Climate change adaptation knowledge for Western Australia

What is NCCARF?

The National Climate Change Adaptation Research Facility is a unique venture established by the Australian Government in 2008 to harness and coordinate the capabilities of Australia’s researchers, to generate and communicate the knowledge decision-makers need for successful adaptation to climate change. NCCARF fulfils its mission by:

• Building capacity in research and end user communities, principally through its eight thematic Adaptation Research Networks;
• Generating knowledge for adaptation through its research programs;
• Effectively delivering knowledge through the NCCARF annual conference, workshops and master classes, reports, policy briefs and information sheets, the website and social media.

NCCARF Adaptation Research Networks in Western Australia

NCCARF’s Adaptation Research Networks are a community of researchers and practitioners working together to progress climate change adaptation knowledge. Established in 2008, there are eight Networks representing various themes. Each Network is convened at an Australian research institution, chosen through a competitive bidding process. In under four years, they have made a significant and growing contribution towards the advancement of climate change adaptation knowledge across the nation. With over 5000 members, the Networks effectively connect and rapidly communicate with researchers and research end users in government and vulnerable sectors and communities.

In order to run activities nationally, Networks have partners across Australia. Network partners provide in-kind support for Network activities and often receive support from the Network hub to run regional events and activities.

Western Australian Network partners include:

• Emergency Management: University of Western Australia; Fire and Emergency Service Authority (WA-FESA)
• Human Health: Curtin University
• Marine Biodiversity and Resources: Western Australian Marine Science Institution
• Primary Industries: University of Western Australia
• Water Resources and Freshwater Biodiversity: Murdoch University; University of Western Australia
• Terrestrial Biodiversity: Curtin University

Collectively the Networks have also provided over $30,000 in travel and research grants for students and early career researchers:

• Angela Eads: Building a model system to measure local adaptation to desiccation stress in a terrestrial breeding frog
• Sophie Arnall: Predicting species survival under climate change – Using biophysics to model the translocation variability of Australia’s rarest reptile
• Brad Evans: Climatic impacts on forest ecosystems in the southwest of Western Australia
• Simon Kilbane: Towards a national green infrastructure – Testing the theory of an interconnected landscape system
• Lorian Woogag: Where are male loggerhead turtles produced in Western Australia? – Current and future scenarios
• Verity Wallace: Modelling the impacts of climate change on water quality, nutrient cycling and aquatic habitat of the lakes of the Lower Serpentine
• Four members of the Adaptation College come from Western Australia

Recent Network events in Western Australia:

• Seminar: Climate change and emergency management – Can we plan to adapt?
• Seminar: Flood recovery in the UK
• Workshop: Focussed strategy meeting with marine stakeholders
• Workshop: Forum on climate change and adaptation – Cities
• Seminar: Local adaptation as a constraint on species’ range change under climate change
• Workshop: Terrestrial Biodiversity Roadshow
• Workshop: Water resources and biodiversity in Western Australia
Projects in NCCARF’s research programs delivering useful results for Western Australia

The National Climate Change Adaptation Research Facility manages two research areas, the Adaptation Research Grants Program (ARGP) and the Synthesis and Integrative Research Program (SIRP). Together, these seek to address knowledge gaps and deliver the information decision-makers need to successfully adapt Australia to climate change.

The thematic ARGP, with a $36 million budget (including cash leveraging) and 96 projects, addresses knowledge gaps identified in National Adaptation Research Plans (NARPs). There are programs in terrestrial, marine and freshwater biodiversity, primary industries, human health, emergency management, settlements and infrastructure, the social, institutional and economic dimensions of climate change, and Indigenous communities and adaptation. The SIRP, with a $6 million budget and 40 projects, builds on existing research to directly address knowledge needs of practitioners. The SIRP synthesises across thematic topics and integrates NCCARF learnings with the wider field of adaptation research to deliver timely and specific information tailored to the needs of practitioners. These practitioners are engaged in projects at all stages of development, implementation and delivery.

Research projects in the ARGP and SIRP can be clustered to address the needs of particular locations and critical adaptation challenges. NCCARF is producing a series of fact sheets to show where information can be found in NCCARF’s research programs to support decision-making and policy development to address critical adaptation challenges.

This fact sheet outlines $4.2 million of NCCARF research addressing the challenges of adaptation in Western Australia.

