



Queensland cyclone 2009\_4

- Key Topics:
- emergency management [2]
  - modelling [3]
  - scenario analysis [4]

Using realistic disaster scenario analysis to understand natural hazard impacts and emergency management requirements [5]

Realistic disaster scenarios help emergency managers better understand disasters. They allow for visualisation of potential impacts before disasters happen, and enable proactive planning for these events. This project developed realistic disaster scenarios using catastrophic loss models so that vulnerable areas, utilities and assets within our major cities can be identified.

Project: detail Notabs

Research team

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### Description


Realistic disaster scenarios help emergency managers better understand disasters. They allow for visualisation of potential impacts before disasters happen, and enable proactive planning for these events. This project developed realistic disaster scenarios using catastrophic loss models so that vulnerable areas, utilities and assets within our major cities can be identified.

The scenarios explored were a 6.0 magnitude earthquake under the Adelaide CBD, a number of different earthquakes under the Melbourne CBD and a category 4 cyclone in south east Queensland. While an earthquake of 6.0 magnitude may be considered unlikely by many, a 5.6 magnitude earthquake occurred in Adelaide in 1954. Fortunately, its epicentre was far from populated areas, however today this area is densely populated. The scenario modelling considered the impacts if the earthquake occurred at 2am and 2pm, as these times were expected to result in the highest casualties. It is predicted that an earthquake like this would result in a large number of homes being destroyed or unsuitable for occupation. For both time periods, casualties could be more than 300, with over 100 life-threatening injuries expected. Basic medical aid that could not be self-treated is estimated to be required for approximately 5,000 people.

For the Melbourne earthquake scenario, three different magnitudes were examined (5.5, 6.0 and 7.0). These are all considerably larger than earthquakes that have occurred in Melbourne, and do not lie on any known faults that are considered active. As with the Adelaide scenario, impacts were modelled based on a 2am and 2pm occurrence. Under all scenarios examined, damaged caused by shaking and liquefaction would render parts of Melbourne inaccessible for large extents of time and cause long term infrastructure damage. Immediate casualties would range from under 200 for a 5.5 magnitude occurring at 2am, to more than 8,500 for a 7.0 magnitude occurring at 2pm. Those with life threatening injuries would range from less than 100 to more than 4,500. Under the most severe scenario, basic medical aid that could not be self-treated is estimated to be required for approximately 100,000 people.

The south east Queensland cyclone scenario was modelled on the track taken by Severe Tropical Cyclone Dinah in 1967. In the modelled scenario, the cyclone remained offshore, but made its closest passage to the mainland near Harvey Bay, and then moved offshore as it moved south, but staying close to the coast until south of the New South Wales border. Approximately 50,000 buildings were simulated to experience moderate structural damage, which may lead to occupants needing to seek emergency shelter. A further 8,000 would suffer major structural damage, and in many instances will need to be completely rebuilt. Older homes would bear the brunt of this damage (70-90%) as they were constructed prior to any stringent wind resistant design requirements. As a result of the damage, 50,000 people would need alternate accommodation. The cost of the damages would run into the tens of billions of dollars.

Modelling plausible scenarios such as these quantifies the impacts on society, critical infrastructure, lifelines and buildings, along with the natural environment. This allows emergency managers to understand the implications for their agencies so they can better prepare for, or mitigate the impacts of, events that are beyond their experience.

Download:  
 Using Realistic Disaster Scenario Analysis - Andrew Gissing and Simon Oppel [37]

### Related News



New online - November 2017

17 NOV 2017

[38]



New online - February 2017

08 FEB 2017

[39]





Researchers test tropical cyclone deployment strategies  
CYCLONE, ENGINEERING

07 DEC 2016

[40]



Journal publishes important research

26 OCT 2016

[41]



New online - September 2016

14 SEP 2016

[42]



New online - March 2016

15 MAR 2016

[43]



What if a large earthquake hit Adelaide?  
EARTHQUAKE, MODELLING

04 MAR 2016

[44]



Magazine explores CRC research, case studies and technology  
COMMUNITIES, LOCAL KNOWLEDGE

29 FEB 2016

[45]





16 JUL 2015

Science direct in videos  
COMMUNITIES, SCENARIO ANALYSIS

[46]



25 MAY 2015

Major award for CRC researcher  
COMMUNITIES, RESILIENCE

[47]





29 OCT 2014













Newsletter 2 - fatalities and building losses

[48]

