
Framing a disaster resilience research portfolio

This paper is a discussion document, prepared by the Bushfire and Natural Hazards Cooperative Research Centre (the CRC) for the new national centre for natural hazards and disaster resilience research (the Centre). The paper is intended as a starting point for discussions with potential partners of the new Centre. These discussions will help to inform the thinking for the establishment of the early (first 1-2 years) research agenda for the Centre.

Based on the CRC's most recent conversations with the Department of Industry, Science, Energy and Resources (the Department), it is expected the Centre will be required to have in place a detailed two year research program for 2021-23 that, among other things, takes into account continuity in research between the CRC and the new centre.

At this time, whilst the Department has asked the CRC to assist by providing guidance on what could be included in the 2021–23 research program for the Centre, there is no commitment being made by the Department to support any particular research project(s). Final decisions on the 2021 – 23 research program will be made after the arrangements for the establishment and funding of the Centre have been finalised.

This is a document for discussion that outlines proposals for key themes for the initial research agenda of the new Centre. Beyond that it has no authority and is for discussion only.

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Background

On 23 July 2020, the Australian Government announced funding of \$88.1 million to extend and scale-up funding for critical research into bushfires and natural hazards¹.

The first \$2 million has already been provided to the Bushfire and Natural Hazards Cooperative Research Centre (CRC) to boost funding for the 2020–21 financial year for important research into the Black Summer bushfires of 2019–20.

These early funds are also supporting the transition of the CRC to a new, world-class research centre for natural hazard resilience and disaster risk reduction (the Centre) by supporting ongoing investment in research during that transition. The new Centre will continue to deliver world-leading, evidence-based research to support the needs of emergency services and communities across Australia to reduce climate and disaster risks, and better prepare for, respond to and recover from the effects and impacts from future disasters caused by natural hazards.

The Australian Government funding supports the new research Centre over 10-years and will be complemented by co-funding from partners from across Australia, including state and territory governments and emergency service agencies, universities and industry partners – representing a true collaborative effort on a national scale. Current expectations for the Centre from the Australian Government are that:

- The Centre will provide both a source of, and connection to, world-leading research. The Centre should leverage existing research and initiatives, by collaborating and linking to research initiatives that provide important outcomes for the Centre's research, such as drought and biodiversity.
- The Centre will play a key role in training our future emergency services sector workforce, including the connection of postgraduate students with key industry partners.

¹ <https://www.minister.industry.gov.au/ministers/karenandrews/media-releases/881-million-new-world-class-disaster-research-centre>

Inputs

This concept paper is based on a range of inputs, including:

- Discussions, propositions and recommendations drawn from the Royal Commission into National Natural Disaster Arrangements and jurisdictional inquiries.
- Areas of identified end user interest and knowledge, and evidence gaps.
- The Bushfire Science Roundtable meetings hosted by Minister Karen Andrews.
- Insights from discussions for the Black Summer research program.
- The Australian Government's recent discussions with potential partners within the emergency services, emergency management and land management sectors and their thoughts on scope for the new research centre.
- The CRC's understanding of the needs of broader stakeholders outside of emergency services and emergency management and how they can contribute to building a more disaster resilient Australia
- The CRC's extensive experience over 17 years of being the leading industry-connected and end-user-informed research centre in emergency management.

The Department has undertaken consultations with stakeholders as it develops guidelines for the Centre. The most recent guidance is that this Centre will have three overarching objectives:

1. Zero preventable deaths	The key focus of community resilience research must be to protect human life and to minimise harm and suffering.
2. Well-prepared and resilient communities	The Centre will provide the research to enable communities to be better informed of the risks associated with an event and therefore be well positioned to make an informed decision if faced with a potential disaster. It will also deliver an understanding of the cost effectiveness of mitigation strategies.
3. Research that translates into action	The Centre will provide for technology demonstrator opportunities, data management and research outcomes that translate to utilisation.

