PROVIDING DECISION SUPPORT TO INCIDENT MANAGEMENT TEAMS

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Operations Research in Bushfire Incident Management

Incident Management Teams (IMTs) work in high pressure environments, making complex decisions while often relying on incomplete information. New technologies have improved the tools available to IMTs, aiding and improving decision making. The availability of new tools comes with a increase in information available to IMTs. Although having accurate and relevant information is a boon to decision making, there is point where decision makers become overwhelmed by the volume of information they have to take into consideration.[1] Incident controllers are expected to take weather conditions, fire spread prediction, fuel state, assets under threat, the value of assets, location of vulnerable people, and more into account and use all this information to make decisions while balancing multiple objectives. These objectives are outlined by the AFAC position on bushfire priorities listed in the box below.

Operations Research (OR) is the use of analytical techniques such as mathematical modelling to help make better decisions. Established methods in OR may be very valuable to IMTs and could provide methods that simplify the decision making process of IMTs. The aim in the development of decision support tools is not to replace any functions or members of an IMT by completely automating decisions, but to support the IMT in applying their knowledge and experience. Past research in application of OR to fire management has focused largely on long term planning such as the location of facilities, fleet composition and fuel management.[2]

AFAC Bushfire Priorities

AFAC identifies the following priorities in the case where bushfires cannot be controlled:

1. issue warnings to enable those at risk to protect themselves,
2. protect vulnerable people,
3. protect assets the community has identified as valuable,
4. stop building-to-building fire spread in built-up areas, and
5. protect less valuable or more isolated assets.

This research considers the application of OR to the design of decision support tools to assist IMTs fighting large fires. The type of questions an IMT faces that may benefit from OR methods are:

- How, when and where should available resources be used to best meet protection priorities?
- Is a building defendable?
- Which assets should be defended and what resources should be assigned to their defence?
- Strategic fire suppression - Where to suppress and where to let the fire run?
- Where should fire breaks be built?

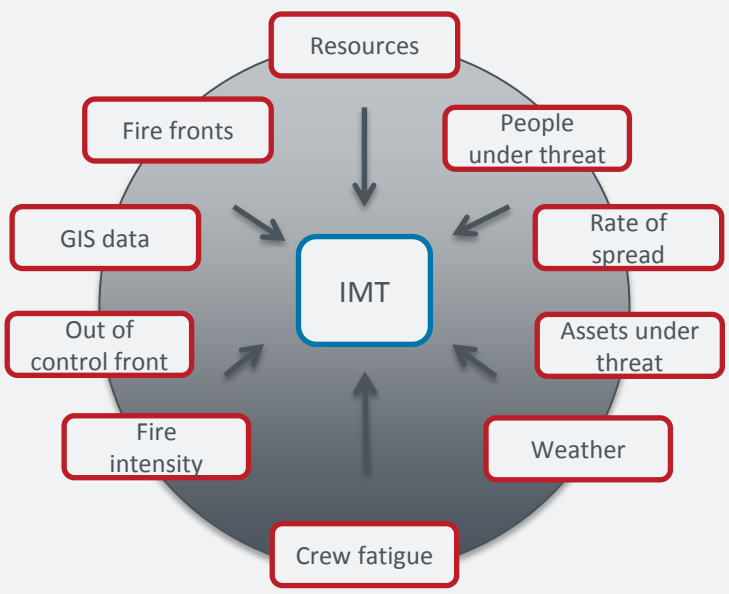

FIGURE: IMTs have to make complex decisions, taking into account a large variety of factors while balancing multiple objectives.

Research Questions

- What are the decision faced by IMTs?
- Are the decisions faced by bushfire IMTs similar to any other decisions environments?
- Which of these decisions could benefit from OR methods?
- What methods are most appropriate for tackling these problems?


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Research Methods

- A literature review of bushfire incident management.
- A review of the application of OR to assist IMTs in bushfire and other emergency response situations.
- Identify decisions for in depth research through interviews with end users and other researchers.
- Qualitative methods such as Systems Thinking will be used to define and structure the problem.
- Quantitative methods such as simulation, linear programming and heuristics will be used to design decision support tools.
- Create a suite of models which could provide decision support to IMTs.
- Collaborate with end users to ensure that the models constructed are realistic and that IMTs will be able to use and understand them.

Research Outcomes

- A better understanding of the decisions faced by IMTs and how OR may benefit these decisions.
- Decision support tools for IMTs.

Literature

1.Mclennan, J., Holgate, A.M., Omodei, M.M. & Wearing, A.J. Decision Making Effectiveness in Wildfire Incident Management Teams. **14**, 27-37 (2006).

2.Minas, J.P., Hearne, J.W. & Handmer, J.W. A review of operations research methods applicable to wildfire management. *International Journal of Wildland Fire* **21**, 189 (2012).