

FIRE NOTE

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ECONOMIC CONTRIBUTIONS TO BUSHFIRE MANAGEMENT AND POLICY

SUMMARY

What does economics have to offer to the bushfire sector? The *Economics and future scenarios* project sets out to answer this question in a review of the international peer-reviewed economics literature applied to bushfire management. The review is motivated by growing advocacy for economic information to help inform resource allocation decisions in the context of socially damaging bushfire events, and predictions for a worsening of the situation for some regions of Australia (Cary et al., 2012). The objective of the review is to appraise the breadth of economic information and methods in relation to bushfire management and policy challenges. The contribution offered by the review is to inform a more complete view of where different economic approaches can be brought to bear on management and policy challenges faced across diverse bushfire decision-making contexts. A summary of the review with a focus on the review framework is presented. The framework defines contributions that economic ideas and analysis can make to bushfire management and policy, set against a categorisation of decisions that identifies the range of decisions commonly made in the sector. Making the link between economic approaches and decisions in the sector is critical to answering the overarching question about what economics has to offer.

ABOUT THIS PROJECT

This *Fire Note* reports on a framework developed to review economic contributions to bushfire management and policy as part of the *Economics and future scenarios* research project conducted under the Bushfire CRC *Managing the threat* program.

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BACKGROUND

While the quantity and diversity of economic analyses of the bushfire sector has increased in recent years, there is (i) a lack of appraisal of the direction and utility of this literature, and (ii) a lack of connection between economic analyses and the diverse range of decisions made in bushfire policy and management to which such economic (and other) analyses can be targeted.

The research review of economic applications to bushfire management and policy aims to address these gaps and provide insight into the contributions of economics in bushfire management, which includes benefit-cost analysis but, importantly, extends beyond monetary costing of fire impact. The review expands the agenda to include areas of economics such as decision-support systems, institutional and behavioural analysis and political-economic interactions. These areas of research offer insights into complex resource allocation and policy decisions in response to bushfire risk.

BUSHFIRE CRC RESEARCH

The work reported is part of the broader project. The objectives are:

- (i) To develop future scenarios of bushfires for selected areas in Australia using critical, evidence-based knowledge
- (ii) To identify appropriate economic methods for understanding key examples of economic implications associated with bushfires, and
- (iii) To provide preliminary analysis of projected economic implications associated with future bushfires in Australia, based on the future scenarios.

The review of economic applications to bushfire reported in this *Fire Note* contributes to the second objective, and will provide a guide to appropriate methods to support achievement of the third objective.

PUBLIC POLICY AND ECONOMIC EFFICIENCY

In the context of public policy, economics offers ideas, tools and frameworks for understanding diverse questions of efficiency, trade-offs between competing priorities, investment of scarce resources across competing priorities, societal values and preferences, and relationships between institutions, politics and human behaviour. Economic efficiency is a central concept across these diverse areas. It concerns how resources are used with respect to the broader public interest – inefficient use of public resources is characterised by a loss of potential social value. In this way, economic efficiency is not concerned with economising as an end in itself; it recognises that how resources are used is important to the outcomes and benefits enjoyed by the community.

Dr Helena Clayton and Professor Stephen Dovers are leading the economics and policy component of this project, in collaboration with Dr Geoffrey Cary, who leads the project overall. The economics and policy research are integrated with investigation into future bushfire scenarios that is being undertaken by Josh Mulvaney, Eddy Collet, Dr Malcolm Gill and Dr Cary.

RESEARCH OUTCOMES: UNDERSTANDING THE CURRENT STATE OF KNOWLEDGE

The framework for the current review combines three perspectives. The first, the focus of this *Fire Note*, combines understanding from economic theory with a thematic review of the literature looking at four different methods of economic analysis (benefit-cost analysis methods, decision support systems, institutional and behavioural analysis, political-economic analysis). Based on this, the research has identified the varied points in policy and institutional systems where decisions are made. The review process has led to the development of a framework to categorise decisions relating to bushfire management and policy. The additional two perspectives of the framework are addressed under Future Directions (page four).

The following section briefly describes the four methods of economic analysis. These methods offer different approaches for evaluating aspects of economic efficiency in the context of bushfire management and public policy (see Breakout Box 1, page 1 for background on public policy and economic efficiency).

1. Benefit-cost analysis

While it is generally accepted that the size and frequency of unplanned bushfire in Australia is significant enough to justify public investment, in a benefit-cost analysis (BCA) framework it is legitimate to question how much investment is justified and where investment would offer the best value for money. BCA is designed to evaluate such questions through valuation of the net benefits (i.e. benefits minus costs) from public investment across alternative projects, activities or policies. For example a BCA could be used to evaluate the net benefits of an overall fire management program or specific aspects of a program such as fuel management strategies, or community education and preparedness measures.