Those objectives will be achieved by a research and utilisation program that delivers outcomes that:

- Improve our understanding of hazards, vulnerability, and risk in a changing climate
- Support a well-prepared Australian community
- Promote the effective use of technology to improve response and resilience

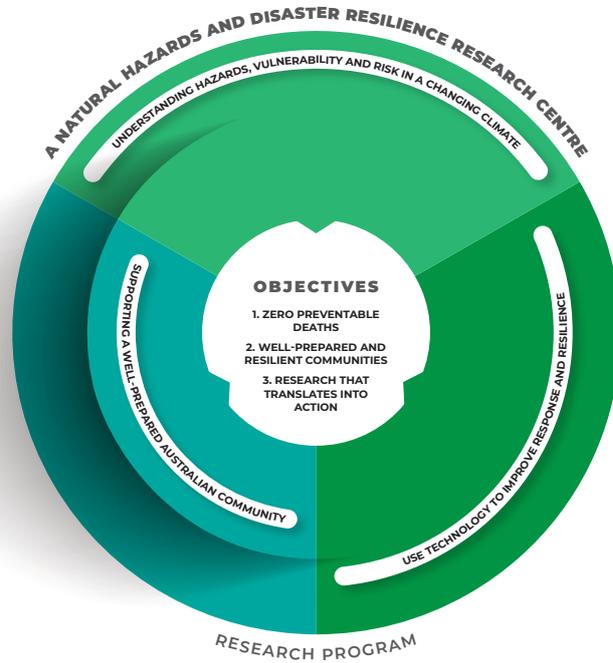


FIGURE 1

In this concept paper, the following portfolio areas are recurrent areas of interest drawn from multiple discussions with end-user and research partners across Australia and at many levels in those organisations. It is also informed through an understanding of current directions in the development of complementary international research priorities.

Engagement with current and prospective researchers and end users will be ongoing as the plans for the new Centre develop.

A conceptual framework for a research portfolio

The Commonwealth has confirmed that the initial scope of hazards for the new centre will include:

- bushfires
- floods
- cyclones
- heatwaves
- storms
- inundation and erosion caused by sea level rise
- earthquakes
- tsunamis
- landslides

The research of the Centre will be managed as a portfolio of short, medium and long-term projects that are developed through end-user engagement and leadership. The portfolio will have clear and measurable outcomes (including performance targets where feasible²), coupled with formalised end-user engagement and agreed pathways to adoption.

As an indicative spread of investments for the research portfolio the following are proposed splits of investment over the life of Centre and indicative dollar amounts assuming a \$10M p.a. research expenditure. These will change over time:

Type of investment	Indicative time frame	Averaged portfolio allocation	Averaged Yearly expenditure ¹	No of Post-doc equiv. FTEs ²
Tactical	<1 year	10%	\$1M	7 FTE
Applied	1-3 years	60%	\$6M	40 FTE
Strategic	3-10 years	20%	\$2M	14 FTE
Students³	3.5 years	10%	\$1M	30-40 students

¹ Assuming \$10M pa spend on research; ² Assuming \$150,000 per FTE (including project costs); ³ Assuming full scholarship of \$30,000 p.a.

These types of investment are defined as: **Tactical** – application or reformulation of existing knowledge; **Applied** – Incremental problem solutions; new incremental knowledge created and **Strategic** – Transformational or step-change knowledge creation and longitudinal understanding of policy and environmental changes.

There are many ways of conceptualising a research portfolio. For the purposes of this paper, several main dimensions are considered. Consideration will also be given to strengthening research areas where Australia leads the world and increasing capacity and capability in areas where Australia should be one of the world-leading research countries – by investing to build and maintain these capabilities.

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

The various dimensions are:

1. **Research themes** – that capture the broad outcomes for each of the research areas, and which will be used to
 - a. determine how individual projects fit into the research portfolio, and
 - b. to test how the outcomes, tools and deliverables as proposed will be relevant to delivering outcomes for the identified research theme end-users.
2. **Influencing variables and strategic partnerships** – that will influence the context in which the research outcomes will be expected to deliver benefits. It is anticipated that many of the variables (for example climate change) will influence multiple hazard programs.
3. **Research Projects** – individual projects (or groups of projects) that will deliver the evidence, tools and capabilities that will be developed to address identified needs in the research themes. Considerations relating to the projects will include:
 - a. End-users needs
 - b. Project time-line – short, medium or long.
 - c. Portfolio mix and balance.
 - d. Likelihood of technical success and likelihood of translation or utilisation given technical success.
 - e. Options analysis of potential future opportunities.
 - f. Building of capability or capacity in areas that need maintaining or expanding
 - g. Linkage to international research programs.
4. **Engagement and Translation** – ways in which individual projects, projects within a theme and projects across the research portfolio will interact with end-users, influencers and decision-makers to drive change in policy and practice. This will include stage-gate processes to ensure that end-users and researchers are actively engaged into the process of delivery of the project outcomes. Consideration will also be given to how research knowledge and outcomes can be used to enhance relevant education and training.
5. **Accessible national data and knowledge collections** – research projects will be expected to contribute to accessible, sustainable national research or operational data collections with ongoing custodianship and governance. Where financially possible the centre's publications will support open-access publication of its outcomes.

