Climate Change Adaptation Research Grants Program
- Emergency Management Projects

Project title:
Agent based simulation framework for improved understanding and enhancement of community and organisational resilience to extreme events.

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Objectives:
To develop a modular agent based simulation platform, that allows emergency management stakeholders to explore complex multi-scalar, multi-actor, emergency management interactions under uncertain future conditions, in order to promote more effective governance arrangements. The platform is also intended to be a long term decision support tool suitable for the development of agent based simulations which address a range of extreme events, such as coastal flooding, heat stress, etc.

Project design and methods
This proposal is a multi-disciplinary collaborative project which aims to produce a specific application of a simulation tool that will support decision making in preparing and responding to evolving bushfire risk, as well producing a modular simulation framework and methodology for developing reusable modules that will facilitate further applications in the future. Due to the fact that stakeholders are currently preparing for the bushfire season and responding to the recommendations of the Royal Commission, it has not been possible to coordinate meetings to discuss the exact focus of the simulation application. However, we have approached key stakeholders (CFA, DSE, AFAC and others) and they have expressed interest. Meetings have been arranged with them early in 2010 to progress this agenda. This engagement will be formalised with the hosting of a workshop in the first month of the project, jointly organised with the National Adaptation Research Network in Emergency Management and will determine the application focus, each organisation's level and type of engagement, and the participation of other relevant stakeholder communities. A series of stakeholder advisory group meetings and project workshops will take place over the course of the intended project.

The project will also be subject to rigorous peer review through a set-up of expert review panels (inputting to both the modelling and institutional work packages). The application component of the research will be informed by 1) the combination of academic knowledge and understanding of institutional adaptive management (and related areas of social science disciplines) and 2) real world contextual information, as elicited through a variety of participatory processes, to populate individual modules and identify key linkages and interactions between them. Developmental work on the platform, methodology, and support tools, will be closely interleaved with the analysis of institutional structures and processes, real world data collation, and the modelling of various aspects of the selected application domains (to be determined in consultation with key stakeholders). In addition to the individual application modules, the research will develop a platform that allows incremental building of a complex simulation by integrating separate modules - some of which will be re-usable and/or pre-existing. This will facilitate extendible applications and allow further consideration of climate change adaptation options in differing contexts across Australia. Addressing this agenda, the project has been structured according to five discrete, though closely inter-linked, work packages:

WP1: Project framing
Due to the complexity of the subject matter, initial scoping activity will be undertaken to establish with stakeholders, the details of the research focus and approach, and to ensure that this is translated into a language that can be understood by all those involved with the project (including the non-academic audience).

WP2: Development of the technical platform
This work package will provide the technical architecture for the agent-based modelling platform. The current approach to building agent based simulations is to develop them as a single integrated application, typically using rather simple agents. Our approach is to integrate separately built modules covering specific aspects or expertise areas, to incrementally build an application. Modules would be able to use different underlying approaches - some having more intelligent/complex agents or organisational structures. Inclusion of GIS map capabilities is also an important aspect of the target platform.

WP3: Institutional analysis
This work package will combine theoretical desk-top research (addressing a range of social science disciplines) with participatory activity that seeks to elicit knowledge from the actors involved in bush fire management (a program of actor-based research involving both RMIT and the University of Melbourne). *WP* 3 *is supported by an expert scientific panel on institutions (including input from the adaptation research network/or emergency management).*

WP4: Application development and testing
Drawing from theoretical and real world evidence, a detailed application will be built using the simulation framework. This will be based on a small number of case studies or scenarios, which we will refer to as 'learning examples'. These will inform the development of the application and are to be selected in consultation with key stakeholders in the inaugural meeting being reflective of critical issues facing those responsible for evolving bushfire management practice. Possible applications could be geographical, multiactor, multi-level, or issue led (e.g. understanding the multi-level interaction, roles and responsibilities of different actors responsible for fire outbreaks in peri-urban areas). An iterative engagement process of interviews, advisory group meetings, and 'learning example' workshops, will be used to elicit the knowledge needed to encode the simulation modules, integrate them into the overall modelling framework, and help resolve technical issues as they arise.
The planned close engagement with experts and wider stakeholder communities ensures that 1) the representation of agents behaviour is informed not only by theory but is also embedded in reality, 2) that the methodology is transparent and understandable, and the interface is user-friendly; and finally, 3) that the stakeholders themselves are involved in a process of social learning as the simulation platform undergoes development.

WP5: Dissemination
An important final task of the project will be to actively showcase and promote the final simulation platform to different stakeholder communities. This will be achieved through a series of workshops which will target key knowledge brokers who will then be able to distribute the resource through their individual peer to peer networks.