this effort, even though much work also went in to synthesis projects and policy briefs, etc. This was probably the weakest area of achievement, although it requires more maturation time.

In summary, NCCARF struggled with processes and governance, particularly in the first half of its existence, but no more than any other ambitious networking enterprise starting from scratch; and it delivered more coherence to Australia’s adaptation research effort than has been achieved in any other nation of the world. There are areas where on-going iterations and time are required to maximise its benefits, but at this point I would count it a valuable success.”
Will is Australian Climate Commissioner, and recently retired from the post of Executive Director of the ANU Climate Change Institute at the Australian National University. His piece reads:

“The NCCARF legacy: preparedness for the inevitable.

There is little doubt that the world is headed for a 2°C rise in global average temperature later this century, and possibly much more. With an average rise of just under 1°C now, we can already see the considerable impacts of climate change, often through its influence on extreme weather events. It is inevitable that these will worsen before we can stabilise the climate system. NCCARF was established five years ago to help Australians deal with the consequences of climate change that are occurring now, and to help us prepare for what is coming.

By any measure, NCCARF has been a success, and in many areas an outstanding success. Perhaps most importantly, it has changed, in close collaboration with colleagues from the CSIRO Adaptation Flagship, the narrative around adaptation to climate change; it has developed sound approaches to create the knowledge base needed to support effective adaptation, and it has built the capacity to undertake adaptation activities on the ground into the future.

Arguably the most important contribution that NCCARF has made is to adopt and promote a user-oriented perspective, built around risk management and a systematic approach to decision-making. The approach has focused on the integration of climate-related risks with many other factors that businesses, industries, communities, conservations groups and others consider when making their decisions and planning their futures. The emphasis has been on using scientific knowledge to inform the adaptation process, rather than to drive it. This approach is sometimes called the “co-production of knowledge”, and involves an ongoing, close collaboration with stakeholders, from problem formulation through the research itself and on to communication and application. It is a concept that is often invoked but much less often implemented. NCCARF, however, has indeed walked the talk. Putting this user-oriented approach into practice has required the building of appropriate capacity across many of the most important sectors in the Australian society and economy. NCCARF has achieved this through the development and support of networks that have drawn in a large number of researchers from many institutions around the country, well beyond the original NCCARF consortium, and connected them to user groups. This has proven to be a very successful strategy, with the development of thriving networks that have churned out a prodigious volume of high quality research over the past five years. More importantly, these networks have gone well beyond the research itself, embedding adaptation to climate change in the everyday planning, decision-making and management in local councils, agricultural businesses, industries, conservation groups and many other enterprises.
One of the most striking outcomes of the NCCARF effort has been the rapid rise of Australian adaptation research and implementation into a world leadership role. The first major international climate adaptation conference was held at the Gold Coast, hosted by NCCARF and the CSIRO Adaptation Flagship. It was as intellectually stimulating as any conference I’ve participated in, but it achieved even more by involving a large number of practitioners who were already committed to the co-production of adaptation knowledge. Since then, the signs of Australian leadership at the global level are obvious – strong representation in subsequent adaptation conferences elsewhere, a large number of high quality Australian papers in the scientific literature, and the clear signs that adaptation research is already influencing decisions on the ground. This is a very good thing, as the world is currently tracking at the highest greenhouse gas emission scenario. This means that Australia will have to cope with an increasingly destabilised climate, loading the dice towards more frequent and more intense extreme weather events.

What does the future hold? The capacity to adapt to an uncertain but rapidly destabilising climate is paramount; without it, we’ll struggle to survive as a society. NCCARF research has undoubtedly built significant capacity right across Australia to deal with this increasingly risky future. The networks that NCCARF has built are essential social capital for this future. It is an outstanding legacy. Yet, there remains a prominent gap that requires attention. NCCARF built more than networks; it created a central capacity to evaluate, synthesise and build on the research coming out of the networks to accelerate the fundamental science and art of adaptation. We need to maintain and strengthen this capacity into the future, a challenge that still remains to be met.”
7.3 Contribution from Prof Bruce Thom

Bruce is a member of the Wentworth Group of Concerned Scientists and Emeritus Professor at the University of Sydney. His piece reads:

“In 2009, I was invited to chair the team responsible for drafting the NCCARF Research Plan on Settlements and Infrastructure (Thom, et al., 2010). This was envisaged as one of the largest of 8 plans designed to facilitate communication between researchers, and through new research provide the nation with enhanced capacity to adapt to the challenges of climate change. In performing this role, I was able to engage with a range of stakeholders in both private and public sectors that were able to identify critical gaps in information to address various issues arising from potential impacts of climate change on Australian settlements and infrastructure.

