A bushfire resilience Toolkit for your region.

BUSHFIRE-RESILIENT HOMES TOOLKIT

Project partners

This project is proudly funded by the New South Wales Government, with assistance from Local Government NSW, Insurance Council of Australia, Minderoo Foundation and Edge Environment.

The purpose of this Toolkit is to provide guidance and advice to homeowners wishing to take action to improve the bushfire resilience of their homes.

The context, data, methodology and findings are based on a demonstration pilot, specifically for bushfire resilience of existing housing stock. The recommendations of the toolkit focus on options for upgrading external building materials with more fire-resistant alternatives, and have been informed through analysis of housing archetype using the multi-hazard Building Resilience Rating Tool (BRRT). Consequently, this Toolkit primarily considers actions related to the materials and structure of the home. The built environment is an important aspect of resilience. Users are encouraged to consider the recommendations as part of a holistic approach, including improved property upkeep and behavioural changes, in order to realise meaningful improvements to bushfire preparedness and housing resilience.

This Toolkit is provided to residents, council and industry in good faith, applying best practice principles from a range of disciplines to develop recommendations. The knowledge and understanding of resilience continues to grow and evolve, providing stakeholders with a depth and breadth of information to explore and apply in a way that is fit for their individual purpose. As such, this Toolkit is intended to be used in combination with a range of other resources and the latest bushfire resilience guidance should always be checked. A list of further resources to assist stakeholders in their own research is provided in the toolkit.

Contents

1

Project overview

Improving the housing resilience of residential dwellings.

The Canberra Region Joint Organisation (CRJO) provides a forum for councils, state agencies and other stakeholders to work together at a regional level to identify shared priorities.

The CRJO consists of ten NSW member councils, two associate councils and one affiliate council. As part of their focus they are working with Insurance Council of Australia, Resilience NSW, Minderoo foundation and Edge Environment to improve the bushfire resilience of residential dwellings in the Canberra region.

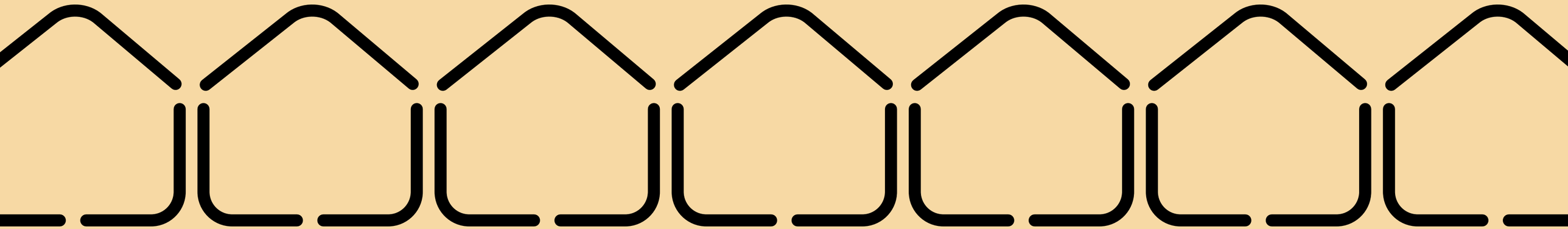
As part of this program of work, a resident toolkit has been developed to accelerate the adoption of climate-resilient housing across the Canberra Joint Region. This Toolkit provides an overview of the findings, ways to improve resilience in the region and resources to replicate this project in your area.

Program objectives

- Determine the current and future natural hazard adaptive capacity of the Canberra Region
- Capture qualitative and quantitative insights to guide toolkit development to accelerate the adoption of bushfire resilience
- Create and deploy the Bushfire-Resilient Homes Toolkit to inform, educate and inspire residents, council and industry to act

Program principles

- Bushfire focus with broader resilience context
- Build upon existing resources available
- Ensure resources have a regional focus
- Design to enable replication across other regions.



2

Program background: Climate Risk

The direct impact and risk of climate hazards has never been greater.

Climate change is having a damaging impact on Australia, with days of extreme heat and dangerous fire conditions increasing in frequency and intensity. There has been an increase in warmer days since the 1960s, which has resulted in extreme fire weather and longer fire seasons across large parts of Australia. Since the 1970s, rainfall has declined by an average of 16 per cent during the April – October period.

