

BUILDING RESILIENCE THROUGH FLOOD RISK COMMUNICATION

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Bushfire and Natural Hazards CRC, Macquarie University BNHCRC RAF: 12-13 April 2018





Australian Government Department of Industry, Innovation and Science Business Cooperative Research Centres Programme



PROJECT FOUNDATIONS



An analysis of human fatalities from flood hazards in Australia, 1900-2015

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Risk Frontiers, Macquarie University, NSW



STORIES OF SCIENCE

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O July 5. 2017 & Operations

People continue to enter floodwater in vehicles and on foot, despite many knowing the risks

Researchers from the Bushfire Natural Hazards CRC and Risk Frontiers, Macquarie University, analysed the who, when and why of flood fatalities, so they could target information to high-risk groups

MAIN ACTIVITIES

- 1. Understanding behaviour in and around flood water
 - Survey Research (Driving into floodwater)
 - Cue utilisation
 - Decision-making (Driving into, and recreating in, floodwater)
- 2. Evaluating and adapting flood risk communication materials







SURVEY RESEARCH – DRIVING INTO FLOODWATER

- 1) Defining Floodwater FMA 2017
- 2) NSW SES Driving through Floodwater Survey (Pilot/Extension) (Rachel Begg)
- 3) Other NSW emergency services Driving through Floodwaters Survey (Lisa Sato)
- 4) Water on Roads Survey (Pilot)
- 5) Public Driving through Floodwater Survey (Arifa Ahmed)
- 6) Intentions to turn around/not enter floodwater young people (Marvin Najem)

SURVEY RESEARCH - DRIVING INTO FLO

Extended invitation to other SES jurisdictions to take part

1) Defining Floodwater – FMA 2017

- 2) NSW SES Driving through Floodwater Survey (Pilot/Extension) (Rachel Begg)
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Your participation is requested! At the breakout session, and beyond...

NSW SES – DRIVING INTO FLOODWATER SURVEY (PILOT)

Aims

- a) Explore experiences of driving into floodwater in a work context
- b) Explore experiences of turning back from floodwater in a work context
- c) Look at associations with
 - demographics, training,
 - organisational safety climate,
 - influencing factors



SURVEY ADMINISTRATION

- Circulated link in weekly newsletter 'Members Connect'
- 2) Link on Members Facebook page
- 3) mid-October to end-November



□ a. Less than 15cm
 □ b. 15cm - 30cm
 □ c. 30cm - 45cm
 □ d. 45cm - 60cm
 □ e. 60cm- 95cm
 □ f. 95cm or above

OVERALL PROFILE OF RESPONDENTS

- 1) 77 responses
- 2) 37% female; 63% male
- 3) 44% most often drive passenger vehicle; 35% light truck/dual cab
- 4) 41% drive SES vehicle rarely (<1 per/m), 29% few times a month, 29% most weeks
- 5) 80% get deployed to work in flood/storm conditions
- 6) 86% volunteer members; 14% paid staff members

TRAINING

1) Flood rescue

- a) 44% no current flood rescue qualifications
- b) 19% Level 1, 10% Level 2, 10% Level 3

2) Driving training

- a) 62% drive operational vehicles
- b) 23% 4WD operations
- 3) Safety training
 - a) 62% maintain team safety



EXPERIENCE OF FLOODED ROADS

56% experience flooded roads at least once or twice a year

Driven through floodwater in the last two years...?

- a) 30% as a driver in a NSW SES vehicle
- b) 27% as a passenger in a NSW SES vehicle
- c) 45% in their own private vehicle

(26 respondents completed the section about their experience)

Turned around?

53% reported that they'd turned around in a situation that other colleagues might have continued driving through (22 respondents completed the section about their experience)

DRIVING INTO FLOODWATER

Risk perception

- 1) Generally not felt to be risky
- 2) However 16% rated seriousness of harm at higher level

Factors that influenced decision to drive into floodwater
1) Lack of alternative route, careful consideration of the situation, Professional SES training/knowledge, knowing the road well

"The water on the road was unexpected, around a bend, there was not sufficient time to come to a complete stop safely to make an evaluation. Water on road was not signposted"

TURNING AROUND FROM FLOODWATER

Risk perception

- 1) Felt it would have been risky to go through (55% rated risk as 5-7 on 7-point scale) Interestingly 33% rated it as low risk (1-3)
- 2) Main risks were perceived as damage to vehicle (35%), and being washed away in vehicle (26%)