<table>
<thead>
<tr>
<th>REGIONAL ADAPTATION STUDIES</th>
<th>Principal Investigator</th>
<th>Institution</th>
<th>Final report availability¹,²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supporting evidence-based adaptation decision-making in Australia’s states and territories – Synthesis and learning from research to date</td>
<td>Jennifer Cane</td>
<td>AECOM</td>
<td>30-Apr-2013</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NCCARF RESEARCH IN WESTERN AUSTRALIA</th>
<th>Principal Investigator</th>
<th>Institution</th>
<th>Final report availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resilience and water security in two outback cities</td>
<td>Glenn Albrecht</td>
<td>Murdoch University</td>
<td>31-Jul-2010</td>
</tr>
<tr>
<td>Adapting to climate change – A risk assessment and decision framework for managing groundwater dependent ecosystems with declining water levels</td>
<td>Jane Chambers</td>
<td>Murdoch University</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Climate-resilient vegetation of multi-use landscapes – Exploiting genetic variability in widespread species</td>
<td>Margaret Byrne</td>
<td>Department of Environment and Conservation, WA</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Adaptive capacity and adaptive strategies of broadacre farms experiencing climate change</td>
<td>Ross Kingwell</td>
<td>University of Western Australia</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>EverFarm* – Design of climate adapted, perennial-based farming systems for dryland agriculture in southern Australia</td>
<td>Amir Abadi</td>
<td>Future Farm Industries CRC</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Novel methods for managing freshwater refuges against climate change in southern Australia</td>
<td>Belinda Robson</td>
<td>Murdoch University</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>What about me? – Factors affecting individual adaptive coping capacity across different population groups</td>
<td>Kerrie Unsworth</td>
<td>University of Western Australia</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Climate change adaptation – Building community and industry knowledge</td>
<td>Jenny Shaw</td>
<td>WA Marine Science Institution</td>
<td>01-Apr-2013³</td>
</tr>
<tr>
<td>Management implications of climate change effects on fisheries in Western Australia</td>
<td>Nick Caputi</td>
<td>WA Fisheries and Marine Research Labs</td>
<td>31-Dec-2013</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NCCARF RESEARCH RELATING TO WESTERN AUSTRALIA</th>
<th>Principal Investigator</th>
<th>Institution</th>
<th>Final report availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating a climate for food security – The business, people and landscapes in food production</td>
<td>Angela Wardell-Johnson</td>
<td>University of the Sunshine Coast</td>
<td>01-Oct-2012</td>
</tr>
<tr>
<td>Building the climate resilience of arid zone freshwater biota – identifying and prioritising processes and scales for management</td>
<td>Jenny Davis</td>
<td>Monash University</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Changes to country and culture, changes to climate – Strengthening institutions for Indigenous resilience and adaptation</td>
<td>Jessica Weir</td>
<td>Australian Institute of Aboriginal and Torres Strait Islander Studies</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Contributing to a sustainable future for Australia’s biodiversity under climate change – Conservation goals for dynamic management of ecosystems</td>
<td>Michael Dunlop</td>
<td>CSIRO Climate Adaptation Flagship</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Will primary producers continue to adjust practices and technologies, change production systems or transform their industry – An application of real options</td>
<td>Gregory Hertzler</td>
<td>University of Sydney</td>
<td>31-Mar-2013</td>
</tr>
<tr>
<td>Future change in ancient worlds – Indigenous adaptation in northern Australia</td>
<td>Steve Larkin</td>
<td>Charles Darwin University</td>
<td>31-May-2013</td>
</tr>
<tr>
<td>Learning from the past, adapting in the future – Identifying pathways to successful adaptation in Indigenous communities</td>
<td>Meg Parsons</td>
<td>University of Melbourne</td>
<td>31-May-2013</td>
</tr>
</tbody>
</table>

¹Completed final reports are available for download at [www.nccarf.edu.au](http://www.nccarf.edu.au)
²Availability dates are estimated using draft report due dates and time for the review process
³These FRDC projects are funded by a partnership between the DCCEE and FRDC to address knowledge gaps identified by the NCCARF National Adaptation Research Plan for Marine Biodiversity and Resources
Supporting evidence-based adaptation decision-making in Australia’s states and territories – Synthesis and learning from research to date
Jennifer Cane, AECOM
NCCARF has commissioned two institutions to produce eight reports, one for each state and territory, targeted explicitly at policymakers. These reports draw together state-of-the-art knowledge of vulnerability to and impacts of climate change, and potential adaptation responses and strategies. This knowledge will emerge from research programs funded by NCCARF and more widely. The projects will deliver knowledge to decision makers seeking to address the challenge of climate change. The outputs of the projects will be presented as adaptation handbooks for decision- and policy-makers, outlining the key challenges of climate change in each state and territory, and strategies to address these challenges through adaptation.