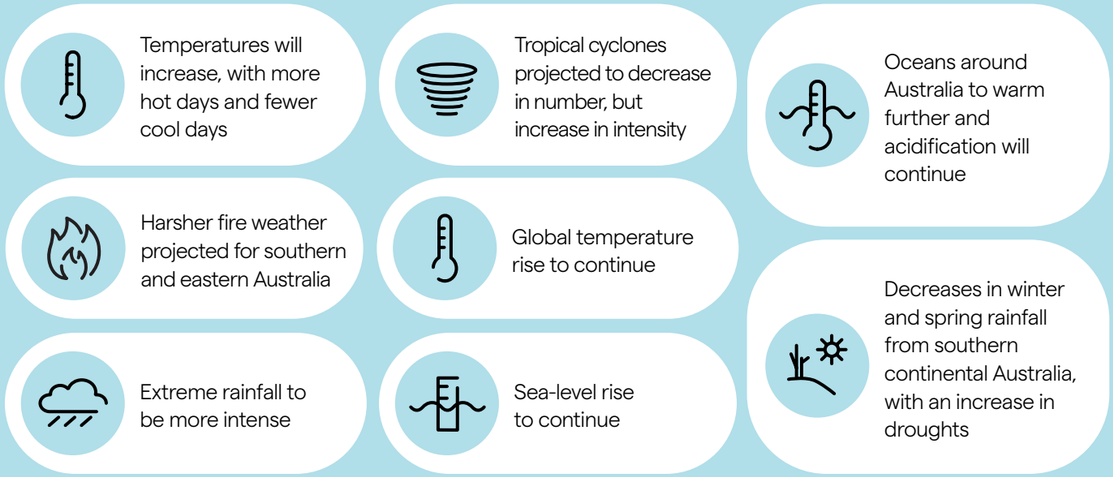
These compounding and cascading effects are resulting in numerous location-specific climate risks and vulnerabilities:

Under the current emissions trajectory, Australia is predicted to experience:

- Increased severity of heatwaves, leading to increased bushfire and heat stress
- Longer and more geographically extended droughts
- Flooding from more intense storm activity
- Sea level rise, leading to coastal damage and loss of ecosystems[1].

"Further global warming over the next two decades is inevitable. As a result, sea levels are projected to continue to rise. Tropical cyclones are projected to decrease in number but increase in intensity. Floods and bushfires are expected to become more frequent and intense"

Royal Commission into National Natural Disaster Arrangements Report[2]



Source: Bureau of Meteorology and CSIRO, 2017

[1] Bureau of Meteorology, 2020, http://www.bom.gov.au/state-of-the-climate/australias-changing-climate.shtml
[2] Royal Commission into National Natural Disaster Arrangements Report, 2020, https://naturaldisaster.royalcommission.gov.au/system/files/2020-11/Royal%20Commission%20into%20National%20Natural%20Disaster%20Arrangements%20-%20Report%20%20%5Baccessible%5D.pdf
[3] Bureau of Meteorology and CSIRO, 2017, http://www.bom.gov.au/climate/current/annual/aus/2017/

2

Program background: Climate Risk

Natural disasters pose a significant resilience risk for Australia due to its reliance on climate and natural assets[2].

Around 7 million people, or 28% of the Australian population, live in rural and remote areas[4] making them more vulnerable to natural disasters. Such events have affected Australian communities in the following ways:

Australian agriculture accounts for 55% of Australian land use[5]. Changes in seasonal conditions has meant that annual average farm profits have reduced by 22% per farm over the past 20 years[6].

The tourism sector accounts for 13% of all Australian businesses and relies on natural assets. It includes national parks and holiday locations as well as semi-rural and rural-residential living[7].

The 2020 bushfire season was devastating for the Australian tourism sector and resulted in travel cancellations, damage to Australia's tourism reputation as a pristine destination as well as extensive emotional and financial distress among regional operators[7].

Seasonal populations include tourists, seasonal workers and other temporary visitors. During bushfire season, this can make evacuations more challenging due to limited awareness of where to go and what to do in the event of a natural emergency[7].

Across Australia, many homes consist of building materials at risk of bushfires, including timber, concrete and roofs made from terracotta roof tiles. These materials increase the ignition of embers due to their surface texture, spacing structure, material design and structure.

They are not designed to withstand extreme heat, direct flame or reduce the ignition of embers, making them far more vulnerable to climate hazards.

