

## FIRE-DST: Fire Impact & Risk Assessment Decision Support Tool

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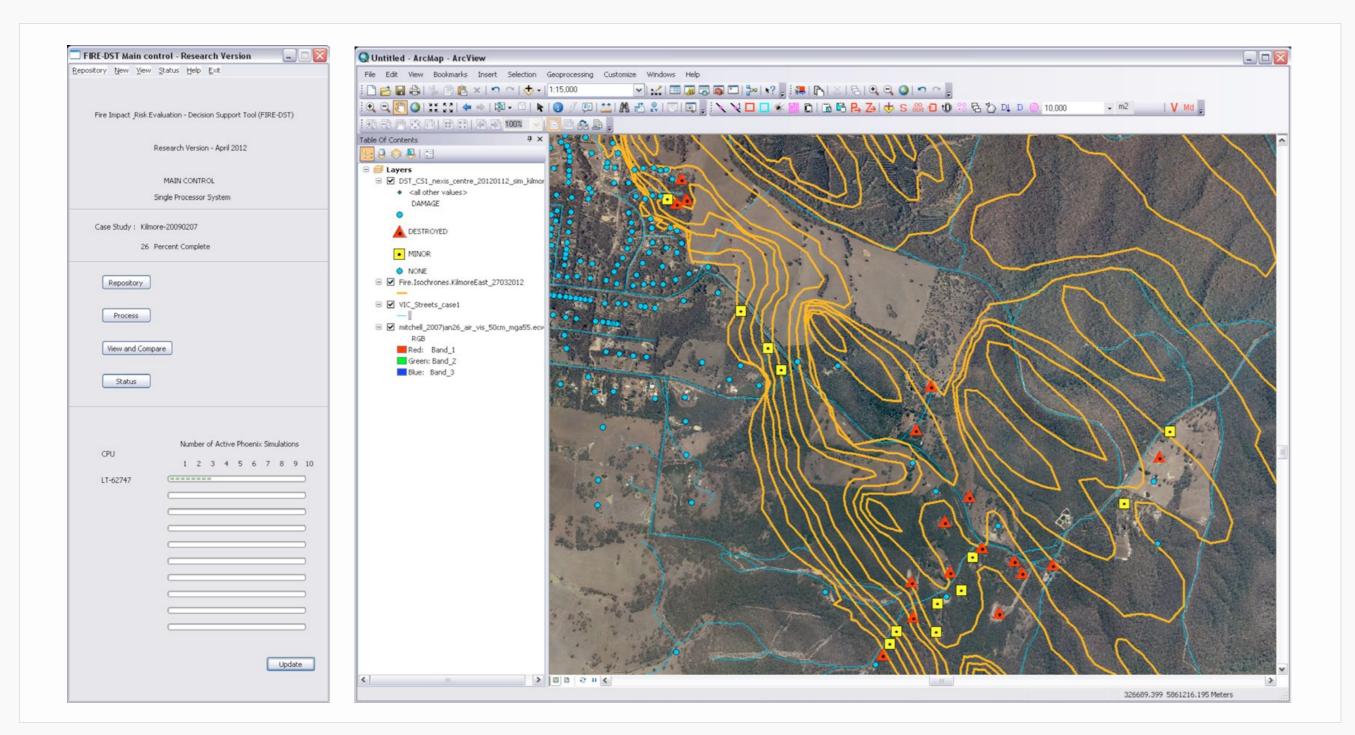
Geoscience Australia

The Bushfire CRC initiated in 2011 the project "Fire & Impact Risk Evaluation – Decision Support Tool (F.I.R.E.-D.S.T)" involving Geoscience Australia, CSIRO, Bureau of Meteorology and University of Melbourne. The project is the largest of the Bushfire CRC's suite of projects and conducts research into the multiple aspects required for the computer simulation of bushfire impact and risk on the periurban and urban interface using a new Bushfire Risk Assessment Framework (BRAF).

A new, quantitative bushfire risk assessment framework has been prepared to address the demand for improved bushfire risk information in Australia. The BRAF provides best practice guidance on bushfire risk assessment for emergency services and planning agencies. There are currently gaps in the key datasets and models required for computational bushfire risk analysis and the framework defines a structure for practitioners to assess and define all aspects of bushfire risk. The framework

Likelihood of events determined by combined probabilities of, e.g., ignition, fire weather, firespread, vulnerability models Exposure Risk Hazard Vulnerability **Impact** Fire weather, People and People and climatology and community People community Consequence of events across categories People Multiple events each with a likelihood of occurrence heritage heritage Environment Environment Infrastructure Infrastructure (natural, Public, private anthropogenic) Public, private Suppression Economy **Economy** Vegetation and Property **Property** fuel loads Commercial Commercial, Industrial, **Public Public** Public administration administration Firespread model Agriculture Agriculture horticulture horticulture Social setting Social setting **Embers** Radiation Natural Natural Smoke resources resources Infrastructure Infrastructure Severe wind Natural Natural environment environment Impact analysis Risk analysis -

Figure 1. Schematic Quantitative Bushfire Risk Assessment Framework. Components and pathways addressed by the FIRE-DST Project are emphasised in red.



**Figure 2.** FIRE-DST Main Control (Research Version) for the Kilmore fire of 7/2/2009. The town displayed at the top left is Wandong. The actual degree of damage to houses and the reconstructed fire isochrones are also displayed.

builds upon the well-defined processes in the Australian Risk Management standard (AS/NZS ISO 31000:2009) and the National Emergency Risk Assessment Guidelines. The BRAF is aimed at developing state of the art fire research in Australia, and fire risk managers in state and territory governments.

The Bushfire Risk Assessment Framework has taken a different approach from qualitative methods to analyse bushfire impact and risk. The BRAF approach separates the risk analysis process into elements that can be quantified and computed. These elements are Hazard, Exposure, Vulnerability, Impact and Risk. The impact (or consequence) of an event is defined as a function of hazard, exposure and vulnerability.

A schematic diagram of the framework is shown in Figure 1. In this diagram, users choose the pathways (dashed lines) from left to right that lead them through the framework elements to the selected impacts or risks of interest. Risk integrates the impact of events with their respective likelihoods across the entire spectrum of possible events. The framework emphasizes the distinction between risk and impact. Risk is intrinsically associated with likelihood.

A computational risk analysis will run thousands of fire impact event scenarios, each with its own likelihood of occurrence and impact. To gain a full understanding of risk, the modelled scenario events need to span a large range of likelihood and consequence in general, there will be many more events with high likelihood and low impact than rare events with high impact.

Major research completed so far has been:

- The inclusion of detailed building level information to improve exposure;
- Human factors and wind damage to determine building vulnerability;
- Using the new Bureau of Meteorology ACCESS Numerical Weather Prediction (NWP) system to provide high temporal and spatial resolution meteorology;
- The development of very-high resolution (30m) local wind modifiers;
- Changes made to the PHOENIX fire simulation system;
- The development of a FIRE-DST research tool (Figure 2);
- Initial research on convection column and smoke plume dynamics.



