Natural Hazards Research Australia

10-Year Research Strategy 2022

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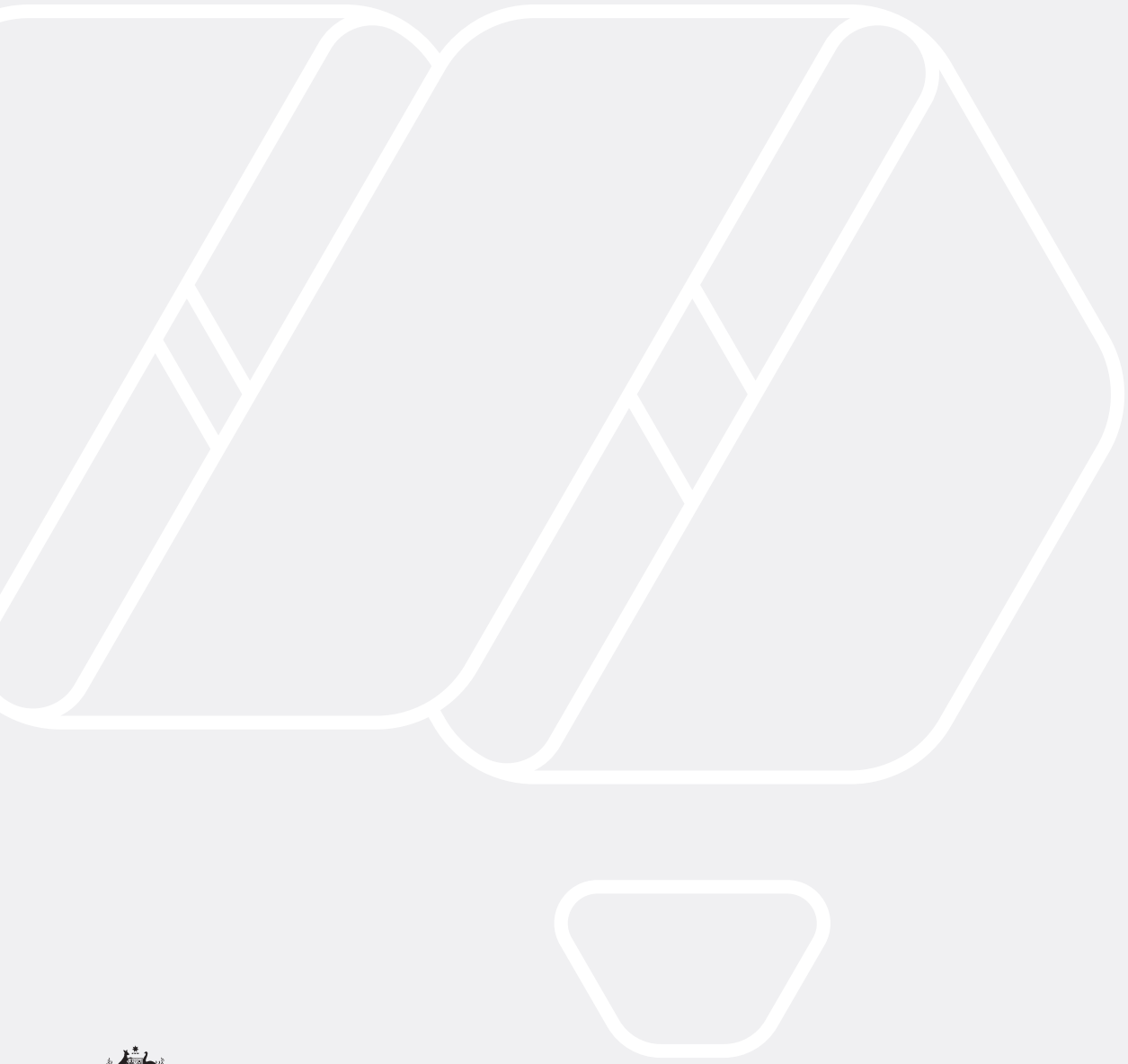

Australian Government

Natural Hazards Research Australia receives
grant funding from the Australian Government.

Endorsed by the Board April 28, 2022

The Centre's Strategic Plan

Natural Hazards Research Australia (The Centre) is Australia's research and implementation centre for natural hazards resilience and disaster risk reduction. The Centre began on 1 July 2021 and is now working closely with the Australian Government and other partners across Australia to deliver a strategic research agenda for the nation.

The Centre is built on the strong foundations of its predecessor Co-operative Research Centres, the Bushfire CRC and the Bushfire and Natural Hazards CRC.