[2] Royal Commission into National Natural Disaster Arrangements Report, 2020, https://naturaldisaster.royalcommission.gov.au/system/files/2020-11/Royal%20Commission%20into%20National%20Natural%20Disaster%20Arrangements%20-%20Report%20%20%5Baccessible%5D.pdf
[4] Australian Institute of Health and Welfare https://www.aihw.gov.au/reports/australias-health/rural-and-remote-health
[5] Australian Department of Agriculture, Water and the Environment 2021 https://www.awe.gov.au/abares/products/insights/snapshot-of-australian-agriculture-2021#:~:text=Agriculture's%20place%20in%20Australia,agriculture%20in%202018%E2%80%9319)%3B&text=1.9%25%20of%20value%20added%20(GDP,%E2%80%9320%20(Figure%201).
[6] The Guardian 2019 https://www.theguardian.com/australia-news/2019/dec/18/climate-change-has-cut-australian-farm-profits-by-22-a-year-over-past-20-years-report-says
[7] Edge Environment, 2021

2

Program background: Fire Risk

The interconnectivity of climate hazards is increasing the threat of fire and the risk to people and property has increased substantially.

“Recognising and accepting what can be defended and what can’t be during an extreme fire season may require a big cultural shift for both the fire services and the community. More trucks and more firefighters are not the answer to the scale of the challenge NSW and Australia was confronted with during the 2019-20 bush fire season”

– NSW Bushfire Inquiry[8]

Bushfire conditions are more dangerous than ever and are projected to become more frequent and severe. The compounding impact of record-breaking drought, very dry fuels and soils as well as extreme heat in 2019 greatly exacerbated the bushfire risk.

Fires of this kind are hard to suppress regardless of authorities’ preparedness requiring local resilience to be greatly improved.

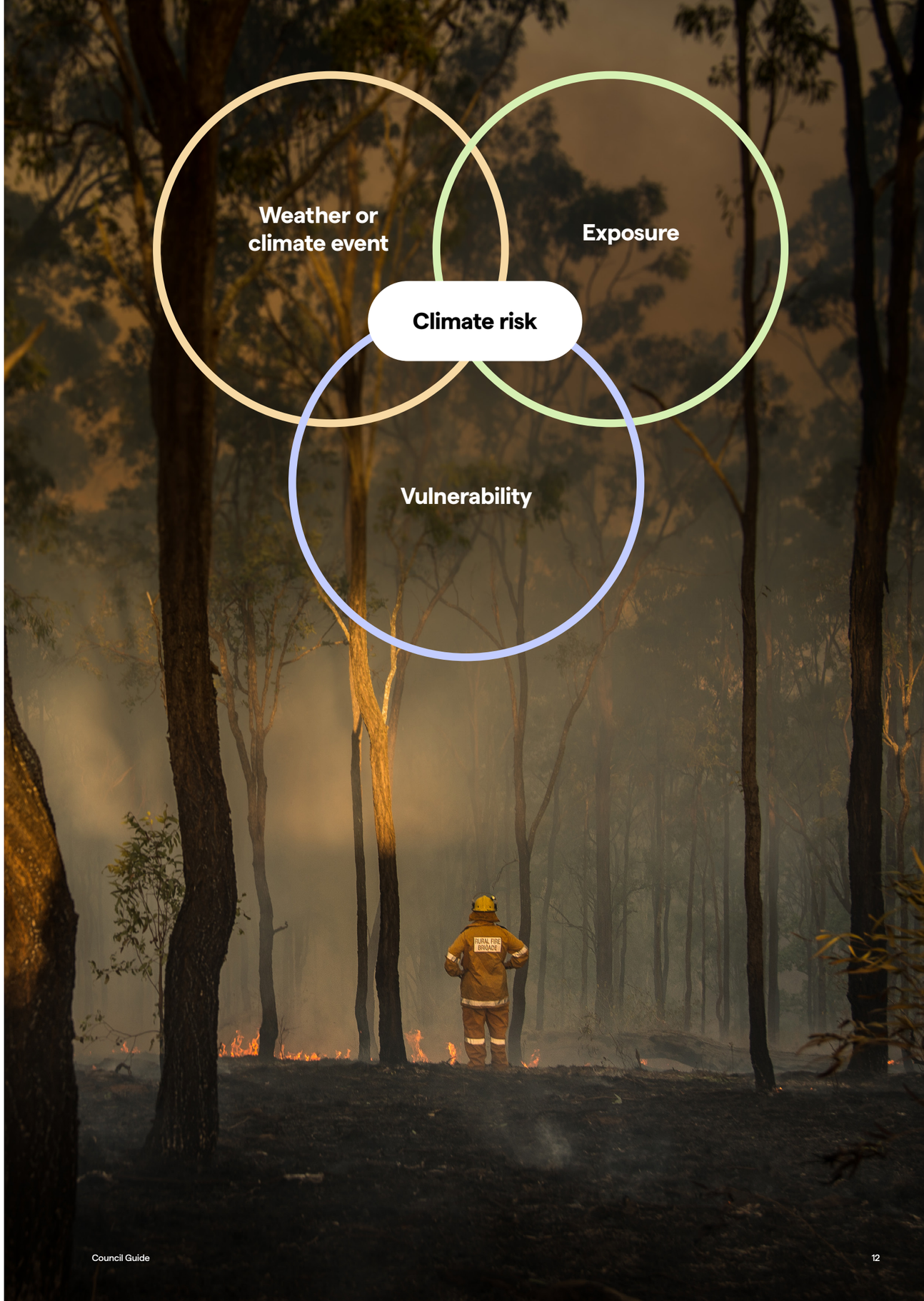
The NSW inquiry[8] notes that:

- Future property losses are likely (given legacy housing and patterns of settlement)
- Firefighters’ lives should not be put at risk to defend property
- Community education and engagement of homeowner risk needs to be central to the government’s response

The Royal Commission[2] notes that:

- Strong adaptation measures are necessary to respond to the impacts of climate change
- Individuals and communities do not control many of the levers needed to reduce some disaster risks. Governments and industry in particular must take coordinated action to reduce disaster risks within their control
- As disaster risk increases, the capacity of communities and systems to be resilient is diminished

[2] Royal Commission into National Natural Disaster Arrangements Report, 2020, https://naturaldisaster.royalcommission.gov.au/system/files/2020-11/Royal%20Commission%20into%20National%20Natural%20Disaster%20Arrangements%20-%20Report%20%20%5Baccessible%5D.pdf
[8] NSW Bushfire Inquiry, 2020, https://www.dpc.nsw.gov.au/assets/dpc-nsw-gov-au/publications/NSW-Bushfire-Inquiry-1630/Final-Report-of-the-NSW-Bushfire-Inquiry.pdf



2

Program background: Bushfire-Resilient Housing

Increasing bushfire-resilient housing in our regions.

As climate risk increases, so does the frequency and severity of bushfire – posing great danger to communities, people and property. As risks have increased, communities which weren't traditionally affected by bushfire have been re-zoned as medium-to-high risk areas. This re-categorisation has increased the building requirements of new and substantial additions to existing homes. Bushfire Attack Level (BAL) ratings are the Australian standard for measuring a home's exposure risk to fire, including embers, radiant heat and direct flame contact. The BAL rating determines the construction and building requirements to protect homes in bushfire-prone areas.

Although building regulations have been upgraded to reflect the increased risk of bushfire, these regulations only apply to new and substantial upgrades to existing homes.

To ensure our communities are as safe as possible we need to upgrade our existing homes to reflect the increasing threat and ensure our homes are resilient to bushfire.

Housing resilience in relation to this Toolkit is defined as, "actions that residents can proactively take to upgrade their home to reduce, accommodate and recover from climate hazards to protect or benefit themselves, or others, in the short and long term."

To do this we need to review legacy housing and the lack of bushfire-resilient homes across our regions. We need to engage and influence owners of existing housing stock, integrating hazard information and hazard reporting, to provide guidance on how to manage and prioritise housing adaptations so that residents are less vulnerable to climate hazards.

Research findings from The Canberra Joint Organisation Bushfire-resilient Housing Toolkit project revealed there are 4 key requirements ensuring resilient resources hit the mark for residents, making it easy to take action[7].

1. The scope of housing resilience and call to action needs to be communicated to residents

To make it clear that residents have an important role to play. Resources need to communicate the clear need for action articulating specific and practical actions that residents can make to their home.

2. To help residents navigate the complexity of structural adaptations outlining a quantifiable impact

To help residents overcome the sea of complex and multi-faceted information available, guidance needs to be simplified and measurable to make it easier for residents to understand the scale of risk and benefit.

