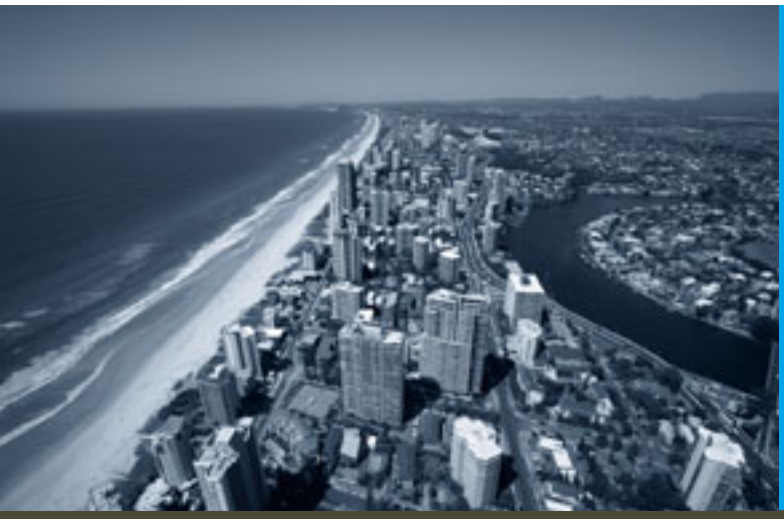
NCCARF
National
Climate Change Adaptation
Research Facility



National Climate Change Adaptation Research Plan: Settlements and Infrastructure

Summary

A National Climate Change Adaptation Research Plan for Settlements and Infrastructure has been developed to identify critical gaps in the information available to address the full range of issues arising from the potential impacts of climate change on settlements and infrastructure.

Climate change poses significant threats to the social fabric of our towns and cities and to our urban and strategic infrastructure. Developing adaptation options will be critical in reducing the impacts of climate change on settlements and infrastructure.

The primary purpose of this Plan is to set out the priority research agenda for the next 5-7 years to inform a better understanding of climate change risks and impacts on settlements and infrastructure and how these risks can be managed and impacts reduced through planned adaptation interventions.

Developing effective adaptation responses will be critical in reducing the impacts of climate change on settlements and infrastructure and, carefully designed and implemented, these responses could generate significant benefits such as increased energy or water efficiency. A range of adaptation strategies have already been identified, including revising building codes to take account of changing climatic conditions, introducing climate-responsive planning measures (e.g., planned retreat, dune management, building design, and regulation of new structures), and managing urban development in climate-sensitive areas through zoning and regulation. However, many more adaptation responses need to be developed and implemented, including shifts in the behaviour and expectations of urban, regional and remote area populations.

This National Climate Change Adaptation Research Plan for Settlements and Infrastructure will support adaptation efforts by identifying research priorities that are most relevant to the needs of key stakeholders from government, industry and the community.

Climate change adaptation in Australia: priorities for settlements and infrastructure

Climate change poses significant threats to the social fabric of our towns and cities and to our urban and strategic infrastructure. Climate change is likely to result in increased damage to buildings, energy, telecommunications, transport and water infrastructure and the services they provide. Coastal settlements and infrastructure will be especially vulnerable to the combined effects of climate change including sea-level rise, increased air and sea surface temperature, increased storm intensity and frequency, and changes to rainfall and runoff. Sea-level rise will cause greater coastal inundation, erosion, loss of wetlands and saltwater intrusion into freshwater sources, with impacts on infrastructure, coastal resources and existing coastal management programs.

The Plan is structured around four themes, which relate to the issues around, and management of, settlements and infrastructure that are under threat from the impacts of climate change.

The themes are:

- Urban and regional planning and management
- Built environment
- Vulnerable coastal communities
- Infrastructure

The Plan identifies a number of critical information needs and research gaps for each sector; these are listed on the following page.

This document provides a summary of the National Climate Change Adaptation Research Plan for Settlements and Infrastructure; the full Plan is available for download from www.nccarf.edu.au

Images: Top L–R: Jana Stiller, Wally Irwin, NSW State Emergency Service, NSW State Emergency Service.
Bottom L–R: National Archives Australia, NSW State Emergency Service, Hayden Malcolmson, Ron Cox.

Climate change and settlements and infrastructure: priority research questions

Urban and regional planning and management

- How can existing urban planning principles and practices accommodate climate change and the uncertainty of climate change impacts? How should these principles and practices differ, based on the location and spatial scale of the settlement? What can we learn about the adaptive capacity of settlements from responses to stresses in the past?
- How can the governance of urban planning in Australia, including formal and informal rules, nationally consistent approaches and guidelines, and locally driven standards and outcomes, and the institutions responsible for decision-making, be improved to facilitate planning processes and outcomes which incorporate adaptation to climate change?
- What are the particular planning needs of remote and Indigenous settlements under a changing climate?

Built environment

- What are the design options and principles for adapting new buildings to climate change in different locations, and how can these be implemented?
- What are the design options and principles for adapting existing buildings to climate change in different locations, and how can these be implemented?
- What are the full life-cycle costs and benefits of adapting the built environment and how can they be reliably estimated? Who will bear these costs and who will benefit? What financial and other policy instruments can be used to address the equity impacts of these costs?

