

Climate change adaptation knowledge for business and industry

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.

Projects in NCCARF's research programs delivering useful results for business and industry

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 addresses the challenge of adaptation for business and industry in Australia.



Projects relevant to business and industry in NCCARF's research portfolio

	Principal Investigator	Institution	Final report availability ^{1,2}
FINANCIAL MECHANISMS FOR ADAPTATION			
Climate change adaptation – A framework for best practice in financial risk assessment, governance and disclosure	Jason West	Griffith University	28-Mar-2013
Assessing the potential for, and limits to, insurance and market-based mechanisms for encouraging climate change adaptation	John McAneney	Macquarie University	31-Mar-2013
EXTRACTIVE AND PRIMARY INDUSTRY			
Extractive resource development in a changing climate – Learning the lessons from recent weather events in Queensland, Australia	Vigya Sharma	University of Queensland	31-Oct-2012
Climate change adaptation for Australian minerals industry professionals – Best practice guidelines	Damien Giurco	University of Tech, Sydney	28-Mar-2013
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	31-Mar-2013
COMMERCIAL FISHING			
Adapting to the effects of climate change on Australia's deep marine reserves	Ron Thresher	CSIRO	30-Jun-2012 ⁴
Ensuring that the Australian oyster industry adapts to a changing climate – A natural resource and industry spatial information portal for knowledge action and informed adaptation frameworks	Andrew Davis	University of Wollongong	24-Dec-2012 ⁴
Preparing fisheries for climate change – Identifying adaptation options for four key fisheries in south-eastern Australia	Gretta Pecl	University of Tasmania	01-Sep-2013
Management implications of climate change effects on fisheries in Western Australia	Nick Caputi	WA Fisheries and Marine Research Labs	31-Dec-2013 ⁴
Vulnerability of an iconic Australian finfish (Barramundi, <i>Lates calcarifer</i>) and related industries to altered climate across tropical Australia	Dean Jerry	James Cook University	31-Dec-2013 ⁴
Management implications of climate change impacts on fisheries resources of tropical Australia	David Welch	James Cook University	14-Mar-2014 ⁴
BUILDINGS, SETTLEMENTS AND INFRASTRUCTURE			
Enhancing the resilience of seaports to a changing climate	Darren McEvoy	RMIT University	31-Aug-2012
Analysis of institutional adaptability to redress electricity infrastructure vulnerability due to climate change	John Foster and Deepak Sharma	University of Queensland & University of Tech, Sydney	31-Mar-2013
Developing adaptively – The role and capacities of private sector development institutions in urban climate change adaptation	Jago Dodson	Griffith University	31-Mar-2013
Strata title in a world of climate change – Managing greater uncertainty in forecasting and funding common property capital expenditure	Chris Guilding	Griffith University	31-Mar-2013
THE FOOD INDUSTRY			
Australian food security: Impact of climate change for risk management – How prepared are food industry leaders?	David Michael	Wondu Business & Technology Services	01-Oct-2012
Creating a climate for food security – The business, people and landscapes in food production	Angela Wardell-Johnson	University of the Sunshine Coast	01-Oct-2012
EXTREMES AND ADAPTATION			
Harnessing private sector logistics for emergency food and water supplies in flood prone areas	Leo Dobes	Australian National University	31-Aug-2012
Damage to buildings during the 2010–11 eastern Australia flooding events	Matthew Mason	Macquarie University	30-Sep-2012
Climate change impacts on workplace heat extremes – Health risk estimates and adaptive options	Elizabeth Hanna	Australian National University	Contact NHMRC ³
TOURISM AND RECREATION			
Beach and surf tourism and recreation in Australia – Vulnerability and adaptation	Mike Raybould	Bond University	30-Sep-2012 ⁴
Identification of climate-driven species shifts and adaptation options for recreational fishers – Learning general lessons from a data rich case	Daniel Gledhill	CSIRO Marine and Atmospheric Research	31-May-2013 ⁴
ADAPTIVE CAPACITY			
Enhancing the adaptive capacity of Small-to- Medium Enterprises (SMEs) to climate change and variability	Natasha Kuruppu	University of Tech, Sydney	30-Apr-2010
Climate change adaptation – Building community and industry knowledge	Jenny Shaw	WA Marine Science Institution	01-Apr-2013 ⁴
COMMUNICATION			
Climate adaptation in the boardroom	Gareth Johnston	Future Ready Pty Ltd	28-Mar-2013