3. To make structural upgrades attractive, residents need to understand the short-term and long-term benefits

A single source of information is required to articulate the increase in fire-prone areas, upgrades to fire zoning and building codes and the difference in vulnerability between different housing stock.

4. Structural adaptations need to be simple and accessible to the majority

The short-term and long-term benefits of housing adaptations need to be communicated to incentivise action.

[7] Edge Environment, 2021

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Replicating the Bushfire-resilient Housing project in your region

Key program phases and steps.

The bushfire-resilient housing project consisted of three key phases[7]:

Phase 1
To determine the current and future natural hazard adaptive capacity of the Canberra Region.

Phase 2
To capture qualitative and quantitative insights to guide the development of a suite of Toolkits that will accelerate the adoption of bushfire resilience and climate-adaptative household upgrades.

Phase 3
To create and deploy the Bushfire-resilient Housing Toolkit in order to inform, educate and inspire residents, council and industry to act.

The following pages will detail the stages and activities involved and provide templates and resources for replication.

Phase 1

- Form Steering Committee
- Develop request for information for council data
- Inception meeting held in the region and attended by project stakeholders, and representatives from the region
- Develop stakeholder engagement strategy (SES)
- Research existing tools, data and guides and summarise existing knowledge and how it interlinks
- Key stakeholder interviews
- Development of 3-5 personas to capture an understanding of the resident base target audience
- Develop a discovery report distilling key learnings to date, principles and recommendations for project (flood, fire and coastal resilience)
- Conduct and facilitate stakeholder engagement workshops from across the region with subject matter experts providing workshops summary (focused on flood, fire and coastal erosion)
- Develop change plan aligning best practice, inputs from external stakeholder workshop and implications for next steps focused on bushfire

Phase 2

- Undertake bushfire hazard mapping, providing a visual representation of bushfire hazards relevant to the study area
- Establish archetypes of existing housing stock that represent 80% of the region's housing
- Determine the vulnerability of the housing stock using the Building Resilience Rating Tool
- Assess each archetype and provide a resilience rating (1–5) based on the Building Resilience Rating Tool methodology
- Develop climate-ready home specification to provide the recommended material and building element required for the main components listed in the archetype with a focus on bushfire relevance
- Undertake economic analysis of cost to transition to climate-ready housing
- Results of the archetype and economic analysis will be applied across a model town to pilot outcomes of the analysis
- Prepare Technical Report summarising the applied methodology and outcomes of Bushfire Resilience Demonstration model town pilot

Phase 3

- Develop an overarching campaign for resilient homes in the Canberra region including visual expression, verbal expression and message hierarchy with supporting deliverables
- Develop a 10-page guide for residents to take action in their homes
- Develop a 10-page guide for other councils to replicate the project
- Develop a report for insurance sector action and engagement

[7] Edge Environment, 2021

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Phase one

The intention of phase one is to determine the current and future natural hazard adaptive capacity of the Canberra Region.

Phase one consisted of 3 stages[7]:

Stage 1: Inception

To form a steering committee, kick-off the project and develop a stakeholder engagement strategy.

Stage 2: Discovery report

To understand the level of climate risk and climate resilience in the region, develop 3–5 key personas that capture an understanding of the resident base target audience and develop a discovery report with key learnings to date, principles and recommendations for the project.

Personas were developed from existing data, aggregated and used to define people's attitudes and beliefs around bushfire and environmental risk, sources of bushfire information, capacity to act and challenges they need to overcome. See persona template for overview and data sources.

The Discovery report was developed based on a literature review of existing tools and guides, insurance and council data. See literature review template for detailed framework.

Stage 3: Change plan

An interactive workshop was designed to gain stakeholders input and develop a change plan. This aligned behaviour-change best practice and implications for the capture of qualitative and quantitative insights to guide the development of a suite of Toolkits to accelerate the adoption of bushfire resilience and bushfire-adaptative household upgrades.

[7] Edge Environment, 2021

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Phase two

Phase two captured insights to guide the development of a suite of toolkits and accelerate the adoption of bushfire-adaptative upgrades.

Phase two consisted of 3 stages[7]:

Stage 1: Bushfire mapping and housing archetypes

To undertake bushfire mapping, existing housing stock archetypes were established with the vulnerability of housing stock determined using the Building Resilience Rating tool.

Bushfire hazard mapping provided a visual representation of bushfire hazards relevant to the study area.