Vision

That communities will be safer, more resilient and sustainable in the face of natural hazards.

Mission

To work with partners and the community on research that is useful, actionable and supportive of better decision-making to save lives and protect communities.

The Centre is focussed on undertaking research that will promote natural hazard resilience and reduce disaster risk, to support the needs of a variety of critical stakeholders – including emergency service agencies and communities – in mitigating impacts of, responding to and recovering from disasters caused by natural hazards[1].

The Centre will be both a leader and a catalyst for expansion of natural hazards research in Australia; ensuring that research is informing national and regional policy and capability and improving public safety.

This 10-Year Research Strategy will directly contribute to the Centre's outcomes, delivering research-informed and research-enabled outcomes that will be used by communities and governments to build resilience and to enhance capability in Australia, and through our international partnerships.

Those outcomes will be implemented through:

- New and enhanced systems and processes
- Research-informed advice and public debate
- Strong and sustainable research, translation and implementation partnerships
- Capability development – in research, research implementation, and operational activities

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1 For the Centre – Natural Hazards are defined as sudden-onset hazards. highlighted by the Commonwealth under the funding agreement are bushfire, flood, cyclone, heatwave, storm, inundation and erosion caused by sea level rise, earthquake, tsunami and landslide.

The 10-Year Research Strategy

The research demands are many and diverse, particularly with the broad nature of the area in which the Centre works. The detailed research agenda of the Centre will necessarily be a balance between competing issues, interests, and timelines.

The research program of the Centre is determined by this 10-Year Research Strategy, which has been developed in consultation with our stakeholders, and informed by:

- Global knowledge and experience with disasters caused by natural hazards
- Knowledge and capability gaps identified by the Centre's end-users
- The need for a balanced research portfolio to deliver a suite of short, medium and long-term projects that deliver benefits across mitigation, response and recovery.
- The need for evidence and knowledge that is usable and timely to inform and contribute to policy development, and which can be used to inform operations, strategy and practice.

In delivering the strategy, the Centre will build Australian capability through:

- Strengthening relevant research capabilities
- Supporting the development of sustainable research and its translation capabilities within research provider and end-user organisations
- Strengthening and expanding the knowledge networks that were developed through the Bushfire Cooperative Research Centre (CRC) and the Bushfire and Natural Hazards CRC (BNHCRC).

The 10-Year Strategy is informed by advice on research priorities, end-user needs and utilisation from relevant key stakeholders, including Commonwealth, State and Territory government representatives, and experts in the fields.

This Research Strategy will be reviewed every 5 years, or earlier if requested by the Centre's Board.

Overarching objectives

The Centre is well positioned to understand the research landscape tapestry and capabilities and the research in progress. Our work is carefully targeted to complement and support other research across the country, and will be substantially addressing the more complex, cross-cutting risks and challenges caused by our exposure to natural hazards.

The overarching objectives of this Research Strategy are to ensure that the Centre's research activities:

- Are focused on research that leads to positive change, increasing disaster resilience, and reducing disaster risk.
- Are innovative – not only in the research that we do, but also in the ways that the knowledge and outcomes of that research are shared, learned, and used.
- Ensure that there is an experienced, knowledgeable, diverse, inclusive and sustainable research-confident workforce that can effectively and efficiently; undertake research; translate and implement the outcomes of research; and evaluate the benefits.
- Contribute to an accessible, managed national natural hazards research data collection.
- Provide research-informed contributions to the ongoing enhancement of essential systems and capabilities.
- Address relevant government and business priorities, including outcomes from Royal Commissions and other relevant inquiries.

Supporting disaster resilience and reducing disaster risk

The Centre will undertake research across the mitigation, response and recovery spectrum., research that contributes to building disaster resilience and reducing disaster risk will be a priority, with the ultimate objective of reducing vulnerability and risk.[2] This will be balanced with the need to invest in more tactical research to address how we respond to, and recover from, the impacts of natural hazards that cannot be mitigated in the short term.

The National Disaster Risk Reduction Framework identifies four priorities that will influence the shape of the Centre's proposed research portfolio. The Centre's research outcomes, education program and communications activities are expected to make a positive contribution across all the priorities:

- Priority 1: Understand disaster risk
- Priority 2: Accountable decisions
- Priority 3: Governance, ownership and responsibility
- Priority 4: Enhanced investment

2 National Disaster Risk Reduction Framework, Department of Home Affairs (2018); https://www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf

Research governance

The Centre's research governance has several important elements:

- End-user Advisory Panel
- Centre Board
- Education and Training Committee
- Research and Implementation Committee
- International Research Advisory Panel

At the project level, there will be additional governance arrangements:

- Project Management Teams – one for each project
- Theme-specific translation and implementation panels (which will provide advice and input to multiple projects).