Research Themes

The proposed research themes are integrated across all phases of a disaster, and collectively contribute to an integrated research program that reflects the complexities and inter-dependencies that are essential in the development and sustainability of disaster resilience.



FIGURE 2

When the proposed research themes are aligned across the high-level concepts for the research program, the interconnectedness of the themes is clear. This integration is important in delivering research that translates into outcomes that can be translated into actions, and where those actions are both sustainable and effective:

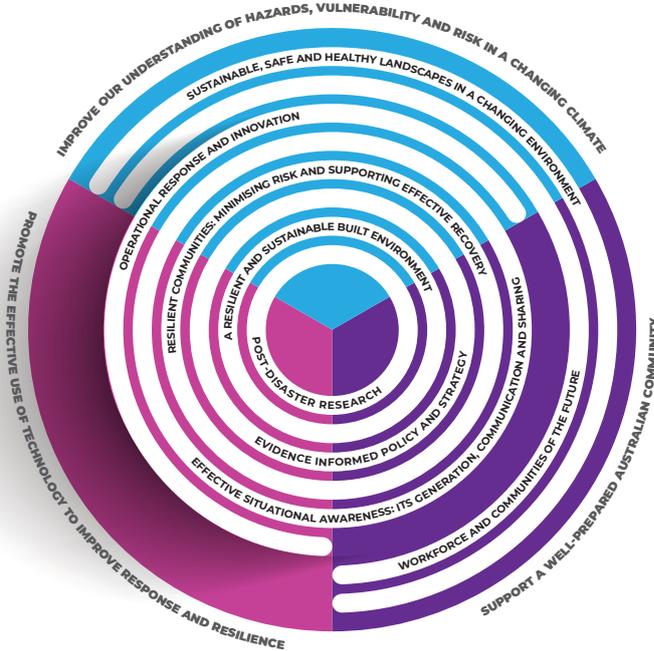


FIGURE 3

1. Sustainable, safe and healthy landscapes in a changing environment

Bringing together all elements that make a landscape what it is, and how they are managed for cultural values, biodiversity, fire risk, water availability, recreation, interfaces with settlements and infrastructure and agricultural production.

Projects will demonstrate how their outcomes and associated knowledge provide benefits to landscapes as a whole, rather than isolated elements, and whether they need other research or knowledge to allow for effective implementation.

2. Effective situational awareness: its generation, communication and sharing

Situational awareness in its broadest sense is a continuum from information owners through emergency services to those in governments, businesses and communities who will benefit from awareness of the environment and any emerging threats around them.

This research theme combines technologies, data, analysis and interpretation for operational awareness and planning, and for informing communications and warnings to governments, businesses and communities. It is likely to include, for example, physical science projects in fire and storm simulation, impact forecasting and the social elements of how this information is effectively shared with those who need to know about, and act on that information.

3. Operational response and innovation

Ensuring that new and emerging innovations and enhancements and data sources are being used to continually improve the safety and effectiveness of operational responses to emergencies and disasters.

Research with an operational focus, that explores new and enhanced equipment, operational safety, efficiencies and effectiveness – combined with the use of data – to enhance ground and aerial operational response and to support the introduction of innovative technologies, through testing and trialling, that supports emergency response activities. Preparing the workforce to operate in new environments and with new operational tools and approaches is captured in a separate research theme.

4. A resilient and sustainable built environment

The built environment is a collection of all that has been built to support our way of life. It incorporates critical infrastructure, business and private buildings, connections between them and the services that are delivered through them. Holistically, the totality of the built environment must work as a complete system to sustain functional communities.

