

Appendix C: Natural disaster research in Australia

Natural disaster research is conducted across all levels of government and across a range of research institutions and universities.

Australian Government

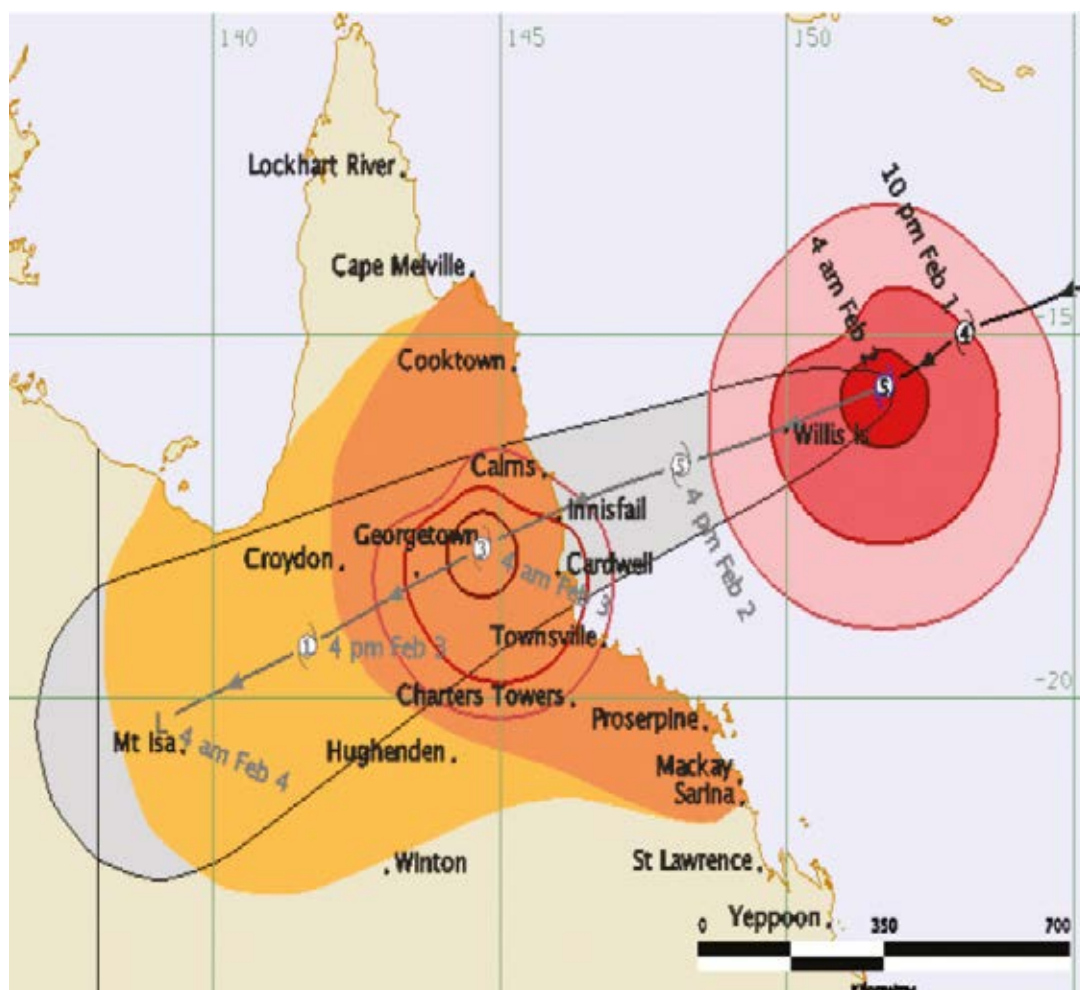
CSIRO

The Centre for Australian Weather and Climate Research (CAWCR) is a partnership between CSIRO and the Bureau of Meteorology to conduct research into areas including weather prediction, hazard prediction and warnings and responses to weather and climate related health hazards.

Research within CAWCR has helped develop a weather forecasting system, ACCESS, which has delivered a ten-fold improvement in weather forecasting over the past five years. ACCESS accurately predicted the path and intensity of Tropical Cyclone Yasi in 2011, five days before the cyclone hit the Queensland coast, which enabled detailed emergency response planning.

Within the Ecosystem Sciences division, a national bushfire research testing system has been developed, CSIRO Pyroton. The facility is open to researchers from around Australia and overseas and features a 25 metre long fire-proof wind tunnel. The division also conducts research into understanding the causes and impacts of flooding.

