NAVIGATING SCIENTIFIC UNCERTAINTY IN BUSHFIRE AND FLOOD RISK MITIGATION

bushfire&natural **HAZARDS**CRC

Timothy Neale[1], Jessica K. Weir[1, 2]
[1] Institute for Culture and Society, University of Western Sydney, NSW
[2] Fenner School of Environment and Society, Australian National University, ACT

- **GIVEN:** uncertainty is a necessary part of scientific practice and method. Those engaged in risk mitigation manage these scientific uncertainties in their decision-making.
- **AND:** decision-makers, practitioners, courts and others hoping to understand risk mitigation should understand the character and influence of these uncertainties.
- **THEREFORE:** the **Scientific Diversity, Scientific Uncertainty and Risk Mitigation Policy and Planning** project conducted an extensive literature review of scientific uncertainties as they emerge in relation to bushfire and flood risk mitigation in Australia.
- The results include a novel set of categories which both experts and non-experts can use in their daily practice to discuss the scientific uncertainties that are encountered and managed in risk mitigation with courts, communities and other audiences.
- These categories are being trialled through three case studies in which scientific knowledge and scientific uncertainties shape bushfire or flood risk mitigation.

ATTEMPTS TO ANTICIPATE AND MITIGATE NATURAL HAZARDS HAVE GENERATED A DIVERSE FIELD OF NATURAL SCIENCE THAT IS DRAWN UPON BY A WIDE RANGE OF PRACTITIONERS AND DECISION-MAKERS. UNCERTAINTY IS A NECESSARY PART OF SCIENTIFIC PRACTICE, BUT HOW CAN WE NAVIGATE IT?

CATEGORIES OF SCIENTIFIC UNCERTAINTY IN BUSHFIRE AND FLOOD RISK MITIGATION

UNCERTAINTY TYPE	KEY FORMS	EXAMPLES AND ELABORATION
1: HISTORICIST **MEANING:** the uncertainties arising out of reliance on historical data, due to methodological relationships between the past, the present and the future	**GAPS:** To what extent do gaps and inconsistencies in the datasets of relevant environmental variables affect confidence?	Gaps can arise out of innovations in measuring apparatuses, variations in metrics, variations in the geographical spread of measuring apparatuses, unreliable apparatuses, the commercial sensitivity of some data, fragmented storage, funding constraints, and many other factors.
	EVENTS: Does the relative rarity, uniqueness and force of the given hazard event effect confidence?	A lack of historical exemplars of hazard events is a barrier their modelling and prediction, as data collected outside of major events (e.g. mean and medium river flow) may have limited relevance to major event behaviours (e.g. flood discharges).
	STATIONARITY: To what extent do we assume that natural systems fluctuate within an envelope of stationarity?	Climate change requires recognition of both temporal and spatial variability into the future, the parameters of which are uncertain. Incorporating this 'new' variability can present significant obstacles.
2: INSTRUMENTAL **MEANING:** the uncertainties arising out of limitations of a given apparatus, heuristic or theory	**BEHAVIOURS:** To what extent are wildfire behaviours accounted for in algorithms and simulators?	Hazard behaviours are highly complex (e.g. feedback mechanisms between fire and atmosphere, the non-linearity of catchment responses to rainfall). Difficulties with capturing behaviours in models and algorithms may also stem from the limitations of computational resources, reporting requirements and historicist uncertainties, such as available data.
	ASSETS: What are the obstacles to assessing consequences to at-risk assets and values?	Assets and values may be spatially static (e.g. property, infrastructure) or spatially dynamic (e.g. human life, flora and fauna), which influences their incorporation into topographical modelling. Dynamic entities may be excluded or rendered through static proxies.
	STANDARDS: To what extent are the relevant methodological standards contested?	Standards (e.g. FFDI, ARI) may be contested by researchers and others because they do not include all available data or relevant variables. These standards often inform the framing of scientific research.
3: INTERVENTIONIST **MEANING:** the uncertainties arising out of calculating mitigation interventions and their effects	**ADDITIONALITY:** What are a baselines and metrics through which intervention effects have been quantified?	The calculation of the benefits and effects of mitigation interventions is subject to specific forms of historicist and instrumental uncertainty, particularly in regards to quantifying the benefit of interventions. What counts as 'risk'? Is additionally directly measureable?
	REFLEXIVITY: To what extent are we interrogating the parameters and primary, secondary and emergent consequences of interventions?	Are uncertain effects of interventions on at-risk values (e.g.: social effects such as 'safe development paradox' or 'levee effect', or the ecological effects of prescribed burning and dams and levees) considered? As Mitigation strategies and methods are influenced by non-scientific aspects such as policy priorities, social values, and political context, these unintended consequences should be considered calculable and non-calculable uncertainties.

This poster is based on:

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Australian Government Department of Industry and Science · Business Cooperative Research Centres Programme · University of Western Sydney Institute for Culture and Society · Australian National University

For more information on this project visit the Bushfires & Natural Hazards CRC website or contact
Dr Jessica Weir (Project Leader, j.weir@uws.edu.au) or
Dr Timothy Neale (Primary Investigator, t.neale@uws.edu.au)