A truly resilient built environment is more than “hard” infrastructure that has been designed, built, strengthened or otherwise protected. Functional resilience is dependent on both interconnected and standalone systems and the people that support them.³

The built environment relies on complex relationships between physical structures, which depend on systems, standards, regulations and processes for guiding planning and construction. For the built environment to function effectively, the resilience of the soft infrastructure, systems and services that allow the benefits produced by those assets has to be strong for the benefits to be delivered to the people, businesses and communities that need those services.

³ Highlighted at the Asia-Pacific Partnership for Disaster Risk Reduction, 1-2 December 2020

5. Resilient communities: minimising risk and supporting effective recovery

With Australia naturally exposed to significant and ongoing risk of disasters, to complement our investment in mitigation and response activities, there needs to be an equivalent investment in building capabilities within and around communities that allow them to be aware, organised, supported and participating before disasters occur, and to have ready access to the systems and support that they need if they are affected during a disaster.

Disaster risk is context specific, being felt immediately and intensely at the local level. Communities must be allowed take a lead in developing their own risk profile and in implementing their local DRR plans, providing them with the appropriate tools and resources and involving them in decision-making process from the beginning.

As observed in the development of the Australian Disaster Resilience Index⁴, resilience cannot be averaged across a country or region – it is location dependent and place-based, and it needs to also understand and engage all groups within the community, including: people with disabilities, older people, youth and financially disadvantaged when developing and implementing local risk profiles and plans.

6. Evidence informed policy and strategy

Developing evidence to support new policy and strategy development, and to determine the value of current and past policies and strategies. And using that evidence through multiple engagement channels to provide a greater understanding of:

- How different investment options compare in their short and long term benefits;
- Forward-looking modelling and projections that can be used to understand the evolution of risk and compare mitigation options
- Development, evaluation and understanding of the new and emerging policy and strategy options
- Monitoring and evaluation of current policies and strategies
- Integrated decision support tools that model the interaction between linked systems and policies
- Concept development and testing for new business models, for example in insurance, and in critical infrastructure, and lifelines

⁴ <https://adri.bnhcrc.com.au/>

7. Workforce and communities of the future

People are fundamental to disaster resilience – across the full spectrum, from emergency services through government agencies and into communities. In different ways, they will all influence the development of resilience and influence the outcomes of emergencies and disasters.

While the common link across this theme is people, there are a range of ways in which research in this theme will provide benefits:

- Future workforce planning
- Understanding of the impacts of future population demographics and dynamics
- Future-casting workforce dynamics and practices
- Better preparing workforces and communities to apply and use technological advancements at work and at home
- Effective participation, diversity and inclusion in the workforce and in community safety and resilience

This theme would support a suite of research that is forward looking, will inform strategic planning, will contribute to asset and change-management investment decisions, policy development and more.

8. Post-disaster research

Information captured after natural hazard emergencies and disasters represents a significant source of data for monitoring and evaluation, and as a resource to support additional research. The new Centre will have the capacity to support collection of information following significant emergencies and disasters caused by natural hazards.

Both social and physical information will be collected, contributing to:

- Operational improvement
- Expanding accessible research and operational data collections
- Providing data records that can be used to validate, develop and test new systems, tools, programs and strategies

Influencing variables

Significant broadscale risks need to be considered when framing research projects.

1. Climate change

- Understanding how the changing climate will influence future life, including:
 - The complexities and understanding of how risk profiles will change
 - how emergency services will prepare and respond
 - how communities will be living
 - how plant and animal life will be affected
 - how uncertainty can be understood and prepared for
 - An understanding about the relevancy of outcomes in a changing environment
- This will be mitigated through engagement with key complimentary research groups who are focused on climate science and projects including the ARC Centre for Climate Extremes, the National Environmental Science program's Earth Systems and Climate Change Hub, various university centres of excellence. The Centre will further engage with thought leadership through the various government and private sector climate change and adaptation groups and through the AFAC Climate Change Group.

2. Demographic change

- Understanding where and how populations will be living, what the structure of these communities will look like and how they will be working, exercising, travelling, recreating and holidaying.
- In this area the Centre will work with key organisations and demographic modellers. Key in this will be local and state governments, not for profit organisations such as the Regional Australia Institute, and the Australia Institute for Disaster Resilience.