¹Completed final reports are available for download at www.nccarf.edu.au

²Availability dates are estimated using draft report due dates and time for the review process

³These projects are being managed by NHMRC who can advise on availability of outputs - www.nhmrc.gov.au

⁴These 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

FINANCIAL MECHANISMS FOR ADAPTATION

Climate change adaptation – A framework for best practice in financial risk assessment, governance and disclosure

Jason West, Griffith University

This project will deliver a consolidated framework for Australian industry to integrate risk management and governance principles in relation to climate change adaptation with existing governance principles. It will identify a matrix of financial disclosure principles to act as guidance for Australian industry to use for information disclosures relating to climate change risk and adaptation costs. These outcomes will be developed in conjunction with representatives from industry, regulators and corporate governance bodies.

Assessing the potential for, and limits to, insurance and market-based mechanisms for encouraging climate change adaptation

John McAneney, Macquarie University

Insurance provides a means of helping communities recover from natural disasters. It is clear, however, that many people afflicted by flooding in southern Queensland in 2011 lacked suitable insurance cover, making recovery difficult and prolonged. This project seeks to understand why cover for riverine flood was so limited when damage from other natural hazards like bushfire, earthquake, tropical cyclone and hail storm are explicitly covered and routinely dealt with in home and contents policies. This project will propose solutions to align the incentives necessary at various levels of government to reduce the risk to Australian communities.

EXTRACTIVE AND PRIMARY INDUSTRY

Extractive resource development in a changing climate – Learning the lessons from recent weather events in Queensland, Australia

Vigya Sharma, University of Queensland

Researchers will examine the devastating impacts of extreme weather events on mining operations, including the 2010–11 floods that cost Queensland more than \$2 billion in export earnings. By applying the lens of the recent floods, the project aims to understand the impact on mining operations and the flow-on socio-economic and ecological impacts on the wider region. It will identify measures needed to get operations back on line after a disaster, and strategies to limit impacts from such events in the future across other Australian mining operations.

Climate change adaptation for Australian minerals industry professionals – Best practice guidelines

Damian Giurco, University of Technology, Sydney

The minerals industry generates 50% of Australia's export earnings, yet research into its ability to adapt to climate change is limited. In a recent study, stakeholders identified the major challenges as use of scarce resources such as water and energy; impacts on the environment and community; hazards and workforce issues; impacts on infrastructure; and mine planning and design. This project will evaluate industry awareness, and existing strategies, and develop best practice guidelines for climate change adaptation and planning by minerals industry professionals.

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.

COMMERCIAL FISHING

Adapting to the effects of climate change on Australia's deep marine reserves

Ron Thresher, CSIRO

The aims of this project are to develop practical options to manage the impacts of climate change on the South-east Commonwealth Marine Reserve and develop a generic model that can be applied to forecasting the impacts of climate change on other deep-sea biota.

Ensuring that the Australian oyster industry adapts to a changing climate – A natural resource and industry spatial information portal for knowledge action and informed adaptation frameworks

Andrew Davis, University of Wollongong

With the onset of climate change, the predominantly estuarine and

ocean oyster industry faces unprecedented, unknown and unpredictable challenges. Climate change threats to the industry must be better informed to manage risks and reduce the potential for local or regional industry collapse. This project will deliver a pilot, online, spatially-referenced, natural resource and industry information portal for resource managers and the industry that makes use of extensive spatial data sources. Researchers will identify pathways for this spatial information portal to inform governance and statutory authorities, strategies and planning policies.