AECOM will deliver seven reports for the states and territories in mainland Australia. Through using a single provider, NCCARF expects a uniformity of approach and knowledge delivery, which should encourage knowledge adoption and meaningful interactions between states and territories to address common challenges.

Resilience and water security in two outback cities
Glenn Albrecht, Murdoch University
This project explores the adaptive capacity of Kalgoorlie and Broken Hill, two inland regional centres that face different challenges relating to climate change and water supply. It will outline the challenge of water security and sustainability, identify historical and current processes that create this challenge, consider the infrastructure, cultural and organisational change needed to meet the water security challenge for each city and provide a range of water security future scenarios to assist in planning for, and adapting to, climate change and other pressures.

Adapting to climate change – A risk assessment and decision framework for managing groundwater dependent ecosystems with declining water levels
Jane Chambers, Murdoch University
This project will develop and test a risk assessment and decision-making tool for managing wetland and cave ecosystems that depend on groundwater. The tool will be tested in south-western Australia, a global biodiversity hotspot and one of the earliest regions impacted by climate change, and modified to help manage similar ecosystems across Australia. It will identify sites of high ecosystem value, including species and communities at risk and produce maps showing the distribution of risk to wetlands and caves in specific regions.

Climate-resilient vegetation of multi-use landscapes – Exploiting genetic variability in widespread species
Margaret Byrne, Department of Environment and Conservation, WA
Multi-million dollar investments in ecosystem maintenance through restoring Australia’s degraded landscapes currently take little account of climate change. Until recently there has been a strong focus on maintaining local genetic patterns for optimal restoration. In a changing climate this paradigm will no longer be relevant. This project will undertake pioneering research at the interface between molecular genetics, plant physiology and climate adaptation, targeting the question ‘What new genetic frameworks can facilitate adaptive restoration in changing environments?’ Addressing this question will ensure optimal outcomes for Australia-wide investment in ecological restoration and provide solutions to ecosystem adaptation in changing environments.

Adaptive capacity and adaptive strategies of broadacre farms experiencing climate change
Ross Kingwell, University of Western Australia
The southwest agricultural region of Australia is projected to experience adverse climate change in coming decades, with many farmers already reporting adverse impacts. Using data provided by farmers, the research team hopes to identify how farmers are adapting to this changed climate. They will study longitudinal farm data, coupled with data from a social/management survey, to identify successful adaptation strategies and the characteristics of a farm, and of a farm manager that makes them better able to adapt. The research findings are likely to be applicable to similar regions across Australia that also risk being affected by adverse climate change.

Everfarm® – Design of climate adapted, perennial-based farming systems for dryland agriculture in southern Australia
Amir Abadi, Future Farm Industries CRC
Expected higher temperatures and reduced rainfall are likely to reduce crop yields and livestock productivity in Australia unless we develop alternative farming techniques. This project will look at the benefits of integrating perennial plants such as mallee eucalypts into dryland agriculture. Researchers will work with farmers to model the economic feasibility of adopting these new techniques on a large-scale.

Novel methods for managing freshwater refuges against climate change in southern Australia
Belinda Robson, Murdoch University
Freshwater refuges are areas that provide important safe habitat for aquatic animals and plants. This project aims to determine which methods for managing refuges are most effective as part of a climate change adaptation strategy for freshwater biodiversity. Researchers will evaluate the usefulness of each method to provide knowledge that environmental managers can incorporate into climate change adaptation strategies.

What about me? – Factors affecting individual adaptive coping capacity across different population groups
Kerrie Unsworth, University of Western Australia
As the scientific evidence for climate change becomes more convincing, the public appears to show a paradoxical decline in interest and recognition of the problem. Little research has examined how people adapt to climate change information and initiatives. The project will examine how individual values, beliefs and goals affect adaptive coping goals and behaviours. It will examine positive climate change adaptation behaviour and those that may have other negative impacts.

Climate change adaptation – Building community and industry knowledge
Jenny Shaw, WA Marine Science Institution
This project will increase knowledge and understanding of likely climate change and adaptation measures open to local communities. It will support a case study for Australia in adaptive
management that cross-correlates regional needs with Australia-wide management policies. Key climate change information will be synthesised, analysed and adapted for marine biodiversity and fisheries businesses, and extension and knowledge sharing activities tailored for regional needs.

