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# ECONOMICS OF NATURAL HAZARDS

Annual project report 2014-2015

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Version	Release history	Date
1.0	Initial release of document	26/10/2015



Australian Government  
Department of Industry and Science

**Business**  
Cooperative Research  
Centres Programme

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**Publisher:**

Bushfire and Natural Hazards CRC

October 2015

Citation: Pannell D, Hailu A, Gibson F, Florec V, 2015, Economics of Natural Hazards: Annual report project 2014-2015, Bushfire and Natural Hazards CRC

Cover: This project takes an economics perspective to help deliver value for money in natural hazard management.

Photo: David Bruce, Bushfire and Natural Hazards CRC.



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## EXECUTIVE SUMMARY

The project tackles from an economics perspective issues relating to non-financial benefit estimation, risk analysis, and development of decision-making frameworks that would help deliver value for money from public investments in natural hazard management. It has a broad scope in terms of natural hazards, including fires, earthquakes, floods, cyclones and tsunamis. It aims to improve the management of bushfires and other natural hazards by delivering the following outcomes:

- Improved recognition of non-financial benefits of management and policy for natural hazards, influencing decisions about budget levels and about management and policy options.
- Improved decision-making about management and policy options considering the full range of relevant factors (technical, social, economic, environmental, policy).
- Improved quality of economic analysis throughout the sector, resulting in stronger and more defensible analyses, and stronger support from Treasury.

The research team has extensive experience in non-market valuation, integrated modelling and the economics of environmental and natural resource management and policy. The team has also recruited four outstanding environmental economists with extensive experience in.

Over the year, the project has actively engaged with end users and the growing list now includes agencies from SA, NSW, TAS, VIC, and WA: Fire and Emergency Services Commission (SA); Attorney General's Department; Rural Fire Services (NSW); State Fire Management Council (TAS); South Australian Metropolitan Fire Service; NSW National Parks & Wildlife Service; Department of Environment, Water and Natural Resources (SA); and State Emergency Management Committee (WA). The projects major accomplishments for the year include the following:

- An agreement has been reached with the State Emergency Management Committee (SEMC, WA) to conduct the first case study on integrated economic modeling of management options in WA
- A proposal was submitted for a workshop on the 'Economics of natural hazard mitigation' as part of the 8th Australasian Natural Hazards Management Conference to be held in Perth, WA during October 12-14. The proposal was successful and preparations are now underway.
- Research team members have conducted several meetings with end users and are have provided advice to agencies in WA regarding the collection of economic information for hazard management
- Research activities in the project began in January 2015 as planned. A comprehensive literature search work was conducted for non-market valuation studies on the impacts of natural hazards; and a paper has been drafted and will be available in September 2015.



## **END USER STATEMENT**

**Ed Pikusa**, *National Risk Assessment, Measurement and Mitigation Subcommittee (RAMMS), Fire and Emergency Services Commission, SA*

The engagement of this project with end users and other related projects in the cluster has been more than satisfactory. The recent engagement with the Western Australian Risk assessment project and the Uni of Adelaide research project is important.

The work has generated interest across many end users, and with timely and high quality deliverables, is at this stage looking very promising.



## INTRODUCTION

Natural hazards have a number of things in common when it comes to planning, decision making and evaluation of public investments. First, they are complex and, therefore, effective decision making and evaluation requires synthesis and integration of many different types of information within a context of high risk and uncertainty. Second, addressing these issues well requires an inherently multidisciplinary approach, often requiring information from biological sciences, physical sciences, social sciences and economics. Third, data requirements for strong decision making and helpful evaluation are extensive, and existing data sources are usually insufficient for this purpose. Fourth, some of the key impacts of natural hazards are relatively intangible, making them difficult to quantify, especially in a way that can feed into decision making. Finally, research into planning, decision making and evaluation for natural hazards is relatively lacking.