Preparing fisheries for climate change – Identifying adaptation options for four key fisheries in south-eastern Australia

Gretta Pecl, University of Tasmania

This project will provide scientific information on the likely effects of climate change on rock lobster, abalone, snapper and blue grenadier, particularly where these effects may impact the harvest strategies for these species. It will identify options for improving assessment and management frameworks to ensure that they perform effectively under climate change scenarios, and evaluate options for adjusting management to reduce negative impacts and maximise opportunities that climate change may provide to commercial and recreational fisheries.

Management implications of climate change effects on fisheries in Western Australia

Nick Caputi, WA Fisheries and Marine Research Laboratories

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.

Vulnerability of an iconic Australian finfish (Barramundi, *Lates calcarifer*) and related industries to altered climate across tropical Australia

Dean Jerry, James Cook University

This project aims to develop predictive models incorporating new physiological and genetic data with available population genetic, environmental and fisheries data to identify vulnerable wild stocks and stakeholders under climate change predictions. Researchers will establish a genetic basis of thermal tolerance differences by identifying thermal tolerance-related genes that can be used as biomarkers for the aquaculture industry to identify fish tolerant to thermal stress. It will develop adaptive management strategies to minimise impacts under altered climate scenarios and determine opportunities for expansion of fisheries and aquaculture.

Management implications of climate change impacts on fisheries resources of tropical Australia

David Welch, James Cook University

The aims of this project are to describe the projected climate-driven changes that are relevant to northern Australian marine fisheries, assess the potential impacts of climate change on key fisheries and species in northern Australia and assess current management to identify approaches that are adaptive to potential climate change scenarios.

BUILDINGS, SETTLEMENTS AND INFRASTRUCTURE

Enhancing the resilience of seaports to a changing climate

Darren McEvoy, RMIT University

This project aims to better understand the vulnerability of critical seaport infrastructure (structural and functional), and to develop new knowledge and methodologies for enhancing port resilience to future climate change. The research will address three research objectives: to gain a better understanding of the complex mix of climate and non-climate drivers that are likely to affect port operations; to assess the vulnerability of core port infrastructure and identify appropriate adaptation measures for enhancing resilience; and to assess the vulnerability of other elements at risk in the wider port environment and identify adaptation measures. Close engagement with policy and practitioner stakeholders will ensure the deliverables will be 'fit for purpose'.

Analysis of institutional adaptability to redress electricity infrastructure vulnerability due to climate change

John Foster, University of Queensland; and Deepak Sharma, University of Tech, Sydney

This project will examine the capacity of Australia's National Electricity Market (NEM) to adapt to existing and predicted climate change conditions. It will identify potential issues and analyse climate change impacts on reliability in the Market under different climate change scenarios to 2030, particularly what adaptation strategies the power generation and supply network infrastructure will need.

Developing adaptively – The role and capacities of private sector development institutions in urban climate change adaptation

Jago Dodson, Griffith University

How equipped is the private urban development sector – developers and financial institutions – to respond to the task of adapting new urban developments to climate change? This study will investigate the capacity of developers and financial institutions to develop and fund climate-adapted urban developments.

Strata title in a world of climate change – Managing greater uncertainty in forecasting and funding common property capital expenditure

Chris Guilding, Griffith University

This project will determine the extent to which uncertainty of climate change-induced building damage is built into strata and community title capital expenditure forecasts, and whether insurance specialists are equipped with tools that can factor in uncertainty and flexibility when projecting capital expenditure.

THE FOOD INDUSTRY

Australian food security: Impact of climate change for risk management – How prepared are food industry leaders?

David Michael, Wondou Business & Technology Services

The combination of a drier and more volatile climate, limited arable land, subsidised competition from biofuel crops and a growing population suggests food availability and prices will become more volatile in Australia and offshore. The project examines the preparedness of food industry leaders for riskier operating scenarios, and the implications of climate change for risk management.

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.