3. Building regulations

- Living with current built risk, managing the impact(s) of current regulations and forecasted changes to the regulations.
- Understanding of what is required to bring in change, what evidence is required, what are the barriers and how long will change take to have an impact.
- Where and how do retrofitting options contribute to reducing the currently built assets.
- In addressing these the centre will work with the Australian Building Codes Board, Standards Australia, AFAC, and Fire Protection Association of Australia, as well as key research centres around the country and internationally.

4. Land use planning

- Impacts of current and emerging planning rules, their likely interpretation, and lead times for achieving any benefits.

5. Community activities and behaviours

- What will communities be doing in their 'normal' life?
- How will communities and community organisations change the way they prepare for and behave when threatened by emergencies caused by natural hazards?

6. Political will⁵

- The impacts of changing intent and motivation to undertake actions and to support change at all levels of government.
- The disruption caused by changing political focus that moves with community sentiment rather than evidence-informed policy.

7. Financial influences

- Major impacts on financial systems that will reduce the availability of funding at any level for mitigation, preparedness, response or recovery (national, state, local, personal).
- Corporate focus on profit and profitability as a key driver.

8. Regulation

- Understanding the influence of the rules that are in place at any point in time influencing (positive or negative) the operations or services of governments, emergency services, businesses, communities, families and individuals.

9. Technological evolution and revolution

- Technologies will continue to evolve, and rates of change, automation and other innovations will influence the rate of adoption and penetration of these technologies across all parts of the country.

10. Research capacity and capability

- The changing research and research funding environment within the university environment, and its influence on research capability retention and development.
- Availability research and research translation capability, capacity and expertise within end users.

⁵ Highlighted at the Asia-Pacific Partnership for Disaster Risk Reduction, 1-2 December 2020

Strategic relationships

The new research 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.

Examples of the organisations that the Centre is likely to have strategic relationships with beyond its core partners include, but are not limited to:

- The ARC Centre of Excellence in Climate Extremes
- NESP Earth Systems and Climate Change Hub
- Australian Bureau of Statistics
- Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)
- US Forest Service, Department of Interior and Bureau of Land Management
- Coimbra University, Portugal
- FireEURisk European H2020 project
- UN Office for Disaster Risk Reduction
- Insurance Council of Australia
- Australian Academy of Science
- CSIRO
- AFAC
- Australian Institute for Disaster Resilience
- Group of Eight Universities
- Firesticks Initiative
- North Australian Indigenous Land and Sea Management Alliance
- Australian Local Government Association
- Flood Management Association
- Fire Protection Association of Australia
- Beyond Blue
- Australian Strategic Policy Institute

Engagement and Translation

The research program for the Centre will be integrated with an active engagement and translation program. The CRC has developed world leading research utilisation practices and processes that can be used as a foundation for the engagement and translation activities of the new Centre.

The CRC has operated as a knowledge network, allowing free exchange of information between its members and partners, which gives

- researchers much greater access to knowledge, capability and data from emergency services, and
- emergency services and other end-users much greater access to academic research information and capability.

At the core is the culture of the centre, based on the concept that utilisation of the research is fundamental and the key to demonstrating the value of the investment of public funds into the research program. This starts with the identification of the problems to be solved. 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 who will lead and coordinate a group of end-users who will help to ensure that every project has guidance on user needs and access to user data and information. This will include linkages to core representative bodies, such as AFAC and its groups.

In addition to the tried and tested approaches of the CRC the new centre will implement a more formalised stage-gate approach to managing projects, ensuring that there is ongoing commitment from both research partners and end-users to use and trial the research outputs, and that the research outputs continue to address industry needs. This approach will ensure that the centre will invest in those projects that have a sustained commitment from end-users to use the product at the end, and that the evidence and outcomes developed by the project are fit-for-purpose.

The Centre will also explore a co-investment model, where the core funding would be matched with co-investment from end-users, 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 may open the way for other partners to be involved in research through later stage investment. These end user arrangements may be directly with state agencies, with AFAC or other industry associations or other private or public sector organisations.