In the case of bushfires, for example, decision making requires combining information on physical, biological, social and economic aspects such as: risks of fire occurrence, risks of fire spread, frequencies of fires of different severities, impacts of weather conditions on these things, losses associated with bushfires of different severities, reductions in those losses under different prescribed burning regimes, and costs of different prescribed burning regimes. Experience in a Bushfire CRC project shows that only a minority of the required information is readily available in existing datasets. Intangible benefits of bushfire management include effects on life, health, feelings of safety, biodiversity, threatened species, and water quality. Integrated economic analysis of strategic bushfire decisions has been undertaken in Australia only for two case studies. The knowledge gaps for other hazards, such as earthquakes, floods, cyclones and tsunamis, are similarly significant.

This project aims to fill key knowledge gaps on issues related to values, risks, and decision making to deliver value for money from public investments in natural hazard management.

This is the first annual report written since the project research activities began in earnest in January 2015. In the next section, we provide a summary of the main components of the project. This is followed by a presentation of the projects key activities over the reporting period. The last two sections present a list of presentations made by the project and the current list of members in the research team.



## PROJECT BACKGROUND

The project has three main components that are outlined below.<sup>1</sup>

### ESTIMATE THE NON-FINANCIAL BENEFITS

End-user organisations have indicated the need for a stronger focus on dollar valuation of non-financial benefits from natural hazard policy and management. The challenge here is that there are so many different contexts within which these values may be needed, and it is not practical or affordable to conduct new studies for each context. Environmental economists have developed a technique called “benefit transfer”, which involves attempting to extrapolate from existing studies, but even this is not an ideal solution. It requires a high level of economics expertise, and it relies on the existence of relevant studies to extrapolate from, which is often not the case for natural hazards.

This project will develop an innovative tool for efficiently generating estimates of dollar values for non-financial benefits. The aim is to develop a tool that people with only moderate economics knowledge are able to use, and that people with no economics knowledge can learn from.

### INTEGRATED ECONOMIC ANALYSIS OF MANAGEMENT AND POLICY

This component of the project involves integration of technical, social, biophysical and policy information within an economics framework with a decision-making focus. Therefore, it is a study that requires high levels of participation by end users. Strengths of the integrated approach to the analysis include that: it provides a mechanism for bringing research results into decision making about policy and management; it combines economic rigour with stakeholder participation; and it provides information in a form that is useful in discussions about resourcing and policy design. Two case studies will be identified in consultation with the CRC and stakeholders. This study differs from other integrated assessment studies or work on decision support systems (DSSs) in that it takes into account the non-financial benefits of mitigation activities. The project is currently collaborating with an end user to conduct its first case study in Western Australia as described in the next section.

### DEVELOP GUIDELINES FOR SOUND ECONOMIC ANALYSIS

This component of the project involves developing an accessible and understandable guide to undertaking economic analysis of natural hazard management and policy. The work will be based on: experience in the research undertaken to address the other project objectives; experience in the Bushfire CRC; relevant research literature and textbooks. The guide aims to be helpful to agencies in:

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<sup>1</sup> The project's initial plans included a component (a PhD student project) focusing on risk analysis in relation to budget allocations for emergency services. This PhD position has been advertised but no suitable candidate has been found so far.



- formulating its needs for economic analysis,
- knowing what to ask economists (internal or external) to do,
- evaluating the quality of economic analysis that has been conducted,
- understanding the data requirements, and
- supporting economists beginning work on natural hazards.



## WHAT THE PROJECT HAS BEEN UP TO

The major activities to date have included the recruitment of staff, staff workshops, literature review and the selection of scope and region for the first case study. The project also submitted a proposal for a workshop on the 'Economics of natural hazard mitigation' in the 8th Australasian Natural Hazards Management Conference to be held in Perth, Western Australia during October 12-14. The proposal was successful and preparations are now underway for the workshop.

### RESEARCH TEAM WORKSHOPS

The Research Team has conducted two workshops. The first, a planning workshop, was held on December 2nd, 2014 and focused on work allocations and individual contributions to the project. The workshop was also used to discuss the scope for the planned studies on valuation and integrated modelling. The second workshop was two days long and involved non-market valuation experts participating in the project. It outlined the conceptual framework for the 'value-tool' component and deliberated on issues relating to data availability and value measurement methods.