The need for national investment in adaptation, including improving our resilience to withstand the devastating impacts of extreme events, has been highlighted in recent Productivity Commission and Senate inquiries. Commonwealth Government efforts to develop policies that address issues of climate change have not put as much effort into adaptation compared to emissions control. Nevertheless, commitments to NCCARF and other programs have demonstrated since 2009 the value of linking the scientific community with decision-makers who are beginning to plan for what many see as inevitable changes to ecosystems and the lives and livelihoods of people.

Climate science points to Australia being very vulnerable to any shifts in climate systems that involves more heat, loss of soil moisture, droughts and exposure to floods and coastal inundation. One of the lessons from the work of NCCARF has been to show that understanding these processes and impacts, and how best to create adaptive responses that enhance our resilience, requires long-term commitments from governments and the private sector. Behavioural, legal and economic changes appear as requiring evaluation and re-evaluation as the nature of forces of climate change develop in intensity and magnitude in coming decades.

What we should not be doing is turning off investments in integrated adaptation research just as they are getting going. NCCARF has offered a model for bringing stakeholders together to help define research needs in the context of user needs. It provides a rare environment for researchers and practitioners from a range of disciplines in universities, in consultancies, in public institutions such as CSIRO, and in state and local governments, to form on-going collaborative research networks. These are needed to enhance our understanding of the nation’s potentially fragile environmental and hence social and economic future and what we should be doing to reduce adverse impacts. Without an NCCARF, the universities in particular are left somewhat rudderless in the way they can contribute to the nation’s long-term welfare.”
References


Appendix 1: NCCARF research reports

AECOM 2013, Supporting evidence-based adaptation decision-making in New South Wales: A synthesis of climate change adaptation research, National Climate Change Adaptation Research Facility, Gold Coast, 120 pp.

AECOM 2013, Supporting evidence-based adaptation decision-making in Queensland: A synthesis of climate change adaptation research, National Climate Change Adaptation Research Facility, Gold Coast, 118 pp.

AECOM 2013, Supporting evidence-based adaptation decision-making in South Australia: A synthesis of climate change adaptation research, National Climate Change Adaptation Research Facility, Gold Coast, 110 pp.

AECOM 2013, Supporting evidence-based adaptation decision-making in the Australian Capital Territory: A synthesis of climate change adaptation research, National Climate Change Adaptation Research Facility, Gold Coast, 94 pp.

AECOM 2013, Supporting evidence-based adaptation decision-making in Western Australia: A synthesis of climate change adaptation research, National Climate Change Adaptation Research Facility, Gold Coast, 107 pp.


Bird, D, King, D, Haynes, K, Box, P, Okada, T & Nairn, K 2013, Impact of the 2010–11 floods and the factors that inhibit and enable household adaptation strategies, National Climate Change Adaptation Research Facility, Gold Coast, 153 pp.


Cockfield, G, Maraseni, T, Buys, L, Sommerfeld, J, Wilson, C & Athukorala, W 2011, Socioeconomic implications of climate change with regard to forests and forest management. Contribution of Work Package 3 to the Forest Vulnerability Assessment, Gold Coast, Australia, National Climate Change Adaptation Research Facility, 105 pp.


Cummings, CR, Matthews, TG & Lester, RE 2013, Novel methods for managing freshwater refuges against climate change in southern Australia: Riparian replanting for temperature control in streams, National Climate Change Adaptation Research Facility, Gold Coast, 37 pp.