The Centre will further develop the core engagement strategies that have worked well for the CRC and its partners, including:

- A large annual international research conference
- Jurisdictional research and utilisation workshops (hub-based where there are jurisdictional hubs linked to the Centre)
- Subject matter workshops and symposia – integrating where feasible with existing forums and groups (similar to the CRC Research Advisory Forums)
- Scenario and exercise development – research implementation and utilisation focus, that will explore and test utilisation concepts, and the strength of evidence needed to drive change
- Living labs – where research can be explored in real life settings with all those involved in the problem, for example in a riverine flooding setting, complex risk environment, a coastal erosion setting, or an urban development setting. This would enable research, policy and practice players to explore the complexities generated in a changing risk environment.
- An extensive outreach program that makes the science accessible to all partners and the community through research briefing notes, online resources, demonstration videos, podcasts, media engagement and other means.

The Centre will also seek to provide opportunities for two-way exchange of people with placement of researchers and students into the end-user environment, and by placement of end-users into the research and research management environment.

In looking for opportunities to provide a direct channel to use outcomes of the research, the Centre will look to integrate its work with other industry run product development programs, including for example the provision of new knowledge and systems for the Australian Fire Danger Ratings project, the development of new science into the fire spread prediction system, and to supplement the NBIC and other data access development initiatives, including the Digital Earth Australia platform⁶.

⁶ A Geoscience Australia product: <https://www.ga.gov.au/dea>

Accessible national data collections

All projects in the new Centre would be expected to contribute to accessible national data collections. Will include concepts of data standards, data dictionaries and data curation.

Additional activities

The formal portfolio would be complemented by:

- An active postgraduate research program, including international placement / exchange.
- Technology demonstrator opportunities to explore new thinking and emerging technologies (challenges, hackathons, etc).
- Data management (research) and (where appropriate) transition of research data into operational systems.

Potential project areas

It is envisioned that the Centre would begin with a defined series of shorter-term projects while developing the longer-term research portfolio. Under each of the research themes potential projects are listed for discussions to develop research priorities. Also, where appropriate, systems and capabilities are listed that will be beneficiaries of research outcomes. Projects in these areas could be tactical, strategic, or longer-term. Some may even be ideal for PhD or Master's students to undertake.

Sustainable, safe and healthy landscapes

Existing related tools and systems

- Prescribed Burning Atlas (Research Tool)
- Fuels 3D vegetation and fuel load mapping (Research Tool)
- AFDRS fuel layers (Fire Services and Land managers)
- Phoenix / Spark / other simulators (Fire Services and Land managers)
- Soil Moisture – Jasmin (BoM)
- AFMS (Research Tool / Geoscience Australia)

Potential projects

- Integrated cultural land management
 - Development of an evidence base to support the value of cultural land management in dedicated landscapes over decadal time periods
 - Development of models for integrated land management that combine the best mix of modern and traditional land management practices to protect 21st century landscapes and settlements
- Effectiveness of vegetation and fuel load management
 - Effectiveness of vegetation and fuel load management practices for reducing the spread of uncontrolled fire
 - Effectiveness of vegetation and fuel load management practices for maintaining environmental and ecological values
 - Impact of severe weather (cyclone, storm) on vegetation and fuel load
- Urban interface management
 - Landowner practices that strengthen the protections at interfaces (fire & flood focus) around the edges of settlements, agricultural developments and other significant assets, including APZs
- Moisture in the landscape
 - Understanding and developing real-time measurements of, and predictive models for moisture in the landscape, including precipitation.
 - Water runoff and streamflows – influence of land management and uncontrolled fire on water availability

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- Decision support tools
 - Models that integrate an assessment of the tradeoffs of values across the multiple values of concern (for example, loss of habitat, destruction of property, preservation of species, impact of smoke, biodiversity, land values, social values, etc)
 - Coastal erosion and inundation of land (coastal and inland)
 - Mitigation and retreat decision support tools
 - Impact on flora and fauna diversity
 - Impacts of fire retardant on environment and wildlife recovery
 - Climate change all projects
 - Climate scenarios

Effective situational awareness, and its communication and sharing

Existing related tools and systems

- AFDRS (Jurisdictions / Fire Services)
- Phoenix / Spark / other simulators (Fire services and Land managers)
- Soil Moisture – Jasmin (BoM)
- AFMS (Research Tool / Geoscience Australia)
- National Warnings System (National Warnings Group)
- ACCESS Fire (BoM and Fire Agencies)