2. Decision-support frameworks

Decision-support frameworks are linked conceptually to BCA, but will often provide a more systematic framing of the decision problem to account for trade-offs and

Table 1: Locating decision makers relevant to bushfire management and response (adapted from Handmer and Dovers 2013)

Institution	Stakeholders
Government	
Central executive: Federal and State	Leader of government, ministers, departmental secretaries, ministerial staff and advisors
Local	Strategic, development and infrastructure planners
Agencies	Fire services (rural and urban); state emergency services authorities; land conservation and wildlife management agencies; commercial forestry managers; water catchment management authorities; forestry, agriculture and primary industry departments; health, education and tourism departments
Legislature	Federal/state parliament; parliamentary committees
Community	Charities; volunteer/community groups; unions
Private sector	Insurance; real estate; property/land developers; infrastructure/utility providers
Individuals, households and businesses	Individuals and families; small business operators; agricultural and private forest landholders

constraints in guiding the prioritisation of resources to meet particular management objectives. Compared to BCA, decision-support frameworks can provide a more pragmatic approach to evaluate and support decisions.

In decision-support frameworks, more diverse types and sources of data can be used, and more flexible decision assessment such as cost-effectiveness analysis, expert or community-based opinion methods applied when monetary valuation of the benefits of an investment decision is not feasible. In the associated Bushfire CRC project led by Professor David Pannell at the University of Western Australia, a decision-support framework to assist in the prioritisation of bushfire risk mitigation effort has been developed and is being trialled in case study settings in Australia and New Zealand.

3. Institutions and human behaviour

Literature in this area is focused on understanding human values, motivations, and behaviour. The emphasis in this area of economics is on understanding how behaviour is influenced by the 'institutional' environment. This 'institutional' environment encompasses the broader public policy setting, laws and regulations, property tenure and market-based settings, as well as the broader social context of culture and norms of behaviour, social cohesion and trust. The challenge of designing policy and institutions to influence individual (or community-level) behaviour towards social goals is central to this area of economics.

Application of this sort of understanding to bushfires might provide insights into how

different institutional settings may influence individual or community decisions about where to live in the landscape, whether or not to volunteer and reciprocate the volunteer effort of others, and how much to invest in personal bushfire risk mitigation. These are private decisions that have important implications for public bushfire management.

4. Political-economic analysis

This area integrates research across the related disciplines of political science and economics. There is a small but significant literature in this space that focuses on evaluating economic efficiency in relation to the efficiency of government response to disasters, and the effect of bushfire budget policy and political pressures on the economic efficiency of bushfire management decisions.

In the case of budgetary policy in a bushfire context, the focus of such analysis has been on evaluating the potential for emergency funding for bushfire suppression to create disincentives for managers to account for the beneficial effects of fire in the landscape, relative to the immediate potential negative effects of unplanned fires. Such approaches can give rise to inappropriate policy outcomes.

Political-economic analysis can also consider the extent to which political pressures arise from the media and the disincentive to account for the full set of benefits and costs associated with bushfire. The concern from an economic perspective is that if the benefits of bushfire (where relevant) are not adequately accounted for in bushfire-management decisions, then investment in risk mitigation will be higher than socially

Table 2: Categorisation of decisions – Linking decision scale, setting and challenges with methods of economic analysis

Scale	Decision setting	Management/policy challenge	Economic analysis ¹	
Macro: Allocating public resources across competing sectors	Central executive levels of government; community/charity	Public resourcing of bushfire management relative to other public good portfolios (e.g. health, education, defence, environment)	BCA	Relative net social benefits
		Allocation of ‘emergency’ funding for particular fire events	I/B BCA P/E	Social acceptance of risk Net benefits from ‘emergency’ funding Incentives for fire managers to consider full set of benefits and costs of resource allocation decisions
Middle: Allocating resources across a fire program or within risk mitigation or recovery strategies	Central executive, agency and local levels of government; community	Investing resources across a fire program (e.g. research, risk modification, preparedness, response, recovery)	BCC	Relative net social benefits across alternative management activities
		What decision-support processes are best able to support economically efficient risk management decisions?	DSF	Identifying fire management priorities to minimise costs and net losses from fire
		Investing within risk management strategies to achieve management objectives (e.g. which fuel management options/technologies offer the best value for money?)	I/B	Evaluating efficiency of fire management decisions under alternative decision support or policy strategies
		Investment priorities under changing profile of risk in the context of global change	BCA DSF	Relative net social benefits across options Prioritisation of resources for the protection of multiple assets
Multi: Policy and institutional considerations within allocation decisions	Central executive, agency and local levels of government; private sector; Individuals, households, businesses	Sharing public/private risk mitigation responsibility	BCA	Expected net social benefits of alternative policy options to address changing risk across the landscape
		Policy to respond to the effects of political, and media pressure on fire management decisions	DSF	Changing priorities for risk mitigation under alternative global change scenarios
		Is there a public policy case for influencing/restricting land use change (e.g. housing, wildlife/carbon plantings)?	I/B I/B; P/E BCA; DSF I/B	Evaluating private incentives for risk mitigation Distortionary effects on private investment from public subsidisation Collaborative capacity and reciprocity across private landholders Evaluating the effects of: 1) budgeting policies; 2) political imperatives, media, society expectation; 3) heuristics and other sources of biasing in the context of risk management Net benefits of alternative land use policies Evaluation of trade-offs across multiple values and bushfire risk Evaluating the extent to which private investment decisions account for bushfire risk to life and assets Evaluating expected behavioural responses to alternative policy mechanisms