Factors that influenced decision to turn around from floodwater
1) careful consideration of the situation, NSW SES's attitude towards safety, professional SES training/knowledge

"I talked the driver out of attempting to drive through it. Other 2 passengers let me do the talking so not sure of their opinions, but I suspect were relieved. The driver was over confident being in a high clearance 4wd ute"

EXTENSION OF THE SES SURVEY TO OTHER JURISDICTIONS











South Australian State Emergency Service





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DEFINING FLOODWATER

- 1) Fundamental question
- 2) Pilot survey (FMA 2017)
- 3) Initial focus on 'experts' and organisational definitions

4) Ideas for next wave of responder and public surveys

- a) What do people regard as 'floodwater' (on a road)?
- b) When does a puddle become a flood?
- c) Is there consistency in evaluation 'experts' vs 'public'?

University	
DRIVING INTO FLOODWA	ATER - DEFINING 'FLOODWATER'
We need your help. Two Bushfire and Natural Hazards CRC researche (Risk Frontiers) are starting a research project on	rs - Mel Taylor (Macquarie University) and Kat Haynes Flood Risk Communication.
We need to define the term "floodwater" to the into floodwater'. Could you please give us your vi	general public (and others) in the context of 'don't <u>dri</u> ews on how best to define it?
2. Do you have a formal/official definition 2. Do you have a formal/official definition 4. Yes 4. No 4. Don't kne 1. Yes, could you write it (or the parts of it you rem	n of 'floodwater' in your organisation/industr w ember) and write it below
2. Do you have a formal/official definition Yes No Don't kno If Yes, could you write it (or the parts of it you rem	n of 'floodwater' in your organisation/industr w ember) and write it below
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DEFINING FLOODWATER





How do you define floodwater?

Do both these photos show dangerous floodwater?

Would you enter the water in a vehicle?

WATER ON ROADS SURVEY

- 1) Collection of 16 photos of water on roads
- 2) Piloted on 32 attendees at TOP last week
 - a) Would you consider driving through?
 - b) Would you consider this road 'flooded'?
- 3) Cut down to a set of 8 photos based on analysis of data
- 4) Now ready for more testing.....with 'experts'





ADDITIONAL RESEARCH DATA

1) Traffic offenders program (Ian Faulks – Technical Panel)

Data collected from more than 230 traffic offenders in program in 2017

Oka	y, let's look at the decisions we make when we are driving and the roads are flooded
Q16) Have you ever driven over a ford or coverage (cost internet to be in the
	see that a lot of cabseway (see image below for a typical example
	e Yes 🗆 No
Q17)	Have you ever driven through floodwater?
	□ Yes → Go to Question 20 [Section 2, on page 4]
	Not sure
218) H	lave you ever turned around at floodwater/flooded road (decided not to enter)?
	□ No → Go to Question 22 [Section 3 on page 6]
219) N	/hy did you decide to turn back?
b	recause the water was too deen
an	d fast flowing to be safe
	J

ADDITIONAL RESEARCH DATA

- 1) Cue utilisation research (Gemma Hope)
 - a) Evidence that higher cue utilisers were able to make faster and more accurate judgements about the risk of flooded roads (low/mid/high risk photographs)

The Role of Risk Perception MACQUARIE and Cue Utilisation in Natural Disasters and Emergency Situations: Decision-Making of Motorists to Drive Through Floodwaters

> STUDY AMS: The safety of individuals near floodwater brazards is of critical importance. To assist in improving safety outcomes, this research explored the cognitive decision-making processes of motor vehicle drivers in choosing to drive through floodwaters.

BACKGROUND

Driving on a road that is submerged has the potential to result in serious vehicle damage and fatalities. Even though water depth may appear shallow, poor water clarity and the refraction of light can distort this perception and even hide deep channels that may have been eroded by relatively fast moving waters (Hyndman & Hyndman, 2014). Regardless of depth, the force of water flow against the wheels, or side, of a vehicle has the capacity to wash it downstream, with water 15cm or higher for small vehicles, and 45cm or higher for 4WDS,

apable of floating the vehicles, potentially pushing it off road and potentially drowning the occupants

RESEARCH STUDENT: GEMMA-ROSE HOPE

RESEARCH SUPERVISOR: DR MEL TAYLOR

HIGHLIGHTS Globally, floodwaters are among the most prevalent of

natural hazards, cited as the highest cause of mortality due

PARTICIPANTS

This study included 87 licenced NSW motor vehicle drivers, aged 17.92 to 48.92 years (24 Male, Mage = 27 years, 5D = 4.87; 62 Female, Mage = 24 years, 5D = 6.77; 1 Not Specified, Mage = 20 years).

