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AN ANALYSIS OF HUMAN FATALITIES AND BUILDING LOSSES FROM NATURAL DISASTERS

Annual project report 2014-2015

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Cover: Flooding in Queensland. Photo by Stutterstock.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Measuring and understanding the impacts of natural hazards in terms of the toll of human life and building damage is a fundamental first step to enabling efficient and strategic risk reduction. By taking a scientific approach to the collection and analysis of accurate information and intelligence, governments, agencies and the wider community are better positioned to reduce disaster risks.

Specifically, the project will provide a longitudinal analysis of the social and environmental circumstances that led to fatalities in order to examine trends over time in terms of exposure and vulnerability. These trends will also be interpreted in the context of emerging issues (e.g. ageing population and population shifts, building codes etc), and how these issues might influence vulnerability and exposure trends in the future. The project will also provide an analysis of building damage by hazard and state/territory due to natural hazards. The timeframe for both fatalities and building damage will be from 1900 to the present.

The outcomes of this project will inform a wide-range of emergency management and government end users to advise on and update policy, practice and resource allocation.

END USER STATEMENT

During April 2015 flooding in Queensland and New South Wales killed nine people. Between the two States there were somewhere between 150 and 200 flood rescues by emergency services. How many lucky escapes were there amongst these rescues? How many other near misses that were not reported we will never know. But there's likely to be a few.

More staggering as Risk Frontiers recently reported in the Sydney Morning Herald is that more than 70 deaths across Australia have occurred in 5 years.

- Why did these people become trapped or choose to enter floodwater?
- What were the circumstances, perceptions, knowledge and motivations that led to the choices that ended so tragically?
- Was every one of these deaths avoidable?
- What does the notion of resilience mean to these people that died?

What is the objective ratio of causal factors leading to fatalities from personal decisions or risk taking compared to risks imparted from infrastructure design or land use (flood) risk management? How can both people and policy be influenced and shaped by evidence and data?

These are just some of the questions that the community and emergency managers must ask and learn from to influence the risk vectors.

Through this project Risk Frontiers will create a valuable repository for many researchers to investigate these factors: a boon for the truly diverse and large sphere which will need wide collaboration and commitment over the next few years. The team will also employ their own experienced research methodologies to provide flood emergency managers with important analysis and outcomes which will shape much needed investment in the space.

Simon Opper, *Emergency Risk Management, State Emergency Service, NSW*

PROJECT DETAILS

BACKGROUND

The goal of the project is to measure and gain a greater understanding of the impacts of natural hazards in terms of the toll of human life, injuries and building damage in order to provide an evidence base for emergency management policy and practice.

The foundation for this work will be the use of the Risk Frontiers' database *PerilAUS*. The database contains historical data (dating back to the earliest days of European settlement in Australia) on the incidence (magnitude, affected locations, etc.) and consequences (property damage and fatalities, etc.) of such events. In particular, the data contains many of the names of the deceased, which enables the collection of more detailed information on the circumstances of the death from coronial records.

In addition to *PerilAUS*, the Insurance Council of Australia's Disaster List, which lists the insurance cost of natural disasters since 1967, will be used to compile information relating to the costs of building losses due to natural hazards in all states and territories in Australia.

PROJECT OBJECTIVES

The objectives of the project are:

1. An analysis of fatalities, in terms of demographics, social and environmental circumstances surrounding deaths.
2. An analysis of people otherwise affected by natural hazards – injured, near-misses, rescued.
3. An analysis of building damage and losses arising from natural hazard events over the last century.

The hazards to be studied include: floods, cyclones, earthquakes, heatwaves, severe storms and bushfires[1]. The social and environmental factors of interest include:

Social - Age, gender, occupation, preparation, risk reduction activities, knowledge and warnings received, activities and decisions leading up to and at the time of death, capacity to act, mode of transport, medical cause of death etc.