Vulnerable coastal communities

- How will demographic pressures and changes in different Australian coastal settlement types affect (i) potential impacts of extreme and gradual climate change, and (ii) current policy and regulatory settings which govern decision-making by government agencies, businesses and individuals? How will planning for coastal climate change impacts respond to local circumstances?
- How well do we understand the relationship between climate and coastal processes? How can methods currently used to determine the physical risk on a regional basis of extreme inundation and coastal erosion from climatic and oceanic processes, either singly or in combination, be improved and new methods developed and applied?

Infrastructure

- What is the vulnerability of infrastructure (individual and interlinked critical sectors) to existing and predicted climate change conditions at various spatial scales, considering average and extreme weather conditions? How can climate-induced service or structural failure thresholds for infrastructure and services be identified in light of the inherent uncertainty in climate projections?
- What impacts on key infrastructure might have downstream or cascading impacts during extreme climate events, and how might these impacts be avoided?
- What design standards for the average recurrence interval (ARI) and/or average exceedance probability (AEP), and planning periods for the various infrastructure components, should be adopted for particular locations and over what time-frames?

Cross-cutting issues

- What would a climate-adapted Australian settlement look like?
- What sectors of society are most vulnerable and least able to adapt to climate change in urban, regional and remote settlements? What is the nature of those vulnerabilities and the barriers to adaptation? How can physical, social, economic and institutional factors reduce their vulnerability and increase their adaptive capacity? At what spatial and temporal scales should adaptation responses for vulnerable communities be developed?
- To what extent can geological/geomorphic/historical/traditional/local knowledge be best applied to assessing vulnerability of existing settlements under different climate change scenarios?

Developing the Plan

The writing team for the National Climate Change Adaptation Research Plan for Settlements and Infrastructure was led by Professor Bruce Thom. The team comprised some of Australia's leading specialists working in the area of urban, coastal and infrastructure planning and risk assessment, including Jennifer Cane, Ron Cox, Catherine Farrell, Peter Hayes, Robert Kay, Allen Kearns, Darryl Low Choy, John McAneney, Jan McDonald, Michael Nolan, Barbara Norman, Jonathan Nott and Tim Smith.

The National Climate Change Adaptation Research Facility coordinated the development of this Plan, and the writing team conducted a series of workshops around Australia in which it consulted broadly with stakeholders. Participants included: representatives from state and territory governments' planning, infrastructure, transport and environmental agencies; local government authorities; water authorities; coastal management and port authorities; natural resource managers; engineers; insurers and reinsurers; architects; property developers; and representatives from the construction and transport industries, among many others.

A formal period of review of the draft Plan provided an opportunity for all interested parties to provide input into the development of the Plan.

Criteria for prioritising research questions

Identified research questions were evaluated and prioritised using the following criteria:

- Severity of potential impact to be avoided or degree of potential benefit to be derived
- Immediacy of required intervention or response
- Need to change current intervention and practicality of alternative intervention
- Potential for co-benefit
- Cross-sectoral relevance
- Equity considerations.

A coordinated national approach to climate change and settlements and infrastructure research in Australia

The implementation of the National Climate Change Adaptation Research Plan for Settlements and Infrastructure will be supported by the Adaptation Research Network for Settlements and Infrastructure, which is funded by the Australian Government via the National Climate Change Adaptation Research Facility. This Network is hosted by the University of New South Wales and convened by Associate Professor Ron Cox.

The aim of both the Research Plan and the Network is to facilitate a coordinated research effort to address the information needs of decision makers. The Network will play an essential role in implementing the research plan and will contribute greatly to building collaboration, information sharing and research capacity across the Australian research community.

The Australian Government Department of Climate Change and Energy Efficiency has made available initial funding of $6.5 million towards implementing the Plan, with further investment anticipated from government, industry and research institutions.

NCCARF
National Climate Change Adaptation Research Facility

How to get involved: key contacts

If you would like further information about the National Climate Change Adaptation Research Plan for Settlements and Infrastructure please contact:

National Climate Change Adaptation Research Facility
Telephone + 61 (0) 7 5552 9333
nccarf@griffith.edu.au
www.nccarf.edu.au

If you would like to be involved in the Adaptation Research Network for Settlements and Infrastructure please contact:

Associate Professor Ron Cox (Network Convenor)
School of Civil and Environmental Engineering
University of New South Wales
Telephone: +61 (0) 2 9385 5766
Email: r.cox@unsw.edu.au

NCCARF expresses its appreciation to the writing team and to the many individuals and organisations who contributed their time and expertise to the development of this Plan.

Published by the National Climate Change Adaptation Research Facility
Email nccarf@griffith.edu.au
Website www.nccarf.edu.au

ISBN 978-1-921609-08-4

NCCARF Publication 06/10

Australian Government
Department of Climate Change and Energy Efficiency

Griffith University
Queensland Government
QUT
Murdoch University
USQ University of Southern Queensland fulfilling lives
Macquarie University
The University of Newcastle Australia
James Cook University Australia
University of the Sunshine Coast