**Management implications of climate change effects on fisheries in Western Australia**

Nick Caputi, WA Fisheries and Marine Research Labs

This project will assess future climate change effects on Western Australia marine environments using a suite of IPCC model projections, downscaled to the key shelf regions and the spatial and temporal scales relevant for key fisheries. It will examine the modelled shelf climate change scenarios on fisheries and implications of historic and future climate change effects; and review management arrangements to examine their robustness to possible effects of climate change.

**Creating a climate for food security – The business, people and landscapes in food production**

Angela Wardell-Johnson, University of the Sunshine Coast

This project will identify and interview stakeholders including producers, businesses, community and government in agricultural areas in southwest WA and southeast Qld to identify risks, current productivity and approaches to adaptation related to climate change in agricultural production, and test approaches to strengthening resilience in agriculture in these areas.

**Building the climate resilience of arid zone freshwater biota – Identifying and prioritising processes and scales for management**

Jenny Davis, Monash University

Important wetlands in the Lake Eyre Basin, Western Plateau and Indian Ocean drainage divisions of Australia’s arid zone include springs, relic streams, rockholes and river pools. Climate change, including rising temperatures and more variable rainfall, will alter connections between these sites, fragment existing habitats and force aquatic animals to follow suitable habitats. Understanding the processes that allow arid zone aquatic communities to persist is critical to understanding how the environment can be managed to help animals adapt to climate change in this region. This project will produce national management guidelines for planning, policy and management decisions and actions across the Australian arid zone.

**Changes to country and culture, changes to climate – Strengthening institutions for Indigenous resilience and adaptation**

Jessica Weir, Australian Institute of Aboriginal and Torres Strait Islander Studies

This project will seek to understand the barriers to and enablers of Registered Native Title Bodies Corporate (RNTBCs) to facilitate community-driven adaptation on native title lands, and to develop best practice for participatory climate change decision-making.

**Contributing to a sustainable future for Australia’s biodiversity under climate change – Conservation goals for dynamic management of ecosystems**

Michael Dunlop, CSIRO Climate Adaptation Flagship

Likely changes in climate and ecological processes due to climate change mean it may not be possible to retain biodiversity and ecosystems in the same form or place. This project seeks to establish a broadened set of goals and objectives for NRM management that will accommodate these inevitable changes of biodiversity in response to climate change and other pressures.

**Will primary producers continue to adjust practices and technologies, change production systems or transform their industry – An application of real options**

Gregory Hertzler, University of Sydney

This project aims to determine the climate change thresholds for transformational change in wheat-dominated agriculture across Australia. Researchers will communicate with producers who are managing wheat-dominated farms, then mathematically model options for how they may choose to transform the industry as the climate changes. Once the decisions of growers are understood, they will draw implications for stranded assets, new technologies and the resilience of agriculture undergoing climate change.

**Future change in ancient worlds – Indigenous adaptation in northern Australia**

Steve Larkin, Charles Darwin University

Northern Australia is likely to experience more frequent and intense extreme weather events as a consequence of climate change. Threats to biodiversity and changes to temperatures and seasons may impact heavily on Indigenous communities. Decisions about how to support Indigenous communities to adapt to, and reduce risks from, climate change must be informed by greater understanding of current capacity. The project will provide understanding of how Indigenous communities view change and risk, how they may be vulnerable or resilient, and how they have coped with past and ongoing environmental changes such as heatwaves, storm surges, cyclones, floods, sea level rise, drought and biodiversity loss.

**Learning from the past, adapting in the future – Identifying pathways to successful adaptation in Indigenous communities**

Meg Parsons, University of Melbourne

This project will examine how Indigenous individuals, households, communities, businesses, and institutions perceive and respond to climate variability and extreme weather events, and explore the importance of climate change relative to other risks Indigenous communities face. It will identify entry points for developing and implementing equitable, efficient and appropriate climate change adaptation plans and policies for Australian Indigenous communities. Using case studies and a systematic review of experiences from across Australia and internationally, it will produce information to assist Indigenous communities and decision makers develop community-level adaptation strategies, and suggest strategies to enhance adaptive capacity within the communities.

---

**Other fact sheets in this series cover:**

- Local Councils
- Coastal Management
- Water Resources
- Infrastructure
- Agriculture
- Vulnerable Communities
- Emergency Management
- Business and Industry
- Policy and Regulation for Effective Adaptation
- Decision Support Tools
- Natural Ecosystems
- Research Investment in States and Territories

For more information on NCCARF research, visit: www.nccarf.edu.au