[1] Bushfire loses will be investigated for building loses only. A detailed analysis of bushfire fatalities has already been conducted in previous projects and will only be included here in terms of an overall analysis and comparison of the fatalities from all hazard events.

Environmental - Details of the location and particular hazard: e.g. flood type, flood height and intensity (such as "a one in 100 event"). This will also include, where possible, details on the location of the deceased with respect to the hazard.

MAJOR OUTCOMES ANTICIPATED

The major outcomes expected from the project are:

- A longitudinal and geographical examination of trends in the exposure and vulnerability of people and buildings.
- An interpretation of trends in exposure and vulnerability in the context of emerging issues (e.g. ageing population, population shifts, climate change), in order to determine potential future trends.
- Evidence-based data to assist with appropriate emergency management and government decision making.

PROJECT METHODOLOGY

(1) Update the fatality and building loss data currently held by Risk Frontiers

1) Update the fatality and building loss data currently held by Risk Frontiers.

Over the past 20 years researchers at Risk Frontiers have documented the details of natural hazard events that have caused building damage and/or loss of life in Australia, dating back to European settlement. This database serves as a unique resource in Australia.

However the dataset is not complete or detailed enough in respect of the circumstances leading to the fatality. This information is crucial in order to meet the objectives of this project and conduct a comprehensive analysis of use to emergency services and government officials. Work is therefore ongoing to update the names of fatalities within the Risk Frontiers data set and concurrently access coronial files to gather more detailed information. These activities are detailed in full below within the section 'what has the project been up to'.

Data relating to building losses is also being updated. This project outcome will be one of the final outputs in order to ensure the data is as complete as possible.

(2) Statistical analysis of the data

Once the data is fully collected and checked, a thorough statistical analysis will be undertaken.

In order to examine the relationship between demographics, social circumstances (warnings received, preparation, reasons behind actions, activities at the time of death, etc.) and the environmental circumstances (location, weather, hazard details, etc.) associated with fatalities, past vulnerability and exposure trends will be interpreted in the context of emerging

issues (e.g. ageing population, population shifts and climate change) in order to determine potential future vulnerability and exposure trends.

For example, in terms of the analysis on floods, it is hypothesized that statistically significant trends in terms of vulnerability and exposure will be present in the data, such as:

- A decrease in fatalities overall.
- A majority of fatalities killed outside, and not while sheltering in the home.
- An increased vulnerability of certain groups such as children, young men, the disabled, the elderly and women in terms of their capacity, awareness and decision making prior to death.
- Changes in terms of the circumstances of death as warnings and preparations improve with the professionalization of emergency management and forecasting.
- Increased number of fatalities associated with cars (e.g. crossing flooded watercourses).

This analysis of the building loss data will highlight spatial, temporal and hazard-specific trends.

(3) Presentation of aggregate results to endusers

A series of conference presentations and reports will be prepared in order to discuss, receive feedback and refine the results to ensure the outputs are of use to the end-users.

Following this, academic journal papers will be prepared for submission.

ETHICAL CONSIDERATIONS

Privacy of the deceased and their families

In the first instance, only the researchers whose details appear on the various ethics applications will be able to view detailed line data on the fatalities. Aggregated results will be provided to the end-users, or any third party, in the form of tables and figures with commentary on the statistical analysis of various time series, thus protecting the privacy of individuals whose details appear within the data set.

Data collected specifically by this project will be made available to other researchers, subject to ethics and data provider approval processes ensuring that the conditions under which the data was originally collected are maintained.

Electronic information will be stored on the secure Risk Frontiers computer server and will be password protected. Hard copy information will be kept locked in filing cabinets in researchers' offices and destroyed once it has been entered electronically. In order to take a further step to ensure confidentiality, the names of the deceased and the data pertaining to that death will be stored separately.

PROJECT DELIVERABLES

Reports:

In addition to the quarterly and annual reports the following deliverables will be produced by the team.