EXTREMES AND ADAPTATION

Harnessing private sector logistics for emergency food and water supplies in flood prone areas

Leo Dobes, Australian National University

Climate change is expected to increase the frequency and/or intensity of cyclones, which will affect the availability of food and water supplies in times of emergency. This project will use the Cairns community as a model for a nationally-applicable scoping study to estimate the costs of supplying water and food using conventional public sector emergency services and of harnessing private sector logistics as an alternative. It will compare the relative efficiency of public and private sector arrangements, and estimate any additional government subsidies that may be justified by a cost-benefit analysis.

Damage to buildings during the 2010–11 eastern Australia flooding events

Matthew Mason, Macquarie University

Insured losses from the 2010-11 floods approached \$3 billion. When accounting for damage to essential infrastructure, lost productivity and the under- or non-insured, the true cost is several times this value. Many affected properties have a history of flood damage, which shows there are clear deficiencies in our ability to adapt to or mitigate the impact of this hazard. This research will detail the extent of damage to buildings during the recent eastern Australia flooding and explore the role planning and design/construction regulations played in these failures. It will highlight weaknesses in the current systems and propose effective solutions to mitigate future damage and financial loss under current or future climates.

Climate change impacts on workplace heat extremes – Health risk estimates and adaptive options

Elizabeth Hanna, Australian National University

Despite its hot climate, Australia has no national guidelines to protect people who work in the heat. This represents an existing health challenge that will be significantly exacerbated as Australia warms within the projected range of 2–4°C by 2070. A policy vacuum exists as we have little understanding about the thermal working environment for Australians. Evidence is lacking about direct heat exposures, worker tolerance levels, early symptoms, the adoption of personal and industry strategies, and which of these are effective in averting heat stress. This innovative project aims to fill that knowledge gap by studying the current effects on health and

productivity of heat-exposed workers, and modelling future trends in likely impacts under climate change in eight urban and rural regions, with and without adaptive health protection strategies.

TOURISM AND RECREATION

Beach and surf tourism and recreation in Australia – Vulnerability and adaptation

Mike Raybould, Bond University

This project will value existing income streams due to beach-related tourism and recreation in a variety of case study locations. It will assess the vulnerability to climate change of assets that are key drivers of marine and coastal tourism and recreation and apply a valuation tool in identified seachange localities to test transferability of results. It will identify social and behavioural responses to climate change impacts on vulnerable tourism and recreation assets and report on the net vulnerability of the regions to climate change.

Identification of climate-driven species shifts and adaptation options for recreational fishers – Learning general lessons from a data rich case

Daniel Gledhill, CSIRO

This project aims to determine changes in distributions of rocky reef fish in eastern Australia over the past four decades, and establish correlation of these changes to climate induced environmental change, such as temperature. It will develop and test a “process model” for engagement and development of climate change adaptation options that can be deployed for other fishing sectors and user groups, including commercial fishers.

ADAPTIVE CAPACITY

Enhancing the adaptive capacity of Small-to-Medium Enterprises (SMEs) to climate change and variability

Natasha Kuruppu, University of Technology Sydney

Small-to-Medium Enterprises (SMEs) comprise 96 per cent of all private businesses in Australia and are the largest employers and the largest contributors to GDP. The capacity of SMEs to adapt to climate change and variability will be vital to the resilience of communities, government agencies and other sectors. Climate change may result in business interruptions, increased investment or insurance costs and declining financial value, return and growth. SMEs face greater short-term losses after a natural disaster and may have lower adaptive capacity than larger businesses. This research aims to identify the extent to which SMEs consider and integrate adaptation into business planning, key barriers and opportunities to adaptation for SME in different sectors, and strategies to adopt in anticipation of climate change.

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.

COMMUNICATION

Communication – Climate change adaptation in the boardroom

Gareth Johnston, Future Ready Pty Ltd

This project aims to support Australian businesses to include climate change impacts and adaptation in their decision making processes by increasing climate awareness and capacity at the executive level. It will explore climate change risks to the supply chain to help inform directors about possible impacts on their business, and will develop and disseminate a climate change adaptation guide for the boardroom.

Other fact sheets in this series cover:

- Local Councils
- Coastal Management
- Water Resources
- Infrastructure
- Agriculture
- Vulnerable Communities
- Emergency Management
- 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