CASE STUDY

Sustainable Buildings Research Centre on Retrofitting for Bushfires

SBRC SUSTAINABLE BUILDINGS RESEARCH CENTRE | UNIVERSITY OF WOLLONGONG AUSTRALIA

LIVING ON THE BUSHFIRE FRONTIER

HOW WE'RE BUILDING BUSHFIRE RESILIENCE IN COMMUNITIES AT RISK

A UNITED EFFORT

At the University of Wollongong a team of experts are participating in a unique project with the aim of targeting the gaps in the scientific understanding of bushfires.

Under the Global Challenges project a multi-disciplinary team is bringing together specialists from social science, engineering and business to capture the complexity of bushfire events and how communities prepare for, respond to and recover from these destructive events.

In areas ranging from the physical interaction between fires and buildings, through to the social and societal factors that can help us build more bushfire-resilient communities, this project, along with other bushfire related work at UOW, will address the substantial hazard faced in Australia from these seasonal events.

THE DEADLY SITUATION

While new houses in fire affected zones are subject to stringent building codes, the majority of properties in bushfire-prone areas predate these regulations. Upgrading or 'retrofitting' existing properties is left to the individual homeowners who often don't have the requisite understanding or resources, to bear the costs and responsibility.

Due to urban expansion, economics and lifestyle considerations, people and communities are increasingly choosing to live adjacent to or amongst fire prone areas. Inevitably this closer proximity poses an escalating risk to people, property and emergency services from seasonal bushfire, which are themselves breaking records for their duration and intensity due to climate change. Put simply, more people are at greater risk from bushfires every year.

To address the increasing bushfire hazard in Australia, we need to facilitate better community cooperation and encourage people to prepare themselves and their properties.

UNDERSTANDING WHAT IT TAKES

Studies have shown that cost, time and understanding are the main barriers preventing residents from preparing for bushfires. In beginning to quantify what it costs in real terms to retrofit a property and recognising the best ways to do that, we can begin to discern whether modifying houses to an upgraded construction standard may provide a cost-effective and sustainable way to reduce the vulnerability of existing communities to bushfires.

A DIALOGUE BUILT ON RESEARCH

Our ongoing research aims to build a conversation with the whole spectrum of concerned parties; those implicated on a micro level because of the location of their homes, and those on a macro level of local and state government, as well as the various fire management authorities and emergency services charged with reacting to and fighting the fires.

THE DEVASTATING SUMMER OF 19/20

Eastern Australia is one of the most fire-prone regions of the world and every year widespread fires ignite and burn with varying degrees of impact and devastation. But even the most seasoned of bushfire veterans was shocked at the extent and ferocity of the 2019-2020 bushfires.

The bushfire season started early due to the prolonged draught and hotter than average temperatures, and by March 2020 a geographic area of approximately 72,000 square miles across Victoria, New South Wales, South Australia and the Australian Capital Territory had been raised.

Multiple states of emergency were declared as cataclysmic fires destroyed over 5,900 buildings including 2,779 homes, and killed at least 34 people and billions of animals. For weeks fire fighters waged intense battles to save lives and properties as the nation choked through a summer of smoke.

"The work we're doing will help shape strategies and policies for future bushfires, to minimise the damage they do and help communities recover more easily."

DR ALAN GREEN, RESEARCH FELLOW SBRC

UNDER THE MICROSCOPE

Two of our projects are examining some of the preventative measures people can take to mitigate the damage to property. In the shadow of the recent bushfire season a project in the Kangaroo Valley is examining the potential retrofitting of houses, while research around the efficacy of sprinkler systems has been ongoing for several years.

RETROFITTING HOMES

Up to 50 homes were lost in the Currowan fire in the Kangaroo Valley where ferocious southerly winds propelled the fire to jump the Shoalhaven River. Residents had spent the preceding days preparing their homes and properties fearful for what was to come.

This study aims to build on the long-term bushfire resilience and recovery examining the real costs of retrofitting houses and what people are willing to pay to make their properties as safe as possible. In 2014 similar retrofitting research in Wyong Shire Council area on the New South Wales Central Coast, focused on ten homes, all built before 2002.