Due Date	Deliverable
30-Oct-15	Final report on flood fatalities
31-Dec-15	Report on data quality for fatalities from tropical cyclone, earthquake, severe storm and the environmental and social circumstances surrounding each fatality
31-July-16	Final report with a detailed examination of fatalities from tropical cyclone, earthquake and severe storm in Australia and a comparison between fatalities from all hazards including bushfires, extreme heat and flood
31-Dec-16	Report on a detailed analysis of all historical natural hazard building losses (by state and time period)
30-Mar-17	Report on the analysis of injury, near-miss and rescue data
15-Jun-17	A report on the impact of changes to policy and procedures relating to natural hazard risk

Publications:

The following academic publications will be produced by the team. Please note that a paper on heatwave fatalities has already been published.

Submission Date	Topic
Late 2015	Exploration of flood fatalities
Mid 2016	Exploration of lightening fatalities
Late 2016	Exploration of fatalities from all natural hazard events
Early 2017	Exploration of building losses

WHAT THE PROJECT HAS BEEN UP TO 2014/2015

The following work has been conducted over the last 12 months:

- ***Locating names of the deceased***

  This involves not only finding names for those nameless deceased currently held within the PerilAUS database but also identifying new deaths. This then enables the team to be able to search further details on the circumstances of the fatality from coronial records.

- ***Researching physical flood characteristics***

  This work is now concentrating on closing the final gaps within PerilAUS from the 1950s to mid 1980s.

- ***Adding details from accessible archived coronial records***

  Accessible coronial inquests are currently being examined at various archives and coronial offices throughout Australia in order to add more data around the circumstances of each fatality. This search is most successful where both the date and name of the deceased has already been obtained and is the justification for spending a significant amount of time over the last year updating the names of the deceased within PerilAus. Data that has or is currently being updated includes:

  - up to 1985 for Vic,
  - up to 1978 for Qld,
  - up to 1962 for NSW,
  - up to 1953 for SA, and
  - up to 2014 for Tas.

- ***Making applications for access to closed records***

  Data access to Coronial inquests is problematic in some areas, as reported in the previous quarterly report. The status of the research process and ethics applications in the various states is detailed below:

  - ***Tasmania:*** Due to our Tas Fire Service end-user's assistance researchers have been successful in gaining records to the inquest files for all years, not just to 1939 (Tasmania has a 75-year withholding period). Researchers visited the offices in late June.
  - ***Western Australia:*** An application has been submitted to the WA Coronial Ethics Committee. A letter of support from the WA Dept. Fire and Emergency Services end-user accompanied the application.
  - Applications to the Coroners for ***Queensland*** and ***South Australia,*** and for the ***NSW*** Glebe (Sydney), coronial courts are in the process of being submitted. This would enable access to the inquest files from the withholding periods of those states, being some 35, 60 and 53 years respectively. However, the NSW situation is more complex and most records of deaths in rural areas are held at the local court for that area: a search of all these is beyond the scope of this project.
  - ***ACT:*** an application has been submitted via email to access any/ all ACT records [There is no public access to records but they supply (for a fee) data on 1993-2000 inquests if date/ name are supplied and prior to 1993 if

name is supplied.]

- ***NT:*** The team has successfully gained access to a number of the records between 1973 and 1999 and will be visiting the offices in early July.
- An application to the ***National Coronial Information Service***, who hold inquest records for all states and territories from 2000 (June 2000 for Qld) to the present, has been submitted. This department is based in Melbourne and this ethics application will also cover access to Victorian data between 1984 and 2000, thereby providing a complete record for Victoria.