Dobes, L, Scheufele, G & Bennett, J 2012, Benefits and costs of provision of postcyclone emergency services, National Climate Change Adaptation Research Facility, Gold Coast, 60 pp.


Fry, P-J & Williams, S 2013, Reforming planning processes: Rockhampton 2050 pilot: Local government climate hazard risk management toolkit study, National Climate Change Adaptation Research Facility, Gold Coast, 196 pp.


Will primary producers continue to adjust practices?


Instone, L, Mee, K, Palmer, J, Williams, M & Vaughan, N 2013, Climate change adaptation and the rental sector, National Climate Change Adaptation Research Facility, Gold Coast, 200 pp.


Kinnear, S, Patison, K, Mann, J, Malone, E & Ross, V 2013, Network governance and climate change adaptation: Collaborative responses to the Queensland floods, National Climate Change Adaptation Research Facility, Gold Coast, 103 pp.

Kong, D, Setunge, S, Molyneaux, T, Zhang, G & Law, D 2013, Structural resilience of core port infrastructure in a changing climate. Enhancing the resilience of seaports to a changing climate report series, National Climate Change Adaptation Research Facility, Gold Coast, 82 pp.

Kuruppu, N, Murta, J, Mukheibir, P, Chong, J & Brennan, T 2013, Understanding the adaptive capacity of Australian small-to-medium enterprises to climate change and variability, National Climate Change Adaptation Research Facility, Gold Coast, 133 pp.


Low Choy, D, Clarke, P, Jones, D, Serrao-Neumann, S, Hales, R & Koschade, O 2013, Understanding coastal urban and peri-urban Indigenous people’s vulnerability and adaptive capacity to climate change, National Climate Change Adaptation Research Facility, Gold Coast, 139 pp.

Lukasiewicz, A, Finlayson, CM & Pittock, J 2013, Identifying low risk climate change adaptation in catchment management while avoiding unintended consequences, National Climate Change Adaptation Research Facility, Gold Coast, 93 pp.

Maani, K 2013, Decision-making for climate change adaptation: A systems thinking approach, National Climate Change Adaptation Research Facility, Gold Coast, 67 pp.


Mason, L & Gioruco, D 2013, Climate change adaptation for Australian minerals industry professionals, National Climate Change Adaptation Research Facility, Gold Coast, 69 pp.


Mason, MS & Haynes, K 2010, Adaptation Lessons from Cyclone Tracy, National Climate Change Adaptation Research Facility, Gold Coast, 82 pp.


McEvoy, D & Mullett, J 2013, Enhancing the resilience of seaports to a changing climate: Research synthesis and implications for policy and practice. Enhancing the resilience of seaports to a changing climate report series, National Climate Change Adaptation Research Facility, Gold Coast, 113 pp.

McEvoy, D, Mullett, J, Millin, S, Scott, H & Trunddle, A 2013, Understanding future risks to ports in Australia, Enhancing the resilience of seaports to a changing climate report series, National Climate Change Adaptation Research Facility, Gold Coast, 140 pp.

McNamara, K, Smithers, S, Westoby R & Parnell, K 2011, Limits to climate change adaptation for low-lying communities in the Torres Strait, National Climate Change Adaptation Research Facility, Gold Coast, 87 pp.


Michael, DT & Crossley, RL 2012, Food security, risk management and climate change, National Climate Change Adaptation Research Facility, Gold Coast, 154 pp.


Moir, ML & Leng, MC 2013, Developing management strategies to combat increased coexstinction rates of plant-dwelling insects through global climate change, National Climate Change Adaptation Research Facility, Gold Coast, 103 pp.


Morrison, C & Pickering, CM 2011, Climate change adaptation in the Australian Alps: Impacts, strategies, limits and management, National Climate Change Adaptation Research Facility, Gold Coast, 78 pp.

Mortazavi-Naeini, M, Kuczera, G, Kiern, AS, Henley, B, Berghout, B & Turner, E 2013, Robust optimisation of urban drought security for an uncertain climate, National Climate Change Adaptation Research Facility, Gold Coast, 74 pp.


