Improved understanding of wildfire risk through simulating dynamic exposure profiles

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Abstract: Disasters pose a significant risk to societies across the world. This risk will likely increase into the future, due to climate change, urban development and changing demographics. Understanding the range of potential future conditions, and the associated key uncertainties, is essential in designing disaster risk management strategies that holistically account for these drivers.

For this purpose, we have developed a spatially explicit, dynamic, multi-hazard decision support system called UNHaRMED (Unified Natural Hazard Risk Mitigation Exploratory Decision Support System), which calculates dynamic risk profiles as a combination of hazard, exposure and vulnerability. The aim of UNHaRMED is to better understand current and future risk, and assess the impact of (a combination) of risk reduction options under various future conditions. In order to do so, UNHaRMED consists of coupled models integrated into a policy support system (Figure 1). It allows the user to understand the impact of climate change, socio-economic developments and risk reduction options on the future evolution of exposure, hazard and vulnerability and hence the resulting risk.

We have applied this system to the greater and peri-urban Melbourne region in Australia for which we assessed dynamic risk profiles for wildfire. We simulated a range of futures using different climate and socio-economic scenarios, and assessed the impact of various risk reduction strategies (zoning restrictions, changes in residential density, changes in building standards and vegetation management) across these scenarios.

We found that in a rapidly growing area, the impact of socio-economic development exceeds the impact of climate change, indicating the importance of including dynamic exposure profiles in risk assessment studies. The modelling further showed that well-thought-out spatial planning strategies in combination with vegetation management can substantially reduce future wildfire risk.

The application of UNHaRMED showcases its potential in better understanding future uncertainties across hazard, vulnerability and exposure, and leveraging this information to assess the impact of risk reduction options under a range of future pathways. Lessons learned from this can then be incorporated in the design of robust and/or adaptive risk management strategies.

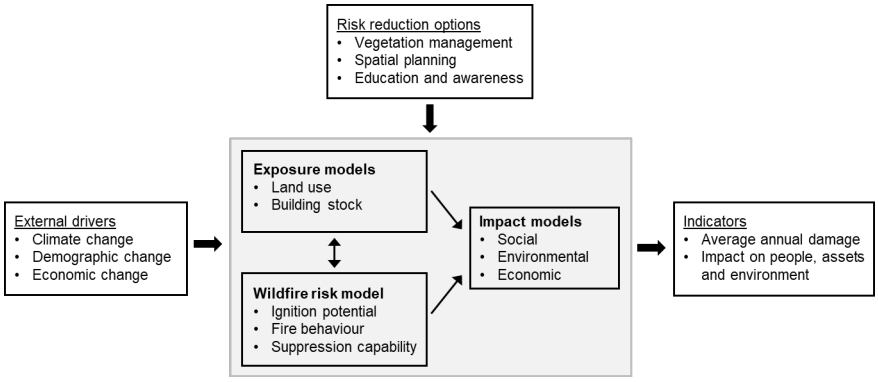

Figure 1. Overview of the bushfire risk calculation in UNHaRMED. Boxes in the centred grey area include the models incorporated; boxes in white the inputs and results

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