Potential projects

- Understanding and modelling high impact weather
 - Ensemble forecasting to deliver improved spatial and intensity forecasting of tropical cyclones, thunderstorms, and severe wind.
 - Forecasting and predicting sudden onset high impact, thunderstorms (giant hail, etc) with increased accuracy in timing and spatial location.
 - Improved prediction and warnings for flash flooding.
 - Enhanced early impact forecasting (linked into GA), providing near real-time exposure risk information for emerging hazard events.
 - Enhanced flood forecasting using available data, including Landsat data and stream gauges
- Landscape curing – incorporation / utilisation of BNHCRC projects into AFDRS and other relevant operational systems
 - JASMIN, AFMS and dead fuels
 - Data integration
 - Data additions and transitions (best available data)
 - Understorey fuel assessments

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- AFDRS – seasonal, supplemented with weekly outlooks
 - Monthly outlooks – to help with prescribed burning planning (weather = 5 days, climate = several months – need to fill the gap)
 - Fire behaviour modelling – linking into international research relationships, building capability and information and enabling Australia to continue to be a significant contributor to those conversations
 - Embers – improved modelling from ember production to ignition probabilities of short and long distance ember movement in the landscape
 - Lightning (dry lightning) – enhanced modelling and prediction of the probability of ignition and spread of fires
 - Downslope winds – improving understanding and modelling of these and other winds at varying scales (broad landscape vs cold air drainage at valley /catchment level)
 - Coupled fire atmosphere modelling (fire atmosphere and atmosphere-fire), with links to international collaborators, including Los Alamos
 - improved vegetation, fuel structure and fuel load estimates (extending the Fuels 3D concept)
 - Improving the use of data from space to assist in high resolution and near real-time situational awareness (with SmartSat and others)
 - Earthquake
 - Unacceptable earthquake risk, – urban pedestrian malls / parapets
 - Rapid response impact estimation
 - Understanding earthquake risk – so we can determine what actions are required
 - Areas with low probability high consequence risks
 - Other
 - Improved understanding, predicting and modelling dust storms
 - Improved smoke modelling (smoke production, spread and dissipation)
 - Ash movement in the atmosphere – including fire and volcanic ash
 - Cascading events – improved understanding of what happens when hazards co-occur, and management / mitigation strategies
 - May be scenario-based
 - Will influence incident management
 - Climate change all projects
 - Climate scenarios
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Operational response and innovation

Existing related tools and systems

- AEIP (Geoscience Australia)
- ARENA (NAFC)
- AFDRS (Jurisdictions / Fire Services)

Potential projects

- Aerial firefighting
 - Understanding suppression effectiveness
 - Optimising use and tasking of aerial assets
- Data and voice communications
- Fire suppression
 - Improved understanding of fireline suppression rates by asset type and class across multiple terrain and weather conditions
 - Wildfire suppression strategies and tactics (including back burning)
- Operational decision-making
 - Resource allocation
 - Risk management
 - Use covid 19 experiences
 - Incident management and control (AIIMS / ICS)
 - Control
 - Systems of coordination
 - Enhanced tools and capabilities for understanding consequences of incident management options
- Decision support tools
 - Automated real-time data processing
- Natural hazard impacts in urban environments
- Enhanced materials and approaches to rapid and robust emergency building repairs
 - Could also look to building and design standards to minimise impact (for example, so that emergency roofing repairs can withstand repeat hailstorms to avoid repeat attendance of emergency services)
- Climate change all projects
 - Climate scenarios

A resilient and sustainable built environment

Existing related tools and systems

- UNHaRMED (Research Tool)
- AEIP (Geoscience Australia)

Potential projects

- Access to robust impact prediction tools
 - AEIP enhancements, including access to best available land surface data
 - Enhancement of vulnerability and cost functions for impact forecasting
 - Extending knowledge base of building vulnerability into industrial and commercial and agricultural
- Land use planning
 - Protection around satellite towns
 - Protection strategies for communities
 - Urban interface planning
 - Climate change all projects
 - Climate scenarios
- Standards and regulations
 - Strengthening standards and regulations, for example, to:
 - Minimise damage from natural hazards, and make the application of emergency repairs as simple and long-lasting as possible
 - Maintenance and effectiveness of APZs
 - Urban interface planning and management
- Planning for community safety
 - Decision support / community protection / evacuation & protection
- Insurability
 - Retrofitting of existing buildings
 - Building materials (new and extended buildings)
 - Building design & standards (new and extended buildings)
- Critical infrastructure resilience
 - Electricity
 - Gas
 - Water
 - Communications
 - Transport infrastructure