End-User Advisory Panel

To ensure that the senior personnel from end-user participants of the Centre remain informed and engaged with the activities of the Centre, there will be an End-User Advisory Panel that will meet twice a year, to receive updates on the activities of the Centre, to raise any concerns and to provide direction on research strategy and use.

This Panel will comprise a representative of each of the Full Participants of the Centre. Supporting Participants will have observer status on this panel.

The Centre Board

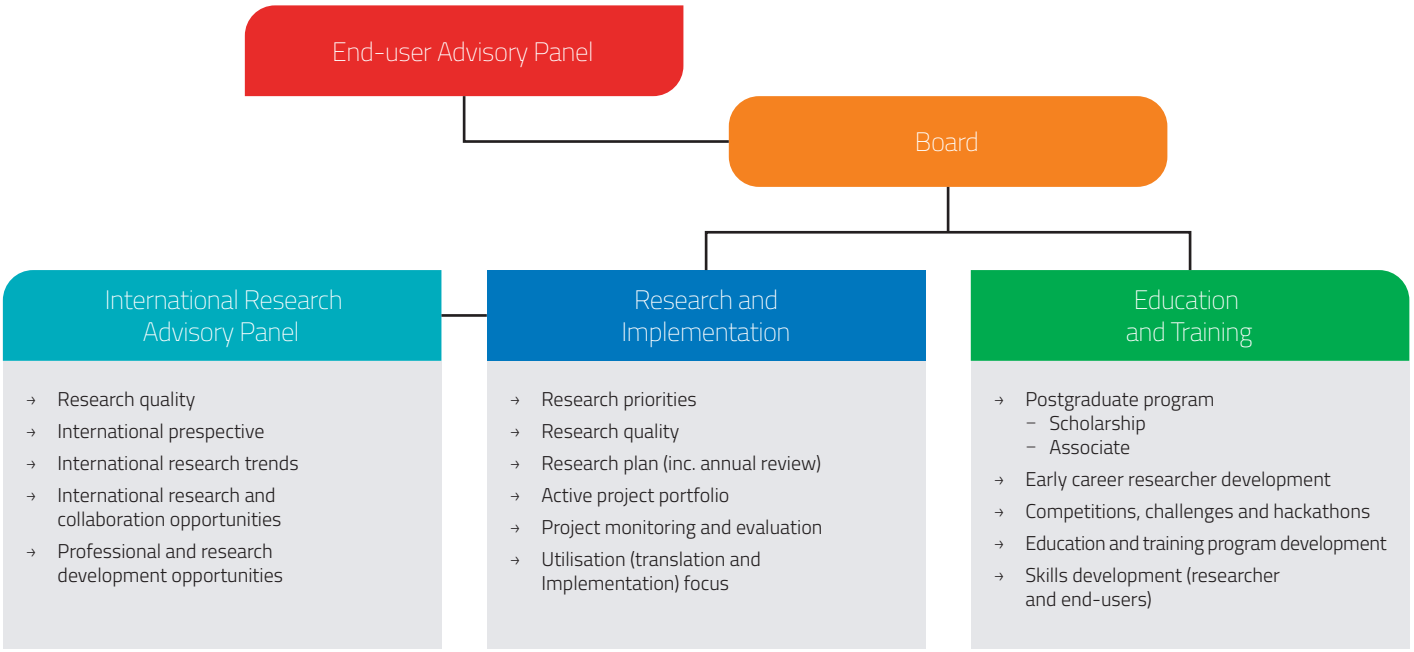
The Centre Board is responsible for:

- assuring the effective operations of the Centre's research governance
- developing and endorsing of the 10-Year Strategic Research Plan in conjunction with stakeholders, which include, but are not limited to, end-users and the research partners
- approving of the rolling biennial Research Plan and recommendation to the End-user Advisory Panel
- annual approval of the Biennial Research Program, including budget
- approving research projects
- monitoring the overall performance of the research program.