Figure C.1: Prediction of Tropical Cyclone Yasi



Source: CSIRO, BoM

The Digital Productivity and Services Flagship, launched in 2012-13 conducts research on digital technology and services for disaster management. Examples of its research are the development of computational modelling including floods and the Emergency Situation Awareness software which analyses Twitter messages to detect disaster events. The flagship is also developing a Disaster Management Decision Support Platform to equip emergency planners with information to aid their decision-making process.

The Climate Change Adaptation Flagship conducted research into a variety of topics related to natural perils, including understanding tropical cyclones, the causes and impacts of extreme heatwaves and climate vulnerability assessments. The work previously being undertaken in the Climate Change Adaptation Flagship related to natural disasters was moved to other areas within CSIRO following a significant scaling back of research activities.

Attorney-General's Department

The Attorney-General's Department provides the National Emergency Management Projects (NEMP) grant program to fund programs of work that contribute to the National Disaster Resilience Strategy. The program is a competitive process and approximately \$3.6 million per year is allocated across a wide range of projects with research projects making up approximately 38% of this. Each project is reviewed by an Australia-New Zealand Emergency Management sub-committee and the Minister for Justice makes the final decision on successful applications. Research projects generally have shorter timeframes compared to other natural disaster research funding arrangements.

Under the National Partnership Agreement on Natural Disaster Resilience, funding is provided to the state and territory governments to enhance the resilience of communities against the impact of natural disasters. The agreement was established to consolidate the Bushfire Mitigation Program, Natural Disaster Mitigation Program and the National Emergency Volunteer Support Fund. Under the agreement, the state and territories then have the freedom to fund their own measures which include research projects.

The Australian Emergency Management Institute within the EMA division hosts the Australian Emergency Management Knowledge Hub which provides a clearing house of research and information useful to the emergency management sector. The institute also produces the Australian Journal of Emergency Management, which is a quarterly publication to facilitate scholarly debate in the area.

The Attorney-General's department also contributes to research by participating in the Bushfire and Natural Hazards CRC and commissioning specific natural disaster related research. Where a gap is identified, funding is procured as part of the government procurement process to fund research. The Critical Infrastructure Protection Modelling and Analysis (CIPMA) Program was also initiated and is managed by the department with Geoscience Australia and CSIRO working to construct the technical components. CIPMA identifies areas of highest risk in Australia's infrastructure and where strengthening is needed if a disaster occurred.

Geoscience Australia

Geoscience Australia produces earthquake hazard maps which are used as inputs for research as well as by insurance companies in developing risk models. A number of applications for use by researchers are also made available including a landslide search, earthquake mapping tool, Australian flood studies database and the Sentinel bushfire mapping application.

The government committed \$12 million over four years for Geoscience Australia to establish the National Flood Risk Information Project as part of its response to the Natural Disaster Insurance Review in November 2011. According to the National Guidelines for the National Flood Risk Information Program, "the 4-year Project will aim to improve the quality, availability and accessibility of flood information in Australia, enhancing community awareness of the flood risks they face and creating opportunities to improve and better inform decision-making in a wide range of areas including emergency management, land use planning and insurance" (Attorney-General's Department, 2012).

The Australian National University (ANU) and Geoscience Australia collaboratively developed ANUGA, a free and open source software package capable of modelling the impact of hydrological disasters such as dam breaks, riverine flooding, storm surge and tsunamis. The modelling results can be used to guide land use planning and the development of evacuation plans by local councils. The software has been used in Western Australia to understand tsunami risk with the results being utilised by emergency managers.

Geoscience Australia has also developed computational models in the earthquake and tropical cyclone areas to analyse risks and impacts. The Earthquake Risk Model was developed to estimate the impacts on communities from earthquakes and formed the basis for reports on earthquake risk in the Newcastle and Perth regions. The Tropical Cyclone Risk Model simulates the impact of tropical cyclone events on a community and can determine the annual probability of cyclonic winds. The Earthquake Risk and Tropical Cyclone Risk Models are open-source software applications allowing the results to be tested or modified independently.

Bureau of Meteorology

The Bureau of Meteorology (BoM) is Australia's lead agency for providing flood forecasting and warning systems. The Water Information Research and Development Alliance is a joint research project between BoM and CSIRO to improve water forecasting and information systems. The research has led to the development of Short-Term Water Information Forecasting Tools, which generate continuous short-term forecasts seven to 10 days ahead. The alliance was funded with a total investment of \$50 million over the five years from 2008 to 2013, with further investment planned between 2013 to 2016 (Bureau of Meteorology, 2013).

