USING REALISTIC DISASTER SCENARIO ANALYSIS TO UNDERSTAND NATURAL HAZARD IMPACTS AND EMERGENCY MANAGEMENT REQUIREMENTS

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Realistic disaster scenarios help us better understand disasters. They allow end-users to visualize potential impacts before disasters happen and proactively plan for these events. In this project, Realistic Disaster scenarios are developed using catastrophe loss models so that vulnerable areas, utilities and assets within our major cities can be identified.

Disaster scenarios for this project will be developed in the following manner:

- Identify realistic and relevant scenarios by using hazard maps, historical records and exposure data (Figure 1)
- Develop vulnerability models to estimate losses of property, infrastructure and life (Figure 2)
- Simulate each scenario taking into account exposure and identifying the most probable outcomes (Figure 3 and 4)
- Model long-term and cascading impacts of disasters
- Develop useful visualization techniques to highlight damage and impacts

comments from end-users

"More quantitative methods of studying hazard risk is an increasingly important capability for Governments and other stakeholders such as infrastructure owners. Consistent modeling (…) of the impacts of hazards on direct and in-direct parts of communities are required to provide useful data to weigh up and treat risks when making decisions about current and future developments". (Simon Opper, NSW SES)

Develop Scenarios

By using Risk Frontiers' hazard models we can determine the most at risk areas in Australia and the most relevant scenarios

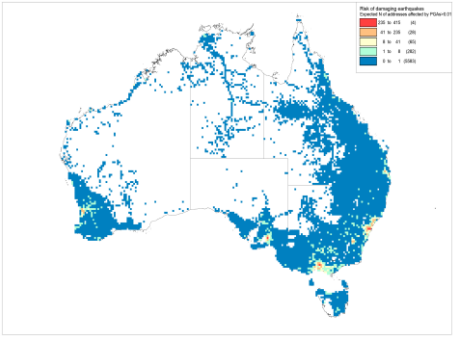

Figure1: Annual average number of addresses affected by damaging earthquakes (PGA > 0.01g)

VULNERABILITIES

Literature review and expert elicitation is used to develop vulnerability curves that estimate damage and loss

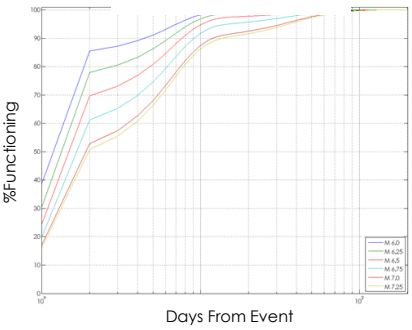

Figure 2: power plant damage curves for specific scenarios

Overlaying hazard and exposures to calculate potential losses

Below we show results for a scenario of an M6.0 earthquake in the Latrobe valley, where 80% of Victoria's energy is generated.

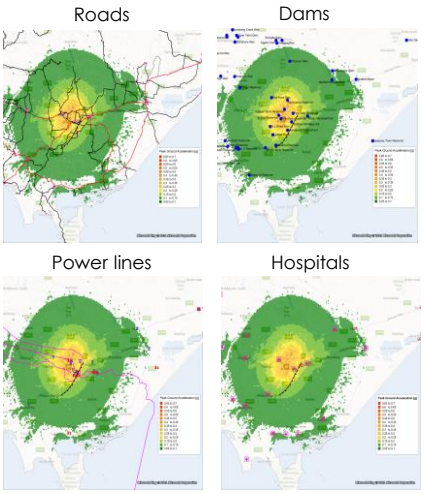

Figure 3: overlay of event hazard maps with essential infrastructure.

LOSS CALCULATIONS

We use the vulnerabilities and modelled hazard to estimate expected losses. Below we show casualties for an M5.5 earthquake in Melbourne

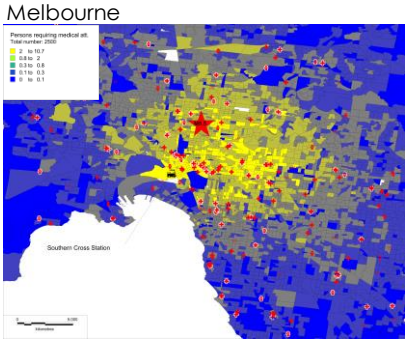

Figure 4: Footprint of casualties for Melbourne scenario overlain with hospital locations

Modelling long-term and long-range losses

Assessing the long-term impacts of a disaster is no easy feat. For example, some long term impacts of the Kobe earthquake (1997) are still felt to this day in the form of economic decline. We'll supplement our modelling in two ways:

- Case studies of past events in Australia, NZ and elsewhere, e.g.
  - Newcastle 1989 earthquake
  - Christchurch earthquake
  - Tropical Cyclone Yasi
- Study the interconnectedness of critical infrastructure and services
  - PhD project at Risk Frontiers (Emma Phillips on network modelling and analysis