Research and Implementation Committee

The Research and Implementation Committee (R&I Committee) is responsible to the Centre Board, providing:

- oversight and advice on progress of the research investment and research program, and recommending projects for funding by the Board
- advice to the Education and Training Committee on the postgraduate student research projects, the early career researcher development program and the industry exchange program
- regular feedback on the selection, progress and impact of projects in the research portfolio
- advice on translation and utilisation of research outcomes



Education and Training Committee

The Education and Training Committee includes representatives from end-user and education participants of the Centre, and provides oversight, advice and guidance on:

- the postgraduate program (scholarship and associate students)
- early career researcher development
- the Disaster Challenge program, engaging high education students and early career researchers
- translation, utilisation and implementation of research knowledge and outcomes through education and training initiatives
- research, development, translation and implementation skills development for researchers and end-users.

International Research Advisory Panel

The International Research Advisory Panel (IRAP) has representatives from the global research community with expertise relevant to the physical, social and political sciences that reflect the Centre's research program. Members of the Panel have knowledge and experience relevant to natural hazards and disaster risk reduction.

The Panel provides advice to the Research and Implementation Committee on the quality and progress of the Centre's research program and on the Biennial Research Plan.

Translation and Implementation Panels (theme-specific)

Translation of research outcomes into policy and practice within end-user organisations is one of the critical steps in achieving effective utilisation. The Translation and Implementation Panels (T&I Panels) provide advice on projects and to the Centre's management team, to ensure there is active end-user engagement in the utilisation of outcomes within end-user organisations.

Stakeholder (end-user) engagement

The research program for the Centre is integrated into the Centre's active engagement, awareness and translation programs. There are a number of specific initiatives that the Centre will pursue to build partnerships that translate research into action.

Engaging with, and supporting the Centre's participants

The premise behind the operation of the Centre as a knowledge network is that there is strong engagement between all of the Centre's participants – from concept development for new projects through to translating the outcomes of the research into a form that can be implemented to influence policies and practices.

Stakeholder engagement will be at the core of the Centre's research activities.

Expanding the knowledge network

Knowledge networks allow free exchange of information between the Centre's participants and collaborators and are a critical success factor for the Centre. These knowledge networks[3] are the set of systems, institutions, social relations, and infrastructures that enable the exchange of knowledge and associated intellectual property (IP) rights within and between networks. These networks will contribute to:

- greater researcher access to knowledge, capability and data from end-users
- greater end-user access to academic research information and capability
- appropriate inclusion of traditional knowledge in the Centre's research activities.

End-user engagement

Utilisation of the research is fundamental and critical to demonstrating the value of the investment of public funds in the research program. This starts with the end-users defining the problems and then working in partnership with the researchers to develop and evaluate potential solutions.

Every project will have:

- a project sponsor from an end-user organisation.
- a link to a Translation and Implementation Panel.

Much of the relevant tacit knowledge sits with the end-user organisations and exists outside the traditional peer-reviewed research literature. Access to this information is enabled through networks and the depth and richness of these will be determined by the quality of engagement across all the relevant players.

3 OECD (2015), The Innovation Imperative: Contributing to Productivity, Growth and Well-Being, OECD Publishing, Paris, p. 115. DOI: http://dx.doi.org/10.1787/9789264239814-en

Strategic relationships

The Centre will actively engage with relevant local and international end-users, research centres, think-tanks and centres of expertise to ensure the effectiveness of the research and research translation program, building partnerships that create and assist knowledge networks.

Links will also be enhanced with peak domestic organisations including the Academy of Sciences and the Group of Eight universities.

The Centre will enhance and expand its linkages to key international organisations including various diplomatic missions, the US Forest Service, International Association of Wildland Fire, the United Nations Office for Disaster Risk Reduction, the European Union Horizon Program and other research and government organisations in Europe and around the world.

From research themes to research projects

The development of the Centre's research portfolio will use a structured process as outlined below.

Research themes

The Centre's research themes capture the broad outcome areas for the Centre and provide a framework for the research.

- Sustainable, safe and healthy landscapes in a changing environment
- Situational awareness
- Operational response and innovation
- Resilient and sustainable built environments
- Resilient communities
- Evidence-informed policy and strategy
- Workforce and communities of the future
- Learning from disasters

Influencing variables

Significant broadscale risks will be considered in the framing of research projects throughout the life of the Centre. These variable risks will influence the context in which the research outcomes are expected to deliver benefits. It is anticipated that many of the variables (for example, climate change, demographics, land use planning) will influence multiple hazard programs. These factors are captured in the National Research Priorities publication.

National Research Priorities

The Centre has engaged with its stakeholders to develop a set of National Research Priorities for Natural Hazards. These priorities have been informed by:

- Relevant Royal Commissions, inquiries and reports
- The National Disaster Risk Reduction Framework
- Agency, jurisdiction, industry and other relevant stakeholder consultation

The first version of the Research Priorities will be published by the Centre in the first half of 2022. These research priorities will guide the annual development of the Centre's Biennial Research Plan, including the Centre's areas of focus within each version of the research plan.