Housing archetypes of existing housing stock determined through existing data, and a Building Resilience Rating Tool was developed to determine the vulnerability of the region. See archetype template for information of the method used.

Stage 2: Climate-ready home

A climate-ready home specification was developed to detail the recommended housing adaptations and building materials for bushfire-ready homes in the region.

An economic cost-benefit analysis was conducted to develop cost-effective climate-ready structural upgrades to existing homes.

Findings from the economic analysis were applied to a model town to determine the resilience ratings of resilience upgrades.

Stage 3: Technical report

A technical report was developed summarising the methodology and benefits of structural upgrades and bushfire resilience outcomes.

[7] Edge Environment, 2021

3

Phase three

Phase three created the Bushfire-Resilient Housing Toolkit to inform, educate and inspire residents, council and industry to act.

Phase three consisted of 3 stages[7]:

Stage 1: Toolkit for residents

To design a 10-page toolkit for residents to take action in their homes.

A 10-page bushfire-resilient resident toolkit incorporated findings from the discovery report, change plan and pilot, articulating the bushfire adaptations homeowners and renters can undertake to make their homes more resilient to bushfires.

Stage 2: Guide for councils and insurance industry report

A 10-page guide was created to help other councils replicate the project across their region.

A 10-page guide was developed for the insurance sector outlining the increased bushfire risk and housing resilience opportunities.

A 10-page messaging guide was developed to help councils engage the community on the topic of bushfire resilience and drive behaviour change within their region.

Stage 3: Promote the toolkit

A press pack was developed to assist project partners with the promotion and distribution of the resident Bushfire-Resilient Toolkit. The press pack included, a detailed press release, conference abstract, and social media assets.

[7] Edge Environment, 2021

4

Desktop review template and steps

Step 1
Identify existing research, reports, tools, toolkits, guides and handbooks*

Step 2
Review existing literature against research criteria

Step 3
Summarise key findings in a discovery report and use these findings to guide the next stages of your project

Suggested literature for desktop review:

- Academic disaster adaption and resilience literature
- Council and fire agency resources
- Preparation and planning reports
- Royal commission and emergency management reports
- Vulnerability and emergency assessments
- Resilience indexes
- Bushfire building codes and best practice guides

Source				Source overview							
Resource title	URL	Organisation	Year	Resource objective	Hazard type/s	Region specificity	Target audiences	Key insights - enablers for action	Key insights - barriers to action	Resilience and adaptation recommendations	Document relevance (5=high, 1 = low)

*see next page for suggested resources

Desktop review template

Project title:

Date:

Source				Source overview							
Resource title	URL	Organisation	Year	Resource objective	Hazard type/s	Region specificity	Target audiences	Key insights - enablers for action	Key insights - barriers to action	Resilience and adaptation recommendations	Document relevance (5=high, 1 = low)

4

Stakeholder engagement template and steps

Step 1
Identify key project stakeholders including regional and subject matter experts.

Step 2
Utilise the IAP2 framework to define stakeholder engagement levels:

- Empower
- Collaborate
- Consult
- Inform

Step 3
Continually engage with stakeholders throughout project, applying learnings and adapting to potential risks.

Source				Source overview							
Resource title	URL	Organisation	Year	Resource objective	Hazard type/s	Region specificity	Target audiences	Key insights - enablers for action	Key insights - barriers to action	Resilience and adaptation recommendations	Document relevance (5=high, 1 = low)

*see next page for suggested resources

Stakeholder engagement template

IAP2 Spectrum of Public Participation

IAP2's Spectrum of Public Participation was designed to assist with the selection of the level of participation that defines the public's role in any public participation process. The Spectrum is used internationally, and it is found in public participation plans around the world.

Increasing impact on the decision

	Inform	Consult	Involve	Collaborate	Empower
Public participation goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

4

Persona development template and steps

Step 1
Review persona building criteria in template.

Step 2
Define personas using suggested resources detailed below.

Step 3
Conduct primary research with residents or a resident focused persona workshop with key stakeholders to finalise persona, exploring community awareness and perception or risk and potential barriers of housing resilience.

Step 4
Finalise personas and use personas to develop communication guides.