Publications

Year	Type	Citation
2019	Book Chapter	Krupar, III, R. [49] & Smith, D. J. [50] <i>Hurricane Risk</i> 1, 199-214 (Springer, 2019).DOI [51] Google Scholar [52] BibTeX [53] EndNote XML [54]
2019	Conference Paper	Pikusa, E. [28] <a href="#">The mitigation exercise: a long term mitigation planning process, with a coastal flooding case study in Adelaide</a> [55]. <i>AFAC19 powered by INTERSCHUTZ - Bushfire and Natural Hazards CRC &amp; AFAC annual conference 2019</i> (Bushfire and Natural Hazards CRC, 2019). Google Scholar [56] BibTeX [57] EndNote XML [58]
2019	Journal Article	Gissing, A. [10], Opper, S. [60], Tofa, M. [61], Coates, L. [62] & McAneney, J. [13] <a href="#">Influence of road characteristics on flood fatalities in Australia</a> [63]. <i>Environmental Hazards</i> 18 , (2019). DOI [64] Google Scholar [65] BibTeX [66] EndNote XML [67]
2017	Report	Koschatzky, V. [21], O'Brien, J. [68] & Somerville, P. [17] <a href="#">Earthquake Scenario, Melbourne</a> [69]. (Bushfire and Natural Hazards CRC, 2017). Google Scholar [70] BibTeX [71] EndNote XML [72]
2017	Report	Loridan, T. [8] & Mason, M. S. [6] <a href="#">Using realistic disaster scenario analysis to understand natural hazard impacts and emergency management requirements: annual project report 2016-17</a> [73]. (Bushfire and Natural Hazards CRC, 2017). Google Scholar [74] BibTeX [75] EndNote XML [76]
2017	Report	Krupar, III, R. [49] & Mason, M. S. [6] <a href="#">A modified Severe Tropical Cyclone Marcia (2015) scenario: wind and storm tide hazards and impacts</a> [77]. (Bushfire and Natural Hazards CRC, 2017). Google Scholar [78] BibTeX [79] EndNote XML [80]
2016	Conference Paper	Rumsewicz, M. [81] <a href="#">Research proceedings from the 2016 Bushfire and Natural Hazards CRC and AFAC conference</a> [82]. <i>Bushfire and Natural Hazards CRC &amp; AFAC annual conference 2016</i> (Bushfire and Natural Hazards CRC, 2016). Google Scholar [83] BibTeX [84] EndNote XML [85]
2016	Conference Paper	Krupar, III, R. [49] & Mason, M. S. [6] <a href="#">Forecasting the impact of tropical cyclones using global numerical weather prediction ensemble forecasts: a Tropical Cyclone Marcia (2015) wind and rain hazard analysis</a> [86]. <i>AFAC16 (Bushfire and Natural Hazards CRC &amp; AFAC annual conference 2016)</i> (Bushfire and Natural Hazards CRC, 2016). Google Scholar [87] BibTeX [88] EndNote XML [89]
2016	Conference Paper	Kloetzke, T. [90], Mason, M. S. [6] & Krupar, III, R. [49] <a href="#">Evaluating topographic influences on the near-surface wind field of Tropical Cyclone Ita (2014) using WRF-ARW</a> [91]. <i>AFAC16</i> (Bushfire and Natural Hazards CRC & AFAC annual conference 2016) (Bushfire and Natural Hazards CRC, 2016). Google Scholar [92] BibTeX [93] EndNote XML [94]
2016	Journal Article	Loridan, T. [8], Coates, L. [62], Argüeso, D. [95], Perkins-Kirkpatrick, S. [96] & McAneney, J. [13] <a href="#">The Excess Heat Factor as a metric for heat-related fatalities: defining heatwave risk categories</a> [97]. <i>Environmental Hazards</i> 17 (2016). DOI [98] Google Scholar [99] BibTeX [100] EndNote XML [101]
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2016	Report	Mason, M. S. [6] <a href="#">A southeast Queensland tropical cyclone scenario</a> [105]. (Bushfire and Natural Hazards CRC, 2016). Google Scholar [106] BibTeX [107] EndNote XML [108]
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2015	Report	de Oliveira, F., Dimer [113] & Mason, M. S. [6] <a href="#">Using natural disaster scenarios to better understand emergency management requirements: Annual project report 2014-2015</a> [114]. (Bushfire and Natural Hazards CRC, 2015). Google Scholar [115] BibTeX [116] EndNote XML [117]
2015	Report	Mason, M. S. [6] & Parackal, K. [118] <a href="#">Vulnerability of buildings and civil infrastructure to tropical cyclones: A preliminary review of modelling approaches and literature</a> [119]. (Bushfire and Natural Hazards CRC, 2015). Google Scholar [120] BibTeX [121] EndNote XML [122]
2014	Journal Article	Coates, L. [62], Haynes, K. [14], O'Brien, J. [68], McAneney, J. [13] & de Oliveira, F., Dimer [113]. <a href="#">Exploring 167 years of vulnerability: An examination of extreme heat events in Australia 1844-2013</a> [123]. <i>Environmental Hazards</i> 15 (2014). DOI [124] Google Scholar [125] BibTeX [126] EndNote XML [127]