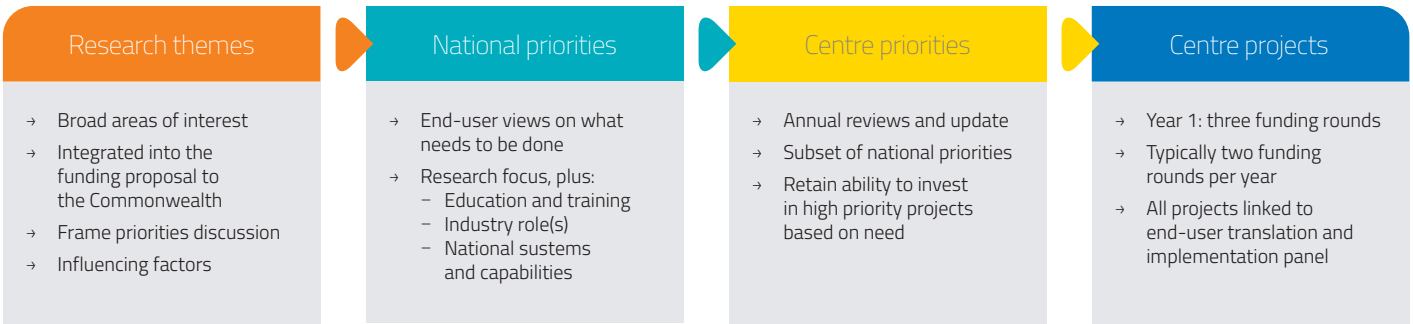
Critical systems, tools and capabilities

The National Research Priorities also captures critical national systems, tools and capabilities, where they need research support during the life of the Centre (for example fire simulation systems, the Australian Exposure Information System, and the National Warnings System). This research support is to ensure these systems, tools and capabilities remain current, and the benefits associated with their use are achieved.

Centre Research Priorities

Each year, the Centre will identify priority research areas that will influence the scope of projects that are funded by the Centre in each funding year. These annual Centre priority areas will be incorporated into Centre's Biennial Research Plan.

Acknowledging the dynamic nature of natural hazards, the Centre will retain an ability to invest in high priority research identified by our participants or in response to particular hazard events of significance.



The Centre's research portfolio

The Centre's research portfolio will include a balanced mix of short (tactical), medium (applied) and long-term (strategic) projects that have been developed through end-user engagement and leadership. Each element of the portfolio will have clear and measurable outcomes (including performance targets where feasible[4]), coupled with formalised end-user engagement and agreed pathways to adoption.

Type of investment	Indicative time frame
Tactical	<1 year
Applied	1–3 years
Strategic	3–10 years

Rolling biennial research plans

To ensure the research of the Centre delivers outcomes for government, the community and industry, the Centre will maintain a rolling two-year research plan (reviewed annually). The rolling research plan will also position the Centre to undertake leading research and to respond to emerging opportunities and a changing environment.

The annual review of the Biennial Research Plan will be linked to the Centre's budget approval process. It will commence in November of each year, and be finalised in May, with Board approval for the Plan and associated budget.

Tactical investments

Tactical projects will be short-term and typically focus on:

- Implementation of research that has already been completed
- Post-disaster data collection and analysis
- Collection of time-sensitive data.

Applied investments

Applied projects will typically be funded for 1–3 years. These projects will typically:

- adapt, augment and apply existing research knowledge
- Deliver translation and implementation outcomes.

Strategic investments

Strategic projects will typically be funded for 3 or more years and will involve a greater level of research to address significant national or regional challenges. These projects will typically:

- Extend existing knowledge
- Require substantial effort to develop effective solutions
- Have greater levels of uncertainty than tactical or applied projects.

A balanced portfolio

When measured across a 3-year window and based on guidance from the Centre's Board, the Centre's research portfolio will be balanced across several measures:

- The mix of tactical, applied, and strategic research projects
- Investment in research addressing challenges and opportunities in mitigation, response and recovery, and
- Research that specifically addresses individual natural hazards and research that is hazard agnostic

Leveraged and co-investment opportunities

The Centre will implement a co-investment model, where core funding will be matched with co-investment from end-users, or through other research funding programs, in a way that ensures that commitment to the project and the delivery risks are shared, while ensuring that underlying world-leading science is also supported. This approach can be a way for other partners to be involved in research by investing at a later stage.