METHOD

MEASURES

Risk perception was assessed through measures of risk progensity and engagement in risk taking behaviours. Cue Utilisation was assessed on the driving version of EXPERTIS 2.0, comprising of drour cue-utilisation performance tasks including: a feature identification task; a poired association task. a feature identification task; a poired basis for the cue utilisation typologies: Relatively higher and lower cue utilisers.

METHOD

Participants completed an online computer-based study using the EXPERTISe 2.0 platform (Wiggins, Loveday & Auton, 2015). A floodwater hazard identification task was developed to assess participants' ability to: - Detect a floodwater hazard - Measured using mean response latency scores. - Accurately attribute the level of risk associated

 with the floodwater hazard
 Measured using summed response accuracy scores.

Participants additionally completed a retrospective task that asked participants about their experiences when deciding to turn back, or drive through, floodwaters. This allowed for the assessment of environmental factors that may have contributed to the decision making processes of motor vehicle drivers' experiences of floodwaters.

RESULTS

Participants with higher cue utilisation demonstrated good performance on the floodwater hazard identification task, with significant results revealing relatively lowier response latency and relatively higher response accuracy, in identifying floodwater hazards and their associated level of risk. No significant results were found for measures of risk perception. No significant interaction effects were found for any of the environmental factors in the

retrospective task.

Results of this study support the hypothesis that : individuals with higher cue utilisation have a lower mean response time in identifying floodwater hazards and a higher summed accuracy score in correctly attributing the associated risk levels of the floodwater hazard, in comparison to individuals with lower cue utilisation.





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INDIVIDUAL VERSUS GROUP DECISION-MAKING



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PUBLISHED RESEARCH ON VEHICLE ACCIDENTS...

- 1) There is a relationship between carrying passengers and vehicle accident risk for young drivers.
- 2) Driver death rates for young drivers increases with the number of passengers.
- 3) Driver death rates for those aged over 30 decrease when passengers are present.
- 4) Young male drivers have higher death rates than young female drivers.
- 5) While carrying passengers significantly increases the death rates for both genders, it is more dramatically so for male rather than female drivers.
- 6) Death rates of young drivers with passengers is higher at night than during the day. Particularly between 12 and 5.59am

INITIAL RESEARCH (DRAFT PLAN)

- 1) Participants: Macquarie University students
- 2) Scenario: Photos and verbal description to set the flood and social context.
- 3) Variables: Gender, number of passengers, importance / reason for the journey.
- 4) Methodology:
 - a) Driver / passengers will be asked a series of questions in relation to the risk and to make a decision in terms of entering or turning around.
 - b) Driver / passengers will be encouraged to discuss their options
 - c) Qualitative data will be collected as participants reason through their decision making
 - d) Quantitative data will be collected via a short questionnaire that examines their general risk propensity and their individual views and attitudes to the scenario they just completed.
- 5) Follow-on work may include utilising the general public as participants; altering the flood risk; testing a wider age range, cultural background and driving experience.

CHILDREN AND FLOODWATER



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INITIAL RESEARCH (DRAFT PLAN)

- Work with children to discuss their perceptions, views and experiences of playing in floodwaters.
- 2) Evaluate current messaging with parents and children.
- 3) Develop new or improved messaging with children and their parents.
- 4) Participants: Up to four groups of children from NSW, QLD, Northern Australia. Initial contact will be made through SLSA / Nippers and other relevant clubs.

NEXT STEPS: EVALUATIONS

- 1) Consultation with end-users and at risk groups to negotiate which risk communication materials to utilise for evaluations
- 2) Development of evaluation scenarios following photo pretesting, survey results and experimental work with passengers and children.
- 3) Preparation, tweaking and improving risk communication materials in consultation with endusers and at risk groups
- 4) Collaboration with Macquarie Department of Marketing – Have been evaluating traffic safety campaigns

OUTPUTS

- 1) Academic papers
- 2) End-users directed 'research into practice' briefs
- 3) Evaluation tool and methodology
- 4) Evaluated materials





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