¹This column links in the four methods of economic analysis outlined on page 2. The abbreviations are as follows: BCA – Benefit-cost analysis; DSF – Decision-support frameworks; I/B – Institutional and behavioural analysis; P/E – Political-economic analysis

desirable. It may seem counterintuitive, but the literature suggests that if the political and government systems discourage risk-taking too much, the result can be the excessive use of resources to reduce bushfire activity beyond that which is desirable from society’s point of view.

A FRAMEWORK FOR CATEGORISING DECISIONS

Based on the review of economic theory and associated bushfire literature, the

project team has developed a framework to categorise bushfire management and policy decisions. The role of the framework is to make explicit the link between bushfire management and policy decisions and key methods of economic analysis and illustrate the multiple ways in which economics can inform bushfire management and policy. The framework makes links between i) where decisions are made across policy and institutional systems (see Table 1), ii) the scale of and type of decisions, iii) management and

policy challenges, and iv) modes of economic analysis.

Over 100 publications from the international bushfire economics literature were analysed to develop the framework. Specific areas were highlighted beyond those commonly promoted or understood, such as the total cost of impact from a fire event.

The key elements of the framework are shown in condensed form in Table 2. The full version

was developed by the research team and then circulated to key Bushfire CRC end users for feedback. The feedback has been used to refine the framework and the overall focus of the economics review.

HOW COULD THE RESEARCH BE USED

The framework links decisions to economic methods. The aim is to provide a tool for end users to identify where different economic methods can assist their fire management and policy challenges across diverse decision-making contexts. The table at right outlines an example using prescribed burning to illustrate the links between critical management and policy questions and the four areas of economic analysis that could be applied to evaluate and support decisions around such questions.

FUTURE DIRECTIONS

The immediate next step is to communicate the integrated review/framework of decision categories to a broader audience of end users and researchers by seeking peer-reviewed publication of a review manuscript.

Two areas of further research underway will draw upon and extend the review. The first area is a targeted review of the benefit-cost evaluations applied to bushfire. This will address specific interests of the Bushfire CRC in key examples of benefits and costs associated with bushfire under current and future bushfire scenarios. The other area will involve a survey of leading decision makers across the bushfire management and policy sector. This work aims to evaluate the use and usefulness of economic information in practice, across diverse bushfire management and policy settings, including in the context of future fire scenarios. The outcomes of the review of economic applications to bushfire management will be integrated with the outcomes of the survey to create a useful end user reference.

Table 3: Applying the categorisation of decision framework to prescribed burning

Management/policy question	Economic methods
Which fuel management strategies offer the best use of a given budget for mitigating bushfire risk to public good assets?	Benefit-cost; decision-support
What are the trade-offs (unwanted costs) associated with prescribed burning?	Benefit-cost; decision-support
How does fuel management on private land affect the benefits of prescribed burning on public land?	Decision-support; institutional-behavioural analysis
Should public funds be used to support private fuel reduction activities?	Institutional-behavioural analysis
To what extent does political pressure and direction influence the net benefits from prescribed burning?	Political-economic analysis
How much should be invested in prescribed burning compared to other prevention strategies?	Decision-support
What is the optimal level of prescribed burning (accounting for different burn strategies and their effect on suppression effectiveness and cost)?	Decision-support

END USER STATEMENT

There are number of gateways for fire agencies and other emergency managers in Australia to add economic modelling to informed decisions and policy.

This project continues to provide the foundations for economics to be incorporated into the decision models and policy development across the sector. It gives examples of how economics can be used to influence our decisions. It identifies a range of economic frameworks that can be applied dependant on the economic question to be considered.

The next step for end users, as the research continues, is to develop our capacity to understand which economic frameworks to apply to which question, and how to ensure quality data is sourced for the models to ensure robust outputs.

– Andrew Stark, Chief Officer, ACT Rural Fire Service

REFERENCES / FURTHER READING

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