Neville, S 2013, Adapting to climate change: A risk assessment and decision making framework for managing groundwater dependent ecosystems with declining water levels. Supporting Document 7: Spatially representing the impacts of falling groundwater due to climate change on groundwater dependent ecosystems, National Climate Change Adaptation Research Facility, Gold Coast, 113 pp.


Petheram, L, Fleming, A, Stacey, N & Perry, A 2013, Indigenous women’s preferences for climate change adaptation and aquaculture development to build capacity in the Northern Territory, National Climate Change Adaptation Research Facility, Gold Coast, 70 pp.

Pickering, CM & Venn, SE 2013, Increasing the resilience of the Australian alpine flora to climate change and associated threats: A plant functional traits approach, National Climate Change Adaptation Research Facility, Gold Coast, 84 pp.


Randall, A, Capon, T, Sanderson, T, Merrett, D & Hertzel, G 2012, Choosing a decision-making framework to manage uncertainty in climate adaptation decision-making: A practitioner’s handbook, National Climate Change Adaptation Research Facility, Gold Coast, 24 pp.

Randall, A, Capon, T, Sanderson, T, Merrett, D & Hertzel, G 2012, Making decisions under the risks and uncertainties of future climates, National Climate Change Adaptation Research Facility, Gold Coast, 66 pp.


Sanò, M, Richards, R, Sahin, O, Ware, D, Sherker, S & Tomlinson, R 2013, Adapt between the flags: Enhancing the capacity of Surf Life Saving Australia to cope with climate change and to leverage adaptation within coastal communities, National Climate Change Adaptation Research Facility, Gold Coast, 146 pp.


Shearer, H, Taygfeld, P, Coliacetto, E, Dodson, J & Banhalmi-Zakar, Z 2013, The capacities of private developers in urban climate change adaptation, National Climate Change Adaptation Research Facility, Gold Coast, 162 pp.

Slade, C & Wardell-Johnson, A 2013, Creating a climate for food security: Governance and policy in Australia, National Climate Change Adaptation Research Facility, Gold Coast, 34 pp.

Smith, TF, Carter, (Bill) RW, Daffara, P & Keys, N 2010, The nature and utility of adaptive capacity research, National Climate Change Adaptation Research Facility, Gold Coast, 68 pp.


Speldewinde, P 2013, Adapting to climate change: A risk assessment and decision making framework for managing groundwater dependent ecosystems with declining water levels. Supporting Document 6: Development of Bayesian Belief Networks for modelling the impacts of falling groundwater due to climate change on groundwater dependent ecosystems, National Climate Change Adaptation Research Facility, Gold Coast, 34 pp.


Thompson, RM, Beardall, J, Beringer, J, Grace, M & Sardina, P 2013, Mitigating impacts of climate change on stream food webs: Impacts of elevated temperature and CO2 on the critical processes underpinning resilience of aquatic ecosystems, National Climate Change Adaptation Research Facility, Gold Coast, 126 pp.

Tran, T, Strelein, LM, Weir, JK, Stacey, C & Dwyer, A 2013, Native title and climate change: Changes to country and culture, changes to climate: strengthening institutions for indigenous resilience and adaptation, National Climate Change Adaptation Research Facility, Gold Coast, 191 pp.


Verdon-Kidd, DC, Kiem, AS & Austin, EK 2012, Decision making under uncertainty: Bridging the gap between user needs and climate science capability, National Climate Change Adaptation Research Facility, Gold Coast, 116 pp.


West, JM & Brereton, D 2013, Climate change adaptation in industry and business: Framework for best practice in financial risk assessment, governance and disclosure, National Climate Change Adaptation Research Facility, Gold Coast, 144 pp.

Wilson, R & Turton, S 2011, Climate change adaptation options, tools and vulnerability. Contribution of Work Package 4 to the Forest Vulnerability Assessment, National Climate Change Adaptation Research Facility, Gold Coast, 119 pp.


Appendix 2:  Peer-reviewed publications resulting from NCCARF activities


Berry, HL, 2009, Pearl in the oyster: Climate change as a mental health opportunity, *Australasian Psychiatry*, 17(6), 453-456.