The ten homes were from two distinct groups; five homes in a predominantly forested area on larger plots with a smooth transition from property to forest (intermix) and five homes on the edge of a developed residential suburb bordering wetland native forest (interface).

We carried out visual inspections to identify actions needed to prepare a home and establish what modifications were needed to retrofit buildings up to the required standard (Australian Buildings Standard AS3959 – *Construction of Buildings in Bushfire Prone Areas*). In addition we conducted interviews with these residents to explore the extent of financial outlay they were willing to contribute to make their homes safer.

Following this process an approximate cost of actions required to rectify any areas of unmet preparedness was estimated, plus the costs to upgrade to cover the next ten years.

OUR RESULTS

Our results threw into stark consideration three factors; the large financial outlay needed to both prepare for the forthcoming bushfire season and retrofit the property, the reluctance of residents to bear the whole cost of this themselves and importantly, the lack of personal preparedness across all households.

FINANCIAL ASSESSMENT

Total cost to prepare a house for the upcoming bushfire season and the total cost to upgrade a building*

	Lowest cost	Highest cost	Average
Cost to prepare	$1,954	$12,905	$7,145
Cost to upgrade**	$8,527	$46,856	$24,596

*These results apply to a specific set of 10 buildings so should not be presented as general findings applicable to all buildings.

**To BAL 40 standard of construction

SOCIAL ASSESSMENT

Perception of risk differed in each group with the intermix residents believing their properties to be at a greater risk. Most households had undertaken basic preparatory actions but there were a number of tasks that few or no households had completed, including completing a written Bushfire Survival Plan, which no resident had done.

Barriers to preparedness fell under uncertainty (for instance whether they had permission to clear trees), frustration (sourcing advice and purchasing equipment), time and perceived priorities (work commitments, approaching council).

Most residents had a limited understanding of preparedness activities but none had a comprehensive understanding of their options for improving their resilience or preparedness. Sadly, this is not uncommon as previous studies have shown residents have difficulty in applying generic information to their property.

SPRINKLER RESEARCH

Sprinklers offer an alternative approach when retrofitting existing properties for bushfire resistance. Rather than looking at modifying the building itself, sprinklers can help to reduce the intensity of bushfire attack on vulnerable building components.

While the theory of reducing radiant heat and extinguishing embers with water sprays is sound, this research is taking some of the first steps needed to gain a scientific understanding of how bushfire sprinklers perform in the hot, windy conditions of a bushfire such as those of the Currowan fire.

The research involved testing sprays in the laboratory using high-speed cameras, measuring spray deposition in outdoor experiments and computational fluid dynamics simulations to twelve different sprinkler systems in a range of bushfire conditions.

Our detailed analysis will enable the design of sprinkler systems that are resilient to the strong wind and heat of a bushfire. And importantly, this continuing research will help residents determine which sprinklers are most suitable for their property, where they should be installed and how to use and maintain them.

WHO PAYS?

The question around who should pay for the retrofitting of properties remains a vexed one, largely due to individual perceptions of responsibility.

In our previous study in Wyong, a shared expense scheme between local Council and homeowners was met with mixed response; those with the higher perception of risk seemed more willing to consider an equal cost scheme and those who thought their risk less, held the view the Council should manage the bushfire risk by clearing nearby fuels.

With the approximate average cost of $25,000 for the houses in that study, each resident would have to pay in the region of $12,500 to adequately modify their house in a shared expense scheme. Clearly, this is both a substantial personal outlay and a significant cost to local government.

As an indication of willingness to contribute, residents were asked if they would pay $5,000 in such a scheme and were considerably resistant to such a proposal.

UNDERSTANDING IS KEY

Ultimately, the choice to live in bushfire-prone areas will always involve the acceptance of some risk. The reduction of this risk is the optimum goal.

A holistic approach of education, both in targeted communities and ideally on a case-specific basis, is crucial. Residents in at-risk communities need to be empowered with a range of information about potential mitigating actions to enable them to make informed decisions about their own risk.

A WORK IN PROGRESS

Without doubt, more research is needed and with the Global Challenges project only just underway, this is happening right now. Running for a year alongside other projects, the University is engaging people from community, government and industry to shape strategies and policies for future bushfires.

Preventing the loss of life and property and reducing the enormous financial and personal costs that result from our Australian bushfires, is the goal.

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