In 2013, the government announced \$58.5 million to improve the Bureau's capacity to respond to extreme weather events and natural disasters. As part of this, a new National Centre for Extreme Weather will be established to conduct research and enhance the dissemination of information about severe weather events. A new flood forecasting system, heavy rainfall risk guidance, enhanced storm surge prediction and an integrated all-hazards decision system are to be developed as part of the centre.

The Bureau collaborates with CSIRO on the Centre for Australian Weather and Climate Research (CAWCR). The Weather and Environmental Prediction group within CAWCR is responsible for the development warning systems for severe weather with the application of the research improving emergency response for floods, bushfires and tropical cyclones. The Bureau is also a participant of the Bushfire and Natural Hazards CRC and collaborates with Geoscience Australia on the Joint Australian Tsunami Warning System.

State and Territory Governments

State and territory governments support the BNHCRC by providing funding, participating in board meetings and by engaging as end users. All states and territories contribute to the BNHCRC and are key stakeholders given their responsibility for the provision of emergency management services. Representatives are engaged as end users within the BNHCRC to refine the research focus of BNHCRC projects and allow direct access to research outputs.

The Natural Disaster Resilience Program, as part of the National Partnership Agreement on Natural Disaster Resilience, provides approximately \$27 million per year to states and territories to enhance the resilience of communities against the impact of natural disasters (Attorney-General's Department, 2014). State and territory governments then use this funding to provide their own grant programs with research funding making up a portion of this. Research projects funded under this arrangement are typically smaller than ARC, CRC or NEMP funded research.

The state and territory organisations participating in the BNHCRC include:

- Department for Communities and Social Inclusion, South Australia
- Department of Environment and Primary Industries, Victoria
- Department of Environment, Water and Natural Resources, South Australia
- Department of Parks and Wildlife, Western Australia
- Department of Planning, Transport and Infrastructure, South Australia
- Department of Premier and Cabinet, South Australia
- Department of Premier and Cabinet, Tasmania

- Department of Primary Industries, Parks, Water and Environment, Tasmania
- Department of Science, Information Technology, Innovation and the Arts, Queensland
- Fire Services Commissioner, Victoria
- Office of Environment and Heritage, New South Wales
- SA Water
- Fire and Emergency Services Commission, South Australia
- Territory and Municipal Services, Australian Capital Territory
- Department of Land Resource Management, Northern Territory (through Bushfires NT).

The state and territory organisations responsible for funding NDRP projects comprise:

- ACT Emergency Services Agency
- Ministry for Police & Emergency Services, New South Wales
- Northern Territory Police, Fire and Emergency Services
- Department of Community Safety, Queensland
- SA Fire and Emergency Services Commission
- Department of Police and Emergency Management, Tasmania
- Office of the Emergency Services Commissioner, Victoria
- Department of Fire and Emergency Services, Western Australia.

As part of the National Emergency Management Projects administered by the Attorney-General's Department funds, research is funded to address problems faced by states and territories. Having a centralised funding source helps to avoid potential overlaps of research topics being funded by individual state and territory agencies separately.

State and territory governments, sometimes in combination with local councils, also directly fund research. The Queensland Floods Commission of Inquiry, for example, recommended that the Queensland Government and local councils should ensure that flood studies are conducted on areas which do not have access to flood information (Queensland Floods Commission, 2012). The Queensland Government's Statistician's office also conducted a community preparedness survey in 2013 to create a data set to be used by disaster management researchers.

Local Government

Local governments commonly fund local engineering and consulting firms to conduct flood research and mapping for their geographical area. The research is a key phase in the planning process and can have a significant bearing on the costs incurred should a flood occur. The availability and quality of flood maps is variable across different councils. Local governments also fund the research and development of hazard management plans.

Organisations such as the Floodplain Management Association (FMA) pool local council resources to conduct research and share knowledge in a more efficient way. The FMA membership is made up of 84 local councils, 14 organisations with links to flooding, as well as professional and individual members. An annual flood plain conference is held each year by the FMA with flood related researchers presenting their findings to attendees. The Australian Local Government Association (ALGA) also conducts research into natural disaster related areas for the benefit of the 560 councils it represents. The ALGA has commissioned research including a national local government emergency management survey and a report on the contribution of land use planning to natural disaster risk management.

Other organisations with local government involvement, such as the South East Queensland Fire & Biodiversity Authority Consortium, aim to conduct applied fire ecology research. The research investigates gaps in fire management and assists land managers with information. The consortium is funded by 12 separate councils as well as other stakeholders.