Bino, G., Steinfeld, C. & Kingsford, RT., in press, Maximising colonial waterbirds breeding events, using identified ecological thresholds and environmental flow management, Ecological Applications.


Blashki, G., Armstrong, G., Berry, HL., Weaver, HJ., Hanna, EG., Bi, P., Harley, D & Spickett, JT., 2011, Preparing health services for climate change in Australia, Asia-Pacific Journal of Public Health, 23(2 suppl), 133S-143S


Caputi, N, Jackson, G & Pearce, A, in press, The Marine Heat Wave off Western Australia During the Summer of 2010/11 – 2 Years On, Fisheries Research Report, Department of Fisheries, Western Australia, 47 pp.


Chester, ET & Robson, BJ, 2013, Anthropogenic refuges for freshwater biodiversity: Their ecological characteristics and management, Biological Conservation, 166, 64-75.

Da Silva Ramos, C & Handmer, JH, 2011, Geopolitica no Pacifico Sudoeste e os conflitos recentes nas Illhas Salomao (Geo-Politics in the South-West Pacific and the recent conflicts in the Solomon Islands), Geografica, 31(1), 5-28.


adaptation, science and end-users as a barrier to climate change
Kiem, AS & Austin, EK, 2013, Disconnect between
www.nccarf.edu.au


McLennan, BJ & Garvin, T, 2011, Increasing the salience of NRM research with innovative methodologies: The example of oriented qualitative case study (OQCS), Society & Natural Resources, 25(4), 400-409.


Moir, ML & Lis, B, 2012, New species of Ceratocader (Hemiptera: Tingidae) from Western Australia, Records of the Western Australian Museum, 27, 148-155.


Strelein, L & Tran T, in press, Building Indigenous governance from native title: Moving away from ‘fitting in’ to creating a decolonised space’, Review of Constitutional Studies.

Sweet, M, 2011, Action on climate change requires strong leadership from the health sector, Vol. 22, Special Issue, Dec 2011, S4-S5


Taylor, GS & Moir, ML, in press, In threat of co-extinction: new species of Psyllidae from vulnerable species of Acacia, Banksia and Grevillea, Insect Systematics & Evolution.

Taylor, S, Kumar, L, Reid, N, Kriticos, DJ, 2012, Climate change and the potential distribution of an invasive shrub, Lantana camara L., PLoS ONE, 7(4), e35565, DOI:10.1371/journal.pone.0035565


Venn, S, Pickering, CM & Green, K, 2012, Short-term variation in species richness across an altitudinal gradient of alpine summits, Biodiversity and Conservation, 21(12), 3157-3186.


Wenger, C, Hussey, K & Pittock, J, 2013, Living with Floods: Key lessons from four Australian flood reviews and similar reviews from the Netherlands, China and the USA, Floodplain Management Association National Conference 28-31 May 2013, Tweed Heads

Appendix 3: NCCARF summary factsheets

**Promoting Excellence in Adaptation**
National Climate Change Adaptation Research Facility 2012, NCCARF Highlights: Promoting Excellence in Adaptation - Factsheets, National Climate Change Adaptation Research Facility, Gold Coast, 2pp. each, factsheet.
1. *Climate Adaptation Futures: The 2010 International Climate Change Adaptation Conference*
2. *Developing Knowledge to Adapt: Key Achievements of the National Climate Change Adaptation Research Facility*
3. *The Forum for NCCARF, States and Territories (FORNSAT)*
4. *Learning from Experience: A Synthesis of Historical Case Studies*
5. *NCCARF Research Programs: Delivering a Portfolio of Research to Support Climate Change Adaptation in Australia*
6. *Public Risk Perceptions, Understandings and Responses to Climate Change in Australia and Great Britain*