The following additional flood data has been added to *PerilAUS since March 2014.*

Fatal flood events: 548 ➔ 1131 (an increase of 107%)

Number of flood deaths: 1207 ➔ 1854 (an increase of 54%)

Named flood deaths: 606 ➔ 1635 (an increase from 50% to 88%)

468 coronial files have been accessed so far, with each providing significantly more data on the circumstances of the fatality. For example, the Coroners' reports list the correct name, occupation, where the deceased was found, the people who were with the deceased and other witnesses and the date of death and when found. The witness statements give a fuller account of the deceased and details up to the time of death, including age, name of relatives, where the deceased came from, the reasoning behind decisions made that led to the death, the actions of the deceased and knowledge or forewarning about the flood dangers, ability to swim, blood alcohol level, etc., who was with the deceased and time of death. Further details are sometimes present that detail the weather and the state of the river (e.g. rising or falling, speed and depth of flood waters), type of flood and distance from entering the river to where the body was found and its location (e.g. in a tree).

However, it should be noted that although the focus over the last year has been on floods, work updating the other hazards, particularly in terms of the names of fatalities, has also been conducted. In particular, those states and territories with smaller numbers of deaths (Tas, NT, ACT, SA) enabled the team to search for all hazard fatalities, instead of just floods, during the visit to the various records offices. However, the states of NSW, Qld and Vic have required several visits just to complete searching for inquest reports for floods.

ENDUSER ENGAGEMENT

Newsletters: Three email newsletters have been sent out to all endusers detailing the progress of data collection and any other news.

The Research Advisory Forum: A presentation on the progress of the project was presented at the Research Advisory Forum in April 2015 at the RFS headquarters, Homebush NSW. Fruitful discussion with endusers during the breakout sessions centred on access to data and potential policy outcomes from the analysis.

AFAC and Bushfire Natural Hazard CRC conference, NZ, 2-4 September 2014**.** Robin Van den Honert and Lucinda Coates gave oral and/ or poster presentations on work completed to date. Rob and Lucinda submitted a paper entitled, *Estimating the impacts of natural hazards on fatalities and building losses* for possible inclusion in the conference proceedings.
Rob gave an oral presentation for our project, on *Estimating the impacts of natural hazards on property and building losses*. This was a first pass at some of our work to date but also building on previous Risk Frontiers' work on normalisation of loss data. Lucinda presented a poster on the heatwaves paper recently published as one of our first outputs: *The heat is on... and has been for a while, new research shows*.

A teleconference was held 5/8/2014 with nine end-users. Items of discussion included what types and kinds of outputs would be most useful to end-users, how to best categorize injuries and what other BNHCRC projects were aligned with the two Risk Frontiers projects.

End-users have been individually rung and emailed to requiest assistance in providing data, especially around rescues, injuries and deaths. Our Tasmanian end-user from Tas Fire Service was instrumental in gaining us access to the full record of Tasmanian coronial inquest records. We also asked for, and received, a great Letter of Support from our WA end-user from WA DFAT. This kind of end-user engagement is ongoing.

As each state or territory is visited, any end-users in that state/ territory are advised of our visit and asked if they have any issues they wish to discuss in person or if they just want to touch base.

PUBLICATIONS LIST

Coates L, Haynes K, O'Brien J, McAneney K J and Dimer de Oliveira F (2014) A longitudinal examination of extreme heat events in Australia 1844-2010: exploring 167 years of social vulnerability, *Environmental Science and Policy* (accepted for publication).

CURRENT TEAM MEMBERS

LIST OF CURRENT INTEGRATED PROJECT TEAM MEMBERS

Project Leaders	Dr Katharine Haynes
	Dr Rob van den Honert
Researchers	Lucinda Coates
	Andrew Gissing
	Dr Ryan Crompton
	Dr Deanne Bird
Cluster Lead End User	Corey Shackleton (NSW RFS)
End Users	Simon Opper (NSW SES)
	Christopher Lee (OEH, NSW)
	Bob Stevenson (SES, SA)
	Melissa O'Halloran (NSW RFS)
	Michael Morgan (SAMFS)
	Damien Killalea (TFS)
	Jennifer Pidgeon (DFES)
	Ed Pikusa (SAFECOM)
	John Richardson (Red Cross)