Suggested sources for compiling personas:

- Subject matter expertise from interview and workshop insights.
- Australian Bureau of Statistics
- Profile ID
- Australian Disaster Resilience Knowledge Hub
- University of Canberra, Regional Wellbeing Survey
- EPA, Who Cares Surveys (climate change)
- Parliament of Australia, 2019–20 Australian bushfires—frequently asked questions: a quick guide
- National Recovery and Resilience Agency, New South Wales, July 2019 - March 2020 Bushfires - Black Summer
- National Recovery and Resilience Agency, Australian Capital Territory, January - February 2020 Bushfires - Black Summer

Persona template:

Persona template

Persona title:

Persona name

Add name

Persona image

Add image

Demographics

Age group ☐ 18–34 ☐ 35–49 ☐ 50-59 ☐ 60-69 ☐ 70-84+

Job situation ☐ Full-time ☐ Part-time ☐ Unemployed ☐ Retired

Annual income (Per Person) ☐ < $50k ☐ $55-70k ☐ $70–84k ☐ $84k+

Occupation ☐ Trades ☐ Student ☐ Manager ☐ Professional

Primary Transport 

Housing ☐ Rented ☐ Purchased ☐ Owned

Sources of information 

Devices used ☐ Basic phone ☐ Smart phone ☐ Laptop or computer

Attitudes, awareness and resilience

Environmental concern Low ▭ High

Level of risk Low ▭ High

Awareness of bushfire Low ▭ High

Perception of bushfire safety

E.g., the audience's awareness of bushfire, risk perceptions and current actions undertaken.

Efforts within community

E.g., the audience's connection with the community and key touch points for engagement

Summary

Add a fictional quote from the persona

Emotions, past experiences & motivations

Housing resilience Low ▭ High

Capacity to act Low ▭ High

Level of cover Low ▭ High

Level of disposable income Low ▭ High

The need

The most impactful action is:

E.g., what type of actions will be most feasible and impactful for this audience.

The biggest challenge to overcome is:

E.g., what is the main thing stopping this audience from acting.

The biggest motivator is:

E.g., what is the biggest driver of action for this audience.

Persona template

Persona title:

Persona name

Persona 5

Persona image

Add image

Demographics

Age group
☐ 18–34 ☐ 35–49 ☑ 50-59 ☐ 60-69 ☐ 70-84+

Job situation
☐ Full-time ☑ Part-time ☐ Unemployed ☐ Retired

Annual income (Per Person)
☑ < $50k ☐ $55-70k ☐ $70–84k ☐ $84k+

Occupation
☑ Trades ☐ Student ☐ Manager ☐ Professional

Residents
☑ Lone ☐ Two ☐ Three ☐ Four +

Primary Transport
Bike

☐ ☑ ☐

Housing
Rented Purchased Owned

Sources of information


Devices used
☑ Basic phone ☐ Smart phone ☑ Laptop or computer

Attitudes, awareness and resilience

Environmental concern Low — High

Level of risk Low — High

Awareness of bushfire Low — High

Perception of bushfire safety

This audience has a high awareness of bush fire, and carries out physical preparation measures as standard.

Efforts within community

This audience has a very limited connection with the community and can go weeks without interaction.

Summary

" This audience is highly practical and motivated but considered high risk due to the rural location of their property, limited resources and low level of community interaction".

Emotions, past experiences & motivations

Housing resilience Low — High

Capacity to act Low — High

Level of cover Low — High

Level of disposable income Low — High

The need

The most impactful action is:

DIY adaptions which can be completed on a tight budget.

The biggest challenge to overcome is:

Limited budget and connection.

The biggest motivator is:

Cost savings.

4

Housing archetype template and steps

Step 1
Access census data to define the population and number of private dwellings in each Council area and their major settlements.

Step 2
Identify two or more settlements that together account for >50% of population in each Council area.

Step 3
Access housing wall-type data for each postcode from the CSIRO Australian Housing Data Tool.

Step 4
Calculate the number of private dwellings with each wall-type in each settlement.

Step 5
Identify the most common housing construction wall-types across the CRJO selected settlements and use this as the basis for archetype selection.

Step 6
Undertake ground-truthing of results through Google street view point searches in each settlement.