Research organisations

Bushfire and Natural Hazards CRC

The Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC) is focused on the following three overarching themes of research:

- Economics, policy and decision-making
- Resilient people, infrastructure and institutions
- Bushfire and natural hazard risks.

The CRC plays a matching role within the research community by assigning end user partners from across emergency management, government departments and non-government organisations. This allows relationships to be built and for the scope of research to be defined in a way that is useful for the organisations involved on the ground as well as the prioritisation of research areas.

National Climate Change Adaptation Research Facility

A portion of the research undertaken is related directly to natural disasters, with one of the thematic research priorities focused on emergency management. The emergency management research focused on the adaptation to an increased frequency and intensity of natural disasters. NCCARF also funded historical case studies of extreme events looking at the lessons learned from the management of past disasters including Cyclone Tracy and the 2008 Queensland floods.

Under phase two of the facility NCCARF will be provided with \$9 million in funding over three years. The emphasis of phase two will be on developing support for local governments in the coastal zone to incorporate sea-level rise into decision-making.

Other research organisations

The CRC for Spatial Information conducts research in the natural hazard area such as a joint initiative between Geoscience Australia and the Space Policy Unit reviewing how spatial information products were used in response to the 2009 Victorian bushfires, the 2011 floods and the recent New Zealand earthquakes. The CRC has also conducted research into the relationship between the extent of physical damage from natural disasters and stress related health outcomes.

Private organisations

The Insurance Council of Australia (ICA) provides historical disaster statistics for use by insurers, reinsurers, researchers and government agencies. The ICA also funds Risk Frontiers, within Macquarie University, and Willis Re to build and maintain the National Flood Information Database (NFID). The NFID combines available government flood mapping into a format that can be analysed at an address level.

The ICA is currently developing a Data Globe database of natural hazard information and has started facilitating the Property Resilience and Exposure Program which will provide information on the resilience of housing stock as well as commission direct research in the area.

Insurance companies devote considerable resources to building natural hazard models to determine the risks associated with a specific address and the pricing of particular policies. Insurance companies also commission and sponsor research to be undertaken by organisations such as Risk Frontiers and the Cyclone Testing Station. Reinsurers regularly release studies and information relating to the global insured losses from natural catastrophes which is commonly cited in natural disaster related research.

Risk Frontiers is an independent research centre based at Macquarie University and sponsored by the insurance industry. The centre is self-funded and undertakes risk assessment and research into natural hazards, develops databases of natural hazards, as well as loss models to improve the pricing of natural hazard catastrophe risks (Risk Frontiers, 2013). Key databases enabling research include the PerilAus database, which provides a historical source of data on natural hazard impacts in Australia from European settlement.

Private consultancies and engineering firms conduct research for local governments to map hazards and assist in the land planning process. Councils regularly engage specialist hydrology engineers to conduct flood and floodplain risk management studies. Geotechnical engineers are also employed to conduct landslide hazard maps and develop models to allocate hazard ratings. Councils also fund Light Detection and Ranging (LIDAR) surveys and other satellite imagery for use in hydrologic models.

The Australian Disaster Management Platform is a collaboration between IBM and the University of Melbourne to develop new IT technologies to help manage disasters. The platform takes a multi-hazard approach to developing prediction frameworks and informing decisions. Geospatial and infrastructure information from multiple data sets are used to develop simulations of natural disasters for communication to decision-makers in the emergency management field.

Other organisations

The Australian Building Codes Board (ABCB) is responsible for the National Construction Code, which details on-site construction requirements across Australia. The Code prescribes how new buildings are currently designed and constructed to withstand extreme weather events such as cyclones, bushfires and floods. As part of these responsibilities, the ABCB conducts research to ensure building standards reflect the latest evidence in the area.

The Australian Red Cross focuses on the humanitarian aspect of natural disaster research. One of the seven priority areas identified is Emergency Services in Australia.

The research conducted within the area is based on three main themes: preparedness, response and recovery. The Red Cross undertakes research by commissioning projects and engaging in research partnerships and participates in the BNHCRC as an end user.

The Regional Australia Institute conducts a research agenda that focuses on issues, including natural disasters, that affect regional areas. The institute commissioned Griffith University to undertake a series of case studies examining the economic recovery of rural communities following natural disasters in 2013 (Regional Australia Institute, 2013). The case studies led to the release of a report on the centrality of business recovery to community resilience.



A woman, evicted from her condemned home, walks along a badly-rutted road after a 6.3-magnitude earthquake devastated Christchurch, February 2011.

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