4 Research performance targets will define the minimum performance required for the outcomes to have a demonstrable benefit to end-users, and that would be sufficient to justify end-user investment to integrate the outcomes into their business/operations.

Emerging technologies and capabilities

The Centre will make use of the most relevant technologies and capabilities in the development and implementation of research outcomes. This can include developing formal relationships with private sector organisations.

The Centre will invest in exploring innovative approaches to develop potential solutions to wicked problems facing end-users. In addition to the research portfolio, one of those approaches will be through the use of hackathons, competitions and similar activities that allow students and early career researchers to bring new ideas and to get experience working on real problems that, if solved, will play a significant role in improving public safety.

Subject to the availability of data, there will also be opportunities to involve researchers, and private enterprises, in challenges to independently develop potential solutions to difficult problems, which can be evaluated by the Centre and its users.

The Centre values its independence and will not undertake research that will actively endorse commercial products. The Centre will, however, undertake research that can support industry-wide innovation and the application of emerging technologies and capabilities.

Targeted commissioned research

The Centre has a core capability of helping partners to develop research ideas, formulate research proposals, find the most appropriate, best value research and oversee the delivery and implementation of the outputs.

Many stakeholders see the benefit of the Centre conducting fully funded research that leverages this capability on a fee for service or more strategic basis. The Centre will continue to undertake this work on an at least cost neutral basis.

The benefits to the Centre are through then ensuring that the outputs of this work are added to, and influence the national agenda, increasing the benefit to the nation.

Research leadership

The Centre will provide research leadership in partnership with its end-users and research providers. This will be achieved through collaboration, networking and engagement that builds partnerships that create national research capability.

It will include:

- Developing and sharing a current version of the national Natural Hazard Research Priorities
- Coordinating investment in, and delivery of, a diverse national natural hazards research portfolio
- Supporting, facilitating and promoting national debate and discussion in public and private sector forums, including the media
- Providing trusted communications and research translation information and resources
- Nurturing an active and inclusive knowledge network across Australia and internationally
- Providing opportunities for enhancing research, and its development and translation, across and between the researcher and end-user workforces
- Working closely and forming partnerships with complementary research organisations and groups
- Supporting First Nations researcher development through funding and mentoring, and broader First Nations participation through engagement in research activities
- Supporting opportunities for researchers to build on their own capacities in their field.

This includes not only domain knowledge, but excellence in the development, execution and delivery of the research program and translation of the outcomes into practical applications that are used.

Skills & workforce development: supporting translation to practice

The Centre's focus on skills and workforce development recognises a strong need to contribute to the development of the end-to-end capabilities from research through to implementation – across multiple traditional workforce boundaries. And then, working to ensure the effectiveness and sustainability of those capabilities – creating national research capability and supporting effective translation of research into action.

Whilst the Centre will offer development opportunities to a broad range of employees within our partners, we will have a significant focus on supporting early career researchers in research roles on our research and end-user partners.

Sustainable and highly skilled research and implementation workforce

An overarching focus of the Centre is to support the development of sustainable research capabilities in relevant research areas. This includes:

- Supporting the development of a critical mass of highly skilled and globally recognised researchers across a core of research providers with strong research capabilities that will be actively assessed in applications for research funding,
- Supporting the sustainability of relevant fields of research, and researchers who are highly skilled in collaborating with end-users to deliver applied research knowledge and products,
- Supporting career development and succession planning in research teams, with a specific focus on PhD students and early career researchers,
- Supporting research groups to actively engage with all relevant knowledge holders in developing and delivering research projects
- Encouraging research groups to expand their funding base and to develop relationships and seek funding opportunities that could extend the range of natural hazards research being undertaken, therefore enhancing the benefits for end-users,
- Supporting work placements, international and domestic research exchange opportunities and participation in conferences and workshops.

Postgraduate students

The Centre will have an active postgraduate development program that includes three components:

- A postgraduate (PhD) scholarship program, where the Centre will provide funding support to selected students and actively engage them in the activities of the Centre
- An associate student program for students not receiving a funding scholarship from the Centre but undertaking research in a relevant subject area that will provide opportunities for participation in the Centre's activities.
- Research management and leadership skills development

The postgraduate program actively encourages and supports applications from Aboriginal and Torres Strait Islander peoples, women, culturally and linguistically diverse people, people with disability, LGBTIQ+ people, and people with family and caring responsibilities.

Enhancing research translation capabilities

Through its research projects, T&I Panels and education and training programs, the Centre provides opportunities and programs that allow end users and researchers to become skilled and experienced in what it takes to effectively translate research outcomes into useable and used products and services.