Building elements	Characteristic	Variant
Roof covering	E.g., Concrete tile	E.g., Colour coated corrugated steel roofing
Guttering	E.g., Painted steel	E.g., PVC
Exposed rafters/beams and soffit	E.g., None	E.g., None
External wall cladding	E.g., Brick cladding	
Windows frame	E.g., Timber	E.g., Aluminium
External doors	E.g., Timber door	E.g., Aluminium framed glass door
Window glazing	E.g., Standard glass	E.g., Toughened 6mm glass
Ground floor structure	E.g.,Suspended timber structure	E.g., Concrete slab on ground
Ground floor enclosure	E.g., Masonry	E.g., Steel mesh
Decks, patios and verandahs	E.g., Concrete	E.g., Stone
External stairs	E.g., None	E.g., Yes
Number of storeys	E.g., One	E.g., Two
Exposure modifiers		
Windows – Bushfire shutters	E.g., None	E.g., None
Doors – Bushfire shutters	E.g., None	E.g., None
Extra elements		
Detached structures	E.g., No additional structures	E.g., Shed or greenhouse within 6m of house
External gas bottles	E.g., None	E.g., External gas bottles
Fences, Screens, Trellis	E.g., No additional structures	E.g., Fences
Firewood	E.g., None	E.g., Firewood pile
Moderators (cost)		
Roof pitch	E.g., 11° to 20°	E.g., 21° to 45°
Roof shape	E.g., Hip	E.g., Gable

Housing archetype template

Building elements	Characteristic	Variant
Roof covering	E.g., Concrete tile	E.g., Colour coated corrugated steel roofing
Guttering	E.g., Painted steel	E.g., PVC
Exposed rafters/beams and soffit	E.g., None	E.g., None
External wall cladding	E.g., Brick cladding	
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Windows – Bushfire shutters	E.g., None	E.g., None
Doors – Bushfire shutters	E.g., None	E.g., None
Extra elements		
Detached structures	E.g., No additional structures	E.g., Shed or greenhouse within 6m of house
External gas bottles	E.g., None	E.g., External gas bottles
Fences, Screens, Trellis	E.g., No additional structures	E.g., Fences
Firewood	E.g., None	E.g., Firewood pile
Moderators (cost)		
Roof pitch	E.g., 11˚ to 20˚	E.g., 21˚ to 45˚
Roof shape	E.g., Hip	E.g., Gable

4

Cost-benefit analysis template and steps

Step 1
Calculate standardised refurbishment schedule based on average age and expected lifespan of typical building elements for each housing archetype.

- Life expectancy of existing building materials

Step 2
Calculate the total bushfire cost for housing archetypes over a 50 year period. Costs include:

- Life expectancy of existing building materials
- Unit costs of relevant upgrade building materials
- Median house price
- Underinsurance rate
- Insurance excess
- BRRT bushfire resilience (likelihood of loss to bushfire in a given year).
- Apply a 7% discount across the 50 year analysis period to account for the reduced value of money over time.

Step 3
Calculate the total bushfire resilience benefits over a 50 year period. Benefits include:

- Archetype Size
- Archetype Age
- Relevant building materials
- Lifespan
- Unit cost benefits of upgraded materials (reduced disruption)
- Apply a 7% discount across the 50 year analysis period to account for the reduced value of money over time.

Step 4
Deduct total costs from total benefits to calculate the net present value.

Step 5
Model three scenarios to calculate the costs and benefits of improving bushfire resilience over a 50-year time period:

- A business-as-usual base case
- A staggered upgrade case
- An immediate upgrade case.

Archetype	Name	Scenario	Costs	Benefits	Net value
Archetype 1	E.g., Older brick veneer house	Staggered upgrade (as refurbs are due)	E.g., $7,532.28	E.g., $22,941.92	E.g., $15,409.64
Archetype 2					
Archetype 3					
Archetype 4					
Archetype 5					
Archetype 1	E.g., Older brick veneer house	Immediate upgrade	E.g., $30,609.90	E.g., $64,082.93	E.g., $33,473.04
Archetype 2					
Archetype 3					
Archetype 4					
Archetype 5					

Cost-benefit analysis template

Housing Archetype:

Base Model Setting: 50 years, 7% discount rate

Archetype	Name	Scenario	Costs	Benefits	Net value
Archetype 1	E.g., Older brick veneer house	Staggered upgrade (as refurbs are due)	E.g., $7,532.28	E.g., $22,941.92	E.g., $15,409.64
Archetype 2					
Archetype 3					
Archetype 4					
Archetype 5					
Archetype 1	E.g., Older brick veneer house	Immediate upgrade	E.g., $30,609.90	E.g., $64,082.93	E.g., $33,473.04
Archetype 2					
Archetype 3					
Archetype 4					
Archetype 5					