Resilient communities: minimising risk and supporting effective recovery

Essentially focusing on social elements from preparedness through to recovery, and understanding the flow of information, supply of understandable evidence, formal and informal education, what happens during an emergency and how to achieve the best possible outcomes through the period of recovery

Existing related tools and systems

- Australian Disaster Resilience Index (Research Tool)
- RECAP Tools (Australian Red Cross)
- National Warnings System (National Warnings Group)

Potential projects

- Understanding and mitigating long term impacts on communities
 - Health impacts
 - Improved understanding of the psychology of disaster recovery
 - Strengthening recovery capitals
 - Community led recovery
 - Community led APZ's and interface management
 - Long term impacts of flood on houses
 - Heatwaves
 - Dust / ash / smoke
 - Coordination of recovery activities – avoiding duplication and maximising seamless delivery of services
 - Family violence in recovery
 - Gender and inclusion in disaster recovery
 - Disaster resilience education for young people and for communities
- Risk understanding and awareness in communities
 - Indicators of resilience
 - Compounding recovery risk exposure: recovery programs for cascading events
 - Recovery M&E best practice, including measures of progress and success
 - Review of inquiries and royal commissions finding and recommendations for recovery and how implemented
- Policy and leadership
 - Better influencing outcomes based on evidence and best practice – not compromised by political and public opinion

Evidence informed policy and strategy

Existing related tools and systems

- ADRI (Research Tool)
- Meso economics⁷ (Research Tool)
- EAST – Economic Analysis Screening Tool (Research Tool)
- UNHaRMED (Research Tool)

Potential projects

- Enhancements, improvements and updates to Australian Disaster Resilience Index
 - Downscale
 - Update and upgrade
 - Link ADRI into extreme event forecasting
 - Likely metrics to assess recovery
 - Link ADRI to AEIP
- Decision Support Systems
 - Integrated Decision Support System suite (national coverage)
- Economic modelling and analysis
 - Economics / policy development to assess retrofitting for all classes of infrastructure
 - Links to insurability
 - Links into new government policy options
 - Economics, to continue and expand meso-economics research to understand impacts on income
 - Robust models for the economics of resilience
 - Strengthen the understanding of intangibles in economic modelling of natural hazards, their impacts and evaluation of mitigation options (increasing Australian context for underlying economic values)
 - Understanding what it is worth to communities not to be flooded / burnt, etc and the willingness of stakeholders to pay for the benefit
 - Robust techniques to measure economic willingness – social license to act
- Better understanding and improved options for efficient and effective policy development in a federated environment
- Climate change all projects
 - Climate scenarios

⁷ Meso-economics is the study of economic arrangements that are not based either on the microeconomics of buying and selling and supply and demand, nor on the macroeconomic reasoning of aggregate totals of demand, but on the importance of under what structures these forces play out, and how to measure these effects.

Future workforce, population and demographics

Existing related tools and systems

- Workforce 2030 (Research product)
- Decision-making (Training product in development)
- Teamwork (Training product in development)
- Volunteer recruitment tools (Research product)

Potential projects

- Increasing understanding of the role of people, behaviour and decision-making before, during and after catastrophic disasters
- Planning for the workforce of the future
 - Recruitment of cohorts to develop future Commissioners and senior officers
 - Succession planning
 - Talent identification and development
 - Recruitment and retention
 - Volunteer
 - Career (paid) workforce
 - Managing the workforce
 - Diversity / inclusion
 - WHS – mental and physical health
 - Knowledge transfer
 - Succession planning
- Increasing capability and embedding non-technical skills across the workforce
 - Decision making
 - Teamwork
 - Operations centre operations (integration of people and technical elements)

Post-disaster research

Existing related tools and systems

- Research data collections
- National Bushfire Information Capability

Potential projects

- Post-disaster social and physical research (data collection and analysis)
- Rapid damage assessment – for loss models and vulnerability curves
- Agency engagement and participation
- Contributions to relevant national datasets