

IDENTIFYING FUTURE BUSHFIRE HOTSPOTS AND RISK MITIGATION OPPORTUNITIES: A WESTERN AUSTRALIAN CASE STUDY

ABOUT THIS PROJECT

This research was conducted as one part of the Bushfire and Natural Hazards CRC's *Improved decision support for natural hazard risk reduction* project.

AUTHORS

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SUMMARY

The Unified Natural Hazard Risk Mitigation Exploratory Decision support system (known as UNHaRMED), developed as part of the CRC's *Improved decision support for natural hazard risk reduction* project, is a framework and software tool that can be used to assess



▲ **Above:** THIS RESEARCH APPLIED THE UNHARMED SUPPORT SYSTEM TO A CASE STUDY IN WESTERN AUSTRALIA TO DEMONSTRATE THE BENEFITS TO FIRE AND LAND MANAGERS WHEN MITIGATING BUSHFIRE RISK. CREDIT: NATHAN MADDOCK.

natural hazards risk in the face of uncertain climate and socio-economic conditions. It measures mitigation benefits over extended periods, enabling and exploration of future changes to land use, building stock, demographics, climate and mitigation options, and the effect these changes have on reduction of risk to natural hazards.

This part of the project worked closely with stakeholders in a proof-of-concept application of UNHaRMED to a Western Australia case study, answering the following questions:

1. Which areas will present emerging bushfire risks due to climate change and population growth in south-west WA?
2. What are the resulting increases in expected bushfire damage?
3. To what extent can fuel management reduce future bushfire damage?

This work demonstrates that UNHaRMED can be used to assist fire and land managers in developing policies that build well-prepared and resilient communities.

BACKGROUND

As population growth and urban sprawl result in the exposure of more people and assets to bushfires, and climate change increases the likelihood and severity of such fires, the impact of bushfires is likely to increase significantly. Consequently, it is vital to identify areas of emerging risk to enable evidence-informed policies and strategies to be developed that assist with achieving zero preventable deaths and well-prepared, resilient communities in the face of these changes.

BUSHFIRE AND NATURAL HAZARDS CRC RESEARCH

UNHaRMED was used in conjunction with end-user consultation and local

bushfire risk management plans to identify areas of emerging bushfire risk (due to climate change and population growth) in WA. Three simulation scenarios were tested in UNHaRMED to identify future bushfire hotspots and quantify bushfire risk in these regions.

All scenarios considered the same projections for population growth and increase in area demand for a range of land uses to focus on the impact of climate change on future bushfire risk: (i) no climate change, (ii) moderate climate change and (iii) severe climate change.

Researchers also investigated whether fuel management - that is, removing vegetation - influenced bushfire risk in buffer zones

around residential areas, using calculations of either (i) no mitigation or (ii) moderate mitigation, taking into account future urban developments and climate conditions.

RESEARCH FINDINGS

The results identified four areas of emerging bushfire risk in south-west WA - Gingin, Margaret River, Kalamunda and Mundaring. In these areas, results showed that bushfire damage increased dramatically with the influence of climate change and population growth (from more than 10 per cent to more than 40 per cent compared to a no-climate-change scenario). This is not surprising, as climate change is predicted to increase the severity of future bushfires, and future

residential hubs and infrastructure in these regions are expected to become more interconnected with natural environments, exposing more assets to potential bushfires.

In scenarios with increasing severity in climate change, the total estimated value of bushfire damage was found to increase significantly in urban residential areas of south-west WA compared to rural residential areas (up to ten times higher). This is likely due to the greater number and higher value of assets in urban environments.

Fuel management in residential buffer zones led to a decrease in bushfire risk compared to a no-mitigation scenario. However, the results suggest that, in cases where fuel management significantly reduces the risk of impacts posed by bushfires, climate change will result in the risk increasing again.

While this case study focused on south-west WA, researchers demonstrated that UNHARMED can be used to quantify future bushfire risk in any area, providing valuable information for investment and adaptive capacities best suited to mitigating future risks, achieving zero preventable deaths and developing well-prepared and resilient communities.

Researchers also demonstrated that UNHARMED can be used to identify where bushfire risk is likely to increase with

future social, ecological and economic change, and whether fuel management efforts such as prescribed burning can be used to reduce the risk in those areas. Other indicators are needed to quantify the social and environmental impact of bushfires in the future, to provide a complete picture of future risk.

HOW CAN THIS RESEARCH BE USED?

A major benefit of UNHARMED, demonstrated by this research, is that it can be used to test the impact of different planning strategies on future bushfire risk. For example, scenarios implementing a range of zoning strategies – such as restricted development or modified building codes for bushfire-prone areas – could be developed to quantify future bushfire risk in the face of climate change under different policy strategies. These simulation results could inform investment prioritisation for mitigation strategies and promote adaptive capacities for local governments across Australia.

Similar work could be extended to other regions in Australia or serve as the foundation to develop a national-scale decision support tool that could quantify changes in long-term bushfire risk at the scale of decades in the future.

FUTURE DIRECTIONS

To extend this research, UNHARMED could be used to explore the impact of a range of fuel reduction treatment levels and strategies on future bushfire risk in areas other than residential buffer zones (for example, different scales and distances to key assets, application of treatments over longer timeframes).

Future research could examine the impact of other risk mitigation options on future risk (for example, increased asset hardening, education/engagement, improved land use planning decisions).

Further work could build on other CRC research on quantifying intangible values and identifying social resilience. The current framework does not look at the costs and benefits of fuel management on social, environmental and infrastructure risks, but it could be considered in the future.

END-USER STATEMENT

“Policy, planning and investment decisions made today will affect the vulnerability of people and the things we value in the future. The benefit of being able to peer through a lens into a potential future, and model the effect of different policy, planning or investment decisions, is useful to guide those decisions to support more efficient and effective medium to long-term outcomes, and to understand and limit any undesirable impacts.

Research such as this supports those who can influence policy, planning and investment decisions in further appreciating and understanding this complexity. This research, focusing on fuel management and assessing the opportunities and risks associated with different approaches to reducing bushfire risk from fuel management, provides further knowledge of the foundational components of the UNHARMED support system. It will assist in guiding the modelling of the effect of fuel mitigation under varied potential future scenarios.”

Tim McNaught, Department of Fire and Emergency Services, WA

FURTHER READING

Jeanneau A, Zecchin A, van Delden H, McNaught T & Maier H (2021)

Identification of fuel management locations and risk reduction potential, Bushfire and Natural Hazards CRC.

Jeanneau A, Zecchin A, van Delden H, McNaught T & Maier H (2021) Influence of climate change and fuel management on bushfire risk in Western Australia, Bushfire and Natural Hazards CRC.

Riddell GA, van Delden H, Maier H & Zecchin A (2020) Tomorrow's disasters – embedding foresight principles into disaster risk assessment and treatment, *International Journal of Disaster Risk Reduction*, 45, DOI:10.1016/j.ijdrr.2019.101437.

Riddell GA, van Delden H, Dandy GC, Zecchin A & Maier H (2018) Enhancing the policy relevance of exploratory scenarios: generic approach and application to disaster risk reduction, *Futures*, 99, DOI:10.1016/j.futures.2018.03.006.

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