Presentations & Resources

DATE [128]	TITLE [129]	DOWNLOAD	KEY TOPICS
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10 Apr 2015	Disaster Scenario Analysis 2015 NSW RAF Presentation [133]	 2.62 MB	[134] (2.62 MB) [135], multi-hazard [136]
02 Jul 2015	Using realistic disaster scenario analysis [137]	 0 bytes	[138] (0 bytes) management [139]
27 Aug 2015	Learning from the past, planning for the future [139]	 166.29 KB	[140] (166.29 KB) multi-hazard [141]
03 Sep 2015	An earthquake loss scenario for Adelaide [142]	 2.16 MB	[143] (2.16 MB) [144], engineer [145]
26 Feb 2016	Fire Australia Summer 2015-16 [146]	 11.81 MB	[147] (11.81 MB) [148], fire impact [149]
17 May 2016	Using realistic disaster scenario analysis to understand natural hazard impacts and emergency management requirements [149]	 2.09 MB	[150] (2.09 MB) management [151]
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30 Aug 2016	Forecasting the impact of tropical cyclones using global numerical weather prediction ensemble forecasts - Richard Krupar III [156]	 3.05 MB	[157] (3.05 MB) cyclone [159], impact [160]
18 Apr 2017	Using Realistic Disaster Scenario Analysis [160]	 1.62 MB	[161] (1.62 MB) management [162]
02 Oct 2018	New flood model takes rapid, regional approach [162]	 1.87 MB	[163] (1.87 MB) [164], flood [165]
30 Jul 2019	Evidenced based capability maturity assessment for severe to catastrophic events [166]	 938.83 KB	[167] (938.83 KB) planning [168]

Posters

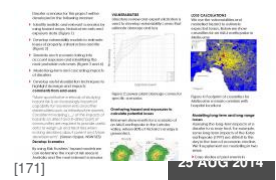


[170]

Can we better understand how scientific knowledges work in risk mitigation through scenario exercises?

[170]

This project focuses on how a better understanding of the role of science in decision-making will help ...



[171]

Using realistic disaster scenario analysis to understand natural hazard impacts and emergency management requirements

[171]

Realistic disaster scenarios help us better understand disasters.



[172]

Disruption of critical infrastructure during prolonged natural disasters

[172]

The project aims to qualify and quantify the impacts of prolonged and multi-hazard natural hazard events on...



[173]

Realistic Disaster Scenarios: Severe Tropical Cyclone SE QLD

[173]

CYCLONE [159], MODELLING [3]

What if a category 4 tropical cyclone impacted south east Queensland? What would the impacts be? Could our...



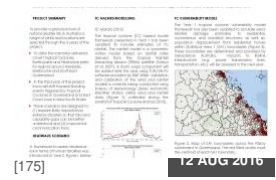
[174]

A Mw 6.0 Adelaide Earthquake Scenario

[174]

EMERGENCY MANAGEMENT [2], MODELLING [3]

What-if a magnitude 6.0 earthquake happened near Adelaide SA? IN this project we have developed such scenario...



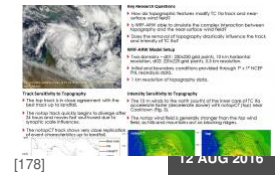
[175]

Using realistic disaster scenario analysis to understand natural hazard impacts and emergency management requirements

[175]

INFRASTRUCTURE [176], RESILIENCE [177]

The study of historical occurrences of natural disasters only provides a very limited view of the full range...



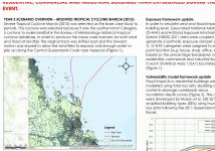
[178]

Evaluating topographic influences on the near-surface wind field of Tropical Cyclone Ita (2014) using WRF-ARW

[178]

INFRASTRUCTURE [176], RESILIENCE [177]

This study utilises the advanced research version of the weather research and forecasting (WRF-ARW) model to...



[179]  
Realistic disaster scenario analysis: North QLD cyclone

[179]  
EMERGENCY MANAGEMENT [2], MODELLING [3]

A modified severe Tropical Cyclone Marcia (2015) landfall event was generated. The modified case study...

Linked Projects

Mapping and understanding bushfire and natural hazard vulnerability and risks at the institutional scale  
[180]

ECONOMICS AND STRATEGIC DECISIONS [181]

Prof Roger Jones  
Victoria University [182]



[182]

Improved decision support for natural hazard risk reduction  
[183]

ECONOMICS AND STRATEGIC DECISIONS [181]

Prof Holger Maier  
University of Adelaide [184]



[184]

Cost-effective mitigation strategy for building related earthquake risk  
[185]

BUILT ENVIRONMENT [186]

Prof Michael Griffith  
University of Adelaide [184]



[184]

Cost-effective mitigation strategy for flood prone buildings  
[187]

BUILT ENVIRONMENT [186]

Dr Ken Dale  
Geoscience Australia [188]



[188]

Improving the resilience of existing housing to severe wind events  
[189]

BUILT ENVIRONMENT [186]

Prof John Ginger  
James Cook University [190]



[190]

Natural hazard exposure information modelling framework  
[191]

BUILT ENVIRONMENT [186]

Dr Krishna Nadimpalli  
Geoscience Australia [188]



[188]

An analysis of building losses and human fatalities from natural disasters  
[192]

SCENARIOS AND LOSS ANALYSIS [193]

Dr Katharine Haynes  
University of Wollongong [15]



[15]

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