Members of the research team have participated in workshops organised by the CRC including the Professional Development Program (PDP) on "Introduction to the Emergency Management Industry" and also on "International emergency response laws" at the AFAC conference.

### END USER ENGAGEMENT

The project has actively engaged with its end users over the course of the year. The number of end-users for the project has grown and now includes agencies from SA, NSW, TAS, VIC, and WA: Fire and Emergency Services Commission (SA); Attorney General's Department; Rural Fire Services (NSW); the State Fire Management Council (TAS); South Australian Metropolitan Fire Service; NSW National Parks & Wildlife Service; Department of Environment, Water and Natural Resources (SA); and State Emergency Management Committee (WA).

The first end-user meeting (a phone hookup) occurred on the 5th of March, 2015. Topics discussed include the background to the project, the role of end-users, progress reports, ideas for the first case study and the Research Advisory Forum (RAF) in Sydney.

Project researchers attended the RAF in Sydney (8th and 9th of April) and held group discussions with end users from NSW, SA and WA. The project team plans to collaborate with Victoria University (Celeste Young) and University of Adelaide (Holger Maier). In Western Australia, research team members have had several meetings with agencies (BGPA, OBRM, and SEMC) to discuss and provide advice on issues relating to the evaluation of bushfire management strategies and the sourcing of economic information for bushfire management purposes.



## LITERATURE REVIEW WORK

A comprehensive literature search for non-market valuation studies on “impacts” of natural disasters (bushfire/wildfire, flood, storms, cyclone/hurricane, earthquake and tsunamis) was undertaken by the project. The relevant publications have been identified and catalogued. The project is writing a paper on non-market valuation of benefits and costs related to natural hazards; this paper will be available in September 2013.

## INTEGRATED MODELLING CASE STUDY

An agreement has been reached between the project and the Emergency Management Committee (SEMC, WA) to undertake the first case study on integrated modelling of hazard management options in WA. SEMC is Western Australia’s peak emergency management body and has initiated the State Risk Project, which aims to improve current understanding of the risks the State faces in relation to various natural and human-made hazards. For this purpose, SEMC is currently actively collecting data at the district level on the potential consequences of different hazards and the likelihood of those consequences actually materialising. In the next phase of the State Risk Project, SEMC aims to explore the costs and benefits of different mitigation strategies for certain hazards analysed in the Project.

Our project will inform the design of economic models for the next phase of the State Risk Project by conducting a benefit-cost analysis of hazard management strategies in Western Australia. The case study will use data that SEMC is currently collecting through workshops organised at district levels.



## **PUBLICATIONS/PRESENTATIONS**

David Pannell presented a poster at the World Congress of Environmental and Resource Economics (WCERE), Istanbul, 28 June to 2 July, 2014. Title: "Lighting fires to prevent fires: The economics of planned burning in Australia"

A project poster on the 'Economics of natural hazards' was presented at the AFAC 2014 conference in Wellington, New Zealand, 2-5 September 2014.

Fiona presented to a meeting of the Australia and New Zealand Emergency Management Recovery Sub-Committee in Adelaide, May 20th, on the "value tool" project.



## **CURRENT TEAM MEMBERS**

The research team currently includes David Pannell (Professor, UWA), Atakelty Hailu (Assoc/Prof, UWA), Michael Burton (Prof, UWA), Fiona Gibson (Assist/Prof, UWA), Veronique Florec (Researcher, UWA), and Abbie Rogers (Assist/Prof, UWA, but on maternity leave for 2015). Dave, Fiona, Michael and Abbie are responsible for the valuation or value tool component of the project. The value tool group is backed by four outstanding environmental economists with extensive experience and high expertise in valuation to be collaborators in this research: Professor Peter Boxall (University of Alberta, Canada); Professor John Rolfe (Central Queensland University); Professor Rob Johnston (Clark University, USA); and Professor Nick Hanley (University of Sterling, UK). Dave, Atakelty and Veronique are responsible for the work on integrated economic modeling of options for hazard mitigation.