Effective translation begins with project definition and continues through the life of the project. The range of skills that those experienced in research translation are expected to master include:

- Defining an essential need
- Understanding how potential solutions could be used
- Knowing how the benefit is measured, and the magnitude of benefit that is required
- Having clarity on what is required to implement an identified solution
- Determining whether there are any additional solutions outside the potential project that would also be required for the research to be implemented

- Understanding constraints and restrictions that could limit uptake
- Imagining how the research outcomes could be implemented across their business
- Being able to understand and manage stakeholder expectations
- Being comfortable with the uncertainty and ambiguity that is inherent in the research process
- Being a creative problem-solver
- Understanding that, to attempt higher-risk projects, it can be better to deliver achievable outcomes before stretching the translation
- Knowing when enough research is done and when it is time to start translation and implementation
- Being able to communicate with decision-makers and influencers and share the benefits of a project.

Research integration into the Centre's education and training program

The Centre will work actively with its research partners to integrate research findings into their formal education programs, and with end-users to identify opportunities for the development of new or enhanced education and training programs.

Specific opportunities that will be explored include:

- Strengthening and updating the content of vocational educational and training programs (with a particular emphasis on the public safety training package)
- Developing or enhancing accredited higher education subjects and courses based on research outcomes
- Identifying and developing accredited and non-accredited subjects and courses linked to the Centre's research and translation activities with end-users
- Developing training packages for end-user internal training programs
- Supporting skills development for applicants undertaking industry accreditation programs.

There are also expected to be opportunities to combine educational opportunities with work placements (internships and secondments between end-users and research organisations) to provide opportunities to practice learnings from education and training courses and programs.

Commissioned research

The Centre will undertake commissioned research through its research partners. This research will be externally funded and while adding to the body of knowledge of the Centre, will be addressing the specific research need of the funding partner:

- Provide value-added services to the Centre's end-user organisations
- Engage organisations who may become future participants in the Centre
- Provide new perspectives on the capabilities of the Centre
- Contribute to the knowledge development of the Centre
- Through projects, provide researchers with access to new tools and data that are owned and used by industry.

The Centre's approach will comprise two pathways for engagement:

- Ad-hoc projects that are related to the Centre's objectives, and that are consistent with the Centre's areas of expertise
- Formal ongoing relationships where the Centre agrees to establish a relationship with an end-user organisation to undertake an ongoing program of end-user-funded research and research-informed activities.

Commissioned research will be undertaken at zero net cost to the Centre.

Data and knowledge management and integration

The Centre is implementing a program to support the effective collection, use, curation and sharing (where feasible) of research data – creating national research data frameworks that will influence natural hazards research data management

All research projects will be required to comply with the Australian Code for the Responsible Conduct of Research, 2018[5] and relevant privacy provisions, to ensure the protection of personal information.

The objective is to ensure that to the extent possible, the Centre can support and contribute to accessible national data and knowledge collections. Ultimately, all funded or affiliated research projects will be expected to contribute to accessible, sustainable national research or operational data collections with ongoing agreed access, visibility to others, custodianship, governance and standardised data dictionaries.

Where financially possible, the Centre will support open-access publication of its outcomes.

This work will be done in collaboration with relevant partners and infrastructure owners and will link where possible with other domestic and national initiatives.

The Centre data will fall into at least five broad categories, each with unique features, and that will include:

- Social science information (typically governed through formal research ethics arrangements)
- Traditional knowledge
- Spatial information
- Physics and physical modelling
- Descriptive biology

The Centre will actively assist in the development of a framework and guidelines for researchers undertaking research in impacted communities in the aftermath of a significant shock or disaster.

Researchers funded by the Centre to develop data and knowledge will be required to comply with the the Centre's Research Data Management Framework.

5 https://www.nhmrc.gov.au/about-us/publications/australian-code-responsible-conduct-research-2018#block-views-block-file-attachments-content-block-1

Monitoring and tracking

In a research and utilisation environment, the Centre's performance measures will cover the four essential activities associated with research – input, process, output and outcomes. This is common across universities, research centres and businesses that invest in research and development.

Both direct and indirect outcomes as measures will be used to demonstrate translation of the Centre's research into action.