**Historical Case Studies**
National Climate Change Adaptation Research Facility 2011, Learning from Experience: Presenting NCCARF Synthesis and Integrative Research - Factsheets, National Climate Change Adaptation Research Facility, Gold Coast, 2pp. each, factsheet.
1. *Historical Case Studies of Extreme Events: Introduction to the Case Studies*
2. *Historical Case Studies of Extreme Events: Meteorological Context*
3. *Key Findings: The 2008 Floods in Queensland: Charleville and Mackay*
4. *Key Findings: Cyclone Tracy*
5. *Key Findings: Drought and the Future of Rural Communities: Drought Impacts and Adaptation in Regional Victoria, Australia*
6. *Key Findings: Drought and Water Security: Kalgoorlie and Broken Hill*
7. *Key Findings: East Coast Lows and the Newcastle-Central Coast Pasha Bulker Storm*
8. *Key Findings: Heatwaves: The southern Australian Experience of 2009*
10. *Key Findings: Storm Tides along East-Coast Australia*
11. *Learning from Experience: A Synthesis of Historical Case Studies*

**Food Security**
National Climate Change Adaptation Research Facility 2012, NCCARF Food Security - Factsheets, National Climate Change Adaptation Research Facility, Gold Coast, 2pp. each, factsheet.
1. *Managing risks to food security*
2. *Implementing food security risk management*

**Limits to Adaptation**
National Climate Change Adaptation Research Facility 2012, Exploring the Limits to Climate Change Adaptation - Factsheets, National Climate Change Adaptation Research Facility, Gold Coast.
1. *Limits to Climate Change Adaptation: Key Findings, 4pp, factsheet.*
2. *Climate Change Adaptation in the Australian Alps, 2pp, factsheet.*
3. *Climate Change Adaptation in the Coorong and Lower Lakes, 2pp, factsheet.*
5. *Limits to Climate Change Adaptation in the Great Barrier Reef, 2pp, factsheet.*
7. *Limits to Climate Change Adaptation for Two Low-lying Communities in the Torres Strait, 2pp, factsheet.*

**Coastal Zone**
National Climate Change Adaptation Research Facility 2012, Adapting to Climate Change in the Coastal Zone - Factsheets, National Climate Change Adaptation Research Facility, Gold Coast.
1. *Managed Adaptation Options, 4pp, booklet.*
2. *Seven Principles of Coastal Zone Climate Change Adaptation, 2pp, factsheet.*
Flooding
1. Flood and drought resilience lessons for the mining industry (2012)
2. Protecting structures from floodwater (2012)
3. Community adaptation strategies to floods (2013)
4. Enhancing disaster resilience and adaptability (2013)
5. The 2008 floods in Queensland: a case study (2013)
6. Adapting our built environment to a changing climate (2013)
7. Key flooding lessons from Australia and abroad (2013)
8. Providing emergency supplies to flood prone areas (2013)

Networks
National Climate Change Adaptation Research Facility 2012, *Living with Climate Change: Climate Change Impacts and Adaptation Factsheets for Australia - Factsheets*, National Climate Change Adaptation Research Facility, Gold Coast, 2pp. each, factsheet.
1. Marine Biodiversity and Resources
2. Terrestrial Biodiversity
3. Water Resources and Freshwater Biodiversity
4. Primary Industries
5. Settlements and Infrastructure
6. Indigenous Communities
7. Emergency Management
8. Human Health
9. Tourism

Other

The National Climate Change Adaptation Research Facility (NCCARF) is a unique venture established by the Australian Government in 2008 to generate and communicate the knowledge decision-makers need to effectively adapt Australia to climate change.

NCCARF is a consortium made up of Griffith University together with funding partners drawn from across the country:

- Queensland Government
- James Cook University
- Macquarie University
- Murdoch University
- The University of Newcastle
- Queensland University of Technology
- University of Southern Queensland
- University of the Sunshine Coast

In its Operational Phase, NCCARF was overseen and guided by a ten-member Advisory Board.

Our Vision
Decision-makers have the information needed to adapt Australia successfully to climate change.

Our Mission
To lead the research community in a national interdisciplinary effort to generate the information needed by decision-makers in government and in vulnerable sectors and communities to manage the risks of climate change impacts.

Our Core Objectives
- To identify knowledge needs of end-users
- To build and harness the capacity of the research and end-user community
- To generate the knowledge to meet end-user needs
- To make knowledge available to end-users

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