Activity		Description	Key influence	Timing
1	Input	Typically measured as investment of resources into projects	Centre	Immediate
2	Process	Including selection and management of progress of projects (typically quality of the portfolio and performance to milestones)	Centre	Immediate
3	Output	Tangible deliverables from the projects (reports, publications, presentations, models, tools, educational resources, etc.)	Researchers and end-users	Immediate
4	Outcomes	How the outputs and project knowledge are being used to change practices and influence policies	End-users	Medium–long term

Direct outcomes

Four activities directly relate to measuring the outcomes of the Centre's activities. Of those, activities 1–3 in the table above are both manageable and controllable by the Centre. The final activity relies on decisions made outside the direct influence of the Centre and will be dependent on close engagement with end-users and changes in the external environment that may have an impact on the willingness of end-users to use the research outcomes, or the relevance of the outcomes to their businesses.

Monitoring activities 1–3 are typically measured based on performance targets set at the establishment of a program. At the same time, research will not always lead to the intended result, or indeed to a result that can do much more than add to the collective knowledge in a field of research. In a corporate world, that is referred to as the success rate.

Given this understanding of success rates as well as the likelihood that the outputs from several projects may well combine into a single outcome, the number of outcomes may be significantly less than the number of outputs.

Hannon, Smits & Weig from McKinsey looked at performance from a corporate perspective, and their model provides some useful insights.[6] The model includes three elements that align well with the activities listed above but add a measure of economic benefit that can be achieved if project(s) achieve their objectives and are efficiently introduced into practice. This model will most effectively capture the direct R&D productivity and is likely to underestimate the impact of the broad knowledge sharing, education and training that are influenced by the Centre's research and up-skilling of research and end-user workforces.

In this model, the outcomes are determined substantially by the acceptance by the end-users of the products and services developed using the outputs of the Centre, and not by the Centre itself. Additionally, where the benefits derived from the research are enhancements to existing products, services or knowledge, it can be difficult to reliably determine the economic benefit directly attributable to the research.

6 https://www.mckinsey.com/business-functions/operations/our-insights/brightening-the-black-box-of-r-and-d

Indirect outcomes

A number of the measures of research impact have an intangible value component that is difficult to measure – something that is openly acknowledged by the European Industrial Research Management Association (EIRMA), who also propose that these intangible contributions are arguably the biggest contributor to earned value.

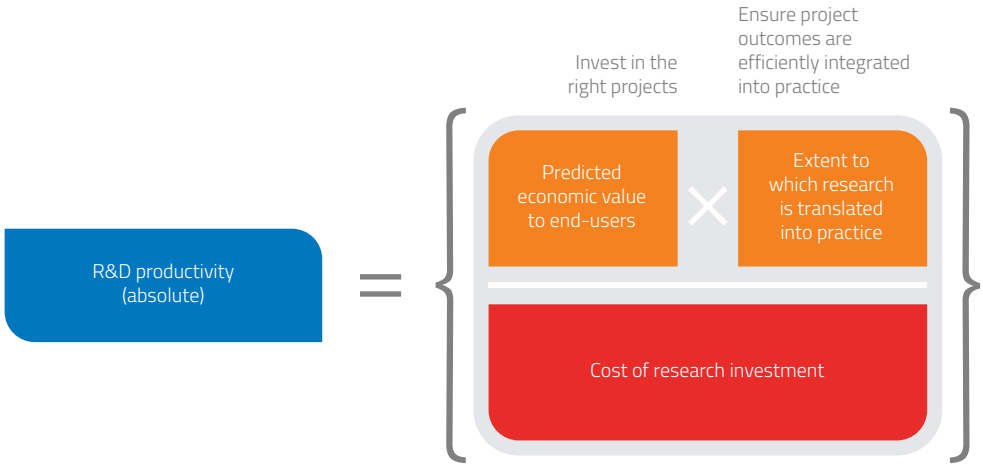
The EIRMA approach does not aim to measure the full intangible value, but suggests a pragmatic approach, focussing on key performance indicators that are easy to measure and clear to understand – something that the Centre will approach through the use of case studies, user testimonials and the adoption of new industry guidelines and standards.

The Centre will expect researchers to work closely with industry throughout the research project to ensure these outcomes are achieved.

Handmer et al[7] have suggested an alternative approach to identify the value of research, using a model that assesses four pathways to generating value:

- Project level impacts
- Training and capacity building
- Knowledge generation
- Broader social and economic impacts.

These approaches to estimating the indirect benefits of the Centre's activities will be considered for measuring the economic impact of its research.



7 https://www.bnhcrc.com.au/publications/biblio/bnh-7214

Find supporting research documents and the portfolio of projects on our website
www.naturalhazards.com.au

We acknowledge the traditional custodians across all the lands on which we live and work, and we pay our respects to Elders both past, present and emerging. We recognise that these lands and waters have always been places of teaching, research and learning.